BASIN MANAGEMENT ACTION PLAN

PHASE 2

for the Implementation of Total Maximum Daily Loads Adopted by the Florida Department of Environmental Protection in the Upper Ocklawaha River Basin

prepared by the
Division of Environmental Assessment and Restoration
Water Quality Restoration Program
Florida Department of Environmental Protection
Tallahassee, FL 32399

in cooperation with the
Upper Ocklawaha River Basin Working Group

July 2014

ACKNOWLEDGMENTS

The Florida Department of Environmental Protection first adopted the *Upper Ocklawaha River Basin Management Action Plan* by Secretarial Order in 2007 as part of its statewide watershed management approach to restore and protect Florida's water quality. The plan was developed and has been updated in cooperation with the Upper Ocklawaha Basin Working Group (BWG), identified below, with participation from affected local, regional, and state governmental interests; elected officials and citizens; and private interests.

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- = Empty cell/no data

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Lake County Soil and Water Conservation District	Florida Department of Agriculture and Consumer Services	Oklawaha Valley Audubon Society
Marion County	Florida Department of Transportation	Andreyev Engineering
Orange County	Florida Department of Community Affairs	B&H Consulting
Polk County	Florida Department of Environmental Protection – Central District	Applied Sciences
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Clermont	Florida Department of Health in Lake County	Boyle Engineering
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Lady Lake	-	Harris Chain of Lakes Restoration Council
Leesburg	-	Jones Edmunds
Mascotte	-	PEAR
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Mount Dora	-	Unaffiliated Citizens
Tavares	-	Stormwater 360
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LIST OF ACRONYMS AND ABBREVIATIONS

BMAP	Basin Management Action Plan
BMP	Best Management Practice
BWG	Basin Working Group
CR	County Road
Department	Florida Department of Environmental Protection
EPA	U.S. Environmental Protection Agency
ERP	Environmental Resource Permit
F.A.C.	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDOT	Florida Department of Transportation
F.S.	Florida Statutes
FWC	Florida Fish and Wildlife Conservation Commission
FWRA	Florida Watershed Restoration Act
GSACSC	Green Swamp Area of Critical State Concern
IWR	Impaired Waters Rule
kg/ha/yr	Kilograms per Hectare per Year
lbs/yr	Pounds per Year
LCWA	Lake County Water Authority
LID	Low Impact Development
LVI	Lake Vegetation Index
MEP	Maximum Extent Practicable
MFL	Minimum Flows and Levels
µg/L	Micrograms Per Liter
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NuRF	Nutrient Reduction Facility
OAWP	Office of Agricultural Water Policy (FDACS)
OCEPD	Orange County Environmental Protection Department
QA	Quality Assurance
QC	Quality Control
SJRWMD	St. Johns River Water Management District
SR	State Road
STORET	Storage and Retrieval (database)
SWMP	Stormwater Management Program
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSI	Trophic State Index
TSS	Total Suspended Solids
WBID	Waterbody Identification (number)

SUMMARY

This document describes the management priorities for the second phase of the 2007 Upper Ocklawaha Basin Management Action Plan (BMAP) adopted by Florida Department of Environmental Protection Secretarial Order in August 2007. In this second phase BMAP, new strategies are proposed for continuing water quality improvements that help in achieving the nutrient total maximum daily loads (TMDLs) covered by the BMAP. The 2007 BMAP remains in full effect, except as specifically modified herein.

The BMAP provides for phased implementation under Subparagraph 403.067(7)(a)1, Florida Statutes (F.S.), and this adaptive management process will continue until the TMDLs are met. The phased BMAP approach allows for incrementally reducing loadings through the implementation of projects, while simultaneously monitoring and conducting studies to better understand water quality dynamics (sources and response variables) in each impaired waterbody. Subsequent BMAP phases will continue to evaluate progress and make adjustments or add new projects, as needed, to meet the TMDLs.

The BMAP process strives to achieve cooperation and consensus among a broad range of interested parties. The process promotes the engagement of local stakeholders in a coordinated and collaborative manner to address the total phosphorus (TP) reductions needed to achieve the Upper Ocklawaha River Basin TMDLs. The Department started development of this phase two BMAP in October 2013 with subsequent monthly meetings through March 2014.

UPPER OCKLAWAHA RIVER BASIN TMDLS

The Upper Ocklawaha River Basin is located mostly in Lake County. It also encompasses the northwest portion of Orange County, southern Marion County, and the northern part of Polk County.

TMDLs establish the maximum amount of specific pollutants that a waterbody can assimilate while maintaining designated uses. All impaired surface waters covered by the BMAP are designated as Class III waters in accordance with Chapter 62-302, Florida Administrative Code (F.A.C.). Class III waters are defined as having suitable water quality for recreational use and for the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Management strategies addressing the TMDLs in this basin were included in a single BMAP, because of the connection of the TMDL waterbodies as chains of lakes.

Certain waterbodies in the basin were previously identified as not meeting their designated uses and were verified by the Department as impaired for nutrients. In 2003 and 2004, the Department adopted TMDLs for the following ten impaired waterbodies that are covered by the BMAP:

- *Lake Apopka.*
- *Lake Beauclair.*
- *Lake Carlton.*
- *Lake Dora and Dora Canal.*
- *Lake Eustis and Haines Creek.*
- *Trout Lake.*
- *Lake Harris (includes Little Lake Harris and Helena Run).*
- *Palatlakaha River (north of State Road 50).*
- *Lake Griffin.*
- *Lake Yale and Lake Yale Canal.*

TP is the primary pollutant contributing to the impairment of all these waterbodies. In Trout Lake and the Palatlakaha River, total nitrogen (TN) contributes to the problem, and biological oxygen demand was also identified as a pollutant contributing to the impairment in the Palatlakaha River. Although the BMAP currently focuses exclusively on TP, the restoration activities under the BMAP will also result in reductions in TN and biological oxygen demand.

PROGRESS SINCE BMAP ADOPTION IN 2007

Annual average TP concentrations in each lake were compared for the TMDL baseline period (1991-2000) and post-TMDL period (2001-2012) and are displayed in **Figure ES-1** as percent change. A positive percent change in **Figure ES-1** indicates a decline in TP concentration, while a negative percent change indicates an increase in TP concentration. The basin was subjected to extended periods of drought in recent years.

TP concentrations in samples collected from Lakes Apopka, Beauclair, Dora, Carlton, and Griffin have declined considerably since the TMDL baseline period with the largest reduction observed in Lake Beauclair (48%). For Lakes Eustis, Harris, and Little Lake Harris there have been much smaller declines. The TP concentrations in samples collected from Lake Yale and Trout Lake have increased. TP

concentration in the Palatlakaha River increased by 38% between the baseline and post-TMDL periods. Those waterbodies not showing water quality improvement will need additional effort during this second BMAP cycle and have been selected as focus waterbodies.

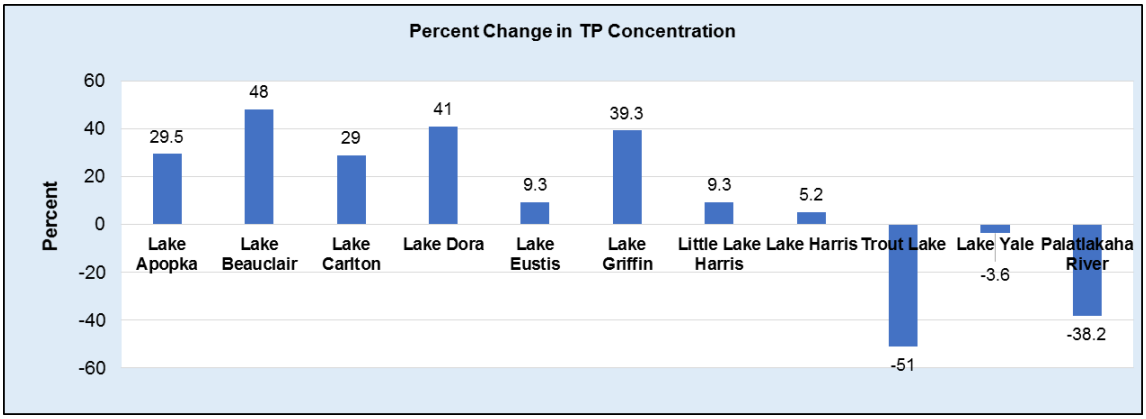


FIGURE ES-1: PERCENT CHANGE IN TP CONCENTRATION BETWEEN THE BASELINE TMDL PERIOD (1991-2000) AND POST-TMDL PERIOD (2001-2012) FOR EACH WATERBODY

Annual average TP loadings were compared across the lakes between the baseline period and post-TMDL period and are displayed as percent change by lake (**Figure ES-2**). TP loading data for Trout Lake for the post-TMDL time period were not available. Little Lake Harris is not explicitly included in the comparison, because its loading is included with Lake Harris. A positive percent change in **Figure ES-2** indicates a decline in loading, while a negative percent change indicates an increase in loading. The greatest decrease in TP loading was found in Lake Beauclair, Lake Dora, and Lake Apopka with decreases of 70%, 67%, and 65%, respectively. Lakes directly downstream of Lake Apopka have benefitted the most from activities to restore former agricultural lands around Lake Apopka and reduce loadings from those lands. Lake Yale's TP loading has increased between time periods.

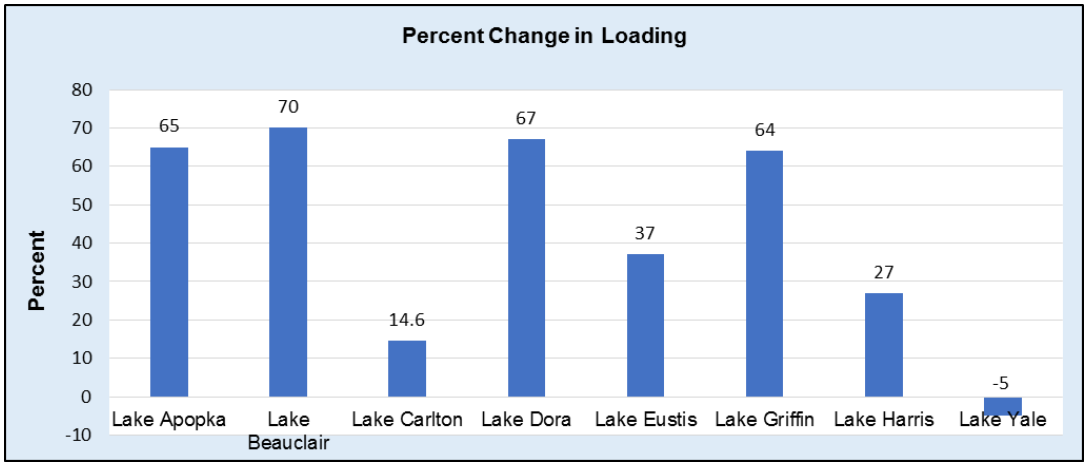


FIGURE ES-2: PERCENT CHANGE IN TP LOADING BETWEEN THE TMDL PERIOD (1991-2000) AND THE POST-TMDL PERIOD (2001-2011)

Figure ES-3 displays the percent change in annual average chlorophyll-*a* concentrations for each lake between the baseline period and the post-TMDL period. Chlorophyll-*a* is used as an indicator of algal biomass in a lake. With the exception of Lake Yale, all lakes were showing a decline in chlorophyll-*a* concentration between the baseline and TMDL periods, although concentrations are still quite high. Chlorophyll-*a* data for the baseline period for Lake Carlton and Trout Lake included uncorrected chlorophyll-*a* data to adequately represent the time period. All other chlorophyll-*a* data were corrected. For this reason, the change in chlorophyll-*a* concentration may not be as large for these lakes. Lake Griffin has had the most dramatic decline in chlorophyll-*a* concentration (55%). Lake Yale's chlorophyll-*a* concentration almost doubled.

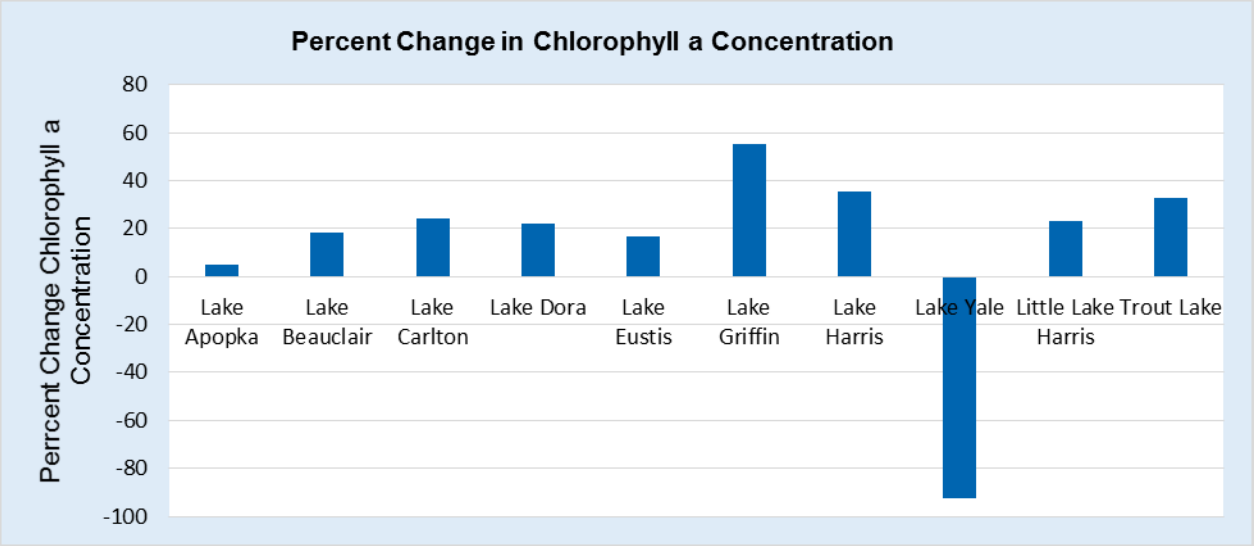


FIGURE ES-3: PERCENT CHANGE IN CHLOROPHYLL-A CONCENTRATION BETWEEN THE TMDL BASELINE PERIOD (1991-2000) AND THE POST-TMDL PERIOD (2001-2012) FOR EACH LAKE

TP LOAD REDUCTIONS AND MANAGEMENT STRATEGIES

Management strategies in the Upper Ocklawaha River Basin prevent more than 247,000 pounds per year of TP from reaching the TMDL waterbodies. Load reductions have been calculated for all TMDL waterbodies based on reductions expected from completed and proposed projects (**Figure ES-4**). Additional loading from future growth is factored into calculations. Waterbodies shaded in dark blue in **Figure ES-4** are expected to meet their TMDLs. The waterbodies shaded in dark pink in **Figure ES-4** will not meet their TMDLs without additional effort.

The first phase BMAP focused on TP load reduction by three primary management strategies: (1) restoration of former agriculture lands by the St. Johns River Water Management District (SJRWMD) to substantially reduce their loading to impaired lakes, (2) completion of the Nutrient Removal Facility (NuRF) by the Lake County Water Authority (LCWA) that removes excess TP from Lake Apopka and

improves water quality in the Apopka-Beauclair Canal and downstream lakes, and (3) construction of local government stormwater improvement projects. The management strategy commitments in this phase two BMAP continue the efforts for public restoration projects and stormwater improvements. In addition, this BMAP adds focus to specific waterbodies within the basin. The five focus waterbodies are Trout Lake, Lake Carlton, Lake Harris, Palatlakaha River, and Lake Yale (**Figure ES-4** and **Table ES-1**). The Department anticipates identifying additional management strategies for these waterbodies within 12 to 18 months after adoption of this second phase BMAP. This BMAP includes strategies to ensure the implementation of agriculture best management practices (BMPs), identify other sources of TP loading, and evaluate new basin TMDLs as they are adopted. This BMAP requires agricultural producers to implement commodity appropriate BMPs upon their adoption by the Department of Agriculture and Consumer Services.

An additional 63 projects are adopted with this second BMAP phase. They largely address the management strategy of improved local government stormwater control. Reducing TP discharges into the basin will help achieve Class III designated uses established by the Department for the Upper Ocklawaha River Basin.

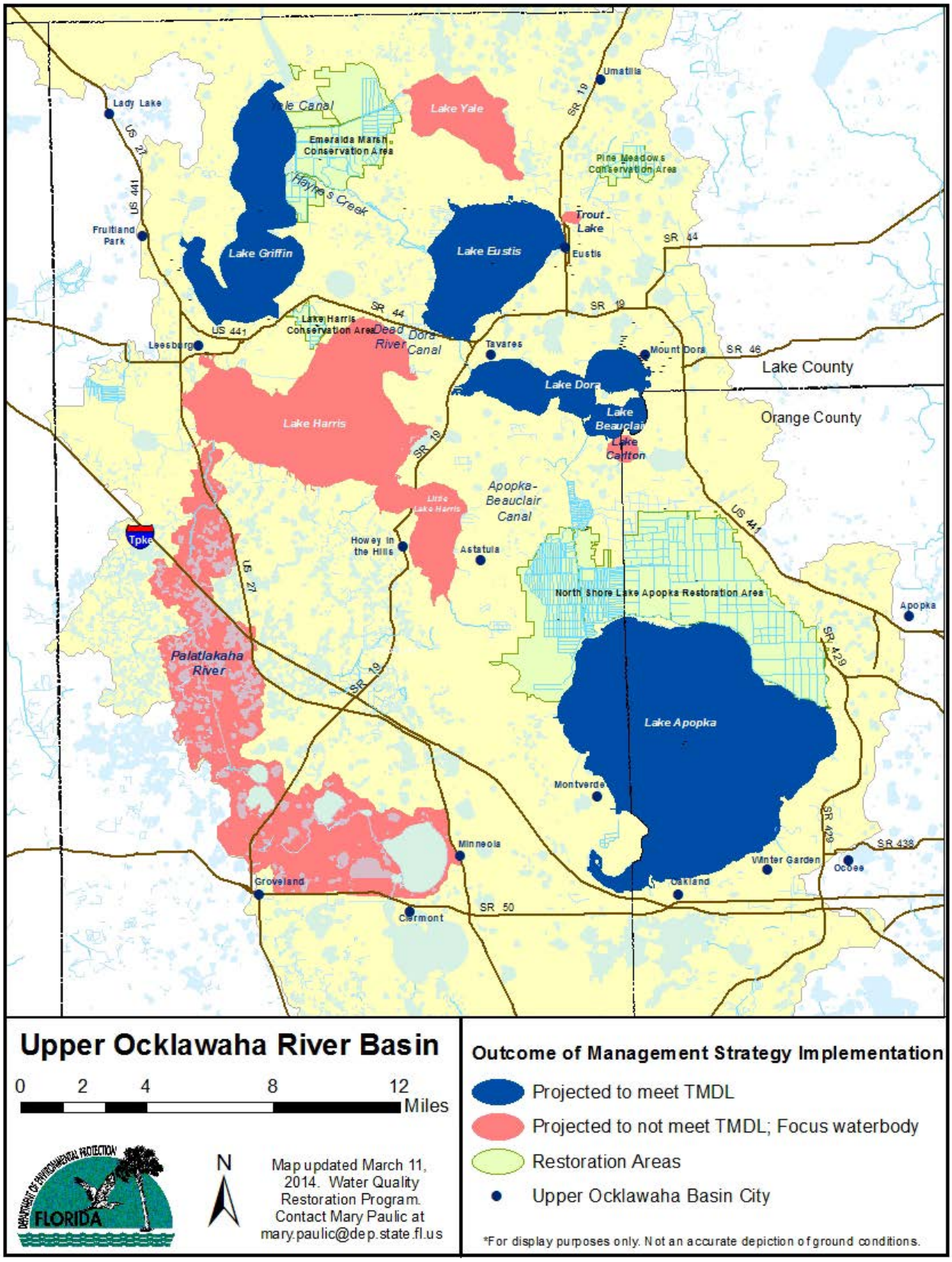


FIGURE ES-4: ANTICIPATED OUTCOMES OF MANAGEMENT STRATEGIES IN THE UPPER OCKLAWAHA RIVER BMAP

TABLE ES-1: SUMMARY OF TP LOADINGS AND CONCENTRATION FROM MEASURED DATA

* - Baseline is 1989-1994; for the comparable 1991-2000 period the average annual loading for Lake Apopka is 113,932 lbs/year.
(+) = Positive or adequate score.
(-) = Insufficient or negative score.

Type of Criteria	Lake Carlton	Lake Beauclair	Lake Dora	Lake Eustis	Lake Harris	Lake Griffin	Lake Yale	Lake Apopka*	Palatlakaha River	Trout Lake
Average Annual Loading 1991-2000 lbs/yr (Baseline)	476	46,721	40,059	35,519	27,597	78,885	3,354	137,451*	NA	2,604
TMDL Loading Target lbs/yr	195	7,056	13,230	20,286	18,302	26,901	2,844	35,052	2,207	521
Average Annual Loading 2001-2011 lbs/yr (Post)	410	14,106	13,410	22,422	20,161	28,652	3,538	47,813	Not applicable	Not available
Percent Reduction Between Baseline and Post Periods	14.6% (+)	70% (+)	67% (+)	37% (+)	27% (+)	64% (+)	-5.5% (-)	65% (+)	Not applicable (-)	Not available (-)
Reduction Needed to Meet TMDL Based on 2001-2011 lbs /yr	215	7,050	180	2,136	1,859	1,751	694	12,761	Not applicable	Not available
Average Annual Loading 2007-2011 lbs/yr	499 (-)	4,669 (+)	7,996 (+)	16,38 (+)	18,779 (+)	19,649 (+)	4,205 (-)	40,249* (+)	Not applicable (-)	Not available (-)
Reduction Needed to Meet TMDL Based on 2007-2011 lbs/yr	304	-2,387.4	-5,234.2	-3,904.3	476.6	-7,252.5	1,361.2	5,197.0	Not applicable	Not available
Number of Projects Adopted	<5 (-)	<5 (-)	30 (+)	>30 (+)	17 (-)	24 (+)	<5 (-)	22 (+)	20 (+)	<5 (-)
Trend in TP concentration	Decrease (+)	Decrease (+)	Decrease (+)	Small decrease (+)	Small decrease (+)	Decrease (+)	No change (-)	Decrease (+)	Increase (-)	Increase (-)
Waterbodies expected to need additional effort	**Carlton**	Not applicable	Not applicable	Not applicable	**Harris**	Not applicable	**Yale**	Not applicable	**Palatlakaha River**	**Trout**

ALLOCATIONS

The BWG agreed that basin allocations adopted as part of each TMDL were appropriate for the initial BMAP, as well as this second BMAP iteration. During this second BMAP phase, the Department and BWG will evaluate whether specific allocations are needed as a tool for achieving reductions in specific waterbodies or parts of the basin. The following factors were considered in making that decision:

- *There is only one permitted facility discharging to a surface water, as of the updating of the BMAP (2014). This facility has a wasteload allocation as part of the Lake Apopka TMDL.*
- *Major restoration and other projects being implemented by SJRWMD and LCWA are substantially reducing nutrient and sediment loadings in the basin. In addition, Lake County, Orange County, several municipalities, Florida Department of Transportation (FDOT), and the agricultural industry are planning stormwater management projects or implementing BMPs that will contribute to nutrient and sediment load reductions.*
- *Local governments are increasingly taking greater responsibility for improvement of their surface water resources. The BMAP process is an opportunity for some to build their expertise and efforts and for others to share their knowledge and resources through partnerships.*

BMAP FOLLOW-UP AND COMMITMENT TO IMPLEMENTATION

The Department will continue to work with the stakeholders to assess progress under the first phase BMAP and this second phase BMAP, organize and evaluate monitoring data, evaluate sources and identify new management strategies, and track management strategy implementation. The BWG will continue to meet after adoption of this second phase of the BMAP to follow up on plan implementation, share new information, and continue to coordinate on TMDL-related issues.

The BWG members are required to implementing the management strategies included in this BMAP and have committed to work together to attain the Upper Ocklawaha TMDLs.

Chapter 1: CONTEXT, PURPOSE, AND SCOPE OF THE PLAN

For this second phase of the basin management action plan (BMAP), new management strategies for continuing water quality improvements that help in achieving the nutrient total maximum daily loads (TMDLs) in this basin are identified. This second phase of the Upper Ocklawaha River BMAP includes ongoing and new management strategies that will be undertaken by local, regional, state, or private entities that reduce total phosphorus (TP) loadings in the Upper Ocklawaha River Basin. The first phase of the BMAP remains in full effect, except as modified herein.

Surface waters in the Upper Ocklawaha River Basin, are categorized as Class III waters, meaning they must be suitable for recreation and must support the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Florida's water quality standards are designed to ensure that surface waters can be used for their designated purposes. TMDLs are a mechanism used to bring impaired waters in compliance with state standards.

The original BMAP focused on TP load reduction by three primary mechanisms: (1) restoration of former agriculture lands by the St. Johns River Water Management District (SJRWMD) to substantially reduce their loading to impaired lakes, (2) completion of the Nutrient Removal Facility (NuRF) by the Lake County Water Authority (LCWA) that removes excess TP from Lake Apopka and improves water quality in the Apopka-Beauclair Canal and downstream lakes, and (3) construction of local government stormwater improvement projects. This second phase of the BMAP continues the efforts in reducing TP loadings by providing for additional focus on specific waterbodies within the basin. The five focus waterbodies are Trout Lake, Lake Carlton, Lake Harris, Palatlakaha River, and Lake Yale. The Department anticipates identifying additional management strategies for these waterbodies within 12 to 18 months after adoption of this BMAP. This second phase of the BMAP includes efforts to ensure full implementation of agriculture best management practices (BMPs), and to identify other sources of TP loading.

There are other factors besides external loading that are causing water quality problems within the TMDL waterbodies, such as lack of aquatic plants and habitat for fish. One of the strategies for the next five years is to identify these factors and their role and influence on water quality and, as feasible, implement projects that address these causes. Some of these factors are identified in the considerations section (**Section 1.5**).

The Florida Watershed Restoration Act (FWRA) allows for a phased approach in meeting the loading reductions in a TMDL. The adopted BMAP reflects this phased implementation of TMDLs. The BMAP should be considered a working document and will be updated as new projects and findings are identified. It is expected that this BMAP will be updated within the next five years.

1.1 BACKGROUND

The Upper Ocklawaha River Basin is located mostly in Lake County (see **Figure 1**) and the impaired waterbodies in the basin are displayed in **Figure 2**. The basin also encompasses the northwest portion of Orange County, southern Marion County, and the northern part of Polk County. About half the flow in this basin originates from the Green Swamp, as the Palatlakaha River, and Lake Apopka watersheds. The Upper Ocklawaha Basin consists of four primary connected chains of waterbodies including:

- *Lake Apopka and the Apopka-Beauclair Canal draining 183 square miles. The Apopka-Beauclair Canal discharges to Lake Beauclair.*
- *The Clermont Chain of Lakes (Minneola, Minnehaha, and Louisa, along with 12 other smaller lakes), connected by the Palatlakaha River draining 223 square miles. The Palatlakaha River discharges to Lake Harris.*
- *The Harris Chain of Lakes including Lakes Beauclair, Carlton, Dora, Eustis, Harris, and Little Harris Dora Canal; Dead River; and Trout Lake draining 240 square miles. Water moves from Lake Harris to Lake Eustis and from Lake Dora to Lake Eustis. Discharge from Lake Eustis flows through Haynes Creek to Lake Griffin.*
- *Lake Griffin and Lake Yale, the Yale Canal, some tributaries to Lake Griffin, Emeralda Marsh, and Haynes Creek draining 232 square miles. The Ocklawaha River originates as a discharge from Lake Griffin.*

Within a chain of lakes, water quality problems that occur in one lake can be easily transferred to the other lakes. Many of the problems experienced by Lakes Dora and Beauclair result from the discharge of degraded water from Lake Apopka through the Apopka-Beauclair Canal.

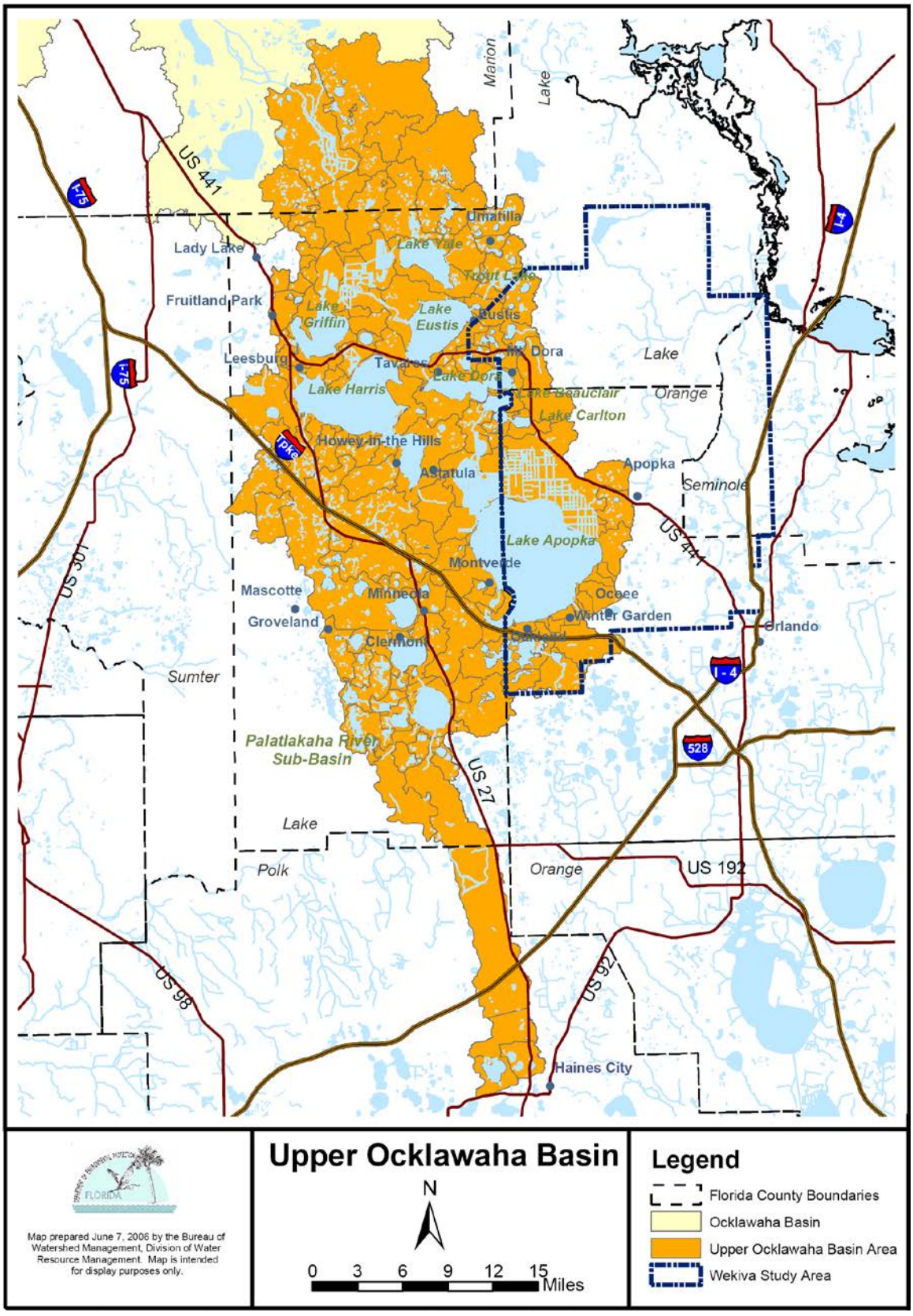
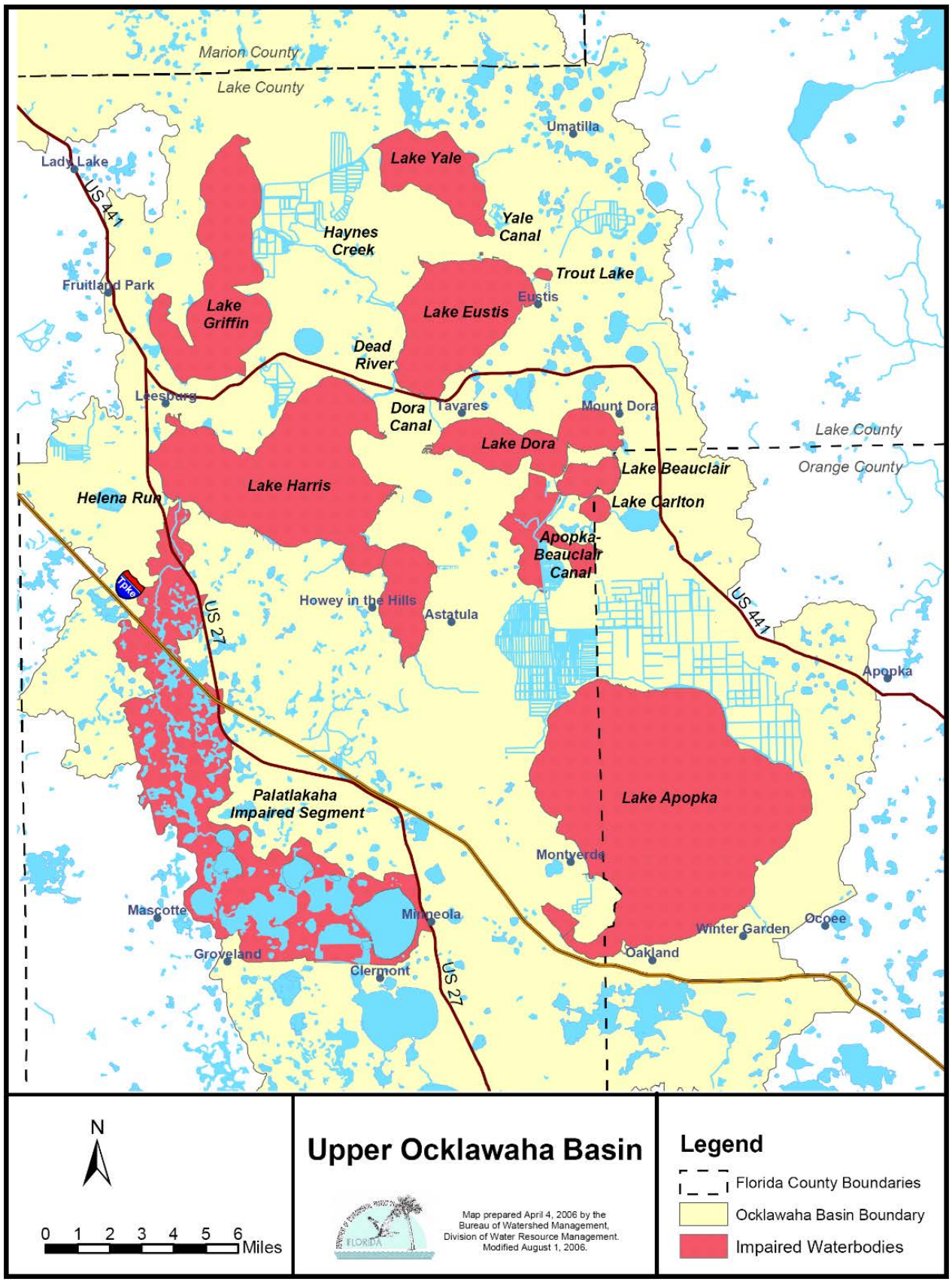


FIGURE 1: MAP OF THE UPPER OCKLAWAHA RIVER BASIN



Note: Red areas represent the boundaries of the impaired water segments.

FIGURE 2: WATERBODIES IN THE UPPER OCKLAWAHA BASIN WITH ADOPTED TMDLS

TMDLs are water quality targets for waterbodies that the Florida Department of Environmental Protection has identified as impaired for specific pollutants (such as TP, total nitrogen [TN], and bacteria). TMDLs, which the Department adopts by rule, establish the maximum amount of specific pollutants that a waterbody can assimilate while maintaining applicable water quality standards, which are based on the designated uses. Ten waterbodies in the basin did not meet their designated uses and were verified by the Department as impaired. TP is the primary pollutant contributing to the impairment of all these waterbodies. In Trout Lake and the Palatlakaha River, TN also contributes to the water quality impairment, and biological oxygen demand has been identified as an additional pollutant contributing to the impairment of the Palatlakaha River.

In 2003 and 2004, the Department adopted TMDLs for the following ten impaired waterbodies and associated tributary and connecting canals and streams (e.g., Haynes Creek, Dead River, Apopka-Beauclair Canal, Dora Canal, and Yale Canal) in the Upper Ocklawaha River Basin: Lake Apopka, Lake Beauclair, Lake Carlton, Lake Dora, Lake Eustis, Trout Lake, Lake Harris (includes Little Lake Harris), Palatlakaha River (north of State Road 50l), Lake Griffin, and Lake Yale.

Table 1 lists the TMDLs currently adopted for these waterbodies. TMDLs loading estimates were based on water quality data for the period of 1991-2000, also called the baseline period, with the exception of Lake Apopka's TMDL which is based on data for 1989-1994. As part of the second BMAP iteration, the Department and several of the Basin Working Group (BWG) members are collecting periodic water quality data that will be used to further analyze the water quality impairments in the basin and establish additional TMDLs. During the second iteration of the BMAP, TMDLs will be proposed for Lake Denham, Marshall Lake, Lake Weir, and Roberts Lake.

TABLE 1: TMDLS IN THE UPPER OCKLAWAHA RIVER BASIN

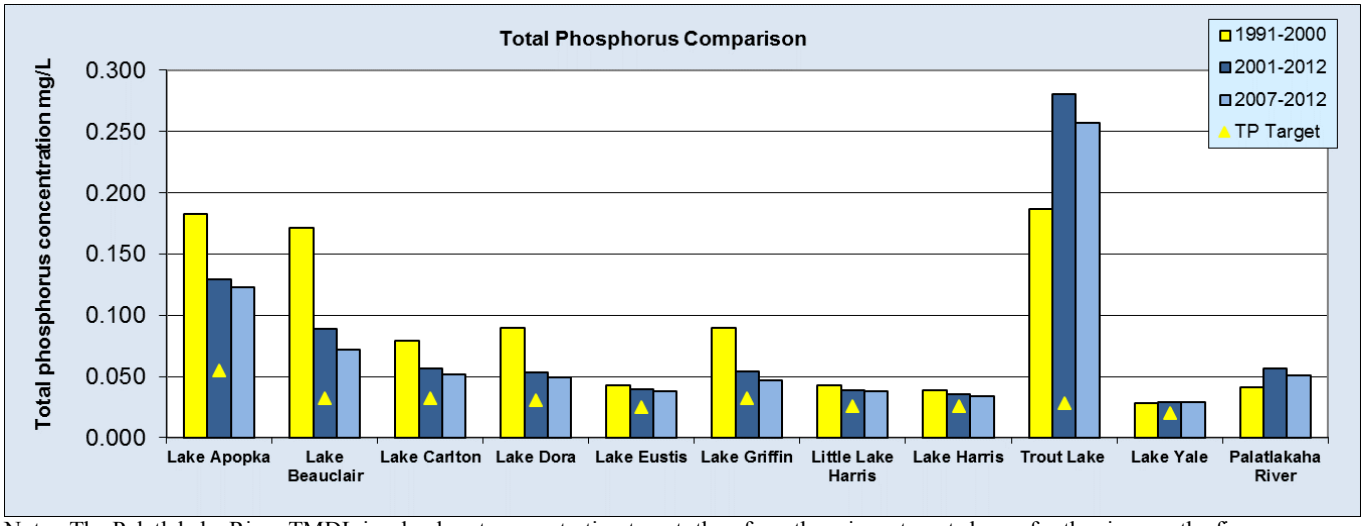
[1] TMDL baseline loads were taken from estimates by SJRWMD, except for the Palatlakaha River, Lake Carlton, and Trout Lake, whose loadings were estimated by the Department. Most of the baseline loading estimates developed by SJRWMD were calculated for the period from 1991–2000; Lake Apopka loadings are calculated for the period from 1989–1994. The Department estimated baseline loadings for Lake Carlton from 1991–2000 and Trout Lake from 1995–2000. The baseline loading year for the Palatlakaha River was 1991.

[2] Numbers for Lake Apopka were converted from metric tons per year. The TMDL includes an explicit margin of safety of 1,168 lbs/yr.

SUB-BASIN	WATERBODY IDENTIFICATION (WBID) NUMBERS	PARAMETER	TMDL (LBS/YR)	TARGET CONCENTRATION (PARTS PER BILLION)	TMDL BASELINE LOAD[1]	WASTEWATER WASTELOAD ALLOCATION (LBS/YR)	NPDES STORMWATER WASTELOAD ALLOCATION (% REDUCTION)	LOAD ALLOCATION (NONPOINT) (LBS/YR)	OVERALL NEEDED REDUCTION (LBS/YR)
Lake Apopka[2]	2835A,C,D	TP	35,052	55	137,451	2,668	None	31,216	102,399
Lake Beauclair	2834C	TP	7,056	32	46,672	None	85	7,056	39,616
Lake Carlton	2837B	TP	195	32	477	None	59	195	282
Lake Dora	2831A and 2831B	TP	13,230	31	39,646	None	67	13,230	26,416
Lake Eustis/ Haynes Creek	2817A and 2817B	TP	20,286	25	35,503	None	43	20,286	15,217
Trout Lake	2819A	TP	521	28	2,604	None	80	521	2,083
Trout Lake	2819A	TN	9,733	780	24,165	None	60	9733	14,432
Lake Harris/ Little Lake Harris	2838A, 2838B, 2832, and 2817C	TP	18,302	26	26,864	None	32	18,302	8,562
Palatlakaha River	2839	Biological Oxygen Demand	43,042	None	49,351	None	12.8	43,042	6,309
Palatlakaha River	2839	TN	16,696	None	17,604	None	5.2	16,696	908
Palatlakaha River	2839	TP	2,207	None	2,350	None	6.1	2,207	143
Lake Griffin	2814A	TP	26,901	32	77,881	None	66	26,901	50,980
Lake Yale/ Yale Canal	2807A and 2807	TP	2,844	20	3,158	None	10	2,844	314

1.2 CHANGES IN WATER QUALITY FROM THE FIRST BMAP CYCLE

Annual average TP concentrations in each lake were compared for the TMDL baseline (1991-2000), post-TMDL (2001-2012), and recent (2007-2012) time periods (**Figure 3**), and as percent change between the TMDL baseline and post-TMDL periods (**Figure 4**). A positive percent change in **Figure 4** indicates a decline in TP concentration, while a negative percent change indicates an increase in TP concentration. The intent of displaying the most recent time period is to indicate the potential direction of trends; however, data collected over this shorter time period is more likely to be influenced by hydrologic conditions, as the basin was subjected to extended periods of drought in recent years. In this context, the averages calculated for the longer time periods are the more reliable indicators of the status of water quality.



Note: The Palatlakaha River TMDL is a load, not concentration target; therefore, there is no target shown for the river on the figure.

FIGURE 3: COMPARISON OF ANNUAL TP CONCENTRATIONS IN EACH OF THE LAKES BY TIME PERIOD

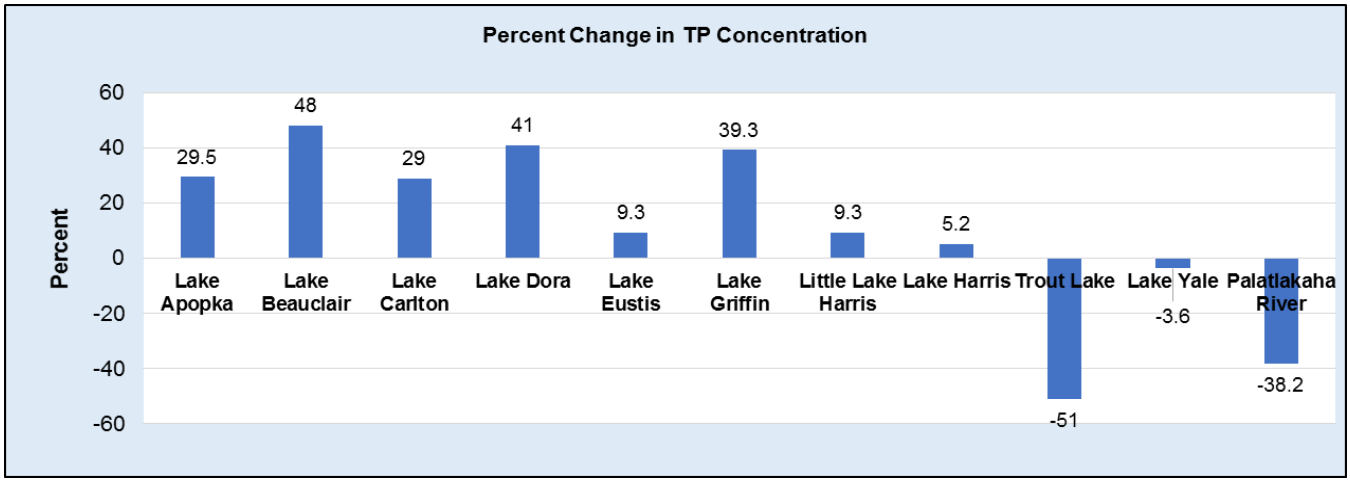


FIGURE 4: PERCENT CHANGE IN TP CONCENTRATION BETWEEN BASELINE AND POST-TMDL PERIODS

Primary agencies that contribute data to these assessments are the SJRWMD, Lake County, Orange County, Department, and Lake Watch.

TP concentrations in samples collected from Lakes Apopka, Beauclair, Dora, Carlton, and Griffin have declined considerably since the TMDL baseline period, with the largest reduction observed in Lake Beauclair (48%). For Lakes Eustis, Harris, and Little Harris, there have been much smaller declines. The TP concentrations in samples collected from Lake Yale and Trout Lake have increased. The TP and TN concentrations in the Palatlakaha River increased by 39% and 15.7%, respectively between TMDL baseline and post-TMDL periods. The Palatlakaha River was listed for DO and mean DO concentrations for the TMDL baseline and post-TMDL periods were 4.75 and 4.2 mg/L, respectively. Those waterbodies not showing water quality improvement will need additional effort during this second BMAP cycle and have been selected as focus waterbodies.

Average annual TP loadings were compared across the lakes between the baseline period and TMDL period, and are displayed as percent change by lake (**Figure 5**). TP loading data for Trout Lake and the Palatlakaha River for the post-TMDL time period were not available. Little Lake Harris is not explicitly included in the comparison because its loading is included with Lake Harris. A positive percent change in **Figure 5** indicates a decline in loading, while a negative percent change indicates an increase in loading. The greatest decrease in TP loading was found in Lake Beauclair, Lake Dora, and Lake Apopka, with decreases of 70%, 67%, and 65%, respectively. Lakes directly downstream of Lake Apopka have benefitted the most from activities to restore former agricultural lands and reduce loadings from those lands around Lake Apopka. Lake Yale's TP loading has increased between time periods.

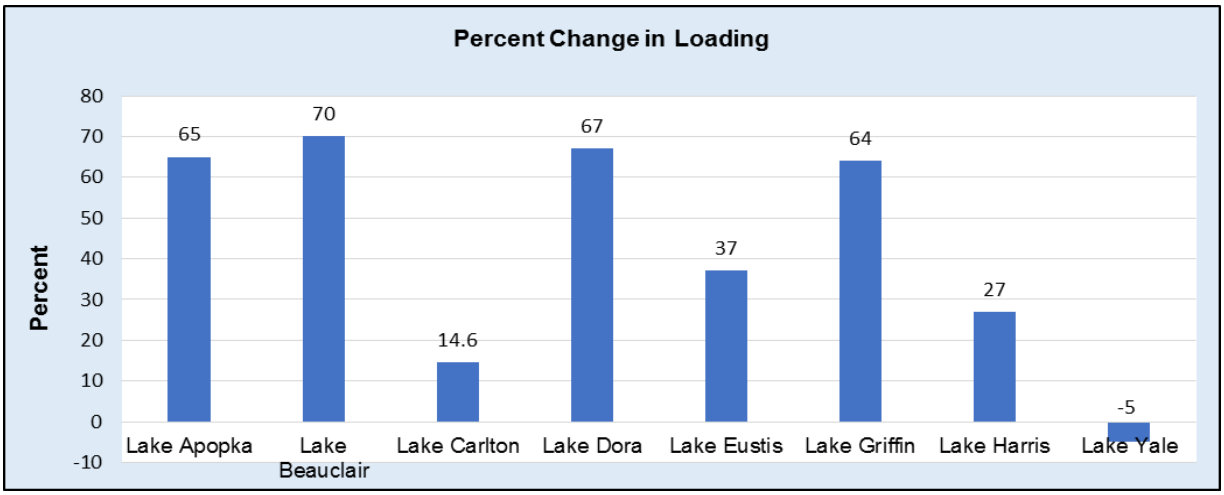


FIGURE 5: PERCENT CHANGE IN TP LOADING BETWEEN BASELINE AND POST-TMDL PERIODS

Figure 6 displays annual average chlorophyll-*a* concentrations for each lake across the three time periods. With the exception of Lake Yale, all lakes showed a decline in chlorophyll-*a* concentration between the baseline and TMDL period, although concentrations are still quite high. Chlorophyll-*a* data for the baseline period for Lake Carlton and Trout Lake included uncorrected chlorophyll-*a* data to adequately represent the time period. All other chlorophyll-*a* data was corrected. For this reason, the change in chlorophyll-a concentration may not be as large in these lakes. Lake Griffin has had the most dramatic decline in chlorophyll-*a* concentration with 55% (**Table 2**). Lake Yale's chlorophyll-*a* concentration almost doubled.

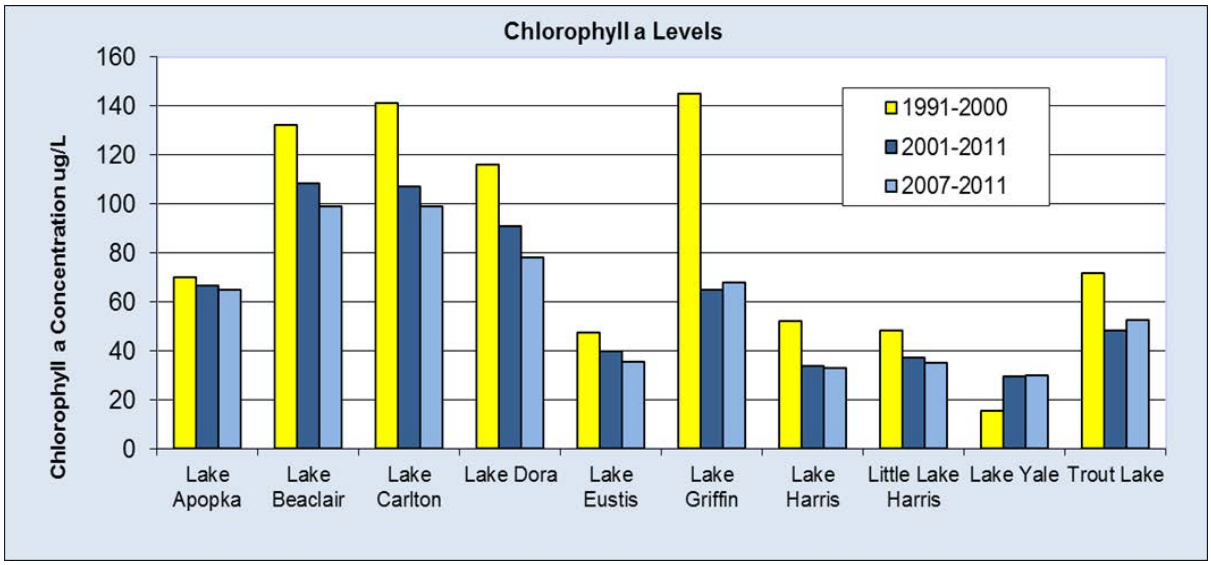


FIGURE 6: CHLOROPHYLL-*A* CONCENTRATIONS

The trophic state index (TSI) was compared for each of the lakes (**Table 2**). TSI is a measure of a lake's nutrient condition. TSI is calculated from nutrient (TN and/or TP) and chlorophyll-*a* data. For lakes with low color, a TSI of 60 is the upper limit for acceptable water quality and, for colored lakes, a TSI of 40 is the acceptable upper limit. A TSI of 60 corresponds to an estimated concentration of 20 micrograms per liter (µg/L) of chlorophyll-*a*. Lake Yale is the only lake for which a TSI of 40 applies.

TABLE 2: COMPARISON OF TSI VALUES BY PERIOD AND PERCENT CHANGE IN CHLOROPHYLL-A CONCENTRATION

Note: The TSI values for Lake Carlton and Trout Lake for the 1991-2000 time period were calculated using uncorrected chlorophyll-*a* values.

Time Period	Lake Apopka	Lake Beauclair	Lake Carlton	Lake Dora	Lake Eustis	Lake Griffin	Lake Harris	Lake Yale	Little Lake Harris	Trout Lake
1991-2000 TSI	79	84	84	79	65	82	65	46	66	72
2001-2012 TSI	79	79	76	74.5	63.5	70	62.5	59	63.5	68.5
2007-2012 TSI	78	78	74	73.5	63	69	62	58	61.5	67
Chlorophyll-*a* percent change	5	18.1	24.2	21.8	16.8	55.3	35.3	-92.2	23.1	32.6

The lakes have internal storages of nutrients in mucky sediments, which continue to supply the lake with nutrients. One of the detrimental effects of a mucky lake bottom is the loss of suitable habitat for rooted aquatic plants. Jeppesen et al. (2005) in a review of 35 lake case studies found that the reduction of external TP loading did result in lower in-lake TP concentrations and lower chlorophyll-*a* concentrations. However, for most lakes with internal loading, it took 10 to 15 years longer for a new TP equilibrium to be reached.

1.3 BMAP PROCESS

The Department invited stakeholders representing local governments, state and regional agencies, and environmental and business interests to participate in the Upper Ocklawaha BMAP development and updating process. Public participation was encouraged to the greatest practicable extent including through the use of a BWG and public meetings. The BWG members are listed in the Acknowledgements Section.

A preliminary evaluation of water quality was presented at the October 2011 BWG meeting. The Technical Working Group met in January 2012 to discuss potential solutions for continued water quality problems. The BWG started development of the BMAP update in October 2013 with subsequent monthly meetings through March 2014. A public meeting was held on January 29, 2014. The BWG, took a consensus-based, collaborative approach when making decisions on the content of the BMAP. To solicit participation from the general public, the BWG meetings and public meeting were formally noticed in the *Florida Administrative Register* and on the Department's website. Advertisements were also placed in local newspapers, the Daily Commercial and the Orlando Sentinel, as notice of the public meeting on the BMAP.

1.4 ALLOCATIONS

The TMDL provides a basis for allocating acceptable loads among all of the known pollutant sources in a watershed, so that appropriate control measures can be implemented and applicable water quality standards achieved. The Upper Ocklawaha BWG agreed that basin allocations adopted as part of each TMDL were appropriate for the initial BMAP, as well as this second BMAP phase. During this second BMAP phase, the Department and BWG will evaluate whether specific allocations to individual entities are needed as a tool for achieving reductions in specific waterbodies or parts of the basin. The following factors were considered in making that decision:

- *There is only one permitted facility discharging to a surface water, as of the updating of the plan (2014). This facility has a wasteload allocation as part of the Lake Apopka TMDL.*

- *Major water quality and habitat restoration and other projects being implemented by SJRWMD and LCWA are substantially reducing nutrient and sediment loadings in the basin. In addition, Lake County, Orange County, several municipalities, Florida Department of Transportation (FDOT), and the agricultural industry are planning stormwater management projects or implementing BMPs that will contribute to nutrient and sediment load reductions.*

- *Local governments are increasingly taking greater responsibility for improvement of their surface water resources. The BMAP process is an opportunity for some to build their expertise and efforts and for others to share their knowledge and resources through partnerships.*

1.5 CONSIDERATIONS

During the BMAP process, several items were identified that should be addressed in the next five years to ensure that future BMAP updates use the most accurate information:

- *<u>In-Lake Nutrient Cycling</u> – While it is important to reduce nutrient loading from the watershed to help improve the waterbodies in the basin, many of the lakes have a layer of muck from current and historical uses in the basin. This muck can cause in-lake nutrient cycling, which will add to the water quality impairment. The Department and BWG members will consider potential options to address in-lake nutrient cycling as part of this BMAP iteration.*

- *<u>Hydrologic Effects</u> – Years of either heavy or limited rainfall influence the amount of loading entering the impaired waterbodies and the TP concentration present in each waterbody. Dry years do not have as much stormwater runoff that enters each waterbody; therefore, loadings will be lower for these years. Lower water levels in dry years has a concentrating effect on the level of TP present. Wet years can provide higher stormwater loading and the volume of water may also have a diluting effect on TP concentration. Over the past decade the basin has experienced long periods of drought resulting in low water levels. Water has not been released from the Apopka-Beauclair Dam downstream to Lake Beauclair from the Burrell Dam downstream to Lake Griffin, or from the Moss Bluff Dam downstream to the Ocklawaha River for the past two years. The influence of dry and wet years is not fully accounted for in evaluation of the status of water quality in each waterbody and is one of the challenges to be addressed in this second BMAP iteration.*

- *Legacy Loading – Historically, a greater portion of the basin was in agriculture, and although land uses have changed over time, some of the loading to the lakes is from legacy loading from these historical agricultural areas. SJRWMD has bought some of the agricultural lands and placed them into conservation as a restoration tool for the impaired waterbodies. The BWG will continue to look for potential options to reduce legacy loading.*
- *Septic Systems – The number of septic systems in the basin is not precisely known, and there is the potential for failing septic systems, located in close proximity to surface waters, to be contributing to the impairments in the lakes. Septic systems were considered as a source during TMDL development. During this second BMAP iteration, additional information about the location and failure rate of septic systems near surface waters will be gathered so that the BWG can determine how to address this source, if necessary.*
- *Future Growth – Estimates of future growth were included in the original BMAP in the calculations of net TP loadings to be achieved from management strategies (**Table 3**). However, growth did not occur as estimated due to the economic downturn. Additional future growth estimates may be needed for some portions of the basin during the next five years.*
- *TP and TN as Water Quality Indicators - The form of nitrogen and phosphorus, whether it is organic or inorganic, may have different uptake potential by aquatic plants. Consideration should be given to the role of different forms of nutrients in aquatic plant growth and how they may indicate changes in water quality.*
- *Minimum Flows and Levels (MFLs) – In 2013, the SJRWMD Governing Board approved the notice of development for MFLs for Lakes Apopka, Beauclair, Dora, Eustis, Griffin, and Harris. These MFLs will be developed in 2014. Once implemented, the MFLs will set the minimum water flows and/or levels for these lakes to prevent significant harm to the water resources or ecology. Improvements in lake level could help to improve the water quality in these lakes.*

Chapter 2: TP REDUCTIONS ACHIEVED AND IDENTIFICATION OF FOCUS AREAS

2.1 NET ESTIMATED TP LOADINGS TO TMDL WATERS

A net estimated loading for each sub-basin was calculated. The basis for this calculation was the TP loadings estimated for each TMDL and for the lakes documented in Technical Publication SJ2004-5 (SJRWMD 2004) and the TMDL documents for Trout Lake, Lake Carlton, and Palatlakaha River. The estimated TP loadings take into account loadings from different land use/land cover types, spring inputs, stormwater inputs, atmospheric deposition, septic systems within 200 meters of the waterbody, and tributary inputs. The loading from an upstream impaired lake is included as a tributary input. The TP reductions expected from the proposed management strategies along with estimated TP loadings from future development were then factored into calculations. The net estimated TP loading for each impaired waterbody is determined by adjusting the baseline or existing loading (1991-2000) with reductions achieved from management strategies and increases in loading expected from future growth. The estimated load changes from future growth are based primarily on future land use maps.

The net loading analysis also considered changes in the tributary contribution to a waterbody's nutrient load. In general, this TP load changes proportionally with the change in upstream water quality. For example, implemented and future acquisition and restoration projects in the Lake Apopka watershed, including the LCWA NuRF, have improved water quality to the extent that the TP load to Lake Beauclair, just downstream, will be reduced by 40,761 pounds per year (lbs/yr) when the NuRF is in operation. These improvements in upstream water quality are reflected in the nutrient load for each affected downstream waterbody

Table 3 presents the anticipated loading reductions from BMAP implementation and provides specific details on the current and anticipated load reductions from different types of activities for each sub-basin. Implemented projects are those completed as of the end of 2005. Future projects are those planned for initiation or completion after 2005, and includes projects initiated since 2007 when the BMAP was first adopted. Restoration of former agricultural lands is a long-term commitment relying on improvements in water quality and biological indicators to determine when restoration is complete. Overall, more than 247,000 lbs/yr of TP are projected to be removed from the Upper Ocklawaha River Basin. The table also presents the net estimated loading of TP to each TMDL waterbody in the Upper Ocklawaha River Basin after BMAP implementation of proposed management strategies. The data presented in the table represent

only the projects that have quantifiable TP load reductions. There are many additional projects where the TP load reduction cannot easily be quantified, such as public education programs.

New projects added since 2007 and the addition of pollutant loads removed through street sweeping will further reduce the annual loading of TP by more than 3,000 lbs/yr. These new projects generally address the contribution of stormwater from developed lands. The estimates made for future reduction of loadings from agricultural lands represent wetland restoration on former farmland; these are not loading reductions from BMPs on operating farmland. Although the estimates used in the table and to create the figure are conservative (they do not include quantifiable loadings for all management strategies), they do indicate that additional effort is needed to continue to achieve all of the targeted TP reductions for all impaired waterbodies and to achieve water quality improvements in the focus areas. Lake Griffin is expected to meet its TMDL TP loading target with current management strategies. Even with additional projects Lake Carlton, Trout Lake, Lake Harris, Lake Yale, and the Palatlakaha River will be short of loading reductions to meet their TMDLs (**Table 3**). Additional studies and assessments may be considered as part of the BMAP as needed to characterize the sources and management opportunities in these sub-basins.

Figure 7 presents a map of the anticipated outcomes of BMAP implementation in the Upper Ocklawaha River Basin TMDL waters. It includes the locations of structural stormwater improvement projects and large scale restoration projects. It highlights (dark pink shading) those waterbodies that are not projected to achieve their TMDLs, and are the focus of this second BMAP phase. The map illustrates the importance of addressing the TP load reductions in Lake Apopka to achieving the targeted load reductions in the downstream lakes (e.g., Beauclair, Dora, and Eustis). SJRWMD's restoration and treatment programs and LWCA's NuRF provide the most significant load reduction efforts in the basin. SJRWMD's Environmental Resource Permit (ERP) requirements will help sustain the water quality improvements achieved through restoration. The net effect of the load reduction in Lake Apopka will be to benefit the downstream lakes by reducing the TP load coming into the lakes.

During the first BMAP phase, the BWG members focused on reducing the TP load from larger pollution sources. In the second BMAP phase, the BWG members will also be evaluating other pollution sources that require additional investigation or that represent a relatively smaller percentage contribution to the total loading.

TABLE 3: SUMMARY OF NET ESTIMATED LOADINGS OF TOTAL PHOSPHORUS TO TMDL WATERS IN THE UPPER OCKLAWAHA RIVER BASIN AFTER BMAP IMPLEMENTATION

Note: TP load reductions for implemented and future projects are represented by negative values (a minus sign) depicted in red text. All other TP loadings (e.g., baseline, increases, net estimated, TMDLs, and additional load reductions) needed are indicated by positive values. If there is no load reduction or increase associated with a specific category of implemented or future project, a double dash " - - " is shown.

LOADING CATEGORY	LAKE APOPKA NET TP LOADS (LBS/YR)	LAKE BEAU-CLAIR NET TP LOADS (LBS/YR)	LAKE CARLTON (TRIB TO LAKE BEAU-CLAIR) NET TP LOADS (LBS/YR)	LAKE DORA NET TP LOADS (LBS/YR)	LAKE EUSTIS NET TP LOADS (LBS/YR)	TROUT LAKE (TRIB TO LAKE EUSTIS) NET TP LOADS (LBS/YR)	LAKE HARRIS & LITTLE LAKE HARRIS NET TP LOADS (LBS/YR)	PALATLA-KAHA (TRIB TO LAKE HARRIS) NET TP LOADS (LBS/YR)	LAKE GRIFFIN NET TP LOADS (LBS/YR)	LAKE YALE (TRIB TO LAKE GRIFFIN) NET TP LOADS (LBS/YR)
TMDL Baseline Loading	**137,451**	**46,672**	**477**	**39,646**	**35,503**	**2,604**	**26,864**	**2,350**	**77,881**	**3,158**
Loading Changes from Implemented Projects	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a. Tributary inflows	- -	*-26,015*	- -	*-20,071*	*-10,762*	- -	- -	- -	*-7,813*	- -
b. Agricultural discharges	*-117,015*	- -	- -	- -	*-746*	- -	*-174*	- -	*-22,703*	- -
c. Restoration	*37,477*	*--*	- -	- -	*-603*	- -	*-4,441*	- -	*-18,747*	- -
d. Stormwater	*-35*	- -	- -	*8*	*-313*	- -	*-96*	- -	*-202*	- -
e. Point sources or other treatment options	*1,256*	- -	- -	- -	- -	- -	- -	- -	- -	*-109*
f. Explicit margin of safety	*1,168*	- -	- -	- -	- -	- -	- -	- -	- -	- -
(Subtotal) Estimated change from implemented project	**-77,149**	**-26,015**	**0**	**-20,063**	**-12,424**	**0**	**-4,711**	**0**	**-49,465**	**-109**
Loading Changes from Future Projects beyond 2005	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
a. Tributary inflows	*-134*	*-9,746*	- -	*-11,379*	*-6,859*	- -	*-121*	- -	*-4,915*	- -
b. Agricultural discharges	*0*	- -	- -	- -	*-458*	*-19*	- -	- -	- -	- -
c. Restoration	*-25,582*	*--*	- -	- -	*-138*	*-726*	*-2,465*	- -	*415*	- -
d. Stormwater	*-1,292*	- -	- -	*1,519*	*-362*	*-143*	*-188*	*-13*	*-224*	*-58*
e. Point sources or other treatment options	- -	*-5,000*	- -	- -	- -	- -	- -	- -	- -	- -
f. Explicit margin of safety	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
(Subtotal) Estimated change from future projects	**-27,008**	**-14,746**	**0**	**-12,898**	**-7,817**	**-888**	**-2,774**	**-13**	**-4,724**	**-58**
Estimated change from *implemented and future projects* (lbs/yr)	**-104,157**	**-40,761**	**0**	**-32,961**	**-20,241**	**-888**	**-7,485**	**-13**	**-54,189**	**-167**
Estimated change from *growth* (lbs/yr)	**0**	**831**	**240**	**1,263**	**3,040**	**592**	**2,896**	**346**	**2,694**	**606**
Estimated change from *projects and growth* (lbs/yr)	**-104,157**	**-39,930**	**240**	**-31,698**	**-17,201**	**-296**	**-4,589**	**333**	**-51,495**	**439**
Net Estimated Loading (lbs/yr)	**33,294**	**6,742**	**717**	**7,948**	**18,302**	**2,308**	**22,275**	**2,683**	**26,386**	**3,597**
TMDL Allowable Loading (lbs/yr)	35,052	7,056	195	13,230	20,286	521	18,302	2,207	26,901	2,844
Additional Reduction Needed (lbs/yr)	0	0	522	0	0	1,787	3,973	476	0	753

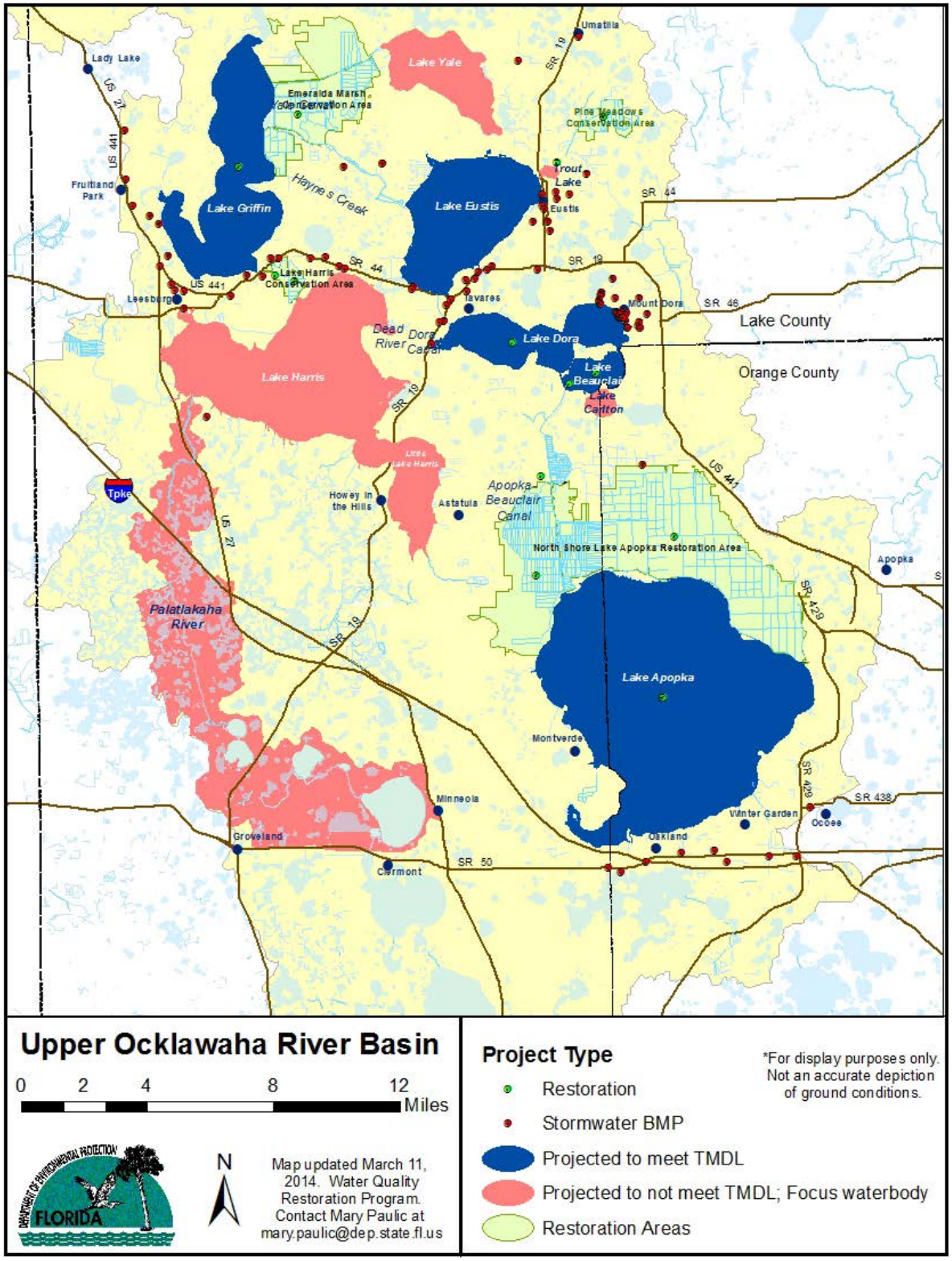


FIGURE 7: ANTICIPATED OUTCOMES OF BMAP IMPLEMENTATION IN UPPER OCKLAWAHA RIVER BASIN TMDL WATERS

Some issues, such as septic tanks, were not directly addressed during the first five years of BMAP implementation because they represent a relatively small percentage of pollutant loading. The relative importance of loading from some sources (e.g., septic tanks, future growth) increases after the implementation of the BMAP management strategies. For these issues, BWG members are implementing a variety of activities. Some will conduct detailed sub-basin studies to characterize nutrient sources to the lakes, and may, in some areas, consider additional treatment strategies (e.g., advanced septic systems design or centralized wastewater treatment facilities). Others may also revise land use development regulations, build on existing ordinances, or update public education strategies to address nutrient loads. In addition, Lake County, Mount Dora, Eustis, Orange County, Apopka, Ocoee, and Winter Garden are participating in an extensive effort to reduce the water quality impacts on springs and river systems as part of the Wekiva Springs Protection Effort implementing the Wekiva Parkway and Protection Act. Some of those efforts will also benefit the impaired waters addressed in this BMAP.

BWG efforts to implement and maintain existing and proposed management strategies, assess their effectiveness, monitor ambient water quality conditions in the basin and interpret these data, further identify and characterize pollutant sources, and evaluate additional load reduction options are all critical to a phased implementation approach. It is especially critical for the sub-basins that are not sufficiently trending towards meeting their TMDL target (e.g., Lakes Carlton, Harris, and Yale, Trout Lake, and Palatlakaha River). The additional investigation and evaluation of options to be conducted by BWG members is essential. The BWG members involved in these efforts will investigate the issues in their communities and make the appropriate management decisions for their citizens.

With this consideration, the BMAP is a working document that includes management strategies to address all the potential TP sources and investigations to improve understanding of the basin, and the additional measures needed to meet the TMDL targets. In addition, an adaptive management approach will be used during the continued implementation of the BMAP to identify and make modifications to the actions contained in the BMAP when circumstances change or feedback mechanisms indicate that a more effective strategy is needed. Tracking implementation, monitoring water quality and pollutant loads, and holding periodic BWG meetings to share information and expertise are key components of the adaptive management approach being used. **Chapter 14** presents details of the monitoring, tracking, and follow-up strategy.

2.2 IDENTIFICATION OF FOCUS AREAS

One of the strategies for the second BMAP iteration is the targeting of water quality improvement activities to specific watersheds or focus areas in the basin. This strategy is not intended to undermine or lessen the efforts already planned or needed on other waterbodies. Large scale restoration projects are still an important component of the overall restoration plan for this basin and are identified in this BMAP as significant contributors to continued improved water quality. However, several waterbodies within the basin are not projected to meet their TMDL targets (Lake Harris, Lake Griffin, Palatlakaha River, Lake Carlton, Lake Yale, and Trout Lake).

Table 4 provides an evaluation of water quality, loading reductions, and level of effort during the first BMAP cycle. This information was used to compare conditions within waterbodies and present recommendations for where to focus additional attention as part of this BMAP. Four different criteria were considered in selecting which waterbodies to target. Equal consideration was given to each criterion. They are:

- *Percent reduction in TP loading between baseline and post-TMDL period, in which a negative percent reduction is a negative trend.*
- *Average annual loading for the 2007-2011 and 2001-2011 periods was used to indicate general direction of trend (short term averages may be heavily influenced by hydrologic conditions), in which an increase in loading is a negative trend.*
- *Number of projects adopted or proposed for adoption, in which a low number of projects is negative.*
- *Trend in TP concentration, in which an increase or no change is negative.*

Cells in **Table 4** that are shaded in red indicate an insufficient or negative score for a given criterion. Green shading indicates a positive or adequate score. Using the criteria, Lake Carlton, Trout Lake, Lake Yale, and Palatlakaha River are in need of additional attention and are selected as focus areas. Management strategies for these waterbodies will be identified before the next BMAP phase. Although it is close to meeting its TMDL targets, Lake Harris was also selected as a targeted waterbody based on the low number of projects in its watershed.

TABLE 4: SUMMARY OF TP LOADINGS AND CONCENTRATION FROM MEASURED DATA

* - Baseline is 1989-1994; for the comparable 1991-2000 period the average annual loading for Lake Apopka is 113,932 lbs/year.
(+) = Positive or adequate score.
(-) = Insufficient or negative score.

Type of Criteria	Lake Carlton	Lake Beauclair	Lake Dora	Lake Eustis	Lake Harris	Lake Griffin	Lake Yale	Lake Apopka*	Palatlakaha River	Trout Lake
Average Annual Loading 1991-2000 lbs/yr (Baseline)	476	46,721	40,059	35,519	27,597	78,885	3,354	137,451*	NA	2,604
TMDL Loading Target lbs/yr	195	7,056	13,230	20,286	18,302	26,901	2,844	35,052	2,207	521
Average Annual Loading 2001-2011 lbs/yr (Post)	410	14,106	13,410	22,422	20,161	28,652	3,538	47,813	Not applicable	Not available
Percent Reduction Between Baseline and Post Periods	14.6% (+)	70% (+)	67% (+)	37% (+)	27% (+)	64% (+)	-5.5% (-)	65% (+)	Not applicable (-)	Not available (-)
Reduction Needed to Meet TMDL Based on 2001-2011 lbs /yr	215	7,050	180	2,136	1,859	1,751	694	12,761	Not applicable	Not available
Average Annual Loading 2007-2011 lbs/yr	499 (-)	4,669 (+)	7,996 (+)	16,38 (+)	18,779 (+)	19,649 (+)	4,205 (-)	40,249* (+)	Not applicable (-)	Not available (-)
Reduction Needed to Meet TMDL Based on 2007-2011 lbs/yr	304	-2,387.4	-5,234.2	-3,904.3	476.6	-7,252.5	1,361.2	5,197.0	Not applicable	Not available
Number of Projects Adopted	<5 (-)	<5 (-)	30 (+)	>30 (+)	17 (-)	24 (+)	<5 (-)	22 (+)	20 (+)	<5 (-)
Trend in TP concentration	Decrease (+)	Decrease (+)	Decrease (+)	Small decrease (+)	Small decrease (+)	Decrease (+)	No change (-)	Decrease (+)	Increase (-)	Increase (-)
Waterbodies expected to need additional effort	**Carlton**	Not applicable	Not applicable	Not applicable	**Harris**	Not applicable	**Yale**	Not applicable	**Palatlakaha River**	**Trout**

Chapter 3: REGULATORY LINKS AND OVERALL MANAGEMENT STRATEGIES

This second BMAP phase requires implementation of specific projects and activities by the BWG entities and agricultural producers in the basin. This chapter describes the management strategies that apply to the entire Upper Ocklawaha River Basin, and identifies the regulatory links that enforce the implementation of management strategies. The management strategies (completed, ongoing, and planned) identified in the BMAP are targeted at addressing both the pollutant loads from historical and current sources and from the estimated future loads associated with population growth and associated land use changes in the basin. The newly required management strategies specific to the individual TMDL waterbodies are included in **Chapter 4** through **Chapter 13**. Required management strategies from the 2007 BMAP that have been modified are contained in **Appendix C**.

Management strategies are the activities or projects that stakeholders are implementing to reduce pollutant loadings in TMDL waterbodies. An important result of the BMAP process in the Upper Ocklawaha River Basin has been the unprecedented level of local stakeholder participation and commitment. The BMAP process enhanced communication and cooperation among basin stakeholders that will have benefits beyond the BMAP. Together, stakeholders identified solutions to some of the basin's complex water pollution issues and are taking decisive steps toward realizing those solutions. Before the next BMAP iteration, management strategies will be refined and new projects developed to reduce nutrient sources to the extent practical.

3.1 REGULATORY LINKS TO BMAP ENFORCEMENT

3.1.1 ERP

Activities that exceed SJRWMD permitting thresholds for stormwater must be authorized by an ERP from the District (Rules 40C-4 through 40C-400, Florida Administrative Code [F.A.C.]) that incorporates both stormwater treatment and the mitigation of any wetland impacts. To obtain an ERP where existing ambient water quality does not meet state water quality standards, an applicant must demonstrate that the proposed activity will result in a net improvement in the parameters that do not meet standards. SJRWMD applies this criteria to waters that are listed by the Department as impaired.

3.1.2 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORMWATER PROGRAM

Many of the municipalities within the basin are regulated by the Florida NPDES Stormwater Program. The basic requirements of this program serve as a foundation for the stormwater management efforts of

these communities. Phase I addresses municipal separate storm sewer systems (MS4s) located in incorporated areas and counties with populations of 100,000 or more, as well as specific industrial activities. Phase II addresses stormwater management requirements for smaller municipalities.

Phase I MS4s were subject to a two-part permit application process requiring the development of a proposed stormwater management program (SWMP) that would meet the standard of reducing (discharged) pollutants to the maximum extent practicable (MEP), and the incorporation of the SWMP into an individual permit issued to the MS4 operator. The Phase I MS4 permittees are required to address structural and source control from commercial and residential areas; detection and removal of illicit discharges to the system; monitoring and control of pollutants from landfills, hazardous waste sites, and other high-risk industrial facilities; and BMPs for construction runoff.

MS4 Phase I permits contain a "reopener" clause, which states, in part: "*The permit may be reopened and revised during the life of the permit to adjust effluent limitations or monitoring requirements should future adopted total maximum daily load, water quality studies, the Department and U.S. Environmental Protection Agency (EPA)-approved changes in water quality standards, or other information show a need for a different limitation or monitoring requirement."*

Under the NPDES MS4 Phase II Stormwater Permit, smaller municipalities are covered under a generic permit, which requires the development of a SWMP that includes BMPs, with measurable goals, to effectively implement six minimum control measures: public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention/good housekeeping.

The generic permit (Paragraph 62-621.300(7)(a), F.A.C.) also states: "*If a TMDL is approved for any waterbody into which the Phase II MS4 discharges, and the TMDL includes requirements for control of stormwater discharges, the operator must review its stormwater management program for consistency with the TMDL allocation. If the Phase II MS4 is not meeting its TMDL allocation, the operator must modify its stormwater management program to comply with the provisions of the TMDL Implementation Plan applicable to the operator in accordance with the schedule in the Implementation Plan.*"

Table 5 lists governmental entities currently designated as MS4s that are within the Upper Ocklawaha River Basin.

TABLE 5: GOVERNMENTAL ENTITIES IN THE UPPER OCKLAWAHA RIVER BASIN DESIGNATED AS REGULATED MS4S

PERMITTEE	PHASE	PERMIT COVERAGE DATES	PERMIT NUMBER
Apopka	I	10/12/2009-10/11/2014	FLS000011
FDOT–*Orange County*	I	10/12/2009-10/11/2014	FLS000011
FDOT–*Polk County*	I	9/12/2011-9/11/2016	FLS000015
Polk County	I	9/12/2011 – 9/11/2016	FLS000015
Ocoee	I	10/12/2009-10/11/2014	FLS000011
Orange County	I	10/12/2009-10/11/2014	FLS000011
Winter Garden	I	10/12/2009-10/11/2014	FLS000011
Eustis	II	11/1/2013-10/31/2018	FLR04E100
FDOT–*District 5*	II	7/1/2013-6/30/2018	FLR04E024
Fruitland Park	II	6/1/2009-5/31/2014	FLR04E114
Lady Lake	II	2/17/2009-2/16/2014	FLR04E104
Lake County	II	6/1/2009-5/31/2014	FLR04E106
Leesburg	II	3/6/2009-3/5/2014	FLR04E110
Marion County	II	4/1/2013-3/31/2018	FLR04E021
Minneola	II	7/22/2009-7/21/2014	FLR04E111
Mount Dora	II	2/17/2009-2/16/2014	FLR04E121
Tavares	II	4/30/2010-4/29/2015	FLR04E113
Umatilla	II	11/5/2009-11/4/2014	FLR04E108
Groveland	II	2/9/2011-2/8/2016	FLR04E136
Clermont	II	2/25/2010-2/24/2015	FLR04E135

3.1.3 URBAN NONPOINT SOURCES

Reductions in loads carried by stormwater that are separate from discharges by a permitted MS4 were established in the "load allocation" component of the TMDL. Subparagraph 403.067(7)(b)2.f, Florida Statutes (F.S.), prescribes the pollutant reduction actions required for nonagricultural pollutant sources that are not subject to NPDES permitting. These "nonpoint" sources must also implement the pollutant reduction requirements detailed in a BMAP. LCWA, Town of Astatula, Town of Howey-in-the-Hills, and Town of Montverde are the entities that may be responsible for reducing nonpoint sources in the Upper Ocklawaha Basin.

Failure by a nonpoint source to reduce loadings, as required in a BMAP, can result in enforcement action by the Department under Paragraph 403.067(7)(b)2.h, F.S. The Department can designate an entity as a regulated Phase II MS4 if its discharges are determined to be a significant contributor of pollutants to surface waters of the state in accordance with Rule 62-624.800, F.A.C. The designation of an entity as a Phase II MS4 can occur when a TMDL has been adopted for a waterbody or segment into which the entity discharges the pollutant(s) of concern. If an entity is designated as a regulated Phase II MS4, it is subject to the conditions of the Phase II MS4 Generic Permit.

3.2 OVERVIEW OF MANAGEMENT STRATEGIES

The required management strategies that are being implemented or have been proposed by the BWG to address the TMDLs in the basin include structural BMPs; agricultural BMPs; restoration and water quality improvement projects directly related to Lake Apopka, Lake Harris, and Lake Griffin; regulations, ordinances, and guidelines; special studies and planning efforts; education and outreach efforts; and stormwater management program implementation. The required management strategies adopted in the 2007 BMAP that were updated are included in **Appendix C**. New strategies that apply to the entire Upper Ocklawaha River Basin are summarized in **Table 6** and are described in the sections below. Strategies that apply to the individual waterbodies are included in **Chapter 4** through **Chapter 13**.

Additional reductions are expected to be necessary in future BMAP phases to meet the loads specified in the TMDLs. Where available, the tables provide information on the assigned nutrient reductions, shown in lbs/yr, for projects benefiting the watershed. The BMAP projects and activities represent a considerable local, regional, and state investment in a multifaceted approach to water quality protection and restoration. Responsible entities submitted these projects and activities to the Department with the understanding that these projects would be included in the BMAP, thereby requiring each entity to timely implement the proposed management strategies, perform any required operation or maintenance associated therewith and achieve the assigned load reduction estimates. However, this list of projects and activities is meant to be flexible enough to allow for changes that may occur over time. Any change in listed strategies, or the deadline to complete these actions, must first be approved by the Department. Substituted management strategies must result in equivalent or greater nutrient reductions than expected from the original strategies.

3.2.1 COST OF BMAP IMPLEMENTATION

This BMAP adopts 63 projects that were not included in the 2007 BMAP. Of these projects, costs were provided for 41 projects or 65.1% of the total projects. The total costs for the new projects are more than $20.9 million. Funding sources range from local stormwater fees to regional and state cost-share grants. The Department supports restoration activities in the basin through Section 319 funding and TMDL Restoration Grants. LCWA provides funding for municipal or community projects through the Stormwater Treatment Grant Program. These grants fund removal of pollutant discharges to wetlands and lakes. SJRWMD through a Cooperative Funding Program makes funds available for projects that reduce nutrient load in springsheds and other waterbodies with nutrient TMDLs.

TABLE 6: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING IN THE UPPER OCKLAWAHA BASIN

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
LC06 – Landscaper BMP training	Lake County/ Landscaper education about BMPs for landscapers and those that hire landscapers/a seminar was held in cooperation with the Lake County Ag Center to educate landscapers about BMPs and BMP brochures were mailed out county wide to landscape companies	Not available	Lake County-wide	Lake County BCC/ Grant from LCWA	$1,276.56	Complete//March 2010
ORANGE09 – Educational Efforts	Unincorporated Orange County / Countywide / Implementation of Educational Efforts per new FDEP Guidelines / 1) FYN funded by the County 2) Local Ordinances existing or under development - Landscape Ordinance under revision to reflect FYN; Fertilizer Ordinance under development to require certifications and reduced TP content; Water Conservation Ordinance limiting landscape irrigation 3) PSAs including pet waste 4) Information pamphlets addressing pollution reduction and good housekeeping from the NPDES program 5) Water Atlas and website addressing nutrient reduction 6) Proactive and reactive inspection programs associated with NPDES and a complaint system for call-in by residents.	Not available	County-wide	Not available	Not available	Complete/ March 2009
UMATILLA03 – Street Sweeping	Umatilla city limits/ Monthly sweeping of city-maintained streets to remove dirt, vegetation, and debris.	Not available	2819A ; 2807A	City of Umatilla / Not available / --	$9,600 per year	Ongoing / Ongoing
UMATILLA04 - Master Stormwater Management Plan	City of Umatilla / -	Not available	2819A; 2807A	City of Umatilla ; Umatilla and LCWA / LCWA	$24,000 ($12,000 LCWA)	Ongoing /2013 / Ongoing
UMATILLA05 – Public Education	Umatilla city limits / Public education and participation program for residents of Umatilla to enhance knowledge and awareness of stormwater management. Part of MS4 Phase 2 public education requirement.	Not available	2819A; 2807A	City of Umatilla /-- /--	$7,500 per year	Ongoing / 2011 / Ongoing
NUTRIENT11 - Statewide BMP Manual for Specialty Fruit-Nut Crops	Upper Ocklawaha Basin / Development and rule adoption of manual that addresses BMPs for fruit and nut production. Management of agricultural runoff reduces nutrient loadings.	Not available	Basin-wide	Florida Department of Agriculture and Consumer Services (FDACS), Office of Agricultural Water Policy (OAWP) / General Inspection Trust Fund / Private landowners	Not available	Ongoing / BMP manual adopted in May 2011, implementation ongoing
NUTRIENT12 – Statewide BMP Manual for Citrus	Upper Ocklawaha Basin / Development and rule adoption of manual that addresses BMPs for citrus. Management of agricultural runoff reduces nutrient loadings.	Not available	Basin-wide	FDACS, Office of Agricultural Water Policy / General Inspection Trust Fund / Private landowners	Not available	Ongoing / Adopted by Rule 5M-16 in 2013, implementation ongoing

3.3 Efforts by the Florida Fish and Wildlife Conservation Commission (FWC)

Aquatic plant management in Florida is delegated to the FWC and is carried out by the Invasive Plant Management section of Habitat and Species Conservation Division. The Invasive Plant Management section's aquatic plant management program designs, funds, coordinates, and contracts invasive non-native aquatic plant control efforts in Florida's 1.25 million acres of public waters under Chapter 68F, F.A.C. Public waterbodies are sovereignty waters accessible by public boat ramps. Invasive non-native aquatic plants, mostly hydrilla, water hyacinth, and water lettuce, are managed in several hundred water bodies each year. FWC biologists work with personnel from other agencies as well as interested private-sector stakeholders to develop annual aquatic plant work plans. Major uses and functions of each public waterbody are identified along with any listed species that may be affected by invasive plants or aquatic plant management activities. Basic management objectives are defined and plant control methods are selected that will conserve or enhance identified waterbody uses and functions. Sites are monitored at least once each year to assess management effectiveness and to determine if any adverse impacts resulted from management activities. Another responsibility of the section is to oversee the permitting program for aquatic plant control and grass carp by homeowners, homeowner associations, golf courses, etc. A more detailed description of the section's responsibilities may be found at: http://myfwc.com/wildlifehabitats/invasive-plants/aquatic-plant/.

3.4 Agriculture

Paragraph 403.067(7)(b), F.S., requires that nonpoint pollutant sources (such as agriculture) included in a BMAP demonstrate compliance with pollutant reductions needed to meet a TMDL, either by implementing appropriate BMPs (adopted by FDACS), or conducting water quality monitoring prescribed by the Department or the applicable water management district that demonstrates compliance with water quality standards. If these pollutant sources do not either implement BMPs or conduct monitoring that demonstrates compliance with water quality standards, they may be subject to enforcement by the Department or the applicable water management district.

Under Paragraph 403.067(7)(c), F.S., the implementation of FDACS-adopted, Department-verified BMPs in accordance with FDACS rule provides a presumption of compliance with state water quality standards. Through OAWP, the Florida Forest Service, and Division of Aquaculture, FDACS develops, adopts, and assists producers in implementing agricultural BMPs to improve water quality and water conservation. Producers who implement BMPs may be eligible for cost-share from FDACS, the water management district, or other sources.

3.4.1 Efforts by FDACS (and Private Agricultural Producers)

A breakdown of agricultural land uses, except for silviculture, in the Upper Ocklawaha Basin, according to 2009 SJRWMD land use data is provided **Table 7.** Prominent land uses are improved pasture, silviculture, citrus, and field crops.

Figure 8 shows the approximate location of these agricultural lands in the basin.

Table 7: Agricultural Land Uses in the Upper Ocklawaha Basin

- = Empty cell/no data

Land Use Code	Code Description	Total Acres
2110	Improved Pasture	35,577.5
2120	Unimproved Pasture	9,945.3
2130	Woodland Pasture	4,448.8
3100	Herbaceous Upland Nonforested	7,093.9
3200	Shrub and Brushland	2,389.8
3300	Mixed Upland Nonforested	2,858.0
2140	Row Crop	1,213.6
2150	Field Crops	12,793.6
2160	Mixed Crops	159.5
2200	Tree Crops	256.6
2210	Citrus	19,841.8
2240	Abandoned Trees	492.8
2310	Cattle Feeding Operation	22.8
2320	Poultry Feeding Operation	34.7
2400	Nurseries	108.8
2410	Tree Nurseries	946.9
2420	Sod Farms	396.1
2430	Ornamentals	3,262.6
2431	Shade Ferns	490.2
2432	Hammock Ferns	24.5
2450	Floriculture	5.0
2500	Specialty Farms	87.3
2510	Horse Farm	2,826.6
2520	Dairies	128.1
2600	Other Open Lands - Rural	101.9
2610	Fallow Cropland	42.8
-	**Total**	**105,549.5**

3.4.2 Agricultural BMPs

BMPs are individual or combined practices determined through research, field testing, and expert review to be the most effective and practicable means for improving water quality, taking into account economic and technological considerations. All agricultural non-point sources in the BMAP area are statutorily required either to implement FDACS-adopted BMPs or to conduct water quality monitoring that demonstrates compliance with state water quality standards. Primary regulatory responsibility for development of agricultural BMPs is divided up between FDACS' Florida Forest Service (Silviculture

BMP Program), Division of Aquaculture (Aquaculture Certification Program), and OWAP (all other agricultural BMP programs).

FDACS's OAWP BMPs fall into two categories: structural and management. Structural BMPs involve the installation of structures or changes to the land, usually are more costly, and often require cost-share for them to be economically feasible. They include water control structures, fencing, and tailwater recovery systems, among other things. Management BMPs, such as nutrient and irrigation management, comprise the majority of the practices and often are not readily observable. Nutrient management addresses fertilizer type, amount, placement, and application timing, and includes practices such as soil and tissue testing to determine crop nutrient needs, application methods, and setbacks from water resources. Irrigation management is the maintenance, scheduling, and overall efficiency rating of irrigation systems. OAWP BMPs and staff contact information are available at http://www.floridaagwaterpolicy.com. Printed BMP manuals can be obtained in the local extension office at county agricultural extension centers, or by contacting OAWP field staff.

3.4.3 BMP ENROLLMENT STRATEGY

The land use data for agriculture in the BMAP area, the acreage associated with commodity types addressed by OAWP BMP manuals and the acres enrolled in OAWP BMP programs, except for silviculture, are summarized in **Table 8** and displayed in **Figure 9**. All agricultural non-point sources in the BMAP area are statutorily required either to implement FDACS-adopted BMPs or to conduct water quality monitoring that demonstrates compliance with state water quality standards. Over the next two years, OAWP will review aerial imagery and use other means to determine changes in agricultural land use in this basin.

Enrollment efforts will focus on pasture, row/field crops, and citrus, which together comprise about 96,000 acres based on 2009 land use data. Even when all agricultural operations in the basin enroll in BMPs, not all of the acreage listed as agriculture in **Table 8** will be included in enrollment figures. The notices of intent (NOIs) only document the estimated total number of acres on which applicable BMPs are implemented, not necessarily the entire acreage associated with an operation and that may be mapped as agriculture land use. Land use data can contain nonproduction acres (such as buildings, parking lots, and fallow acres) that will not be counted on the NOIs submitted to OAWP. There also may be acreage that is not appropriate for enrollment in OAWP BMPs, such as lands not in commercial production (operations conducted as a business). In addition, OAWP BMPs are not designed for smaller-acreage, non-

commercial equine ranchettes, which would be addressed more appropriately by local government or Department regulation or BMPs.

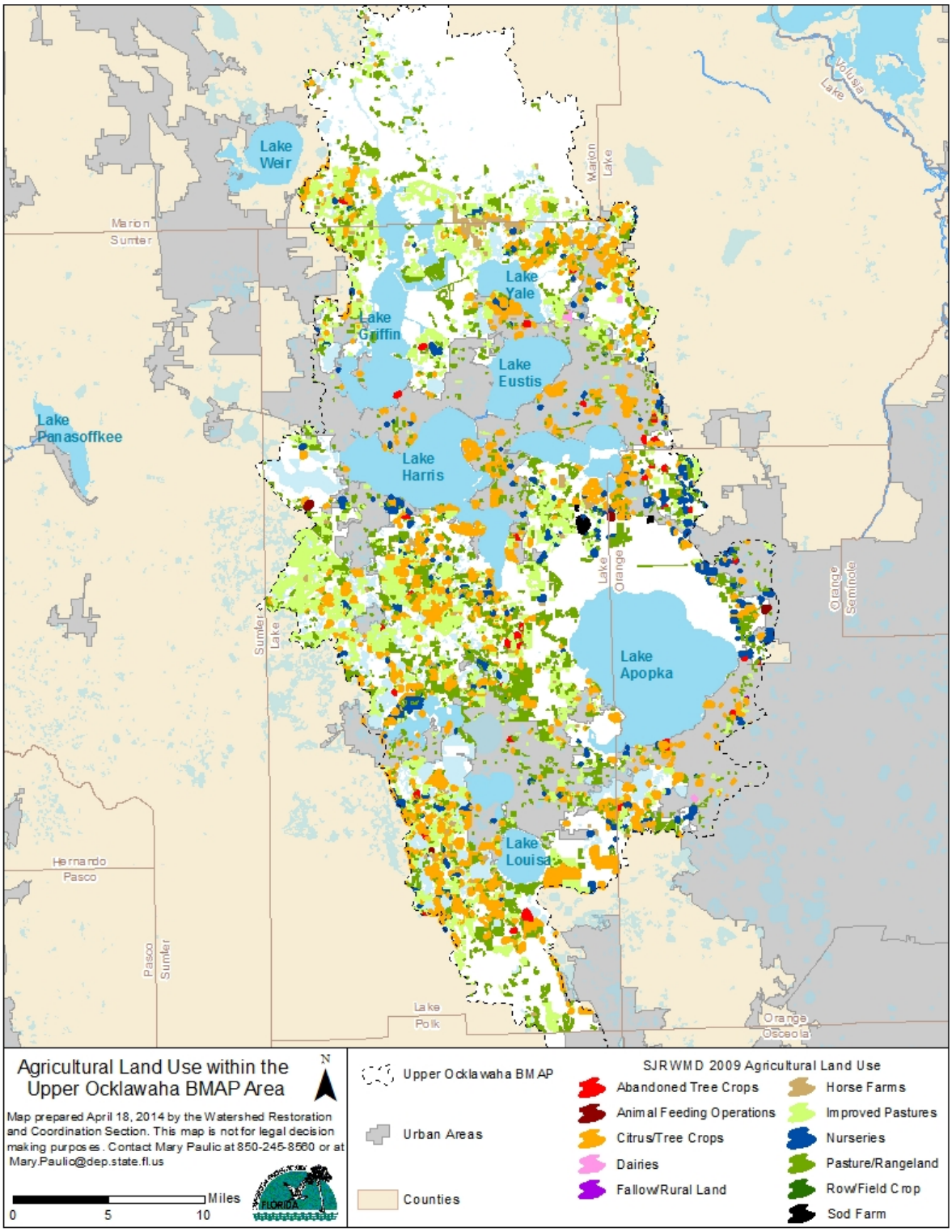


FIGURE 8: 2009 AGRICULTURAL LANDS IN THE UPPER OCKLAWAHA BASIN

TABLE 8: AGRICULTURAL ACREAGE AND BMP ENROLLMENT FOR THE UPPER OCKLAWAHA BASIN

N/A = Not applicable

[1] FDACS staff-adjusted acreage for purposes of enrollment is based on a review of more recent aerial imagery in the basin and local staff observations.

2009 SJRWMD LAND USE	ACRES	FDACS ADJUSTED ACRES[1]	RELATED FDACS BMP PROGRAMS	ACREAGE ENROLLED	RELATED NOIS
Pasture and Rangeland	62,313.3	62,313.3	Cow/Calf; Future (hay)	1,342.0	6
Row/Field/Mixed Crops	14,166.7	14,166.7	Vegetable/Agronomic Crops	1,157.6	4
Horse Farm	2,826.6	2,826.6	Equine	23.9	1
Citrus	19,841.8	19,841.8	Ridge Citrus; Flatwoods Citrus	5,318.1	145
Fruit Orchards/Other Groves	256.6	256.6	Specialty Fruit and Nut	385.1	17
Abandoned Tree Crops	492.8	0.0	No enrollment needed	N/A	N/A
Nurseries and Vineyards, Ornamentals	3,371.4	3,371.4	Container Nursery	3,253.4	112
Tree Nurseries	946.9	946.9	Future Nursery	0.0	0.0
Sod Farms	396.1	396.1	Sod	521.3	3
Shade / Hammock Ferns	514.7	514.7	Future Nursery	0.0	0.0
Floriculture	5.0	5.0	Future Nursery	0.0	0.0
Specialty Farms	87.3	87.3	Conservation Plan Rule	0.0	0.0
Dairies	128.1	128.1	Conservation Plan Rule	0.0	0.0
Cattle Feeding Operations	22.8	22.8	Conservation Plan Rule	0.0	0.0
Poultry Feeding Operations	34.7	34.7	Conservation Plan Rule	0.0	0.0
Other Open Lands – Rural	101.9	0.0	No enrollment needed	N/A	N/A
Fallow Cropland	42.8	0.0	No enrollment needed	N/A	N/A
Total	**105,549.5**	**104,912.0**	**N/A**	**12,001.4**	**288**

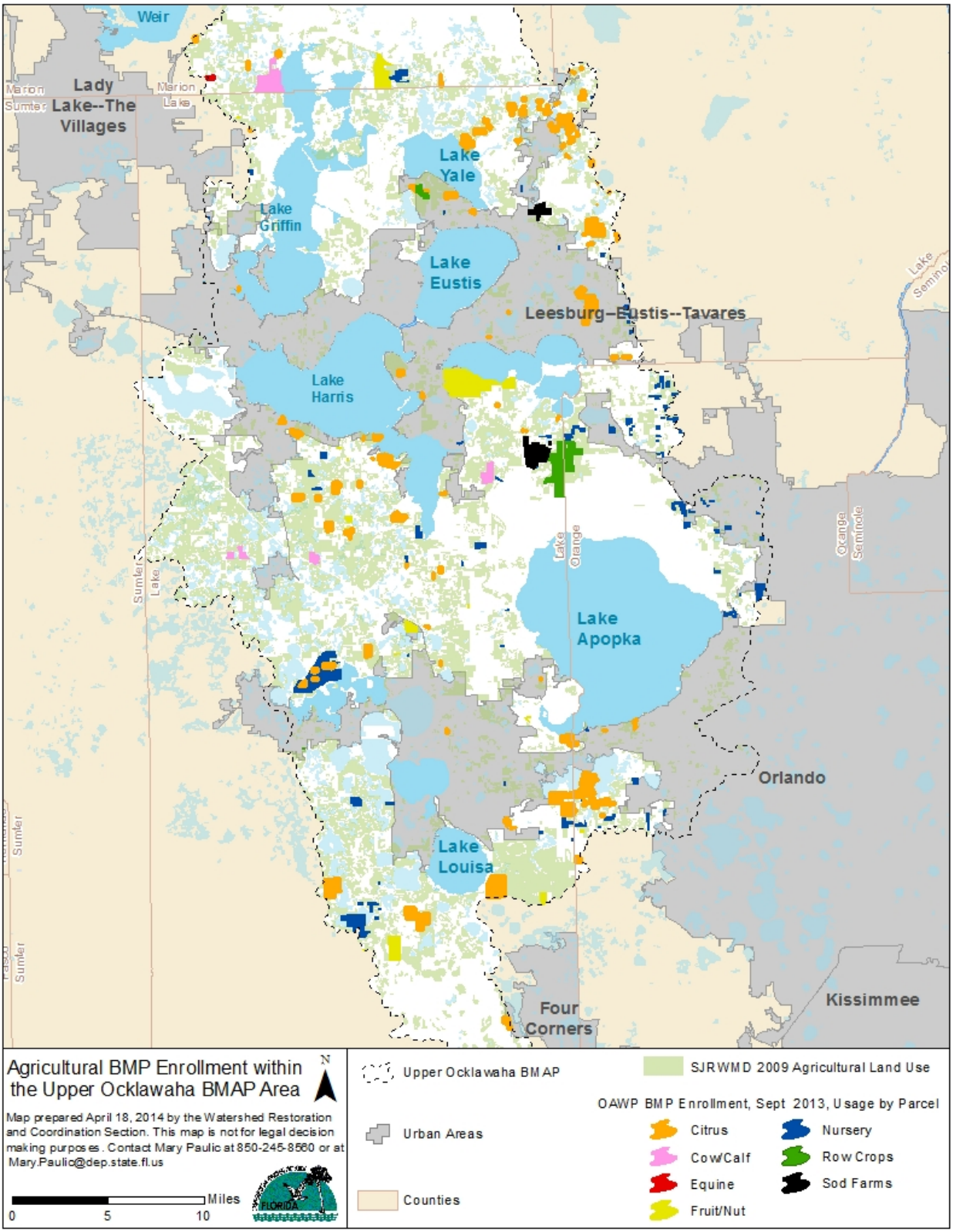


FIGURE 9: OAWP BMP ENROLLMENT IN THE UPPER OCKLAWAHA BASIN AS OF SEPTEMBER 30, 2013

3.4.3.1 Agricultural BMP Load Reduction Estimates

The estimates of TN and TP load reductions from the implementation of BMPs are not currently documented for the basin. Estimating the TP loading reductions expected from the implementation of BMPs is one of the tasks to be completed in the next five years. The models used to estimate loading from agriculture did not include information about BMPs. Accomplishing this task will require reconciling discrepancies in land use data as expressed by the land use/land cover data that supports water quality modeling and FDACS information about the location of acreage covered by NOIs. With a more accurate accounting of the location of agriculture, commodity-specific methods developed for the Lake Okeechobee watershed can be applied to estimate TP loading reductions.

3.4.4 FDACS Role in BMP Implementation and Follow-Up

OAWP works with producers to submit NOIs to implement the BMPs appropriate for their operations. OAWP will increase their compliance assistance efforts with producers in the Upper Ocklawaha River Basin to enroll in adopted BMP programs applicable to their operations. OAWP staff and contractors will identify existing producers, to the greatest extent possible, through grower associations, information on county agricultural exemptions, field staff knowledge, and other means. OAWP will attempt to ensure that all producers are aware of their statutory obligation to implement BMPs, through letters, email, workshops, brochures, and/or other means. Staff/contractors will assist producers in selecting the appropriate BMPs, with emphasis on nutrient management, irrigation management, sediment/erosion control, stormwater management, and record keeping.

The FWRA requires that, where water quality problems are demonstrated despite the proper implementation of adopted agricultural BMPs, FDACS must re-evaluate the practices, in consultation with the Department, and modify them if necessary. Continuing water quality problems will be detected through the BMAP monitoring component and other Department and SJRWMD activities. If a re-evaluation of the BMPs is needed, FDACS will also include SJRWMD and other partners in the process.

3.4.5 Florida Forest Service Role in BMP Implementation and Monitoring

FDACS' Florida Forest Service's silviculture BMP program is responsible for the development, implementation, and monitoring of silviculture BMPs across the state. Florida's first *Silviculture BMP Manual* was published in 1979. The current *Silviculture BMP Manual* (2008) contains 150 individual BMPs within 14 categories.

Implementation of silviculture BMPs in Florida is primarily done under an educational format, designed to transfer BMP technology to silviculture landowners and practitioners through public workshops and by providing professional technical guidance. Implementation is also accomplished through a variety of outreach services including silviculture BMP courtesy checks for ongoing or recently completed operations, silviculture BMP site assessments for planned silviculture operations, and the silviculture BMP notice of intent program.

The silviculture BMP notice of intent program began on February 11, 2004. As of December 2013, there were 50,677 acres signed up under the silviculture BMP notice of intent within the Upper Ocklawaha Basin.

Since 1981, the Florida Forest Service has monitored silviculture operations for compliance with BMPs by conducting biennial surveys. Surveys consist of on-the-ground evaluations of randomly selected sites where recent silviculture operations have taken place. The most recent survey (2013) reported the overall average silviculture BMP compliance was 98.9%.

More information on silviculture BMPs and FDACS' Florida Forest Service's silviculture BMP program is available from the "For Landowners" section of www.FloridaForestService.com.

3.5 Related Water Resource Protection Initiatives

Other environmental protection initiatives that affect some local governments in the Upper Ocklawaha River Basin are the Wekiva Springs Parkway and Protection Act and BMAP, which addresses the Wekiva Study Area, and also the Silver Springs BMAP.

Portions of the following jurisdictions are included in the Wekiva Study Area and BMAP: Lake County, Mount Dora, Eustis, Orange County, Apopka, Ocoee, and Winter Garden. The Wekiva Springs Protection Effort implements the Wekiva Parkway and Protection Act (Chapter 369, F.S.). The act, which was based on the recommendations of the Wekiva Coordinating Committee, requires that water quantity and quality in the Wekiva River and associated spring systems be protected from the impacts of development.

Ground water withdrawals, stormwater, agricultural sources, wastewater treatment through centralized facilities, and onsite septic treatment and disposal systems will all be addressed to reduce the impacts to the springs and river system. Local governments are required to amend their local comprehensive plans to establish land use strategies that optimize open space and promote a pattern of development that protects

the most effective recharge and karst areas and sensitive natural habitats as a means to encourage "smart growth" and low impact development (LID) practices. The Wekiva Springs Protection Effort will benefit the implementation of TMDLs for Lake Apopka, Lake Carlton, Lake Dora, and Lake Beauclair in the Upper Ocklawaha River Basin. The Wekiva Parkway and Protection Act Master Stormwater Management Plan Support was completed in November 2005 and updated in March 2006. The BMAP is pending adoption.

The Silver Springs TMDL was adopted in November 2012, and requires a 79% reduction in nitrate in the ground water and the Silver River. Portions of the Lake Griffin watershed and the following jurisdictions are within the Silver Springs BMAP management area: Lake County, Fruitland Park, and Lady Lake. Protective actions taken in the Lake Griffin Watershed could provide benefit to Silver Springs.

3.6 ESTIMATES OF FUTURE LOADINGS FROM GROWTH AND FUTURE MANAGEMENT STRATEGIES

As mentioned above, estimates of additional TP loadings from future growth were considered as part of the first cycle of the BMAP and those estimates were included in calculation of expected reductions in loading from management strategies (**Table 3**). Consequently, to meet the expected loading reductions stakeholders considered pollution prevention management strategies to address TP loadings from new development (or redevelopment) through regulations, ordinances, or guidelines. There are also many management strategies in the BMAP aimed at preventing water quality problems through public and private sector education and outreach. Collectively, these preventive management strategies are considered lake- and stream-friendly activities. They can include LID planning and engineering, education, and local ordinances or land development regulations that protect water quality by maintaining or enhancing predevelopment water flow and reducing pollutant loads in developing and urban watersheds.

Chapter 4: LAKE APOPKA

4.1 EXPECTED TP LOADING TO LAKE APOPKA AFTER BMAP IMPLEMENTATION

Overall, the net reduction in TP loading to Lake Apopka from all management actions is estimated to be 104,156 lbs/yr (a reduction of about 75%), which results in loadings sufficient to meet the TMDL target load for TP for Lake Apopka. However, achievement of ambient TP water quality criteria targets may not be realized until future BMAP cycles.

Figure 10 presents the expected net TP loading to Lake Apopka, after reductions from all projects described in the BMAP. The only wastewater facility permitted to discharge to Lake Apopka is attaining its wasteload allocation set in the Lake Apopka TMDL. Street sweeping and new stormwater structural BMPs have fully addressed the necessary stormwater loading reductions for this lake. Based on ongoing and planned management actions, TP load reductions after BMAP implementation are expected to be sufficient to meet the TMDL (35,052 lbs/yr). These reductions also are important for the health of downstream lakes, which will receive significantly lower nutrient loading from Lake Apopka.

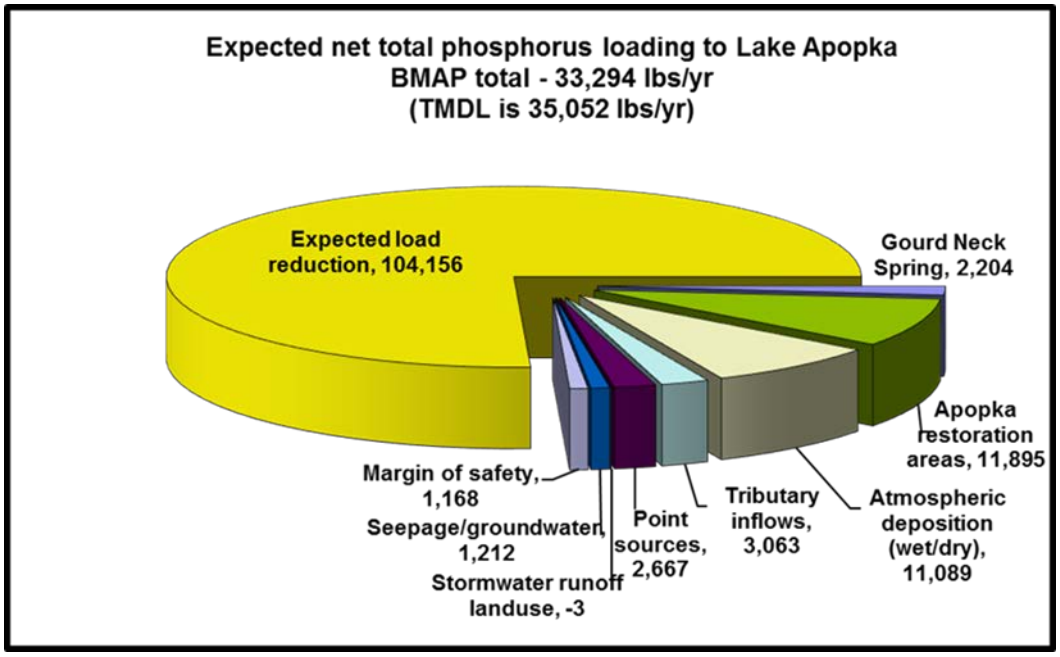


FIGURE 10: EXPECTED NET TP LOADING TO LAKE APOPKA

4.2 MANAGEMENT STRATEGIES

Attaining water quality targets in Lake Apopka largely relies on the continued efforts to restore former agricultural lands around Lake Apopka and to remediate in-lake cycling of TP. Most of the associated

restoration activities are documented in the Lake Apopka Surface Water Improvement and Management (SWIM) Plan and 2007 BMAP. Management strategies adopted in the 2007 BMAP include restoration of the north shore, operation of the marsh flow-way, and harvesting of gizzard shad. The Lake Apopka Initiative (described in **Section 4.3**) will also provide additional ecological benefit through habitat restoration and new technologies that remove TP. Management strategies being added to the BMAP through this second phase in the Lake Apopka basin are included in **Table 9**.

TABLE 9: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING TO LAKE APOPKA

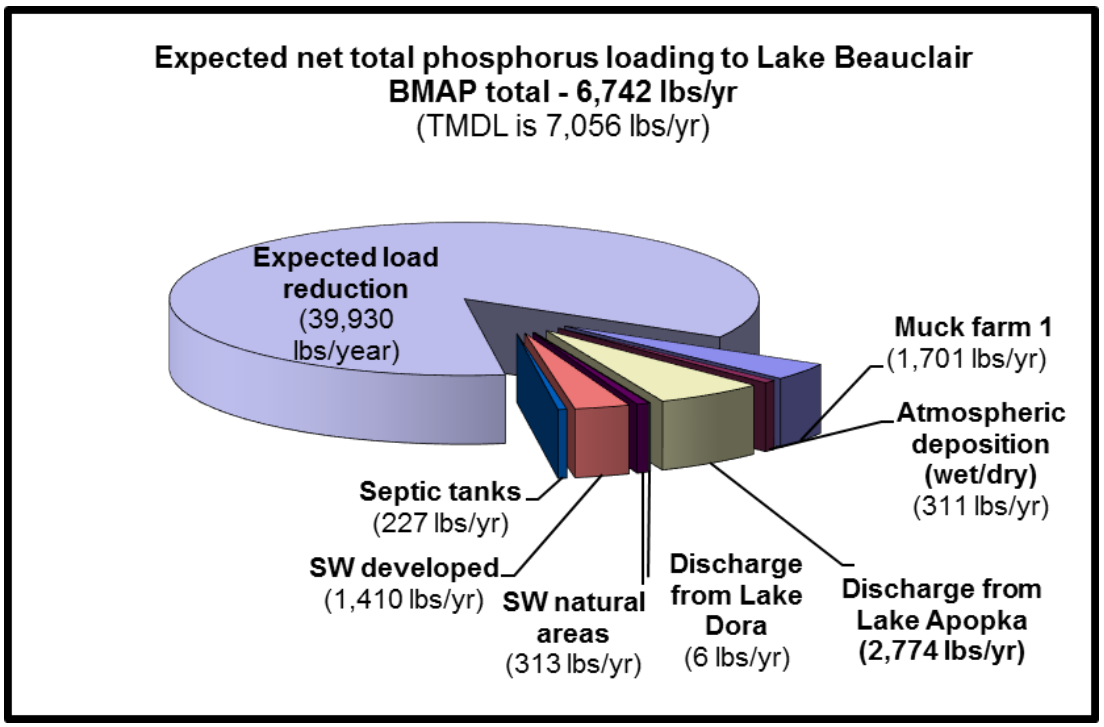
PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
LAP30 – State Road (SR) 50 Basin 1 (L-4)	Lake Apopka / SR 50 From West of Avalon Road to SR429 (410983-1) - Basin 1 (L-4) / Wet Detention. No increase in TP load with Road Improvement.	12.19	2835D	FDOT, District 5 / Florida Legislature / NA	Not Available	Complete / Complete
LAP31 - SR 50 Basin 2 (L-7)	Lake Apopka / SR 50 From West of Avalon Road to SR429 (410983-1) - Basin 2 (L-7) / Wet Detention. No increase in TP load with Road Improvement.	16.11	2835D	FDOT, District 5 / Florida Legislature / NA	Not Available	Complete / Complete
LAP32 - SR 50 Basin 3 (M-10/11)	Lake Apopka / SR 50 From West of Avalon Road to SR429 (410983-1) - Basin 3 (M-10/11) / Wet Detention. No increase in TP load with Road Improvement.	27.06	2835D	FDOT, District 5 / Florida Legislature / NA	Not Available	Complete / Complete
LAP33 - SR 50 Basin (N2)	Lake Apopka / SR 50 From West of Avalon Road to SR429 (410983-1) - Basin 4 (N-2) / Wet Detention. No increase in TP load with Road Improvement.	2.31	2835D	FDOT, District 5 / Florida Legislature / NA	Not Available	Complete / Complete
LAP34 – Dillard Street Pond Expansion	Project is part of permitting process for New City Hall in Winter Garden; modify storm sewer system adjacent to pond to treat previously untreated runoff	Not Available	Unknown	City of Winter Garden	$246,000	Complete / Complete
LAP35 – Plant St. Segment 1	Project involves widening Plant St., including blowing out intersection of West Crown Point Rd. in Winter Garden; no stormwater treatment for this section of road prior to widening	Not Available	Unknown	City of Winter Garden	$2,000,000	Complete / Complete
LAP36 - FM: 239535-2 (2 treatment projects)	State Road 50: Add lanes from east ramps of Turnpike to Avalon Rd.; Wet Detention Ponds A and B providing treatment for runoff from existing and proposed pavement	7.25	Unknown	FDOT District 5	Unknown	Design 100%/ pending funding

4.3 LAKE APOPKA INITIATIVE

The Florida Legislature provided $4.8 million in 2012 to fund projects associated with Lake Apopka including those intended to improve habitat and water quality. Several projects were approved, including evaluation of new and innovative phosphorus removal techniques (Department), establishment of aquatic vegetation (FWC), and installation of fish attractors (FWC). FWC, SJRWMD and the Department are partnering together to issue requests for proposals for innovative nutrient and sediment removal techniques in Lake Apopka. Effectiveness of the pilot project will be used to determine the feasibility of expanding the project or modifying for additional testing. The FWC has installed more than 300,000 giant bulrush (*Scirpus californicus*) and 40,000 spatterdock (*Nuphar luteum*) plants, mainly along the north shore, as well as placing 41 quarter-acre fish attractors around the lake.

Chapter 5: LAKE BEAUCLAIR

Figure 11 presents the expected net TP loading to Lake Beauclair after reductions from the projects described in the BMAP and increases from estimates of future growth. Overall, the net reduction in TP loading to Lake Beauclair is estimated to be 39,930 lbs/yr (about an 86% reduction), including the expected reductions from the NuRF project, which is sufficient to meet its associated TMDL (7,056 lbs/yr). However, achievement of ambient TP water quality criteria targets may not be realized until future BMAP cycles. Continued improvement in the quality of water released from Lake Apopka should further reduce the loading to Lake Beauclair. Likewise, the expected water quality improvements in Lake Beauclair is the primary reason that the downstream Lake Dora should meet its TMDL.



SW - Stormwater

FIGURE 11: ESTIMATED LOAD REDUCTION AND NET TP LOADING TO LAKE BEAUCLAIR

Chapter 6: LAKE CARLTON

Figure 12 presents the estimated net TP loading to Lake Carlton after reductions from the projects described in the BMAP and increases from estimates of future growth are incorporated. Additional reductions in TP loading of 522 lbs/yr are needed to meet the TMDL for the lake. However, because of the apparent close connection and exchange of water between Lakes Carlton and Beauclair, reduced loadings into Lake Beauclair is expected to benefit Lake Carlton. There are frequent reversals in net flow between the two lakes. Based on this observation, the parallel trends in TP concentrations in the two lakes, and the absence of other major TP sources for Lake Carlton, it is assumed that flows from Lake Beauclair are a significant TP source for Lake Carlton. Lake Carlton is one of the focus waterbodies in this BMAP iteration.

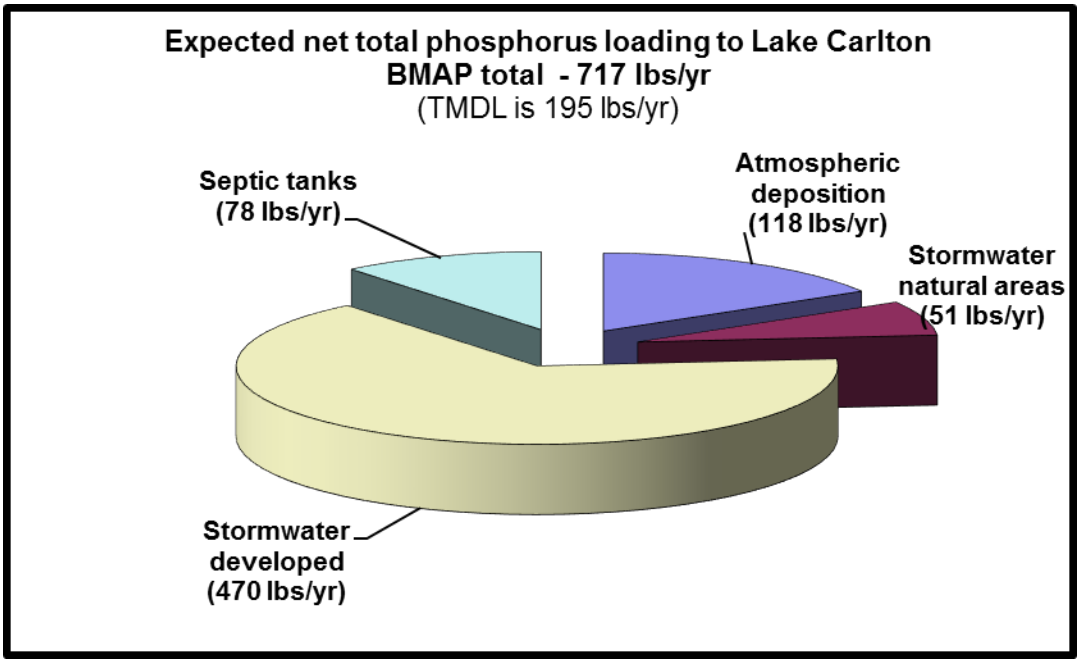
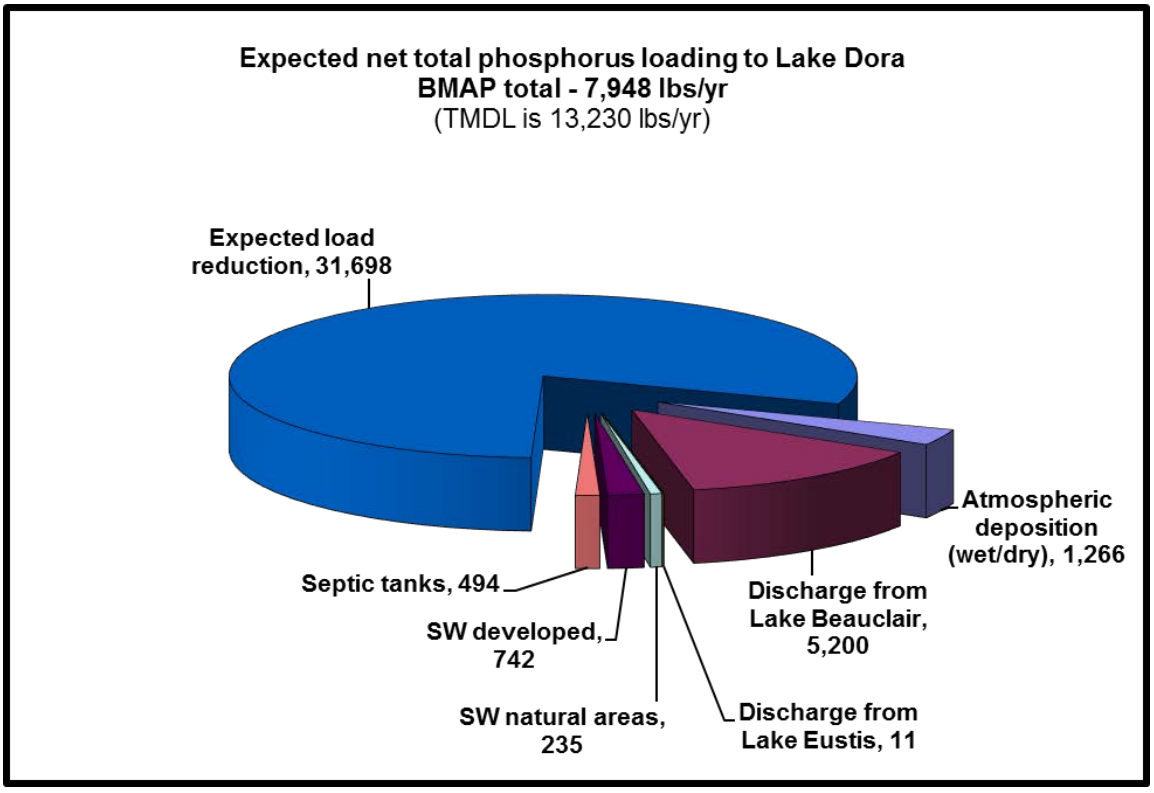


FIGURE 12: ESTIMATED NET TP LOADING TO LAKE CARLTON

Chapter 7: LAKE DORA

Figure 13 presents the expected net TP loading to Lake Dora. After factoring in reductions from the projects described in this BMAP and increases from estimates of future growth, the net reduction in TP loading to Lake Dora is estimated to be 31,698 lbs/yr (about a 80% reduction), which should result in attainment of the TMDL (13,230 lbs/yr). However, achievement of ambient TP water quality targets may not be realized until future TMDL cycles. Because these lakes lie in a chain, an improvement in the upstream lake is directly linked to an improvement in the lake downstream. Thus the expected improvement in Lake Dora will have a similar effect on lakes downstream.



SW - Stormwater

FIGURE 13: ESTIMATED LOAD REDUCTION AND NET TP LOADING TO LAKE DORA

7.1 MANAGEMENT STRATEGIES

The management strategies proposed for this second iteration of the BMAP in the Lake Dora basin are included in **Table 10**.

TABLE 10: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING TO LAKE DORA

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
DORA17 – Lake John - Dogwood Mountain Retrofit	Lake Dora Basin / Interlocal agreement between City of Mt. Dora & Lake County Public Works	Not available	2831B; 2823	City of Mount Dora /City of Mt. Dora / Lake County Public Works	$1,203,771.84 with the City of Mt. Dora cost at $698, 461.33 and the County share at $505,310.51	Complete/ 2009
DORA18 – Vincent Drive Drainage Improvement	Lake Dora Basin	Not available	2831B	Lake County/Lake County Stormwater MSTU/	$10,553.51 construction	Complete/ April 2009
DORA19 – Nutrient Separating Baffle Box-Gilbert Park	Within City limits of Mt. Dora at Gilbert Park lake front / Nutrient Separating Baffle Box installed at stormwater discharge culvert. Box removes trash and organic debris in top basket and captures sediment in series of baffle beneath the basket.	2.0	2831D	City of Mount Dora /City of Mount Dora / NA	$54,035	Complete/ December 10, 2008
DORA22 - Nutrient Separating Baffle Box at 4th Ave & Lakefront	City of Mt. Dora-4th Ave @ Lakefront / Installed Suntree 2nd Generation Nutrient Separating Baffle Box (NSBB) at 4th Ave at the lakefront on Lake Dora.	6.0	2831B	City of Mt. Dora	$69,061	Complete/ August 2009
DORA23 - Flexstorm Inlet Filters	City of Mt. Dora-Downtown / Install Flexstorm Inlet Filters into curb inlets in the downtown area of Mt. Dora. Filters capture gross pollutants, leaves, trash, debris and some sand. 65 filters installed.	15	2831B / Lake Dora	City of Mount Dora	City of Mt. Dora 50% / Lake County Water Authority 50%	Complete / Installed October 2010 / Maintenance on-going
DORA24 - Nutrient Separating Baffle Box at Grandview St. and Johns St.	City of Mt. Dora-Grandview St & Johns St. / Installed Suntree Nutrient Separating Baffle Box at the corner of Grandview and Johns Streets. System removes sand & debris from stormwater runoff before entering Lake Dora.	5.0	2831B	City of Mt. Dora	$140,125	Complete/ May 2012
DORA25 - Nutrient Separating Baffle Box at 5th Ave & Rossiter St.	City of Mt. Dora-5th Ave & Rossiter St. / Installed Suntree Nutrient Separating Baffle Box at corner of 5th Ave & Rossiter St. System removes sand & debris from stormwater runoff before entering Lake Franklin.	6.0	2831B	City of Mt. Dora	$124,168	Complete/ April 2012
DORA26 - StormX Gross Pollutant Traps	City of Mt. Dora-three locations / StormX Gross Pollutant Traps were installed at the discharge point of three stormwater pipelines.	6.0	2831B	City of Mt. Dora	$19,025	Complete/ August 2012
DORA28 - Nutrient Separating Baffle Box at 4th Ave and Donnelly St.	City of Mt. Dora-4th Ave & Donnelly St. / Installed Suntree 2nd Generation Nutrient Separating Baffle Box (NSBB) at 4th Ave & Donnelly St.	2.0	2831B	City of Mt. Dora	$88,100	Complete/ -

Project Number - Project Name	General Location / Description	Estimated TP Load Reduction lbs/year	WBID Number	Lead Entity / Funding Source / Project Partners	Project Cost	Project Status / Completion Date or Anticipated Completion Date
DORA20 – Nutrient Separating Baffle Box-Lake Gertrude	Nutrient Separating Baffle Box Retrofit into existing junction box at stormwater discharge into Lake Gertrude. Box removes trash and organic debris in top basket and captures sediment in series of baffle beneath the basket.	1.6	2823A	City of Mount Dora /City of Mount Dora / NA	$7,400	Complete/ October 2009
DORA21 – Ten Grate Inlet Skimmer Boxes	Within City limits at Public Works Complex / Ten Grate Inlet Skimmer Boxes to be installed within the complex to remove sand and debris from paved areas.	Not available	2827	City of Mount Dora /City of Mt. Dora 50%; Lake County Water Authority 50% / Lake County Water Authority	$10,050	Complete/ October 2009
DORA29 - Nutrient Separating Baffle Box at 3rd Ave. and McDonald St.	City of Mt. Dora-3rd Ave & McDonald St. / Installed Suntree 2nd Generation Nutrient Separating Baffle Box (NSBB) at 3rd Ave and McDonald St.	4.9	2831B	City of Mt. Dora	$45,090	Complete/ -
DORA31 - Continuous Deflection Separation Unit at Old Eustis Rd and Overlook Rd.	City of Mt. Dora-Old Eustis Rd. & Overlook Rd. / Installed Continuous Deflection Separation (CDS) Unit at Old Eustis Rd. and Overlook Rd. System removes sand and Debris from stormwater runoff before entering Lake Gertrude.	1.0	2831B	City of Mt. Dora	$71,002	Complete/ -
DORA32- Stormwater Treatment System at 6th Ave. and Baker St.	City of Mt. Dora-6th Ave & Baker St. / Installation of an Underground Stormwater Treatment System as part of the 7th Ave. Stormwater Project. Off-line stormwater treatment system located in Donnelly Park under the tennis court and event area.	20	2831B	City of Mt. Dora	$150,000	Planned/ October 2014
DORA33 - S. Johns St StormTech Installation	City of Mt. Dora-S. Johns St. / Installed StormTech System: two 50 LF rows with "Isolator Row" for maintenance. Re-graded and paved road to improve drainage.	Not available	2831B	City of Mt. Dora	$10,000	Complete/ October 2011
DORA35 – City of Mt. Dora MS4 System	City of Mt. Dora / City-wide catch basin and pipeline cleaning program.	82	2831B	City of Mt. Dora	$69,061	Ongoing/ Ongoing
DORA30 - Continuous Deflection Separation Unit at Charles St.	City of Mt. Dora-Charles St. / Installed Continuous Deflection Separation (CDS) Unit at Charles St. System removes sand and Debris from stormwater runoff before entering Lake Dora.	Not available	2831B	City of Mt. Dora	$71,001	Complete/ -
DORA34 - Hwy 441 & Hwy 46 Stormtech Installation	City of Mt. Dora- Hwy 441 & Hwy 46 / Installed StormTech System: 100 LF in-line arrangements with "Isolator Rows" at each end for maintenance	Not available	2831B	Lake County Public Works	Unknown	Complete / December 2010

Project Number - Project Name	General Location / Description	Estimated TP Load Reduction lbs/year	WBID Number	Lead Entity / Funding Source / Project Partners	Project Cost	Project Status / Completion Date or Anticipated Completion Date
DORA36 – Exfiltration System at McDonald Street and 5th Ave Parking Lot	City of Mt. Dora at McDonald Street and 5th Avenue / Installed exfiltration system with perforated CMP to reduce TP loading in stormwater.	Not available	2831B	City of Mt. Dora / City of Mt. Dora /	Not available	Complete/ -
DORA37 – Exfiltration System at Suntrust Bank	City of Mt. Dora on 5th Avenue between Tremain and Baker Streets / Installed exfiltration system with perforated CMP to reduce TP loading in stormwater.	Not available	2831B	Private (Suntrust) /	Not available	Complete/ -
DORA38 – Exfiltration System at Medical Office	City of Mt. Dora on southeast corner of Baker Street and 4th Avenue / Privately installed exfiltration system with perforated CMP to reduce TP loading in stormwater.	Not available	2831B	Private (Medical office) /	Not available	Complete/ -
DORA39 – Exfiltration System 3rd Avenue and Donnelly Street Parking Lot	City of Mt. Dora northeast corner of 3rd Avenue and Donnelly Street Parking Lot / Installed Exfiltration System with perforated CMP to reduce TP loading in stormwater.	Not available	2831B	City of Mt. Dora / City of Mt. Dora /	Not available	Complete/ -
DORA40 – Stormtech Chambers Highland and Liberty Streets Parking Lot	City of Mt. Dora parking lot at intersection of Highland and Liberty Street (west side of Highland) / Installed Stormtech Chambers (infiltration system) to reduce TP loading in stormwater through filtering.	Not available	2831B	City of Mt. Dora / City of Mt. Dora /	Not available	Complete/ -
DORA41 – Stormtech Chambers at East side of Highland and Liberty Streets	City of Mt. Dora at intersection of Highland and Liberty Streets (east side) / Installed Stormtech Chambers (infiltration system) to reduce TP loading in stormwater through filtering.	Not available	2831B	City of Mt. Dora / City of Mt. Dora /	Not available	Complete/ -
DORA42 – Stormtech Chamber at 13th and Annie Streets	City of Mt. Dora at corner of west 13th Street and Annie Street / Installed a 125 foot by 75 foot Stormtech Chamber (infiltration system) to reduce TP loading in stormwater through filtering.	Not available	2831B	Private (Christian Home & Bible School) /	Not available	Complete/ -

Chapter 8: LAKE EUSTIS

Reductions in TP loadings from upstream sources and the efforts of jurisdictions in the Lake Eustis sub-basin are estimated to reduce TP loading in Lake Eustis to meet the TMDL goal. The primary reduction in loading is anticipated to occur through improved water quality in Lake Dora, and to a lesser extent in Lake Harris. Improved water quality in Lake Dora, taking into account future loadings, is estimated to reduce TP loading to Lake Eustis by 15,262 lbs/yr. Improved water quality in Lake Harris, also accounting for future loadings, is estimated to reduce TP loading to Lake Eustis by 1,074 lbs/yr.

Figure 14 presents the expected net TP loading to Lake Eustis. After factoring in reductions from the projects and sources described in this BMAP and increases for estimates of future growth, the net reduction in TP loading to Lake Eustis is estimated at 17,197 lbs/yr (about a 48% reduction), which should achieve the TMDL for Lake Eustis (20,286 lbs/yr). However, achievement of ambient TP water quality criteria targets may not be realized until future BMAP cycles. Because these lakes lie in a chain, an improvement in the upstream lake is directly linked to an improvement in the lake downstream. The expected improvement in Lake Eustis will help improve Lake Griffin, downstream.

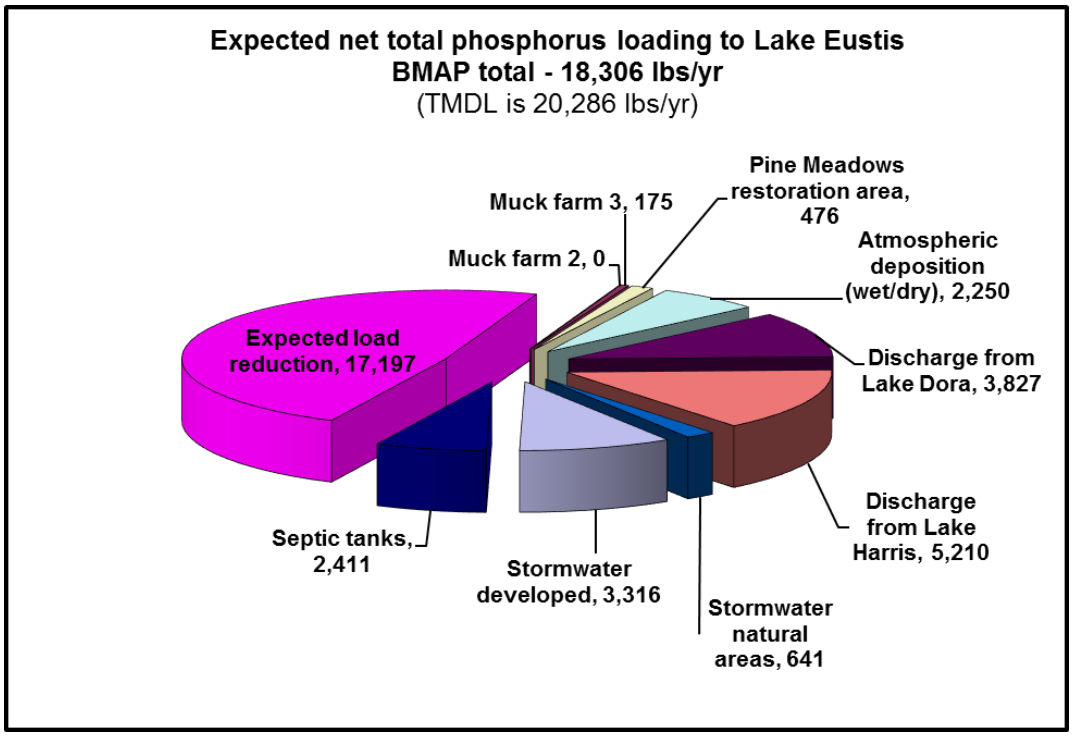


FIGURE 14: ESTIMATED LOAD REDUCTION AND NET TP LOADING TO LAKE EUSTIS

8.1 MANAGEMENT STRATEGIES

The management strategies proposed for this second iteration of the BMAP in the Lake Eustis basin are included in **Table 11**.

TABLE 11: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING TO LAKE EUSTIS

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
EUS26 – Lakeshore Drainage Improvement	Lake Eustis Basin	Not available	2817B	Lake County/Lake County Stormwater MSTU/	$172,981.00 design/$700,000 estimated for construction	Complete/ December 2010
EUS27 - Bates Avenue Pond	Cardinal and Bates Avenue / Two ponds / south side pond treats Bates, north side pond treats Cardinal	10.3	2817B	City of Eustis // LCWA	$250,236; $75,118 from LCWA	Complete / 2012
EUS28 - Downtown Stormwater Master Plan	Master plan for downtown Eustis including construction of pond off Grove St and new stormwater lines along SR 19.	44.9	2817B	City of Eustis	$6,528,473	Complete/ 2012
EUS30 – Orange Avenue Retrofit	Lake Bracy Watershed in Umatilla / Addition of catch basins and stormwater pond addition and enlargement.	18.76	2817B	City of Umatilla	$1,644,427	Ongoing / 2013

Chapter 9: TROUT LAKE

Figure 15 presents the expected net TP loading to Trout Lake. Overall, a net reduction in TP loading of 296 lbs/yr is expected. An additional reduction in TP loading of 1,787 lbs/yr is needed to meet the TMDL for the lake.

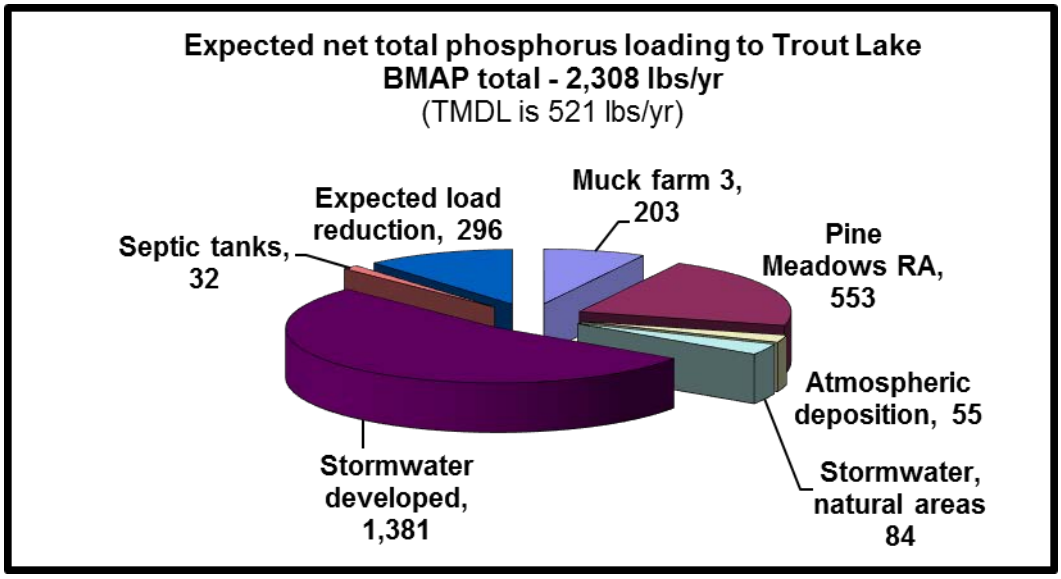


FIGURE 15: ESTIMATED LOAD REDUCTION AND NET TP LOADING TO TROUT LAKE

9.1 MANAGEMENT STRATEGIES

The management strategies proposed for this second iteration of the BMAP in the Trout Lake basin are included in **Table 12**. Trout Lake is one of the focus waterbodies in this BMAP iteration. Stormwater retrofits completed in the first iteration remove 296 lbs/yr of TP loading. Future consideration of regional treatment strategies may be necessary to remove a larger quantity of TP loading.

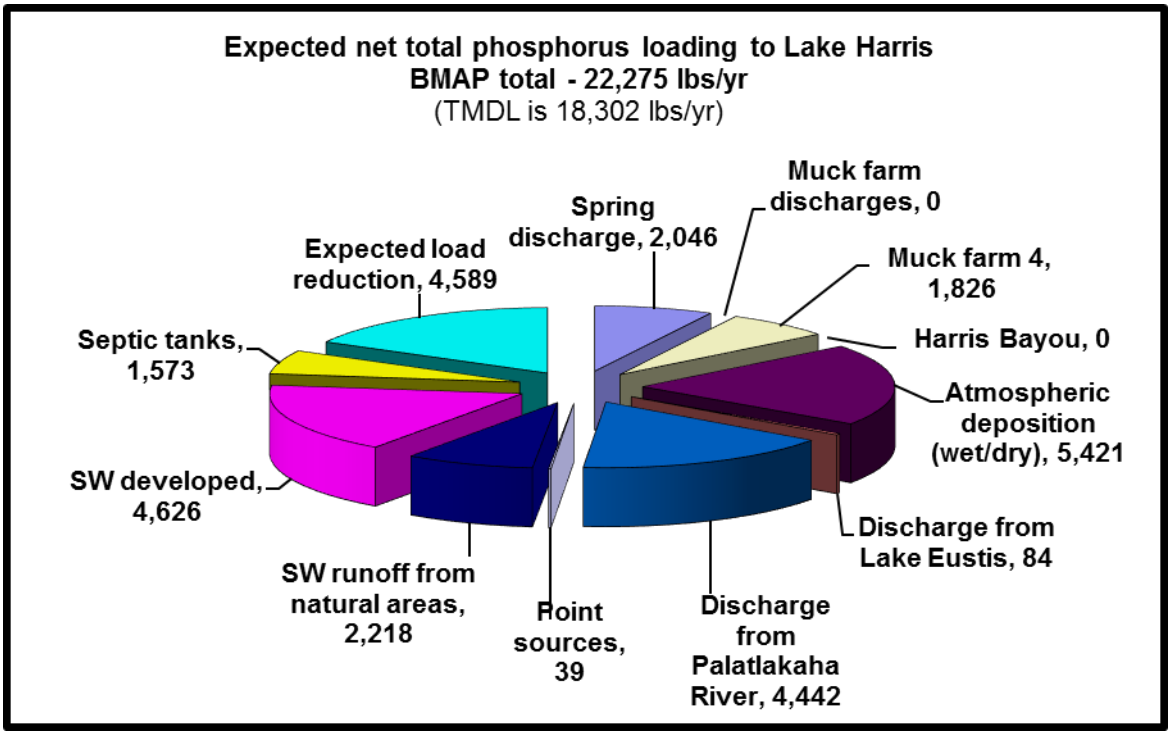
TABLE 12: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING TO TROUT LAKE

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
TROUT07- Lake Joanna	Lake Joanna / WQI project - water monitoring, education, removal of invasive species and re-vegetation, and installed of Bee-mat at the inlet channel; increased water quality sampling is ongoing.	Not available	2821B	Environmental Utilities /Pollution Recovery Trust Fund & mini-grant/	$6,000	Ongoing / Ongoing

Chapter 10: LAKE HARRIS

The expected net TP loading to Lake Harris, presented in **Figure 16**, includes reductions from the projects listed in this BMAP and loading increases from estimated future growth. The net reduction is projected to be 4,589 lbs/yr, or about 17%. However, to meet the TMDL target for Lake Harris, an additional reduction of 3,973 lbs/yr is needed.

Increased loading from future growth is the most important TMDL-related issue facing the sub-basin. Without factoring in future growth, the net loadings would already be achieving the TMDL loading target. The net future increase comes primarily from anticipated runoff from developed uses and loading from more septic tanks (a net increase of 2,307 lbs/yr). An increase in loading of 573 lbs/yr from the Palatlakaha River, caused by expected growth in that sub-basin, is also anticipated.



SW – Stormwater

FIGURE 16: ESTIMATED LOAD REDUCTION AND NET TP LOADING TO LAKE HARRIS

10.1 MANAGEMENT STRATEGIES

The management strategies proposed for this second iteration of the BMAP in the Lake Harris basin are included in **Table 13**.

TABLE 13: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING TO LAKE HARRIS

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
HAR15 – Porto Bello Avenue Drainage Improvements	Lake Harris Basin	Not available	2838A	Lake County/Lake County Stormwater MSTU/	$171,567.20 (construction)	Complete/ /July 2009
HAR16 – Orange Avenue Drainage Improvements	Lake Harris Basin	Not available	2838A	Lake County/Lake County Stormwater MSTU/	$154,274.64 (construction)	Complete/ July 2009
HAR17 – Lake Harris Water Quality Improvement Project at Venetian Gardens	Leesburg Venetian Gardens / nutrient reducing baffle box to remove pollutants	Not available	2838A	Environmental Services /319 grant, SJRWMD grant & City stormwater utilities fee /	$167,000 total (engineering and construction)	Complete/ September 2008
HAR18 – Silver Lake	Silver Lake / WQI project - water monitoring, education, removal of invasive species & re-vegetation. / Background and ongoing water monitoring, survey, individual permits issued	Not available	2825A	Environmental Utilities / Department Mitigation Project & mini-grant /	$6,000	Ongoing / 33 % complete
HAR19 / Heritage Estates Stormwater Improvement	Heritage Estates / Former CSX vacated rail to possible 1/2 acre pond and/or swales	Not available	2838A	City of Leesburg Public Works / City stormwater fee / Grants and cost shares	$351,000 (engineering/ property/ construction costs)	Planned/ Start in fiscal year 2015, estimated completion in two years
HAR20 / Pine Street Stormwater Pond	Pine Street / 0.89 acre dry detention	Not available	2838A	City of Leesburg Public Works / City stormwater fee / Grants and cost shares	$343,000 (engineering/ property/ construction costs)	Planned/ Start in late fiscal year 2015 or early fiscal year 2016, estimated completion in three years

Chapter 11: PALATLAKAHA RIVER

Figure 17 presents the estimated net TP loading to the Palatlakaha River sub-basin. With one exception, the management actions described in this BMAP could not be quantified; therefore, associated load reductions could not be factored into the net loading estimate. Overall, a net increase in TP loading to the sub-basin of 333 lbs/yr is estimated (about a 14% increase), attributed to future land use changes. TP loading would need to be reduced by about 476 lbs/yr to meet the TMDL for the sub-basin. However, the sub-basin is characterized as being close to its TMDL because of the relatively small reduction needed. The Palatlakaha River is one of the focus areas identified for extra effort in the second BMAP iteration.

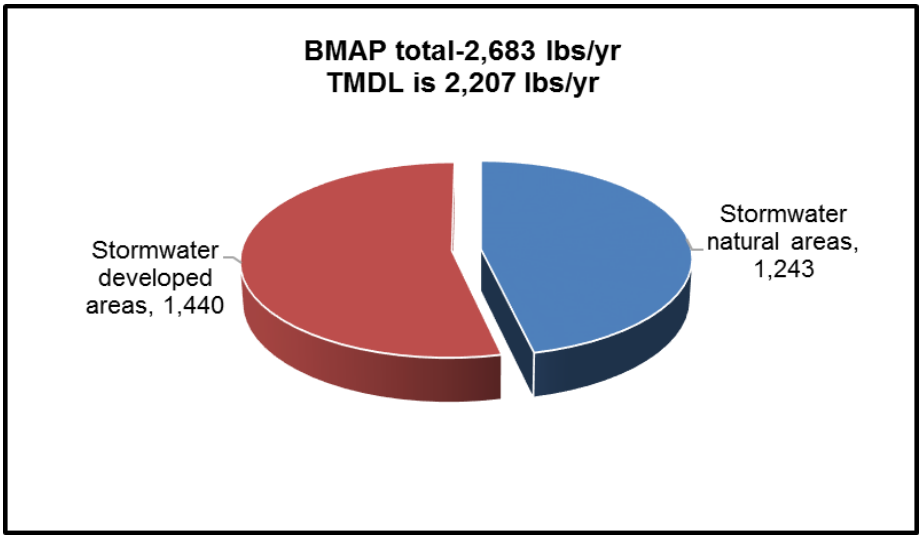


FIGURE 17: ESTIMATED NET TP LOADINGS TO THE PALATLAKAHA RIVER

11.1 MANAGEMENT STRATEGIES

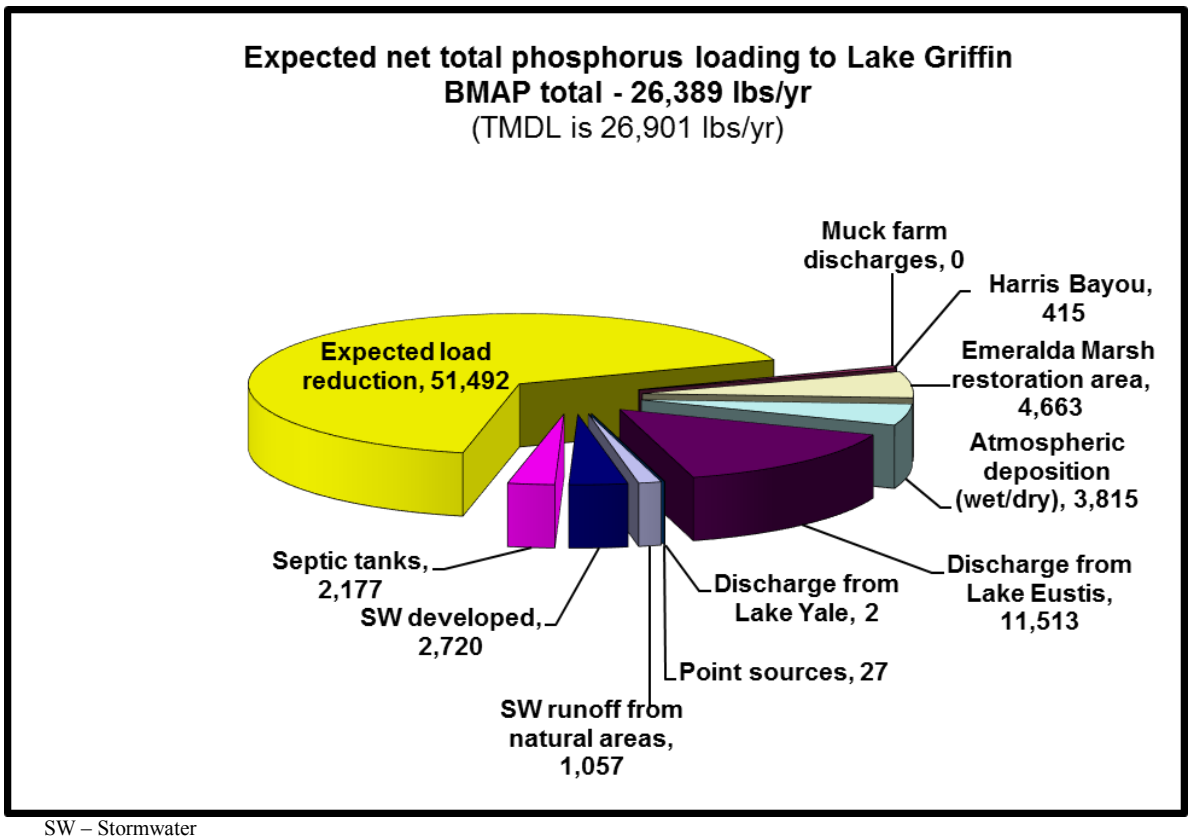
The management strategies proposed for this second iteration of the BMAP in the Palatlakaha River basin are included in **Table 14**.

TABLE 14: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING TO PALATLAKAHA RIVER

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
PAL24 - Lake Winona	Lake Winona / WQI project -water monitoring, education, removal of invasive species & re-vegetation. / Background and ongoing water monitoring, survey, individual permits issued.	Not available	2839X	Environmental Utilities /General Revenue & grant /	$6,000	Ongoing / 33 % complete

Chapter 12: LAKE GRIFFIN

Figure 18 presents the expected net TP loading to Lake Griffin. After factoring in reductions from the projects described in this BMAP and increases for estimates for future growth, the net reduction in TP loading to Lake Griffin is estimated to be 51,492 lbs/yr (about a 66% reduction). This reduction is sufficient to meet the TMDL for the lake. Because the lake lies at the end of the chain, an improvement in the upstream lake is directly linked to an improvement in waters downstream. The point source contribution is not from direct discharge to the lake, but is the contribution from spills and sprayfield runoff. The expected improvement in Lake Griffin will help improve conditions in the Ocklawaha River, downstream.



SW – Stormwater

FIGURE 18: ESTIMATED LOAD REDUCTION AND NET TP LOADINGS TO LAKE GRIFFIN

12.1 MANAGEMENT STRATEGIES

The management strategies proposed for this second iteration of the BMAP in the Lake Griffin basin are included in **Table 15**.

TABLE 15: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING TO LAKE GRIFFIN

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
FRUITLANDP01 – Street Sweeping	Fruitland Park city limits/ Annual sweeping of city-maintained streets to remove dirt, vegetation, and debris.	Not available	2814A	City of Leesburg / Not available / --	Not applicable	Ongoing / Ongoing
GRIF23 – Lake Griffin Water Quality Improvement Project at Canal St WWTP	Canal St. WWTP / sediment box	Not available	2814A	Environmental Services /SJRWMD grant & City stormwater utilities fee /	$150,000	Complete / July 2007
GRIF24 - SR 500 US 441-Basin D	Lake Griffin / SR 500 (US 441) From Martin Luther King to Lake Ella Rd - Basin D (238395-4)/ Wet Detention. No increase in TP load with Road Improvement.	15.48	2814A	FDOT, District 5 / Florida Legislature / NA	Not Available	On-going / Projected completion June 2014
GRIF25 - SR 500 US 441-Basin C	Lake Griffin / SR 500 (US 441) From Martin Luther King to Lake Ella Rd - Basin C (238395-4)/ Wet Detention. No increase in TP load with Road Improvement.	7.78	2814A	FDOT, District 5 / Florida Legislature / NA	Not Available	On-going / Projected completion June 2014
GRIF26 - SR 500 US 441-Basin E	Lake Griffin / SR 500 (US 441) From Martin Luther King to Lake Ella Rd - Basin E (238395-4)/ Dry Retention. No increase in TP load with Road Improvement.	7.81	2814A	FDOT, District 5 / Florida Legislature / NA	Not Available	On-going / Projected completion June 2014
GRIF27 – Lady Lake Service Area #1 & Service Area #3	Skyline Drive Drainage Improvement / Improved stormwater conveyance system. Area covers Skyline Drive north to Ray Street, west to Summit Street, and east to High Street. / Submitted for Dept. of Economic Opportunity Community Block Grant.	Not available	2814A	Town of Lady Lake	Unknown	Proposed / Start Date Unknown
GRIF28 / Watershed Management Plan	Marion County portion of Lake Griffin / Watershed management plans will be completed county-wide and are used to identify and address Marion County water quality issues. The plans will include creation and maintenance of a comprehensive geodatabase for Marion County storm sewer system data, watershed boundaries and hydrologic features county-wide. The plan for Lake Griffin has been initiated. The digital elevation model, watershed evaluation, modeling parameterization, model development and verification, and floodplain analysis and delineation have been completed. The remaining work, the Floodplain Level of Service, the Surface Water Resource Assessment Report and the Capital Projects Report are scheduled for fiscal years 2016/2017, 2017/2018, and 2018/2019, respectively.	Not available	2814A	Marion County Stormwater Section / Marion County Stormwater Assessment /	$975,832	Ongoing / Fiscal Year 2018/2019
GRIF29 / Roc-Mac Stormwater Pond	Roc-Mac Stormwater Pond / 2.7 acre wet detention pond with possible wetland	Not available	2814A	City of Leesburg Public Works / City stormwater fee / Grants and cost shares	$440,000 (engineering/ property/ construction costs)	Planned/ Start in fiscal year 2015, estimated completion in two years

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
GRIF30 / Oak Terrace Drive Detention	Oak Terrace Drive / 1.0 acre wet detention	Not available	2814A	City of Leesburg Public Works / City stormwater fee / Grants and cost shares	$355,000 (engineering/ property/ construction costs)	Planned/ Start in late fiscal year 2015 or early fiscal year 2016, estimated completion in three years

Chapter 13: LAKE YALE

Figure 19 presents the expected net TP loading to Lake Yale. The point source discharge to surface waters (from a former citrus-processing plant) that occurred during the TMDL baseline period has ceased. However, considering increases from estimates for future growth, the net change in TP loading to Lake Yale is estimated to increase by 439 lbs/yr (about 16%). A net reduction in TP loading of 753 lbs/yr is needed to meet the TMDL for Lake Yale. Atmospheric deposition is the largest source of TP loading to the lake, but it is an uncontrollable source. Stormwater (developed) and septic systems are two sources that can be managed.

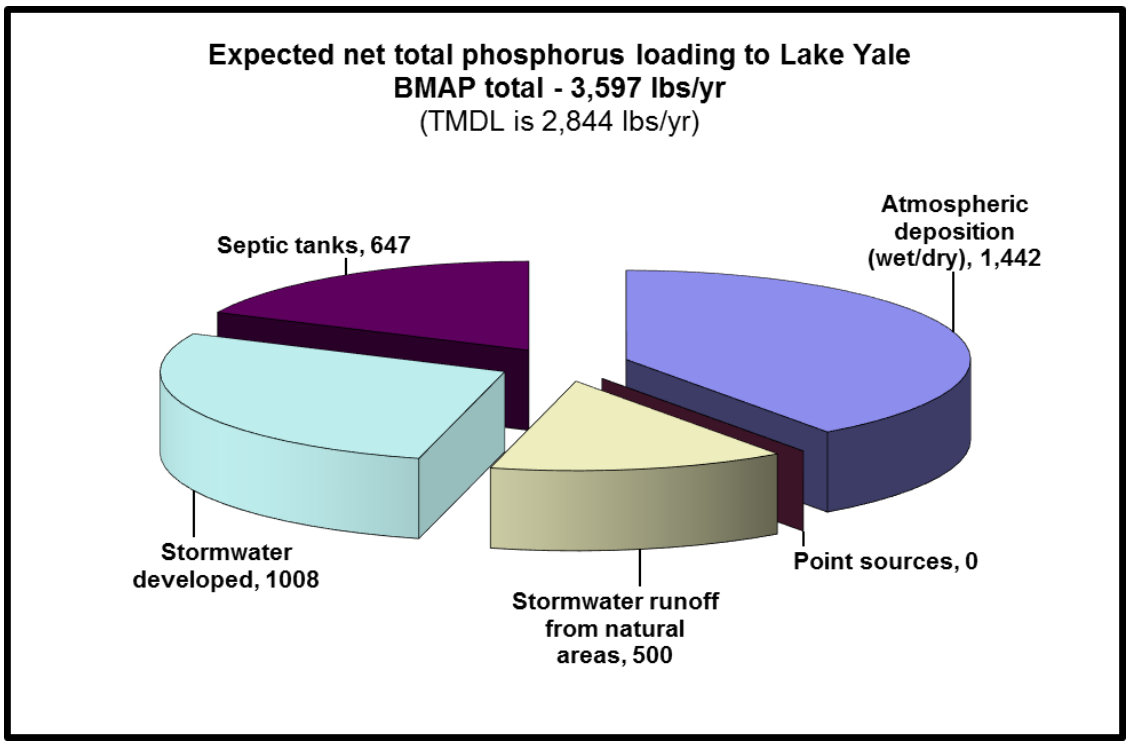


FIGURE 19: ESTIMATED LOAD REDUCTION AND NET TP LOADINGS TO LAKE YALE

13.1 MANAGEMENT STRATEGIES

The management strategies proposed for this second iteration of the BMAP in the Lake Yale basin are included in **Table 16**.

TABLE 16: MANAGEMENT STRATEGIES TO REDUCE NUTRIENT LOADING TO LAKE YALE

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
YALE02 – Washington Avenue and Side Streets (Phases 3 and 4) Drainage Improvements	Lake Yale Basin	Not available	2807A	Lake County/Lake County Stormwater MSTU/	$913,000	Ongoing/ September 2015
YALE03 – Old Chisholm Trail Drainage Improvements	Lake Yale Basin	Not available	2807A	Lake County/Lake County Stormwater MSTU/	$94,331 design/ $88,224 construction	Complete / July 2008
YALE04 – Lake Yale Priority for Reuse	City of Umatilla / Lake Yale priority reuse	58.2	2819A; 2807A	City of Umatilla / / FDEP; LCWA ; Lake County	$2,905,000 ($36,575 LCWA)	Ongoing / 2013 / estimated design completion 2014 and construction completion pending funding

Chapter 14: ASSESSING PROGRESS AND MAKING CHANGES

14.1 MONITORING WATER QUALITY AND POLLUTANT LOADS

The Department and BWG partners currently collect water quality data periodically from over 200 locations in the Upper Ocklawaha Basin lakes and streams, as well as the Palatlakaha River. The Technical Working Group has developed a strategy for monitoring water quality and measuring pollutant loads that builds on existing programs being conducted by the Department, SJRWMD, LCWA, Lake County, and Orange County. Two water quality monitoring networks are used: a trend network that tracks water quality changes in each impaired waterbody, and a potential sources network that provides information about TN and TP loadings contributed by external sources, used in pollutant modeling for the SWIM Program and TMDLs.

Figure 20 and **Figure 21** show the water quality monitoring stations needed for BMAP follow-up. These stations are devoted to water chemistry measurements. Biological indicators are also a part of the proposed network.

14.1.1 MONITORING OBJECTIVES

Objectives listed are applicable to both the trend and source networks.

- **Primary Objectives***:*
  - To determine whether the target TP and TN (where applicable) concentrations used to develop the TMDLs are being achieved.
  - To determine whether expected improvements in other water quality indicators are being achieved, particularly reductions in chlorophyll-*a* concentrations.
- **Secondary Objectives***:*
  - To measure tributary loadings.
  - To measure loadings associated with specific sources or projects, as feasible.

14.1.2 WATER QUALITY INDICATORS (REPRESENTING APPLICABLE DESIGNATED USES)

Table 17 and **Table 18** lists the core and supplemental water quality indicators, respectively, selected for the basin to ascertain whether a waterbody meets its designated uses. Core indicators are those most directly related to the target constituents. Supplemental indicators are supporting measures that help

interpret water quality improvements that occur with reductions in nutrient loadings and the achievement of designated uses and anticipated waterbody responses.

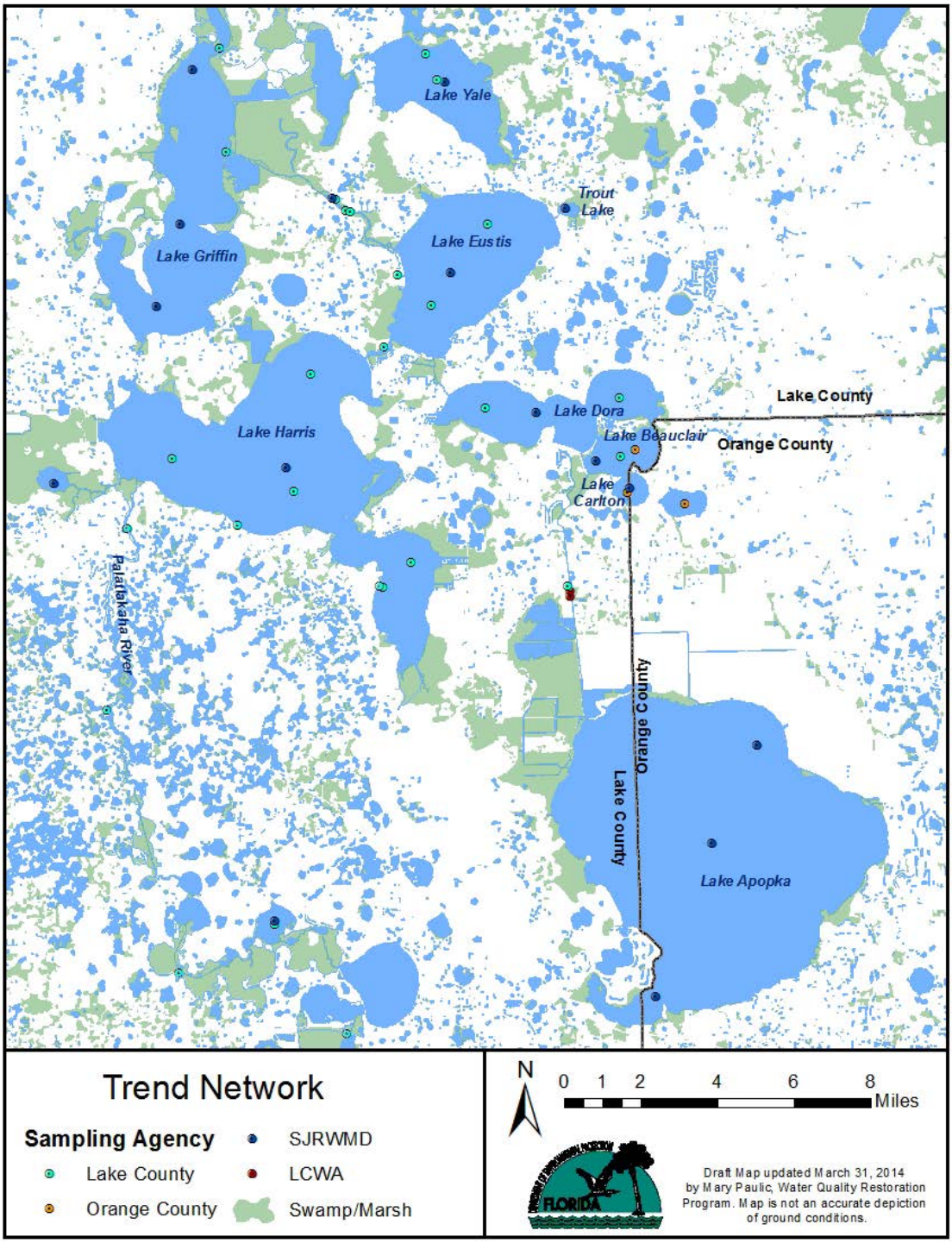


FIGURE 20: LOCATION OF TREND STATIONS IN THE UPPER OCKLAWAHA RIVER BASIN

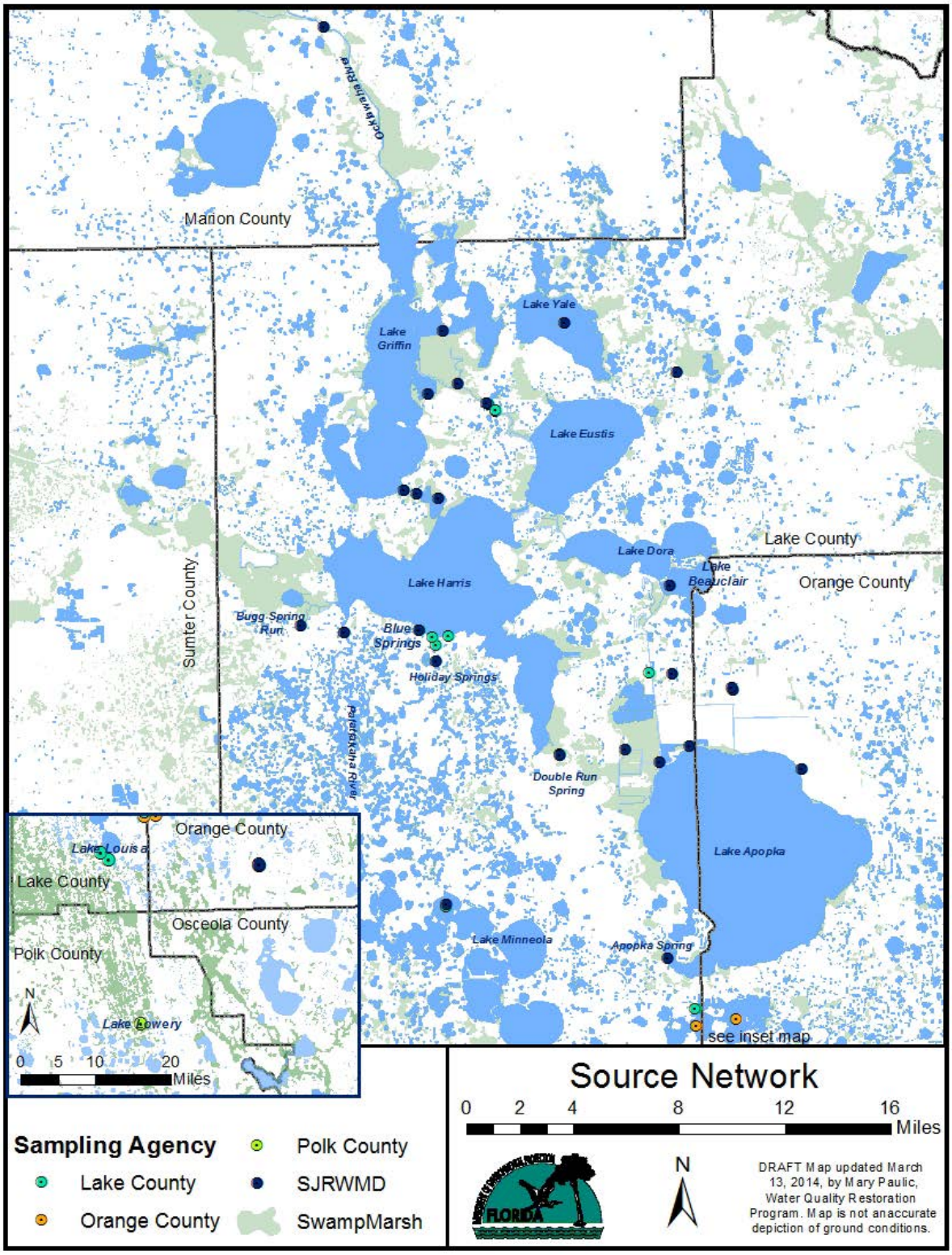


FIGURE 21: CONTRIBUTING SOURCES MONITORING NETWORK IN THE UPPER OCKLAWAHA RIVER BASIN

As water quality conditions in the lakes improve, biological indicators become more important measures of lake restoration. Biological indicators that are proposed for the lakes are the lake vegetation index (LVI) and phytoplankton enumeration and taxonomic classification. The LVI is an indicator of the distribution and diversity of aquatic plants and provides an estimate of available in-lake and littoral habitat. Phytoplankton taxonomy is an indicator of ecological diversity within a lake. **Table 19** shows the waterbody responses anticipated as load reductions are achieved. These responses will help determine whether the related designated uses (for Class III waters) are being met in the TMDL waterbodies.

TABLE 17: CORE WATER QUALITY INDICATORS

- = Empty cell

CORE WATER QUALITY INDICATORS	LAKES	CANALS	PALATLAKAHA RIVER
Biological Oxygen Demand	-	-	√
Chlorophyll-*a*	√	√	√
Dissolved Oxygen	-	-	√
Stream Condition Index	-	-	√
TN	√	√	√
TP	√	√	√
Trophic Condition per the TSI	√	-	-
LVI	√	-	-
Phytoplankton Enumeration and Identification	√	-	-

TABLE 18: SUPPLEMENTAL WATER QUALITY INDICATORS

- = Empty cell

SUPPLEMENTAL WATER QUALITY INDICATORS	LAKES	CANALS	PALATLAKAHA RIVER
Algal Biomass	√	-	-
Alkalinity	√	√	√
Biological Oxygen Demand	-	-	√
Clarity Measured as Secchi depth	√	√	√
Color	√	-	-
Conductivity	√	√	√
Dissolved Oxygen	√	√	-
pH	√	√	√
Temperature	√	√	√
Total Organic Carbon	√	√	-
Total Suspended Solids (TSS)	√	√	√
Turbidity	√	√	√
Unionized Ammonia	√	√	√
Field Conditions during Sampling	√	√	√

TABLE 19: ANTICIPATED WATERBODY RESPONSES TO LOAD REDUCTIONS

- = Empty cell

ANTICIPATED WATERBODY RESPONSE – INDICATOR RESPONSE	RECREATION DESIGNATED USE	FISH/WILDLIFE DESIGNATED USE
Reduction in frequency and magnitude of algal blooms—decreased frequency of chlorophyll-*a* values greater than 60 ppb; decreased concentrations of TN and TP; decreased TSI; changes in phytoplankton community structure	√	√
Increased water transparency—increased Secchi depth; decreased chlorophyll-*a* concentrations	√	√

ANTICIPATED WATERBODY RESPONSE – INDICATOR RESPONSE	RECREATION DESIGNATED USE	FISH/WILDLIFE DESIGNATED USE
Re-establishment of noninvasive, beneficial aquatic plants	--	√
Reduction in resuspension of bottom sediments—decreased TSS and turbidity	√	√
Improved habitat quality for sport fish	√	√
Increased sportfish populations	√	√

14.1.3 MONITORING DESIGN AND EVALUATION

Stations were selected using the following criteria:

- *A network of stations supporting both the primary and secondary objectives was assembled from monitoring networks supported by Lake County, LCWA, Orange County, and SJRWMD. Lake County's Adopt-a-Lake volunteer monitoring program supplements data collected by agencies.*
- *For the primary objective, stations representative of the lakes, the tributaries between the lakes (e.g., Dead River and Haynes Creek), and the Palatlakaha River (see* ***Figure 20)*** *were selected for preliminary inclusion in the network).*
- *As a secondary objective, stations that provide data on specific loading sources were selected for preliminary inclusion in the network (see* ***Figure 21****).*
- *Information describing each network includes station location, frequency of sampling, indicators sampled, and responsible entity.*
- *Monitoring agencies agree that each impaired waterbody, at a minimum, has at least one monitoring station.*
- *The minimum sampling frequency is quarterly data collection, however, a higher frequency of sampling is recommended to strengthen trend detection. Quarterly data allows the calculation of seasonal averages required by the Department's Impaired Waters Rule (IWR) and verified impaired listing process.*

Refinements to the sampling network may periodically be necessary. The following provides guidance for those situations:

- *The Technical Working Group will periodically review the list of monitoring stations to ensure that each impaired waterbody is being monitored. The goal is to have at least one agency sampling at least one location within each impaired waterbody.*

- *Feedback from long-term data or research monitoring efforts, can be used to identify the best locations for sampling and the frequency of sampling. There are statistical techniques that can be used to determine adequate sampling frequency.*
- *As issues arise or data analysis indicates the need for additional monitoring, the Technical Working Group will periodically review the monitoring list to identify opportunities to add sampling locations or increase frequency of monitoring.*

14.1.4 Quality Assurance/Quality Control (QA/QC) Mechanisms

The collection of both ambient and performance-based water quality data will be conducted in a manner consistent with the Department's standard operating procedures for QA/QC. The most current version of these procedures can be downloaded from http://www.dep.state.fl.us/water/sas/sop/sops.htm. All stakeholders contributing data in support of the BMAP agree to follow these standard operating procedures s.

14.1.5 Data Management Mechanism(s) for Data Storage and Retrieval

Chemistry data from all monitoring agencies (e.g., Lake County, Orange County, SJRWMD, and LCWA) goes to the Department's centralized water quality database. The Department utilizes the Florida Storage and Retrieval (STORET) database and IWR database as central data storages. The IWR database supports the Department's 303(d) process for identifying and listing waterbodies not meeting standards and criteria that need to be addressed by TMDLs. Much of the data that is stored in the IWR originates from the STORET database, but not exclusively. The Department, as the centralized database manager, will be responsible for data storage and retrieval after the data have been uploaded. The responsibility for data quality rests with the contributing agency.

14.2 Tracking and Follow-up Actions

BMAP implementation is a long-term process. Some key projects with significant estimated load reductions will extend well beyond the next five years of BMAP implementation. This means that TMDLs established for the basin likely will not be achieved in the near term. The BWG will track its implementation efforts and monitor water quality in TMDL waterbodies (through existing water quality monitoring programs), to ensure that the BMAP is carried out and to measure its effectiveness. The BWG will meet periodically (approximately every 12 months) to discuss implementation issues and opportunities, consider new information, and determine other management strategies needed for

waterbodies that are not projected to meet their TMDLs or which have had new TMDLs established by the Department.

Each entity responsible for implementing management strategies as part of the BMAP will complete an annual report for submittal to the BWG and the Department, using the existing project tracking spreadsheet. The report will track the implementation status of their management strategies listed in the BMAP and document additional management strategies undertaken to further the water quality improvements in the basin.

The BWG will review the annual reports to assess progress in meeting the goals of the BMAP. At its semiannual meetings, the BWG will also develop follow-up steps or modifications to the agreed-on management strategies as necessary to achieve the targeted pollutant reductions.

Adaptive management involves setting up a mechanism for making course corrections in the BMAP when circumstances change or feedback mechanisms indicate that a more effective strategy is needed. The FWRA requires that the plan be revised, as appropriate, in collaboration with basin stakeholders. All or part of a revised BMAP must be adopted by secretarial order. Adaptive management measures include the following:

- *Procedures to determine whether additional cooperative actions are needed.*
- *Criteria/process for determining whether and when plan components need to be revised due to changes in costs, environmental impacts, social effects, watershed conditions, or other factors.*
- *Descriptions of the BWG's role after BMAP completion.*

Tracking implementation, monitoring water quality and pollutant loads, and holding periodic BWG meetings to share information and expertise are key components of adaptive management.

14.3 COMMITMENT TO PLAN IMPLEMENTATION

While the BMAP is linked by statute to permitting and other enforcement processes that target individual entities, successful implementation requires that local stakeholders willingly and consistently work together to achieve adopted TMDLs. This collaboration fosters the sharing of ideas, information, and

resources. The members of the Upper Ocklawaha BWG have demonstrated their willingness to confer with and support each other in their efforts.

APPENDIX A: REFERENCES

Florida Department of Environmental Protection. 2003. *Water quality assessment report: Ocklawaha.*

———. 2003. *Total maximum daily load (TMDL) for the Palatlakaha River to address dissolved oxygen impairment*.

———. May 2, 2006. *Integrated water quality assessment for Florida: 2006 305(b) report and 303(d) list update.* Tallahassee, Florida.

Gao, X., and D. Gilbert. 2004. *Nutrient total maximum daily load for Trout Lake, Lake County, Florida.* Florida Department of Environmental Protection.

Jeppense, E., M. Søndergaard, J. P. Jensen, K. E. Havens, O. Anneville. L/ Carvalho, M. F. Coveney, R. Deneke, M.T. Dokulil, b. Foy, D. Gercdeaux, S. E. Hampton, S. Hilt, K. Kangur, J. Köhler, E. Lammens, T. L. Laruidsen, M. Manca, M. R. Miracle, B. Moss, P. Nõges, G. Persson, G. Phillips, R. Portielje, S. Romo, C. L. Schelske, D. Straile, I. Tatrai, E. Willen, and M. Winder. 2005. "Lake Responses to reduced nutrient loading - an analysis of contemporary long-term data from 35 case studies". *Freshwater Biology,* 50:1747-1771.

Magley, W. 2003. *Total maximum daily load for total phosphorus for Lake Apopka, Lake and Orange Counties, Florida*. Florida Department of Environmental Protection.

———. 2003. *Total maximum daily load for total phosphorus for Lake Beauclair, Lake County, Florida*. Florida Department of Environmental Protection.

———. 2003. *Total maximum daily load for total phosphorus for Lake Dora and Dora Canal, Lake County, Florida*. Florida Department of Environmental Protection.

———. 2003. *Total maximum daily load for total phosphorus for Lake Eustis and Haines Creek Reach, Lake County, Florida*. Florida Department of Environmental Protection.

———. 2003. *Total maximum daily load for total phosphorus for Lake Griffin, Lake County, Florida*. Florida Department of Environmental Protection.

———. 2003. *Total maximum daily load for total phosphorus for Lake Harris and Little Lake Harris, Lake County, Florida*. Florida Department of Environmental Protection.

———. 2003. *Total maximum daily load for total phosphorus for Lake Yale and Yale Canal, Lake County, Florida*. Florida Department of Environmental Protection.

———. 2004. *Total maximum daily load for total phosphorus for Lake Carlton, Lake County, Florida*. Florida Department of Environmental Protection.

Minogue, P.J., et. al. September 13, 2013. *Effectiveness of Silviculture Best Management Practices for Forest Fertilization in Pine Straw Production to Protect Water Quality in Florida: Four Year Monitoring Results and Interpretation.* University of Florida. Institute of Food and Agricultural Sciences, North Florida Research and Education Center.

Vowell, J.L. 2001. "Using stream bioassessment to monitor best management practice effectiveness." *Forest Ecology and Management, 143. 237-244.*

Vowell, J.L., and R.B. Frydenborg. 2004. A biological assessment of best management practice effectiveness during intensive silviculture and forest chemical application. *Water, Air, and Soil Pollution: Focus 4. 297-307.*

APPENDIX B: POTENTIAL FUNDING SOURCES

A BMAP must identify feasible funding strategies for implementing the management strategies presented. This appendix provides a list of potential funding sources.

The **Clean Water State Revolving Fund (SRF) loan program** provides low-interest loans to local governments to plan, design, and build or upgrade wastewater, stormwater, and nonpoint source pollution prevention projects. Certain agricultural best management practices may also qualify for funding. Discounted assistance for small communities is available. Interest rates on loans are below market rates and vary based on the economic wherewithal of the community. The Clean Water SRF is Florida's largest financial assistance program for water infrastructure. More information is available at www.dep.state.fl.us/water/wff/cwsrf.

The **Drinking Water SRF loan program** provides low-interest loans to local governments and certain private utilities to plan, design, and build or upgrade drinking water systems. Discounted assistance for small communities may be available. Interest rates on loans are typically 40% below market rates. More information is available at www.dep.state.fl.us/water/wff/dwsrf.

The **Small Community Wastewater Facilities Grants Program** provides grants to fund the construction of wastewater facilities in municipalities with 10,000 or fewer people and per capita income levels below Florida's average per capita income. A local match is required. The program is linked to the Clean Water SRF loan program outlined above, and is highly competitive. More information is available at www.dep.state.fl.us/water/wff/cwsrf/smalcwgp.htm.

Florida's **Section 319 grant program** administers funds received from the U.S. Environmental Protection Agency (EPA) to implement projects or programs that reduce nonpoint sources of pollution. Projects or programs must benefit Florida's priority watersheds ("impaired waters"), and local sponsors must provide at least a 40% match or in-kind contribution. Eligible activities include demonstration and evaluation of urban and agricultural stormwater BMPs, stormwater retrofits, and public education. More information is available at www.dep.state.fl.us/water/nonpoint/319h.htm.

Funding for projects related to the implementation of **Total Maximum Daily Load** determinations may be available through periodic legislative appropriations to the Department. When funds are available, the program prioritizes stormwater retrofit projects to benefit impaired waters, somewhat along the lines of

the Section 319 grant program listed above. More information is available at www.dep.state.fl.us/water/watersheds/tmdl_grant.htm.

The Florida Legislature may solicit applications directly for **Community Budget Issue Request** projects, including water projects, in anticipation of upcoming legislative sessions. This process is an opportunity to secure legislative sponsorship of project funding through the state budget. The Legislature may coordinate applications with the Department. In other years, the Legislature will not solicit projects but may include them in the budget in any event. You are advised to contact your local legislative delegation to determine whether there are opportunities available to fund your project. Information on contacting Senators and Representatives is available at www.leg.state.fl.us.

There are a number of other programs at both the state and federal levels that offer the possibility of water infrastructure funding. These include:

Florida Department of Economic Opportunity **Small Cities Community Development Block Grant Program** – Funds are available annually for water and sewer projects that benefit low- and moderate-income persons. Monies also may be available for water and sewer projects that serve a specific "job-creating entity" as long as most of the jobs created are for people with low or moderate incomes. For more information, visit http://www.floridajobs.org/community-planning-and-development/assistance-for-governments-and-organizations/florida-small-cities-community-development-block-grant-program.

Florida Rural Water Association Loan Program – This program provides low-interest bond or bank financing for community utility projects in coordination with the Department's SRF programs discussed above. Other financial assistance may also be available. For more information, visit www.frwa.net/ and look for the links to "Funding" and "Long-Term Financing."

Enterprise Florida – Enterprise Florida's program is a resource for a variety of public and private projects and activities, including those in rural communities, to facilitate the creation, capital investment, and strengthening and diversification of local economies by promoting tourism, trade and economic development. The various Enterprise Florida programs and financial incentives are intended, among other things, to provide additional financial assistance to enable communities to better access other infrastructure funding programs. For more information, visit www.eflorida.com/; contact information is available from the "Contact Us" link at the top of the page.

Florida's **five regional water management districts** also offer financial assistance for a variety of water-related projects, for water supply development, water resource development, and surface water restoration. Assistance may be provided from ad valorem tax revenues or from periodic legislative appropriations for Alternative Water Supply Development and Surface Water Improvement and Management projects. The amount of funding available, matching requirements, and types of assistance may vary from year to year. For information on funding opportunities, contact the water management district with jurisdiction in your area—see www.dep.state.fl.us/secretary/watman for a map and links to each of the districts.

U.S. Department of Commerce **Economic Development Administration Public Works and Development Facilities Program** – The program provides funding to help distressed communities in economic decline revitalize, expand, and upgrade their physical infrastructure to attract new industry, encourage business expansion, diversify local economies, and generate or retain long-term, private sector jobs and investment. The program focuses on redeveloping existing infrastructure. For more information, visit www.eda.gov/investmentPriorities.htm.

U.S. Department of Agriculture **Rural Development Rural Utilities Service Guaranteed and Direct Loans and Grants** – This program provides a combination of loans and grants for water, wastewater, and solid waste projects to rural communities and small incorporated municipalities. Some nonprofit entities also may be eligible. For more information, visit http://www.rurdev.usda.gov/UWEP_HomePage.html.

Congress's **State and Tribal Assistance Grant Program** provides the opportunity to secure Congressional sponsorship of project funding, including water project funding, through the annual federal budget process. The program's stated purpose is to strengthen state, local governments, and tribal abilities to address environmental and public health threats while furthering environmental compliance. You may want to consider contacting your Representatives or Senators for assistance in pursuing funding; see http://thomas.loc.gov/links/.

Grants.gov at http://www.grants.gov/, which is the official federal website for information on more than 1,000 federal grant programs. The site includes an automatic email notification system for keeping apprised of federal grant opportunities.

Catalog of Federal Domestic Assistance at http://www.cfda.gov/, which provides a database of all federal programs available to state and local governments; public, quasi- public, and private profit and

nonprofit organizations and institutions; specialized groups; and individuals. There are a variety of sources of niche funding that may be appropriate to your situation. There are also private funding sources (endowments, private trusts, etc.) that may, on occasion, fund water-related projects; a variety of sources to investigate these opportunities are available on the web.

The **Florida Resource Directory** at http://redi.state.fl.us/ provides a searchable directory of information about and links to many state and federal programs with resources available to help local communities. Funding for water-related projects is just one of many types of assistance identified here.

If you are interested in **disaster relief**, your first contacts should be to Florida's **Division of Emergency Management** at http://www.floridadisaster.org/ or your county emergency management agency (see www.floridadisaster.org/fl_county_em.asp); and the **Federal Emergency Management Agency** at 1.800.621.FEMA (3362), or visit www.fema.gov/government/grant/pa/index.shtm, where the process for securing disaster-related infrastructure assistance begins.

APPENDIX C: MANAGEMENT STRATEGIES ADOPTED IN THE FIRST BMAP ITERATION

The following tables list the management strategies adopted in the first BMAP iteration, which have been modified since adoption. Management strategies were grouped in a table by category of activity. The tables include a description of each project, the lead entity/project partners, cost and funding source(s), schedule, and anticipated benefits and load reductions (if known). The management strategies in the tables are organized by each waterbody and for watershed-wide or sub-basinwide actions in the Upper Ocklawaha River Basin.

TABLE C-1: STRUCTURAL BMPS—QUANTIFIABLE LOAD REDUCTIONS

PROJECT NUMBER	PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION (LBS/YR)	WBID	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
DORA04	SR 500 US 441-Basin 300A	Lake Saunders / US 441 from Lake Eustis Dr. to County Road (CR) 44B Basin 300A. Exfiltration trench. No increase in TP with road improvement.	3.04	2831B	FDOT, District 5 / Florida Legislature / --	Not available	Complete/ June 2007
DORA05	SR 500 US 441-Basin 300A,B,C,D	Lakes Saunders and Woodward / US 441 from Lake Eustis Dr. to CR 44B - Basin 300A, B, C, & D.	-10.51	2831B	FDOT, District 5 / Florida Legislature / --	Not available	Complete/ June 2007
EUS20	SR 500 US 441	Lake Juanita / US 441 from Lake Eustis Dr. to CR 44B. Wet pond detention. No increase in TP load with road improvement.	1.85	2817B	FDOT, District 5 / Florida Legislature / --	Not available	Complete/ June 2007
EUS21	SR 500 US 441	Lake Juanita / US 441 from Lake Eustis Dr. to CR 44B. Wet pond detention. No increase in TP with road improvement.	3.28	2817B	FDOT, District 5 / Florida Legislature / --	Not available	Complete/ June 2007
EUS24	North Bay Street and Clifford Avenue Retrofit	Intersection North Bay St. and Clifford Ave. in Eustis / Stormwater retrofit. Divert stormwater runoff to dry detention pond via storm sewer retrofit for total treatment and storage. Divert stormwater runoff to pond instead of discharge into Lake Eustis.	51	2817B	City of Eustis / LCWA - $327,250; Eustis- $327,250 / LCWA / Department / SJRWMD	$654,500	Ongoing / Consolidated with Master Plan November 2009
GRIF08	Canal Street Retrofit	Canal St. / Stormwater retrofit, construct 2.4-acre pond.	7.00	2814A	City of Leesburg Environmental Services / Leesburg - 75%; LCWA - 25% / LCWA	$200,000	Complete/ April 2009
GRIF10	Whispering Pines Regional Stormwater Retrofit	Whispering Pines Basin / Stormwater retrofit. Construction of 2 stormwater ponds. Expected 66% reduction in TP.	130	2814A	City of Leesburg Environmental Services / Leesburg - 50%; LCWA - 50% / LCWA / Department	$1,500,000	Complete/ April 2009
GRIF13	SR 500 US 441-Basin 100	Lake Griffin / US 441 from west of Griffin Rd. to east of Perkins St. - Basin 100. Wet pond detention. No increase in TP load with road improvement.	54.66	2814A	FDOT, District 5 / Florida Legislature / --	Not available	Complete / Complete
GRIF14	SR 500 US 441-Basin 200	Lake Griffin / US 441 from West of Griffin Rd. to east of Perkins St. - Basin 200. Wet pond detention. No increase in TP load with road improvement.	74.06	2814A	FDOT, District 5 / Florida Legislature / --	Not available	Complete / Complete
GRIF15	SR 500 US 441-Basin 2	Lake Griffin / SR 500/US 441 Leesburg - Basin 2. No increase in TP load with road improvement.	9.59	2814A	FDOT, District 5 / Florida Legislature / --	Not available	Complete / Complete
HAR13	Hollondel Road Stormwater Pond	Lake Harris Basin / Stormwater pond. SJRWMD assisted with purchase of property.	150	2838A; 2838B	Lake County Public Works / Lake County Stormwater Assessment; SJRWMD / SJRWMD	$140,000 design; $816,000 construction	Complete / September 2009

Project Number	Project Name	General Location / Description	Estimated TP Load Reduction (lbs/yr)	WBID	Lead Entity / Funding Source / Project Partners	Project Cost	Project Status / Completion Date or Anticipated Completion Date
HAR14	Dead River Road Stormwater Park	Lake Harris Basin / Stormwater park. Lake County Public Works partnered with Public Lands to purchase property.	38.10	2838A; 2838B; 2817C	Lake County Public Works / Lake County Stormwater Assessment / Lake County Public Lands	$1,600,000	Complete/ 2010
LAP09	Jones Avenue Regional Stormwater Management Project Section	North of Lake Apopka, city of Apopka, north shore of Lake Apopka / Jones Avenue Regional Stormwater Management Project in northern part of north shore area is a 15-acre regional wet detention pond and 20-acre wetland restoration project located in Section 19,20, 21;Township 20S;Range 27E. It serves an area of 1,000 acres during 100-year flood elevation. It treats 0.35 inches over 500 acres. Project reduces maintenance of ditches along Jones Ave. Improves water quality: removes TP and TSS. Reduces stormwater runoff from hazardous waste site. Habitat restoration. Net decrease in TP and other parameters.	296	2835D	Orange County Public Works / Orange County - $4.3 million; SJRWMD Ad valorem - $300,000 (plus land costs for both partners) / SJRWMD Lands Division	$4,600,000	Complete / November 2008
LAP14	SR-50-Basin G	Johns Lake / SR-50 from west of Hancock Rd. to east of Turnpike -Basin G. Wet pond detention.	-2.8	2835B	FDOT, District 5 / Florida Legislature / --	Not available	Complete / Complete
LAP15	SR-50-Basin H	Johns Lake / SR-50 from west of Hancock Rd. to east of Turnpike -Basin H. Wet pond detention. No increase in TP load with road improvement	13.46	2835B	FDOT, District 5 / Florida Legislature / --	Not available	Complete / Complete
LAP16	SR-50-Basin I	Johns Lake / SR-50 from west of Hancock Rd. to east of Turnpike -Basin I. Dry detention pond. No increase in TP load with road improvement.	-0.02	2835B	FDOT, District 5 / Florida Legislature / --	Not available	Complete / Complete
PAL14	US 27-Basin 1	Big Creek / US 27 from US 192 to North Boggy Marsh Rd. - Basin 1. Wet pond detention. No increase in TP load with road improvement.	13.3	2839	FDOT, District 5 / Florida Legislature / --	Not available	Complete / Complete
TROUT06	Getford Road Stormwater Park	Trout Lake Basin / Lake County stormwater master plan implementation. Joint project between Lake County and city of Eustis. Construction of stormwater pond with passive park features.	142.6	2819A	Lake County Stormwater / Lake County Stormwater Assessment; City of Eustis; Department / City of Eustis	$2,900,000	Complete / July 2009
GRIF20	Lake Griffin Marina Improvements	Lake Griffin Marina / Swale improvements planned.	1	2814A	Lake County Public Works / Lake County Stormwater Assessment / --	$150,000	Pending / Construction not started

TABLE C-2: STRUCTURAL BMPS—LOAD REDUCTIONS NOT CURRENTLY QUANTIFIED

PROJECT NUMBER	PROJECT NAME	GENERAL LOCATION / DESCRIPTION	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
Remove DORA16	Lake Gertrude Outfall Project	Lake Gertrude sub-basin / Proposed improvements to Lake Gertrude outfall. Lake Gertrude is a tributary discharge to Lake Dora.	2831B; 2823	City of Mt. Dora / / Lake County Public Works	$635,000	Remove from project list / Replaced with DORA15 and DORA14
CLR01	Baffle boxes	Throughout city of Clermont / 7 baffle boxes with hydrocarbon absorbent pillows installed. Each unit 15 ft. by 5.33 ft. by 7 ft .deep. Units installed recently; no estimate of debris and sediment removed.	2839	City of Clermont / City of Clermont / --	Not available	Ongoing / ongoing
GRIF16	Picciola Road ditches	Picciola Road - unincorporated Lake County / Recontouring of ditches. Addition of ditch blocks.	2814A	Lake County Public Works / Lake County Stormwater Assessment / --	$150,000	Complete / Complete
GRIF17	Harbor Oaks retrofit	Harbor Oaks / Exfiltration system installed.	2814A	Lake County Public Works / Lake County Stormwater Assessment / --	$200,000	Complete / Complete
GRIF21	CR 466B Swale Improvements	CR 466B / Swale improvements planned for 2008.	2814A	Lake County Public Works / Lake County Stormwater Assessment / --	Not available	Complete / 2004
LAP22	East Bay Streets Community Development Project	Lake Apopka Basin / Paving and drainage upgrades - Section 13, 24; Township 22; Range 27. Roadway improvements will include resurfacing and overbuilding of existing pavement. Miami curbing and sidewalks will be installed based on proposed typical section. Drainage improvements include installation of proposed storm sewer, cross drains, construction of retention ponds and associated outfall system.	2835D	Orange County Public Works / Housing and Community Development Block Grant / --	$1,700,000 estimate	Pending / Projected start date 6/1/2007
LAP28	Shore Drive and Lake Blvd-Johns Lake Retrofit	Shore Drive and Lake Blvd. / Exfiltration and outfall improvements.	2835B	Lake County Public Works / Lake County Stormwater Assessment / --	$100,000	Complete / May 2008
Tavares02	Baffle Boxes	Tavares / Baffle boxes have been placed in many of direct stormwater discharges into lakes. City has installed more than 10 baffle boxes during past 5 years. Funds were provided by LCWA and Department. Boxes collect sediments and debris and prevent their entry into lakes. May remove some TP if attached to sediment.	2831B; 2817B	City of Tavares / City of Tavares / --	Not available	Ongoing / Ongoing
Not applicable	Ingram Estates Subdivision	11.47-acre residential site, single lots, with stormwater system; 2 dry retention systems; recharge volume to be recovered within 72 hours; sewered area	Unknown	Ocoee	Unknown	Ongoing / Ongoing
Not applicable	West Colonial Property	Construct 6.95-acre commercial development; sewered area	Unknown	Ocoee	Unknown	In progress

TABLE C-3: AGRICULTURAL BMPS

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
MARION02 - Clean Farms Initiative	Marion County portion of Upper Ocklawaha Basin / The Clean Farms Initiative is designed to assist Marion County farm owners and managers with implementation of BMPs for animal waste and nutrient management and to recognize them for their cooperative efforts. The Initiative was begun by passage of Resolution 04-R-384, by the Marion County Board of County Commissioners, which recognizes the importance of agriculture to the county's history and economy, while also recognizing the need to protect water resources. As part of the Initiative, a Farm Outreach Coordinator position was created. The Farm Outreach Coordinator position educates on water quality, targeting practices such as manure management and fertilization. Education is provided on Best Management Practices (BMPs), science-based and field-tested techniques meant to help protect and preserve the integrity of the ground and surface waters. Events and programs, ranging in size from a few to over a thousand, are developed and produced; tabling/networking at equine events is done regularly. Talks and presentations to various groups are also produced and given. Monthly articles written for trade journals, such as The Florida Horse, further enhance one-on-one farm consultations. Partnerships with government, NGO's and community agencies that share common goals are developed and sustained. The Marion County Soil & Water Commission has also established a program to recognize Farms of Environmental Distinction.	Marion County	Marion County Stormwater Section / Marion County General Revenue / Marion County Planning Department; Marion County Extension Service; Marion County Soil and Water Commission; Southwest Florida Water Management District (SWFWMD)	$55,000 (Does not reflect all costs, including those by the Soil & Water Commission for implementation of their Farms of Distinction program.)	Ongoing / Ongoing
NUTRIENT05 - Statewide Cow/calf BMP Manual Development and Implementation	Upper Ocklawaha Basin / Development and rule adoption of manual that addresses BMPs for cow/calf agriculture operations. Reduce nutrient loadings in runoff from cow/calf agriculture operations.	Basin-wide	FDACS, Office of Agricultural Water Policy / General Inspection Trust Fund / Private landowners	Not available	Ongoing / Adopted by Rule 5M-11 in 2009, Implementation ongoing
NUTRIENT06 - Statewide Equine BMP Manual Development and Implementation	Upper Ocklawaha Basin / Horse Farm BMP implementation and effectiveness verification. Protection of streams and lakes from surface runoff generated by agricultural activities.	Basin-wide	FDACS, Office of Agricultural Water Policy / General Inspection Trust Fund / Private landowners	Not available	Ongoing / Adopted by Rule 5M-14 in March 2012, Implementation ongoing
NUTRIENT07 - Statewide BMP Manual for Container Grown Plants	Upper Ocklawaha Basin / Revision and adoption of manual that addresses BMPs for container-grown plants. Management of agricultural runoff reduces nutrient loadings.	Basin-wide	FDACS, Office of Agricultural Water Policy / General Inspection Trust Fund / Private landowners	Not available	Ongoing / Adopted by Rule 5M-6 in 2007, Implementation ongoing
NUTRIENT08 - Statewide Sod Operations BMP Manual Development and Adoption	Upper Ocklawaha Basin / Development and rule adoption of manual that addresses BMPs for sod operations. Reduce nutrient loadings in runoff from agricultural operations.	Basin-wide	FDACS, Office of Agricultural Water Policy / General Inspection Trust Fund / Private landowners	Not available	Ongoing / Adopted by Rule 5M-9 in 2012, Implementation ongoing

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
NUTRIENT09 - Silviculture Best Management Practices Implementation and Compliance	Upper Ocklawaha Basin silviculture lands / BMPs for silviculture applied to industrial, public, and private lands. Silviculture BMP implementation and compliance. Silviculture BMPs were established in mid-1970s in response to Clean Water Act, and revised most recently in 2008. These BMPS are minimum standards for protecting and maintaining water quality and wildlife habitat during forestry activities, including forest fertilization.	Basin-wide	FDACS, Florida Forest Service / Not available / Private landowners	Not available	Ongoing / Adopted by Rule 5I-6 in 2004, Implementation ongoing
NUTRIENT10 - Statewide BMP Manual for In-ground Nurseries	Upper Ocklawaha Basin / Development and rule adoption of manual that addresses BMPs for in-ground nurseries. Management of agricultural runoff reduces nutrient loadings.	Basin-wide	FDACS, Office of Agricultural Water Policy / General Inspection Trust Fund / Private landowners	Not available	Ongoing / Adopted by Rule in 2012, Implementation ongoing

TABLE C-4: RESTORATION AND WATER QUALITY IMPROVEMENT PROJECTS

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION (LBS /YR)	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
ABC01 - Nutrient Reduction Facility	Apopka-Beauclair Canal/CC Ranch / Water in Apopka-Beauclair Canal treated off-line with alum. Removes phosphorus containing compounds from Lake Apopka discharge. Reduce loading from Lake Apopka to Lake Beauclair and Apopka-Beauclair Canal.	5,000	2835A; 2834C	LCWA / LCWA; Legislature / SJRWMD/Department	$7,300,000	Complete / March 2009
BCL02 - Suction dredging of western Lake Beauclair	Western end of Lake Beauclair / Suction dredging to remove 1 million cubic yards of sediment in western end of Lake Beauclair.	Unknown	2834C	FWC/LCWA/SJRWMD / cost share / --	$9,300,000	Complete / Complete 2013
BCL03 - Gizzard shad harvest	Lake Beauclair in-lake removal of fish / Harvest of gizzard shad by commercial fishermen. Removal of fish removes nutrients from lake. Reduces recycling of nutrients from sediments and reduces sediment resuspension (TSS). Stabilizes bottom to reduce TSS.	Unknown	2834C	SJRWMD / SJRWMD Ad valorem; Legislative appropriation / --	$150,000/year in 2005 and 2006	Complete / 2012, no further harvest of gizzard shad planned for this lake
DORA13 - Gizzard shad harvest	Lake Dora in-lake removal of fish / Harvest of gizzard shad by commercial fishermen. Part of experimental assessment with University of Florida and FWC. Removal of fish removes nutrient from lake. Reduces recycling of nutrients from sediments and reduces sediment resuspension (TSS). Stabilizes bottom to reduce TSS.	Lake Dora estimated direct P removal of 1,927 lbs P in 2005 as well as 3,377 lbs P recycling prevented ; direct P removal in 2006 was 2,085 lbs and 4,178 lbs P recycling prevented	2831B	SJRWMD / SJRMWD Ad valorem; Legislative appropriation / --	$150,000/year in 2005 and 2006	Complete / 2012, no further gizzard shad harvest planned for this lake
EUS25 - Pine Meadows Restoration Area	Pine Meadows Restoration Area. Muck farm is east of Trout Lake and discharges to Hicks Ditch. / Reduce TP loadings from former muck farm. Restore aquatic, wetland, and riverine habitat. Chemical treatment of soil (alum) to bind phosphorus containing compounds. Reduce nutrient outflow to feasible level of 1.1 kg/ha/yr of TP, or about 1 lb. per acre. Trout Lake is tributary to Lake Eustis. Reduction in nutrient loading benefits both Lake Eustis and Trout Lake. Most of the property, including the former muck farm area, has been donated to Lake County. SJRWMD will continue monitoring water quality and elevation at the discharge point to Hicks Ditch.	1,487 - Lake Eustis; 726 - Trout Lake	2817B	SJRWMD / Lake County	To be determined	Property donated to Lake County. SJRWMD continues to monitor water quality and water elevation at discharge to Hicks Ditch /
GRIF01 - Lake Griffin Emeralda Marsh Restoration	Emeralda Marsh Conservation Area (northeast marshes) north of Haines Creek / Lake Griffin Emeralda Marsh restoration: To be managed for wetland habitat restoration, planting; alum treatment to bind phosphorus containing compounds in sediments; manage excess nutrient outflow; and remove TSS. Manage nutrient outflow to Lake Griffin to feasible loading of 1.1 kg/ha/yr TP, or about 1 lb. per acre.	41,450	2814A	SJRWMD / SJRWMD Ad valorem; Legislative appropriation / --	$15,000,000 for land acquisition; $975,204 to treat 1,635 hectares with alum between 2001-2005	Ongoing / Ongoing

Project Number - Project Name	General Location / Description	Estimated TP Load Reduction (lbs /yr)	WBID Number	Lead Entity / Funding Source / Project Partners	Project Cost	Project Status / Completion Date or Anticipated Completion Date
GRIF02 - Gizzard Shad Harvest	Lake Griffin in-lake removal of fish / Gizzard shad removal from Lake Griffin by commercial fishermen. Expanded to Lake Dora and Lake Beauclair, with possible future expansion to other lakes in Harris Chain. Remove and export nutrients via fish. Reduces recycling of nutrients from sediments and reduces sediment resuspension (TSS). Stabilizes bottom to reduce TSS.	Unknown Lake Griffin estimated direct P removal ranged from high of 7,140 lbs P in 2002 to low of 1,587 lbs P in 2003: P recycling prevented ranged from high of 19,698 lbs P in 2002 to low of 4,788 lbs P in 2003	2814A	SJRWMD / SJRWMD Ad valorem; Legislative appropriation; LCWA / --	$1,000,000 spent since 2002 harvest	Complete / 2012, no further harvest of gizzard shad planned for this lake
HAR02 – Lake Harris Conservation Area	North shore of Lake Harris / Restoration of former muck farm. Chemical treatment of soil (alum) to bind phosphorus containing compounds for nutrient control. Aquatic and wetland habitat restoration. Reduce and manage nutrient outflow to Lake Harris to feasible loading of 1.1 kg/ha/yr TP, or about 1 lb. per acre.	6,665	2838A	SJRWMD / Ad valorem; legislative appropriation / --	$550,000; $400,538 to treat 160 hectares with alum between 2008-2010	Ongoing / Ongoing
HAR03 - Harris Bayou Conveyance Project	Harris Conservation Area to Lake Griffin / Establish water flow connection to Lake Griffin. After connection established, future TP discharges from Project HAR02 go to Lake Griffin, instead of Lake Harris. Modification of hydrodynamics to accommodate higher flows of water.	Unknown	2838A	SJRWMD / Ad valorem; legislative appropriation / --	$5,000,000	Complete/ 2008
LAP06 - North Shore Restoration Area	North shore of Lake Apopka / Wetland habitat restoration. / Constructed new "interconnect" system to treat discharge water through new alum injection system and discharge away from Lake Apopka downstream to the Apopka-Beauclair Canal.	99,960	2835D	SJRWMD / SJRWMD/Legislative appropriation – Preservation 2000:Save Our Rivers: Conservation and Recreation Lands; U.S. Department of Agriculture Wetlands Reserve Program / U.S. Department of Agriculture	$~100 million in land acquisition; $2.1 million to treat 2,590 hectares with alum residual between 1998-2009	Ongoing / Ongoing
LAP08 - Removal of Gizzard Shad	Lake Apopka / Harvest of gizzard shad by commercial fishermen. Removal of fish removes nutrient from lake. Reduces recycling of nutrients from sediments and reduces sediment resuspension (TSS). Stabilizes bottom to reduce TSS.	Direct TP removal ranged from 13,594 lbs in 2007 to of 1,920 lbs in 2001; TP recycling prevented ranged from 35,071 lbs in 2007 to 4,954 lbs P in 2001; treats about 30,800 acre area of lake	2835D	SJRWMD / SJRWMD ad valorem ;Lake County; LCWA; Legislature appropriation / Lake County/LCWA	~$500,000 annually	Ongoing / Ongoing

Project Number - Project Name	General Location / Description	Estimated TP Load Reduction (lbs /yr)	WBID Number	Lead Entity / Funding Source / Project Partners	Project Cost	Project Status / Completion Date or Anticipated Completion Date
TROUT01 - Pine Meadows Restoration Area	Pine Meadows Restoration Area. Muck farm is east of Trout Lake and discharges to Hicks Ditch. / Reduce TP loadings from former muck farm. Restore aquatic, wetland, and riverine habitat. Chemical treatment of soil (alum) to bind phosphorus containing compounds. Reduce nutrient outflow to feasible level of 1.1 kg/ha/yr of TP, or about 1 lb. TP per acre. Trout Lake is a tributary to Lake Eustis. Reduction in nutrient loading benefits both Lake Eustis and Trout Lake. Most of property, including former muck farm area has been donated to Lake County. SJRWMD plans to continue monitoring water quality and elevation at the discharge point to Hicks Ditch.	1,487 - Lake Eustis; 726 - Trout Lake	2817B; 2819A	SJRWMD / SJRWMD / Lake County	$1,300,000 combined cost for both lakes	Property donated to Lake County. SJRWMD continues to monitor water quality and water elevation at discharge to Hicks Ditch /

TABLE C-5: REGULATIONS, ORDINANCES, AND GUIDELINES

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
EUSTIS03 - Stormwater design rules	Within city of Eustis jurisdiction / Eustis code Sec. 115-5. Eustis stormwater rules for new development are more stringent than state or SJRWMD rules. All new development must provide stormwater treatment meeting city requirements and are subject to review by staff. City staff do field inspections of new construction. Eustis rule has 3 design criteria: 100-year storm, 50-year storm, and 25-year storm based on geotechnical and soil conditions. SJRWMD only requires 25-year peak storm flow design criteria. Most development within Eustis requires 50- or 100-year design criteria.	2831B	City of Eustis / Eustis Stormwater Utility Fee / --	Not available	Ongoing / Ongoing
LAP01 - Apopka Basin Development Guidelines, contained within County Land Development Regulations.	Lake County portion of Lake Apopka watershed including Johns Lake / Apopka Basin Development Guidelines, contained within Lake County Land Development Regulations. Provides ground and surface water protection.	2835D; 2835C	Lake County Public Works / Not available / --	Not available	Ongoing / Ongoing
LC01 - Golf Course Resource Management Plan	Lake County - countywide / Golf Course resource management plans are applicable to the unincorporated portion of Lake County. They apply to new and existing golf courses. Regulatory approach that will provide protection to ground and surface waters.	Lake County	Lake County Public Works / Lake County / -	Not available	Ongoing / Ongoing
LC02 - Lake County Shoreline Protection Guide	Lake County - countywide / Lake front property owner guide. Guide for lakefront land owners on water resource issues including shoreline protection, stormwater BMPs, erosion, and aquatic plants. Outreach program targeted at county residents. Inform property owners of better land management practices to improve water quality protection.	Lake County	Lake County Public Works / Lake County / - -	Not available	Ongoing / Ongoing
MARION01 - Springshed Protection Program	Rainbow and Silver Springsheds / Prevent further degradation of water quality of Rainbow and Silver Springs, and to reduce or eliminate existing sources of pollution. / Marion County Board of County Commissioners adopted Resolution 05-R-106 declaring support the protection of Marion County springs and directing staff to develop recommended policies for springs protection. Fertilizer Ordinance 08-35 was adopted on November 4, 2008. Irrigation Ordinance 08-09 was adopted on April 1, 2008 and subsequently amended in Ordinance 09-13 on May 19, 2009. Springs Protection Ordinance 09-17 was adopted June 2, 2009 and included multiple amendments to the county land development code, adoption of a spring protection overlay zone, regulations for springs protection and water conservation, etc. Updates to the county land development code initiated in August 2011; accepted by the Board in September 2013; effective in October 2013.	Marion County	Marion County Office of the County Engineer / Marion County Office of the County Engineer / Marion County Planning Department; Marion County Extension Service; Marion County Soil and Water Commission; SWFWMD	Not available	Ongoing / Land Development Code effective date October 2013

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
ORANGE08 - Orange County Parks Phosphorus (measured as phosphate) Fertilizer Use Reduction	Orange County Parks, including Trimble, Roosevelt, Nichols, Magnolia Park, Chapin Station, Winter Garden Station, and County Line Station. / OCEPD and Parks Department agreed to reduce use of phosphorus fertilizers for each new lawn care and maintenance contract issued on all park facilities. Agreement includes use of reduced phosphorus (measured as phosphate) between 0-5% on turf areas (athletic fields, recreational and waterfront parks). Higher percentages of phosphorus are allowable in localized areas (i.e. flower beds, trees and shrubs) needing greater amounts on an as needed basis. Prohibition on use of fertilizers, pesticides—specifically herbicides—within 10 feet of shoreline. Application of weed controls directly rather than by broadcast methods. Limitation of nitrogen (measured as water soluble organic nitrogen) to less than 0.5 lb. per 1,000 square feet. The parks fertilizer program contracts with landscape companies adjusted in 2008 to reflect the changes that occurred as the result of passage by FDACS of the Urban Turf Fertilizer Rule (5E-1.003 F.A.C.), that went into effect on Dec. 31, 2007.	Orange County	OCEPD / Not available / Orange County Parks Department	Not available	Ongoing / Ongoing
PAL01 - Septic Tank LDR	Green Swamp Area of Critical State Concern (GSACSC) / Septic tanks within Green Swamp are required to be pumped every five years. Land Development Regulation addresses ground and surface water protection.	2839	Lake County Public Works / Not available / --	Not available	Ongoing / Ongoing

TABLE C-6: SPECIAL STUDIES AND PLANNING EFFORTS

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
DORA15 - Lake Saunders Flood Study	Lake Saunders sub-basin / Priority project identified from Lake Dora Basin Study.	2831B; 2830A; 2830	Lake County Public Works / Lake County Stormwater Assessment / --	$43,102	Complete / 2009
HAR12 - Lake Harris and Little Lake Harris Basin Study	Lake Harris/Little Lake Harris drainage basin / Lake Harris and Little Lake Harris drainage evaluation, per county's stormwater program. Precursor to stormwater retrofit and restoration activities.	2838A	Lake County Public Works / Lake County Stormwater Assessment / --	$200,000	Complete / January 2009
LAP20 - Lake Apopka Master Plan - Orange County	Lake Apopka / Lake Apopka Master Plan done by Camp, Dresser, and McKee. Stormwater management plan for Lake Apopka. Phase 1 complete, ongoing with Phases 2 and 3. Identify retrofit opportunities to remove nutrient loading into Lake Apopka.	2835D	Orange County Public Works / Orange County Public Works / --	$250,000	Complete / Complete
MARION04 - Marion County Aquifer Vulnerability Assessment	Marion County - countywide / Identification of vulnerable areas of aquifer. / Project provides a scientifically defensible water-resource management and protection tool that will facilitate planning of human activities to help in minimizing adverse impacts on ground water quality. Aquifer vulnerability maps are displayed in classes of relative vulnerability (one area is more vulnerable than another). The maps benefit local government, planners and developers in guiding growth into more appropriate areas (e.g. ground water recharge areas) and improve site selection for expanding existing or establishing new well fields.	Marion County	Marion County Office of the County Engineer / Marion County Stormwater Assessment / Department; SWFWMD; SJRWMD; University of Florida	$101,932	Complete / August 2007
PAL08 - Lake Minnehaha Study and Stormwater Improvements	South of SR 50 and west of US 27 / Lake Minnehaha Study and Stormwater Improvements; project will involve study followed by design of recommended improvements; goal is to collect and treat stormwater before it enters the lake; began study June 2004. Project is currently in conceptual/study phase – specific design has not yet been determined.	2839	City of Clermont Engineering Dept. / 75% LCWA grant; 25% Clermont Stormwater Fees / LCWA	Study/ Design $64,000; Construction Costs TBD	Ongoing / Ongoing
PAL09 - Lake Winona Study and Stormwater Improvement	South of SR 50 and west of US 27 / Lake Winona Study and Stormwater Improvements; Project will involve study followed by design of recommended improvements; goal is to collect and treat stormwater before it enters the lake; began study June 2004. Project is currently in conceptual/study phase – specific design has not yet been determined.	2839	City of Clermont Engineering Dept. / 75% LCWA grant;25% City Stormwater Fees / LCWA	Study/ Design $40,000; Construction Costs TBD	Ongoing / Ongoing
PAL21 - Lower Palatlakaha River Basin Study	Lower reaches of Palatlakaha River and connected lakes / Basin study of lower Palatlakaha River Basin. Basin drainage evaluation, per county's stormwater program. Precursor to stormwater retrofit and restoration activities. PEC is performing study.	2839	Lake County Public Works / Lake County Stormwater Assessment / --	$323,211	Complete / October 2009
TROUT05 - Trout Lake Basin Study	Trout Lake Basin / Basin study of Trout Lake basin. Basin drainage evaluation, per county's stormwater program. Precursor to stormwater retrofit and restoration activities. Study is continuation of Lake Eustis Basin Study. Study performed by PEC.	2819A	Lake County Public Works / Lake County Stormwater Assessment / --	$130,000	Complete / March 2008
YALE01 - Lake Yale Basin Study	Lake Yale sub-basin / Basin study of Lake Yale sub-basin. Basin drainage evaluation, per county's stormwater program. Precursor to stormwater retrofit and restoration activities. Inwood is performing study for county. Marion County participating in study by providing information/data for their part of basin.	2807A	Lake County Public Works / Lake County Stormwater Assessment / --	$266,374	Complete / April 2008

TABLE C-7: EDUCATION AND OUTREACH EFFORTS

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
LC05 - Support of Adopt-a-Lake Program	Lake County - countywide / Adopt-a-Lake Program is outreach program to residents of Lake County that enhances knowledge and awareness of stormwater management. Part of MS4 Phase II public education requirement. (Adopt-a-Lake Program replaces Watershed Action Volunteers Program)	Lake County	Lake County Public Works / Lake County Stormwater Assessment / --	$12,000 per year	Ongoing / Ongoing
ORANGE07 - Orange County Water Resource Atlas	Orange County - countywide / Web-based outreach education program focused on water resource issues. Web-based outreach program targeted at residents of Orange County. Objective is to inform residents about water resource issues, including TMDLs, stormwater, water quality, etc.	Orange County	OCEPD / Not available / City of Winter Garden and City of Apopka	Annual maintenance fee for county-wide atlas is $57,650.	Ongoing / Ongoing
MARION05 / Marion County Low Impact Development Practices	Marion County wide / Encourage adoption of low-impact development practices to preserve and protect water resources. / To foster low impact development (LID) not only within Marion County's springs protection zones, but throughout the County, the Stormwater Section conducted a day-long seminar for developers, engineers, landscape architects, and construction professionals in April 2007. The seminar shared LID options and discussed the impact of LID on water resources.	Marion County wide	Marion County Stormwater Section / Marion County Stormwater Assessment / University of Florida	$6,500	Complete / March 2007

TABLE C-8: BASIC STORMWATER MANAGEMENT PROGRAM IMPLEMENTATION

PROJECT NUMBER - PROJECT NAME	GENERAL LOCATION / DESCRIPTION	ESTIMATED TP LOAD REDUCTION LBS/YEAR	WBID NUMBER	LEAD ENTITY / FUNDING SOURCE / PROJECT PARTNERS	PROJECT COST	PROJECT STATUS / COMPLETION DATE OR ANTICIPATED COMPLETION DATE
APOPKA01 - Street sweeping	Apopka city-wide / Street sweeping to reduce debris and sediment entering Lake Apopka. The benchmark frequency for sweeping shall be quarterly or as needed. Removes sediment and debris from streets that would otherwise contribute potential nutrient loadings to Lake Apopka.	557	2835D	City of Apopka / City of Apopka / --	Not available	Ongoing / Ongoing
CLR02 - Street Sweeping	Commercial area of Clermont and main roads / City sweeps streets within commercial area and main roads. The frequency benchmark shall be monthly or as needed. The performance benchmark shall be 650 miles of road swept with approximately 328 cubic yards of material removed annually	Not available	2839	City of Clermont / City of Clermont / --	Not available	Ongoing / Ongoing
EUSTIS01 - Street Sweeping and Drainage Maintenance	Throughout City of Eustis / City, FDOT and citizen groups sweep streets. Downtown Village streets are swept weekly (52 times/year). Other streets are swept monthly. The performance benchmark shall be 1,110 miles of road swept with 1,587 cubic yards of material removed annually.	Not available	2817B; 2819B	City of Eustis / Eustis Stormwater Utility Fee / --	$234,951 per year	Ongoing / Ongoing
LADYL02 - Street Sweeping	Within jurisdiction of Lady Lake / Town-wide street sweeping to remove dirt and debris. The benchmark frequency shall be quarterly or as needed. Removal of debris and potential pollutants prevents their entry into lakes. The performance benchmark shall be 250 cubic yards of material removed annually.	8	2814A	Town of Lady Lake / Town of Lady Lake / --	$25,000 per year	Ongoing / Ongoing
LADYL03 - Storm Water System Maintenance	Within the jurisdiction of Lady Lake / Town-wide curb and gutter cleaning and catch basin vacuuming. Remove pollutants and debris before entering stormsewer system. The benchmark frequency for this routine maintenance shall be quarterly or as needed.	Included with street sweeping	2814A	Town of Lady Lake / Town of Lady Lake / --	Not available	Ongoing / Ongoing
LEESBURG01 - Street Sweeping	Leesburg city limits. / Sweeping of city-maintained streets to remove dirt, vegetation, and debris. The benchmark frequency shall be monthly covering an estimated 170 miles of pavement each month. The performance benchmark for removal shall be 50 cubic yards of debris collected and disposed of each month.	Not available	2814A	City of Leesburg Environmental Services / Leesburg Stormwater Utility Fee / --	$125,000 per year	Ongoing / Ongoing
MTDORA01 - Street Sweeping	Within city limits of Mt. Dora / Citywide street-sweeping program. Removes sediments and debris from streets and prevents their entry into lakes. May remove some TP if attached to sediment. The benchmark frequency for this activity shall be quarterly or as needed.	1,369	2831B	City of Mt. Dora / City of Mt. Dora / --	$50,578 per year	Ongoing / Ongoing
OCOEE01 - Street Sweeping	Ocoee city limits. / Sweeping of city maintained streets to remove dirt, vegetation, and debris. Removal of 987 tons of debris collected annually, which results in a reduction of 670 lbs/yr of TP and 1,045 lbs/yr of TN.	670	2835A; 2835D	City of Ocoee Stormwater Department / City of Ocoee / --	Not available	Ongoing / Ongoing

Project Number - Project Name	General Location / Description	Estimated TP Load Reduction lbs/year	WBID Number	Lead Entity / Funding Source / Project Partners	Project Cost	Project Status / Completion Date or Anticipated Completion Date
ORANGE01 - Street Sweeping in the Lake Apopka Basin	Unincorporated Orange County within the Lake Apopka Basin / Contractor and FDOT conduct street sweeping. Contractor and FDOT sweep about 460 miles of road periodically on an annual county-wide basis. The benchmark for sweeping shall be 3,000 cumulative miles annually. Based on typical street sweeping, the debris picked up would be approximately 28 tons.	Not available	2835D	OCEPD/Public Works / Orange County	Based on Orange County contract rates, the estimated annual cost would be $60,000.	Ongoing / Ongoing
ORANGE04 - Street sweeping in the Lake Carlton and Lake Beauclair Basins	Orange County–maintained roads in sub-basins that contribute to Lake Carlton and Lake Beauclair, which are primarily roads around Lake Ola and areas to the north of that lake. / Contracted street-sweeping services on Orange County–maintained roads. Basin area approximately 6,522 acres. Within that area, the benchmark is 13.87 miles of roads swept monthly for annual total mileage of 166.44. Estimated amount of debris collected through that effort is a performance removal of 3,080 pounds.	Not available	2834C; 2837B	OCEPD / Not available / --	Estimated cost based on Orange County contract rates is $3,300.	Ongoing / Ongoing
Tavares01 - Street Sweeping	Tavares / Citywide street-sweeping program. Removes sediment and debris from streets that would otherwise contribute potential nutrient loadings to Lakes Dora and Eustis. The benchmark frequency for sweeping shall be quarterly or as needed.	Not available	2831B; 2817B	City of Tavares / City of Tavares / --	Not available	Ongoing / Ongoing
WNTRGAR01 - Street Sweeping	Winter Garden city limits / Sweeping of city-maintained streets to remove dirt, vegetation, and debris. The benchmark frequency for sweeping shall be quarterly or as needed. The performance benchmark shall be 4,355 miles of pavement swept with 312 cubic tons of debris collected annually.	Not available	2835A; 2835D	Winter Garden Public Works Department / City of Winter Garden / --	Not available	Ongoing / Ongoing
GROVE01 - Street Sweeping	Groveland city limits / Sweeping of city-maintained streets to remove dirt, vegetation, and debris. The benchmark frequency for street sweeping shall be once every 30 days or as needed.	Not available	2839	City of Groveland Public Works Division / City of Groveland / --	$19,890 per year	Ongoing / Ongoing