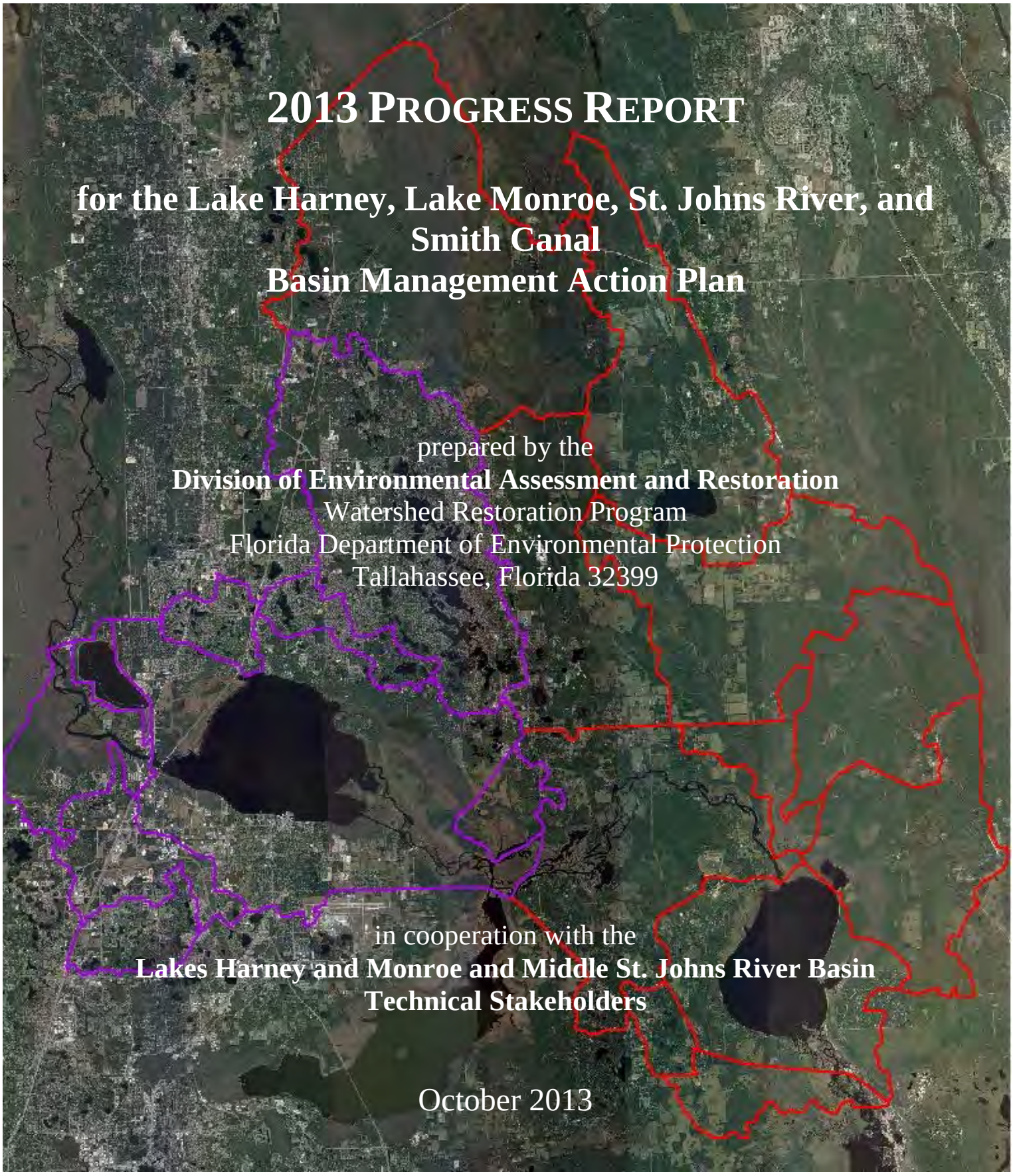

2013 PROGRESS REPORT

for the Lake Harney, Lake Monroe, St. Johns River, and Smith Canal Basin Management Action Plan

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

in cooperation with the
Lakes Harney and Monroe and Middle St. Johns River Basin Technical Stakeholders

October 2013

ACKNOWLEDGEMENTS

This 2013 Lakes Harney and Monroe and Middle St. Johns River BMAP progress report was prepared as part of a statewide watershed management approach to restore and protect Florida's water quality. It was prepared by the Florida Department of Environmental Protection in cooperation with the Lakes Harney and Monroe and Middle St. Johns River stakeholders.

For additional information on the watershed management approach in the Lakes Harney and Monroe and Middle St. Johns River Basin, contact:

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LIST OF ACRONYMS AND ABBREVIATIONS

BMAP	Basin Management Action Plan
BMP	Best Management Practice
Department	Florida Department of Environmental Protection
FDACS	Florida Department of Agriculture and Consumer Services
FDOT	Florida Department of Transportation
FPL	Florida Power & Light
FYN	Florida Yards and Neighborhood (Program)
HSPF	Hydrologic Simulation Program – FORTRAN (model)
lbs/yr	Pounds Per Year
MS4	Municipal Separate Storm Sewer System
MSJR	Middle St. Johns River
NPDES	National Pollutant Discharge Elimination System
PSA	Public Service Announcement
RSF	Regional Stormwater Facility
SJRWMD	St. Johns River Water Management District
SR	State Road
STORET	STOrage and RETrieval (Database)
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
WBID	Waterbody Identification

SUMMARY

TOTAL MAXIMUM DAILY LOADS

The Lakes Harney and Monroe and Middle St. Johns River (MSJR) Basin includes the main stem segments of the MSJR located between the inlet of Lake Harney and the confluence of the St. Johns River with the Wekiva River. These river segments receive discharges from the Upper St. Johns River and from several major tributaries, including the Econlockhatchee River, Deep Creek, and Lake Jesup. The Smith Canal watershed is located in the southern portion of the Lakes Harney and Monroe and MSJR Basin and drains an area of about ten square miles.

The Florida Department of Environmental Protection identified the Lakes Harney and Monroe and MSJR Basin to be impaired by nutrients and low dissolved oxygen, and, in December 2009, adopted total maximum daily loads (TMDLs) for total phosphorus (TP) and total nitrogen (TN) for the lakes and river segments. The Smith Canal TMDL was adopted by the Department in September 2009 for TP. An important consideration for the restoration of the Lakes Harney and Monroe and MSJR Basin is that the majority of the loading to the impaired waterbodies comes from sources outside the watershed. Therefore, reductions from the upstream sources must occur before water quality standards can be met in the impaired waterbodies.

The Lakes Harney and Monroe and MSJR Basin Management Action Plan (BMAP) was adopted in August 2012 to implement the TP and TN TMDLs within the watershed. This 2013 Progress Report is the first annual progress report for the Lakes Harney and Monroe and MSJR BMAP, and it describes the activities that occurred during the reporting period from September 1, 2012 through August 31, 2013.

SUMMARY OF LOAD REDUCTIONS

The reductions that occurred during the reporting period total 4,718.8 lbs/yr of TN and 988.6 lbs/yr of TP. These reductions are in addition to those projects given credit before BMAP adoption; therefore, the total project reductions to date are 66,384.9 lbs/yr of TN and 15,084.2 lbs/yr of TP. The first BMAP iteration addresses 50% of the allocated reductions, and the required reductions for this iteration are 43,828.2 lbs/yr of TN and 8,854.9 lbs/yr of TP. Therefore, the reductions that have occurred to date are greater than the reductions required for the first BMAP iteration. The progress towards the total TMDL load reductions for TN and TP are shown in **Figure ES-1** and **Figures ES-2**, respectively.

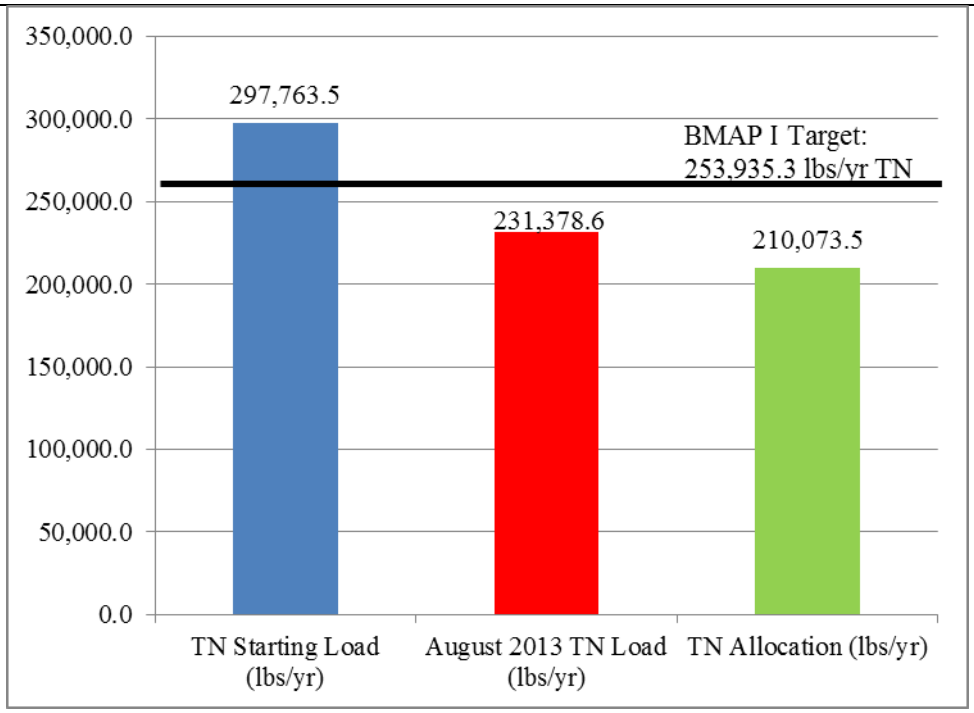

FIGURE ES-1: PROGRESS TOWARDS THE LAKES HARNEY AND MONROE AND MSJR TN TMDL THROUGH AUGUST 31, 2013

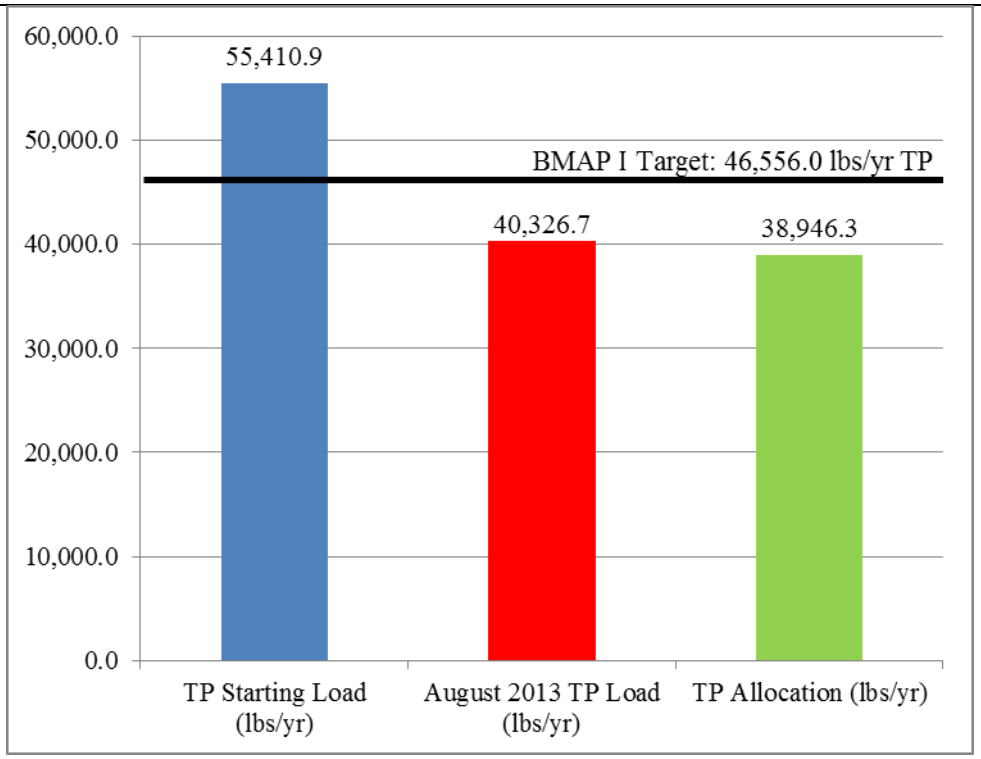

FIGURE ES-2: PROGRESS TOWARDS THE LAKES HARNEY AND MONROE AND MSJR TP TMDL THROUGH AUGUST 31, 2013

WATER QUALITY AND BIOLOGICAL MONITORING

The City of Deltona continued its monthly water quality monitoring at three stations in the basin. Seminole County sampled two water quality stations in the basin. One of these stations, MILL1, located on Mill Creek, has not had suitable conditions for monitoring during several months in 2013. This site had low water levels and no flow conditions during the early part of the year. In addition, depending on the wind condition, the creek flows in the upstream direction. This site may need to be removed from the BMAP monitoring plan if these conditions continue. Seminole County was unable to conduct biological monitoring this year due to conditions that were not representative.

Volusia County has continued its monthly sampling at six of the nine stations included in the BMAP. The county no longer samples station VC-DC04, which is located along Deep Creek to the south of station VC-DC05 or station VC-083, which is the Gemini Springs outfall. However, the county is sampling other stations in these two areas. Volusia County has had problems sampling station VC-

COW, located on Cow Creek at Maytown Road, due to no measureable flow in this area. It appears that this creek only flows during heavy rains; therefore, this is not a suitable location for monitoring and the site will be removed from the BMAP monitoring plan.

SJRWMD continued to sample its ten ambient water quality stations that are part of the BMAP monitoring plan. SJRWMD also continued its phytoplankton sampling at three stations in the basin. The highest total phytoplankton biovolume values at these stations were at station SJR-415, which is located downstream of Lake Jesup and upstream of Lake Monroe.

A detailed water quality evaluation will be conducted no later than after four years of BMAP implementation to determine water quality improvements in the basin from actions included in the first BMAP iteration.

Section 1: INTRODUCTION

1.1 PURPOSE OF THE REPORT

This is the first annual progress report for the Lakes Harney and Monroe and Middle St. Johns River (MSJR) Basin Management Action Plan (BMAP). **Section 2** describes the activities that occurred during the period from September 1, 2012 through August 31, 2013. **Section 3** describes the water quality and biological monitoring that occurred during the reporting period.

1.2 TOTAL MAXIMUM DAILY LOADS FOR THE LAKES HARNEY AND MONROE AND MSJR BASIN

The Lakes Harney and Monroe and MSJR Basin includes the impaired main stem segments of the MSJR located between the inlet of Lake Harney and the confluence of the St. Johns River with the Wekiva River. These river segments receive discharges from the Upper St. Johns River and from several major tributaries, including the Econlockhatchee River, Deep Creek, and Lake Jesup. Two major lakes, Lake Monroe and Lake Harney, are also impaired segments of the MSJR main stem. The basin encompasses portions of Seminole County and Volusia County and areas within the cities of DeBary, DeLand, Deltona, Lake Helen, Lake Mary, Orange City, and Sanford.

Smith Canal is located in northwest Seminole County and drains an area of about ten square miles. Smith Canal is approximately six miles in length and flows northwest until it enters the St. Johns River approximately 1.4 miles upstream of the outlet to Lake Monroe. The Smith Canal watershed includes portions of Seminole County, Lake Mary, and Sanford.

Figure 1 shows the Lakes Harney and Monroe and MSJR watershed and the local governments in this area.

The total maximum daily loads (TMDLs) for the Lakes Harney and Monroe and MSJR Basin were adopted by the Florida Department of Environmental Protection in December 2009, and the TMDL for Smith Canal was adopted in September 2009. For assessment purposes, the Department has divided the Lakes Harney and Monroe and MSJR Basin into water assessment polygons with unique waterbody identification (WBID) numbers for each watershed or segment. An important consideration for the restoration of the Lakes Harney and Monroe and MSJR Basin is that the majority of the loading to the impaired waterbodies comes from sources outside the watershed. Approximately 96.4% of the total nitrogen (TN) loading and 95% of the total phosphorus (TP) loading enters the impaired waterbodies

from the Upper St. Johns River, Econlockhatchee River, and Lake Jesup basins. Therefore, implementing projects in the watershed alone will not achieve the TMDLs; reductions from the upstream sources must occur before water quality standards can be met in the impaired WBIDs.

Table 1 lists the TMDLs and pollutant load allocations in pounds per year (lbs/yr) or percent reduction adopted by rule for each of the impaired WBIDs in the Lakes Harney and Monroe and MSJR Basin.

TABLE 1: TMDLS IN THE LAKES HARNEY AND MONROE AND MSJR BASIN

WBID NUMBER	WBID NAME	PARAMETER	TMDL (LBS/YR)	WASTELOAD ALLOCATION FOR NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) WASTEWATER (LBS/YR)	WASTELOAD ALLOCATION FOR NPDES STORMWATER (% REDUCTION)	LOAD ALLOCATION (LBS/YR)
2964A	Lake Harney	TN	3,355,570	0	39%	3,355,570
2964A	Lake Harney	TP	241,026	0	33%	241,026
2964 + 2893F	St. Johns River Downstream of Lake Harney + St. Johns River Above Lake Jesup	TN	3,741,990	0	37%	3,741,990
2964 + 2893F	St. Johns River Downstream of Lake Harney + St. Johns River Above Lake Jesup	TP	276,141	0	32%	276,141
2893D + 2893E	Lake Monroe + St. Johns River Above Lake Monroe	TN	4,171,255	0	38%	4,171,255
2893D + 2893E	Lake Monroe + St. Johns River Above Lake Monroe	TP	315,512	0	31%	315,512
2893C	St. Johns River Above Wekiva River	TN	4,202,340	19,342	37%	4,182,998
2893C	St. Johns River Above Wekiva River	TP	318,236	2,345	31%	315,891
2962	Smith Canal	TP	4,300	0	26%	26%

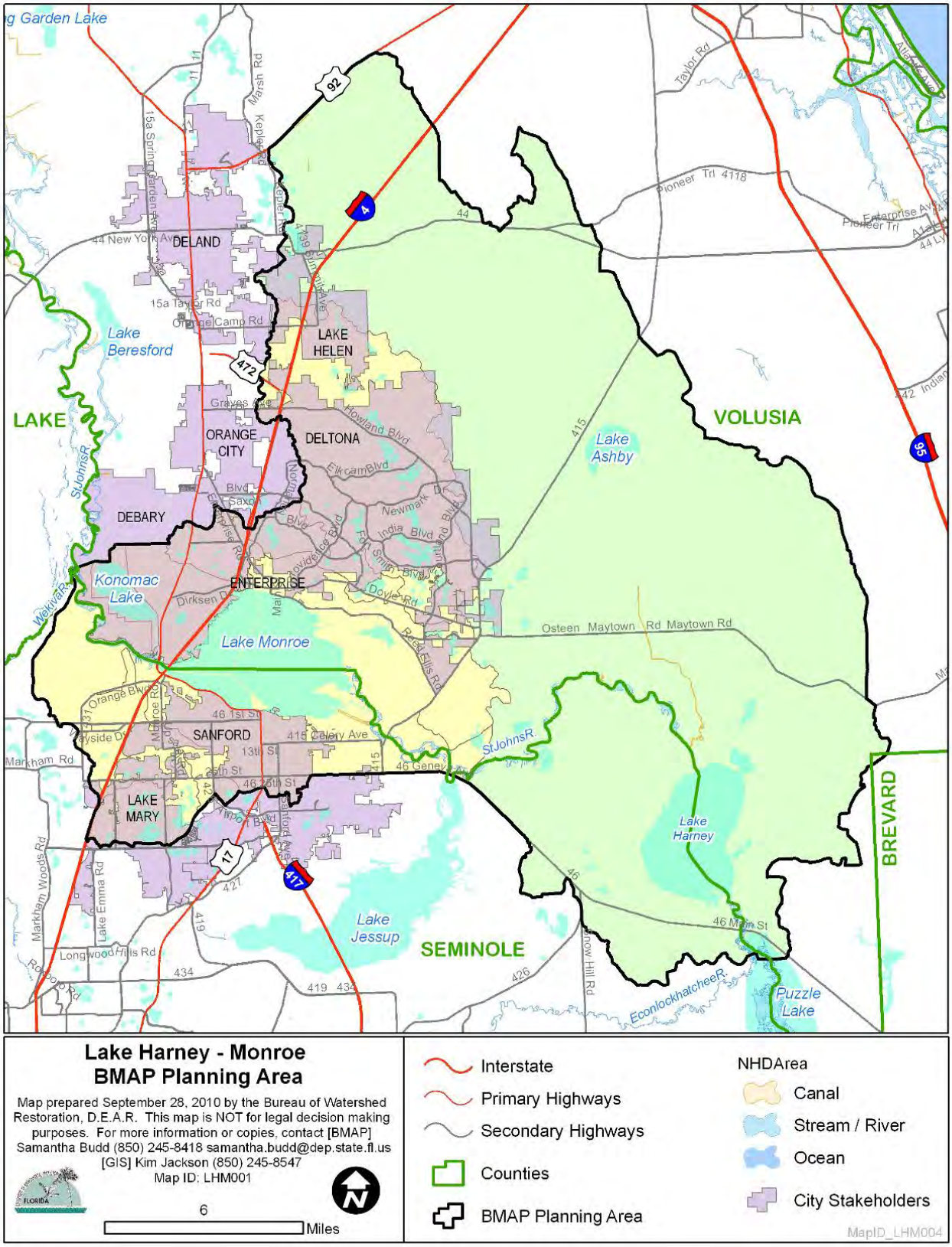

FIGURE 1: LAKES HARNEY AND MONROE AND MSJR BASIN

1.3 RESPONSIBLE PARTIES AND KEY STAKEHOLDERS

The Lakes Harney and Monroe and MSJR BMAP identified municipal separate storm sewer systems (MS4s), urban nonpoint, and agricultural sources of TN and TP in the basin. Those entities that are responsible for achieving the load reductions are:

- *Agriculture*
- *City of DeBary*
- *City of DeLand*
- *City of Deltona*
- *City of Lake Helen*
- *City of Lake Mary*
- *City of Orange City*
- *City of Sanford*
- *Florida Department of Transportation (FDOT) District 5*
- *Florida Turnpike Authority*
- *Seminole County*
- *Volusia County*

In addition to the these entities, the Florida Department of Agriculture and Consumer Services (FDACS), the Department, and St. Johns River Water Management District (SJRWMD) are essential to the implementation of the BMAP activities.

1.4 BMAP ALLOCATIONS

The stakeholders determined that assigning detailed allocations was the best approach for achieving the TMDL reductions. The acreage and loading information for each stakeholder was calculated using output from the Hydrologic Simulation Program – FORTRAN (HSPF) model. Each entity's baseline loadings for TN and TP were calculated using information from the HSPF model. Based on these starting loads, the City of DeLand, City of Lake Helen, City of Orange City, and Florida Turnpike Authority were determined to be *de minimus* and were not assigned allocations in the first BMAP

iteration. Each of these *de minimus* stakeholders contributed less than 0.5% of the total load for both TN and TP and combined they contribute approximately 1% of the total load.

For the stakeholders that received allocations, the allowable loadings were calculated using a target load per acre for TN and TP. These target loads per acre were multiplied by each entity's acreage in the basin to determine the allowable loading. The difference between the baseline loading and the allowable loading resulted in each entity's required reductions.

Since Smith Canal is located mostly within the Lakes Harney and Monroe and MSJR watershed, reductions made to achieve the Lakes Harney and Monroe and MSJR TMDLs should also address the Smith Canal TMDL. Therefore, the Smith Canal watershed was included as part of this BMAP and initial reductions to achieve the Smith Canal TMDL are based on the reductions needed for the overall Lakes Harney and Monroe and MSJR Basin.

The BMAP provides for phased implementation, which allows for the implementation of projects designed to achieve incremental reductions, while simultaneously monitoring and conducting studies to better understand the water quality dynamics in the watershed. The total required reductions from the TMDLs are spread over a 15-year timeframe. The first BMAP iteration addresses 50% of the allocated reductions over a five-year period. The required reductions for the first BMAP iteration are shown in **Table 2**.

TABLE 2: TN AND TP REQUIRED REDUCTIONS FOR THE FIRST BMAP ITERATION

ENTITY	BMAP 1 TN REQUIRED REDUCTION (LBS/YR)	BMAP 1 TP REQUIRED REDUCTION (LBS/YR)
Agriculture	21,141.0	6,885.1
DeBary	1,880.2	86.4
Deltona	3,608.7	388.3
FDOT	1,231.8	0.0
Lake Mary	0.0	0.0
Sanford	10,360.0	1,339.6
Seminole County	3,973.6	155.5
Volusia County	1,632.9	0.0
Total	**43,828.2**	**8,854.9**

Section 2: Activities During the Reporting Year

The accomplishments over the past year are described in **Section 2.1** through **Section 2.2**, and the individual project tables are included in **Appendix A**.

2.1 Activities by Entity

2.1.1 City of DeLand

The City of DeLand maintained and distributed educational materials about the impacts of stormwater discharges and the steps the public can take to reduce pollutants (project DL-1). Approximately 450 brochures were delivered to the DeLand Industrial Park users and all airport tenants, and were made available at city hall and to local businesses. The city maintained electronic versions of the main brochures (*A Citizen's Guide to Stormwater Ponds and Stormwater Facts*) on the city website at: http://www.deland.org/Pages/DeLandFL_PSEngineering/NPDES. The city utilized local volunteer groups and public works department employees to implement the stormwater marker program (see **Figure 2**. City drains are marked with a decal that reads, "Only Rain Down the Drain." A total of 137 stormwater markers were installed, and there were 34 volunteers for this event. The city also held two city stormwater awareness meetings concerning stormwater issues, requirements, and educational opportunities. A total of 57 people attended these meetings.

Figure 2: City of DeLand's Stormwater Marker Program

2.1.2 CITY OF DELTONA

In November 2012, the City of Deltona completed the Lake Gleason control structure (project DEL-4), which resulted in an estimated reduction of 672.0 lbs/yr of TN and 188.4 lbs/yr of TP. The McGarity/ Kirkhill Regional Stormwater Treatment Facility (project DEL-1) is working to remove nutrients and monitoring efforts have begun. The surrounding area is now a designated park that attracts various types of wildlife (see **Figure 3**). The city has continued its education efforts and catch basin maintenance.

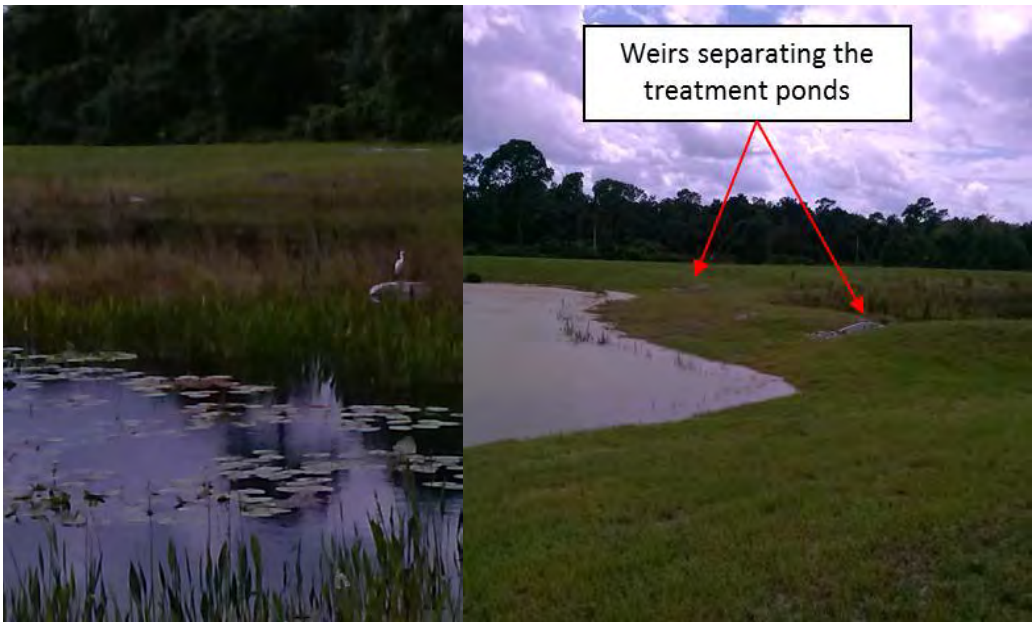

FIGURE 3: CITY OF DELTONA'S MCGARITY/KIRKHILL REGIONAL STORMWATER TREATMENT FACILITY

The city has also developed fertilizer and stormwater pollution control ordinances, with the first reading in front of the city commission scheduled for September 16, 2013. Adoption of these ordinances will follow this meeting. The city's NPDES inspector was certified in December 2012 as an instructor in Green Industries- BMPs for the Protection of Florida Water Resources. This certification is needed for anyone who is required to obtain the Limited Commercial Fertilizer Applicator Certificate from FDACS by January 1, 2014. Deltona offered a free certification class on July 16, 2013 to assist local businesses and help ensure the proper application of fertilizers and pesticides (see **Figure 4**). The city's NPDES inspector was also certified in the State of Florida Standard Operating Procedures for Field Sampling of Surface and Ground Waters in April 2013.

FIGURE 4: CITY OF DELTONA'S GREEN INDUSTRIES-BMPS CLASS IN JULY 2013

The Florida Stormwater, Erosion, and Sedimentation Control Inspector Certification class was held in the City of Deltona on February 20 and 21, 2013 (see **Figure 5**). This class certified 39 individuals on BMPs to prevent sediments from entering the stormwater and the potential for nutrient and pollutant impacts to surface waters from those sediments. In addition, the BMAP monitoring requirements were added to the city's five-year Stormwater Management Program required by their MS4 permit.

FIGURE 5: CITY OF DELTONA'S STORMWATER INSPECTION CERTIFICATION CLASS IN FEBRUARY 2013

2.1.3 CITY OF LAKE HELEN

The City of Lake Helen continues to enforce the adopted irrigation ordinance and pet waste ordinance, and continues to provide informational pamphlets to the public (project LH-1). A "*Stormwater Pollution Prevention Factsheet for Residential Properties*" was mailed to all developed residential

properties within Lake Helen and the factsheet was also posted to the city's website. The city's illicit discharge program consists of routine monitoring of inlets/catch basins/retention ponds by public works department personnel, construction site inspection by city inspection staff, and enforcement of the illicit discharge provisions of the stormwater pollution prevention ordinance.

In addition, the city completed the surveying and conceptual design for the stormwater project on Tangerine Avenue and Barbe Street at the north shore of Lake Helen. Funds for completion of this project are reflected in the draft five-year capital improvement plan document for fiscal year 2015. It is anticipated that this project will result in the improved quality of stormwater entering the northeast shore of Lake Helen.

2.1.4 CITY OF LAKE MARY

The City of Lake Mary continued its street sweeping on public roads (project LM-2) and its education and outreach efforts (project LM-1) in the basin.

2.1.5 CITY OF ORANGE CITY

The City of Orange City continues to post information regarding NPDES, Environmental Resource Permits, and nonpoint source pollution on its webpage. Also included are links to other websites with stormwater information and information for children. Handouts are provided for new customers at the utility's customer service counter (project OC-1).

2.1.6 CITY OF SANFORD

The City of Sanford has continued its street sweeping (project S-1), public education (project S-3), and catch basin clean out projects in the basin. The city has found that the operation of an additional street sweeper during heavy leaf fall has been helpful to reduce organics going into the river.

2.1.7 FDOT DISTRICT 5

FDOT started construction efforts along State Road (SR) 415 (projects FDOT-36, FDOT-37, FDOT-38, and FDOT-39). The widening of the two-lane road to four-lanes will include stormwater treatment where no treatment previously existed. The nutrient load reduction for street sweeping was originally estimated based on sweeping reports from a prior contract. FDOT recently changed its street sweeping contracts to a performance-based criteria, which has resulted in a reduction of sweeping activities from the previously estimated amount (project FDOT-33). FDOT is currently reevaluating this program in an effort to increase the amount of street sweeping activities within the BMAP basin. However, FDOT still

has enough project reductions to meet the requirements for the first BMAP iteration; therefore, this is not a compliance issue.

2.1.8 SEMINOLE COUNTY

Seminole County has continued its street sweeping throughout the county (project SC-5) and its public education and outreach efforts (project SC-6).

2.1.9 TURNPIKE AUTHORITY

The Turnpike Authority has continued its street sweeping in the basin (project T-1).

2.1.10 VOLUSIA COUNTY

Volusia County has continued its public education and outreach efforts (project VC-1) and street sweeping (project VC-2) in the basin. In addition, the county has been working with SJRWMD to update the drainage basins in Volusia County for future modeling.

2.1.11 AGRICULTURE

FDACS enrolled a total of 3,760.6 acres of agriculture in BMPs in the basin (refer to **Table 3**). This enrollment has an estimated reduction of 4,046.8 lbs/yr of TN and 800.2 lbs/yr of TP.

TABLE 3: AGRICULTURAL ACREAGE, BMP ENROLLMENT, AND FUTURE ENROLLMENT GOALS FOR THE LAKES HARNEY AND MONROE AND MSJR BASIN

[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.
[2] Most of these horse farms likely are not commercial agriculture, and will be addressed through FDEP-developed BMPs.
[3] FDACS staff has observed no active poultry operations in the BMAP area, but will be confirming this supposition.
[4] Actual acreage enrolled will be less than targeted because some agricultural lands will not be in production.
[5] The enrollment acreage is being evaluated by FDACS and may be adjusted in future reports.

2004 SJRWMD LAND USE	2004 ACRES	FDACS-ADJUSTED ACRES[1]	RELATED FDACS BMP PROGRAMS	ACREAGE ENROLLED AS OF JUNE 30, 2013	RELATED NOTICES OF INTENT
Pasture	15,901.1	15,901.1	Cow/Calf; Future (Hay); Statewide Sod	2,950.8	6
Row/Field/Mixed Crops	2,862.8	825.6	Vegetable/Agronomic Crops	728.5	1
Fallow Cropland	1.7	1.7	No enrollment needed	N/A	N/A
Horse Farm[2]	174.1	174.1	Equine	0.2	N/A
Citrus	450.1	450.1	Citrus	26.5	3
Abandoned Citrus	633.9	0.0	No enrollment needed	N/A	N/A
Tree Crops	13.3	13.3	Specialty Fruit and Nut	0.0	N/A
Tree Nurseries	76.5	76.5	Future Nursery; Specialty Fruit/Nut	0.0	N/A
Ornamentals	243.0	243.0	Container Nursery	42.4	4
Shade Ferns	0.6	0.6	Future Nursery	N/A	N/A
Hammock Ferns	2.4	2.4	Future Nursery	N/A	N/A
Specialty Farms	2.2	2.2	Conservation Plan Rule	0.0	N/A
Cattle Feeding	11.3	11.3	Conservation Plan Rule	0.0	N/A
Poultry Feeding[3]	80.9	80.9	Conservation Plan Rule	11.9	N/A
Other Open Lands – Rural	0.1	0.0	No enrollment needed	N/A	N/A
Aquaculture	*12.5*	*12.5*	*FDACS Aquaculture Division*	*0.3*	*1*
Total	**20,466.6**	**17,795.3**	**N/A**	**3,760.6[5]**	**15**
5-Year Enrollment Goal (90%)[4]	**N/A**	**16,015.8**	**N/A**	**N/A**	**N/A**
Acreage Enrolled	**N/A**	**3,760.6**	**N/A**	**N/A**	**N/A**
Remaining Acres to Enroll[4]	**N/A**	**12,255.2**	**N/A**	**N/A**	**N/A**

2.1.12 SJRWMD

SJRWMD participates in cost share projects with local governments, primarily for reclaimed water system improvement/expansion. SJRWMD priorities indicate that cost share programs will continue in the coming years, and projects that focus on water supply, as well as water quality improvements, will be considered for funding. SJRWMD solicited applications for cost share projects in May 2013. Multiple projects were selected for funding while some also received funding through the Department to further advance efforts. Projects predominantly involved the distribution and/or storage of reclaimed water. Several projects within the MSJR Basin were selected, and will be implemented by the local government or utility.

SJRWMD is conducting an assessment of hydrologic and water quality conditions within the Deep Creek basin encompassing Lake Ashby, Deep Creek, and Deep Creek diversion canal. The goal of the project is to develop information that is essential to developing water quality improvement project options for later optimization. The initial work order for storm event sampling for this project has been executed. SJWRMD also evaluated the use of alternative technologies to treat water from Lake Monroe to remove TP at the Florida Power & Light (FPL) power plant in the basin. However, FPL withdrew its participation in the project, which was voluntary, and this effort is currently suspended.

SJRWMD also has projects adjacent to the Lakes Harney and Monroe and MSJR Basin. In the Lake Jesup Basin, SJRWMD is planning rehabilitation and reconstruction of degraded drainage conveyances in the watersheds of Salt Creek and Sweetwater Creek to reduce TP loadings to Lake Jesup. This work is being funded by the Department and managed by Seminole County. Field reconnaissance, survey, hydrological modeling, development of preliminary concepts, load analysis, and cost estimates have been completed. It appears that Salt Creek may offer more opportunity for improvement projects. Selection of the preferred alternative with associated cost estimates to follow. SJRWMD has also completed initial studies to determine whether long-term harvesting of *Phragmites* (common reed) from Lake Jesup is a viable option with the potential for TP removal. Additional studies are needed to assess potential ecological impacts, use of repeated harvests for permanent TP removal, material handling limitations, and to identify possible end-use collaborators for disposal of harvested materials.

In the Lake George Basin, SJRWMD is using gill nets to harvest rough fish (gizzard shad) from the lake for phosphorous removal through direct removal of fish biomass. Harvesting began under permit from the Florida Fish and Wildlife Conservation Commission on June 3, 2013 and finished on September 6, 2013. The total catch was 1,173,570 pounds of fish biomass, which equates to about 9,388 pounds of

TP removed from the system. SJRWMD also evaluated a project in the Econlockhatchee River Basin, which would provide treatment of river flow from the Econlockhatchee River and reduce nutrient loadings and concentrations downstream in the St. Johns River. After feasibility investigations were completed, the project was not selected as a priority at this time.

2.2 Summary of Accomplishments

The projects completed during the first annual BMAP reporting period are summarized in **Table 4**. These projects resulted in an estimated reduction of 4,718.8 lbs/yr of TN and 988.6 lbs/yr of TP. These reductions are in addition to those projects given credit before BMAP adoption. Therefore, the total reductions to date are 66,384.9 lbs/yr of TN and 15,084.2 lbs/yr of TP, which are greater than the required reductions in the first BMAP iteration of 43,828.2 lbs/yr of TN and 8,854.9 lbs/yr of TP. **Table 5** and **Table 6** show the completed project credits by entity for TN and TP, respectively, and the credits that have already been achieved towards reductions in future BMAP iterations, where applicable.

The progress towards the total TMDL load reductions for TN and TP are shown in **Figure 6** and **Figure 7**, respectively. The first bar in these figures shows the starting load for urban and agricultural stormwater runoff. The second bar shows the current estimated loading with the implementation of projects and the removal of non-contributing areas. The third bar shows the total allocation for stormwater runoff to meet the TMDLs. The line shows the target for the first BMAP iteration.

Table 4: Summary of Projects Completed in the Reporting Period (September 1, 2012 Through August 31, 2013)

Entity	Project Number	Project Name	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)
City of Deltona	DEL-4	Lake Gleason Control Structure	672.0	188.4
FDACS	N/A	Agricultural BMP Enrollment to Date	4,046.8	800.2
Total	**N/A**	**Total Reductions in Reporting Period**	**4,718.8**	**988.6**

Table 5: TN Summary of Completed Projects Credit and Credit for Future BMAPs

Allocation Entity	BMAP 1 TN Required Reduction (lbs/yr)	Completed Projects TN Reduction (lbs/yr)	TN Credit for Future BMAPs (lbs/yr)
Agriculture	21,141.0	20,506.5	-634.5
City of DeBary	1,880.2	13,561.7	11,681.5
City of DeLand	0.0	9.1	9.1
City of Deltona	3,608.7	7,151.4	3,542.6
City of Lake Helen	0.0	30.8	30.8
City of Lake Mary	0.0	371.1	371.1
City of Orange City	0.0	1.3	1.3
City of Sanford	10,360.0	12,973.9	2,613.9
FDOT	1,231.8	1,987.3	755.5

Allocation Entity	BMAP 1 TN Required Reduction (lbs/yr)	Completed Projects TN Reduction (lbs/yr)	TN Credit for Future BMAPs (lbs/yr)
Seminole County	3,973.6	7,637.8	3,664.2
Turnpike Authority	0.0	21.6	21.6
Volusia County	1,632.9	2,213.6	580.7
Total	**43,828.2**	**66,466.1**	**22,637.8**

Table 6: TP Summary of Completed Projects Credit and Credit for Future BMAPs

Allocation Entity	BMAP 1 TP Required Reduction (lbs/yr)	Completed Projects TP Reduction (lbs/yr)	TP Credit for Future BMAPs (lbs/yr)
Agriculture	6,885.1	4,002.9	-2,882.2
City of DeBary	86.4	2,207.0	2,120.6
City of DeLand	0.0	0.7	0.7
City of Deltona	388.3	1,229.9	841.6
City of Lake Helen	0.0	4.5	4.5
City of Lake Mary	0.0	58.6	58.6
City of Orange City	0.0	0.2	0.2
City of Sanford	1,339.6	4,897.3	3,557.7
FDOT	0.0	429.3	429.3
Seminole County	155.5	1,905.9	1,750.4
Turnpike Authority	0.0	14.4	14.4
Volusia County	0.0	358.3	358.3
Total	**8,854.9**	**15,109.0**	**6,254.1**

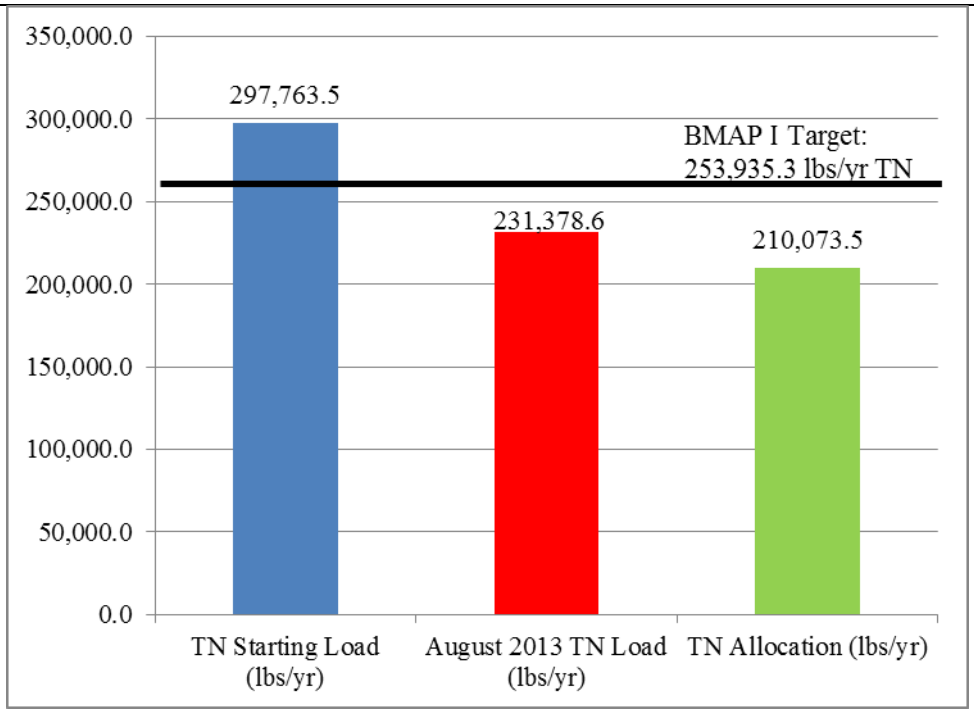

FIGURE 6: PROGRESS TOWARDS THE LAKES HARNEY AND MONROE AND MSJR TN TMDL THROUGH AUGUST 31, 2013

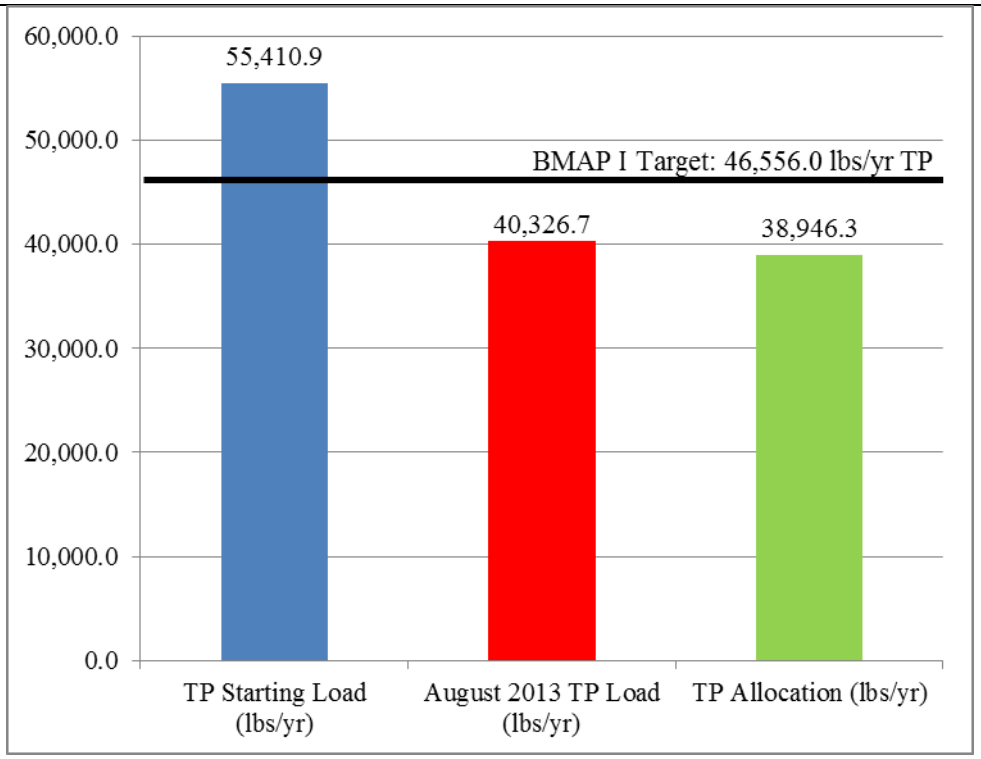

FIGURE 7: PROGRESS TOWARDS THE LAKES HARNEY AND MONROE AND MSJR TP TMDL THROUGH AUGUST 31, 2013

Section 3: WATER QUALITY AND BIOLOGICAL MONITORING

The Lakes Harney and Monroe and MSJR BMAP monitoring plan was designed to enhance the understanding of basin loads, identify areas with high nutrient concentrations, and track water quality trends. The information gathered through the monitoring plan will measure progress toward achieving the TMDLs and provide a better understanding of the watershed loading. The BMAP monitoring plan consists of ambient water quality sampling and biological and vegetation monitoring. A detailed water quality evaluation will be conducted no later than after four years of BMAP implementation to determine water quality improvements in the basin from actions included in the first BMAP iteration. All responsible stakeholders participated in the monitoring plan in the first year of BMAP implementation. A few highlights of the monitoring efforts are described below.

The City of Deltona continued its monthly monitoring at three stations in the basin and has been uploading the data to STORET.

Seminole County continued its water quality sampling at the two BMAP stations in the basin. Site MILL1 is located in Mill Creek at the outflow to Lake Monroe, just upstream of the Highway 17-92 bridge crossing. Seminole County started sampling this site for the City of Sanford on January 24, 2013. However, no samples were pulled for the first four months of 2013 due to low water levels and no visible flow conditions. There is a large vegetation tussock at the outfall of the creek into the lake which, during low flow conditions, appears to act as a surface water blockage. Also, depending on the wind conditions present, the county has often seen the creek's surface flow in the upstream direction. Samples were not taken during these conditions. This station may need to be removed from the BMAP monitoring plan if these conditions continue. The county has also sampled the Smith Canal site monthly for water quality, if the appropriate field conditions were present.

Seminole County's last stream condition index (biological monitoring) at Smith Canal was performed on April 10, 2012. The result from this event was "Fair = Healthy" based on the present standard operating procedures. During 2013, there were not favorable or "representative" conditions to conduct the biological monitoring included in the BMAP.

Volusia County continued its monthly sampling at six of the nine stations included in the BMAP. The county no longer samples station VC-DC04, which is located along Deep Creek to the south of station VC-DC05. Station VC-DC05 is still sampled by the county and is sufficient to represent water quality

in this part of the basin. The county also stopped sampling station VC-083, which is the Gemini Springs outfall. The county continues to sample station VC-082, which is the adjacent to station VC-083 and this station is sufficient to represent water quality in this part of the basin. Volusia County has had problems sampling station VC-COW, located on Cow Creek at Maytown Road. When the county tries to sample in this location, there is typically no measurable flow. It appears that this creek only flows during heavy rains; therefore, this is not a suitable location for monitoring and the site will be removed from the BMAP monitoring plan.

SJRWMD continued to sample its ten ambient water quality stations that are part of the monitoring plan. Of these stations, eight are sampled monthly and two are sampled every other month. SJRWMD also continued its phytoplankton sampling at stations SRN, OW-SJR-1, and SJR-415. These three stations are located progressively downstream in the St. Johns River. Station SRN is located furthest upstream before the confluence of Lakes Harney, and represents river water coming from the Upper St. Johns River Basin. Station OW-SJR-1 is located downstream of Lake Harney and the outflow from Lake Ashby. Station SJR-415 is downstream of Lake Jesup and upstream of Lake Monroe. The highest total phytoplankton biovolume values (μm^3/mL) at these stations were at station SJR-415 in January through May 2008 with values from about 6 to 25 million μm^3/mL. A similar trend was observed from August 2008 through July 2010, but with significantly lower total biovolumes. During 2011 and 2012, total biovolume values at station SJR-415 were generally higher than they had been in the previous two years. The second highest biovolume value (1.6 million μm^3/mL) at station SJR-415 was observed in March 2013. To better understand the difference between these stations and the bodies of water influencing them, each of these stations is summarized in more detail in **Appendix B**.

APPENDIX A: BMAP PROJECTS

The BMAP project tables below show the implementation status of the BMAP projects as of August 31, 2013. The tables provide information on the nutrient reduction attributed to each individual project, shown in pounds per year (lbs/yr). These projects were submitted to provide reasonable assurance to the Department that each entity has a plan on how they will meet their allocation; however, this list of projects is meant to be flexible enough to allow for changes that may occur over time, provided that the reduction is still met within the specified timeframe.

TABLE A-1: CITY OF DEBARY PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT DETAIL	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
DeBary	DB-1	Noncontributing Basin	Noncontributing basin, not included in the TMDL model	N/A	6,522.5	1,036.8
DeBary	DB-2	Noncontributing Basin	Noncontributing basin, not included in the TMDL model	N/A	7,039.2	1,170.2
DeBary	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**13,561.7**	**2,207.0**
DeBary	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**1,880.2**	**86.4**
DeBary	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**11,681.5**	**2,120.6**

TABLE A-2: CITY OF DELAND PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT DETAIL	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
DeLand	DL-1	Education Efforts	Florida Yards and Neighborhoods (FYN) Program, irrigation ordinance, fertilizer ordinance, pamphlets, website, illicit discharge program	Ongoing	9.1	0.7
DeLand	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**9.1**	**0.7**
DeLand	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**0.0**	**0.0**
DeLand	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**9.1**	**0.7**

TABLE A-3: CITY OF DELTONA PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT DETAIL	TREATMENT ACRES	PROJECT COST	ANNUAL O&M	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
Deltona	DEL-1	McGarity Kirkhill Regional Treatment Facility	Wet detention pond	Retrofit project to treat surface water runoff from a residential area in the city	277.2	$1,500,000	$50,000	09/2011	Completed	344.6	91.8
Deltona	DEL-2	DRA GC-5	Retention BMPs	Water quality treatment for a residential area	10.5	$120,000	$6,000	08/2009	Completed	25.5	4.3
Deltona	DEL-3	Swales	Swales	Swales throughout the city	2,368.7	$2,000,000	$100,000	Varies	Completed	4,820.2	728.6
Deltona	DEL-4	Lake Gleason Control Structure	Wet detention pond	Proposed control structure to increase storage in Lake Gleason	581.6	$150,000	$3,000	Unknown	Completed – 11/14/2012	672.0	188.4
Deltona	DEL-5	Education Efforts	Education	FYN, irrigation ordinance, pet waste ordinance, public service announcements (PSAs), pamphlets, website, illicit discharge program	N/A	Unknown	Unknown	Ongoing	Ongoing	1,270.0	206.4
Deltona	DEL-6	Catch Basin Maintenance	Catch basin cleanout	Catch basin cleanout throughout the city	N/A	Unknown	Unknown	Ongoing	Ongoing	19.1	10.4
Deltona	**N/A**	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**7,151.3**	**1,229.9**
Deltona	**N/A**	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**3,608.7**	**388.3**
Deltona	**N/A**	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**3,542.6**	**814.6**

TABLE A-4: CITY OF LAKE HELEN PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT DETAIL	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
Lake Helen	LH-1	Education Efforts	Irrigation ordinance, pet waste ordinance, pamphlets, website, stormwater pollution prevent factsheet	Ongoing	30.8	4.5
Lake Helen	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**30.8**	**4.5**
Lake Helen	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**0.0**	**0.0**
Lake Helen	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**30.8**	**4.5**

TABLE A-5: CITY OF LAKE MARY PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT DETAIL	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
Lake Mary	LM-1	Education Efforts	FYN, landscape ordinance, irrigation ordinance, pet waste ordinance, PSAs, pamphlets, website, illicit discharge program	Ongoing	361.5	52.2
Lake Mary	LM-2	Street Sweeping	Sweeping of 53.58 curb miles per year	Ongoing	9.6	6.4
Lake Mary	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**371.1**	**58.6**
Lake Mary	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**0.0**	**0.0**
Lake Mary	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**371.1**	**58.6**

TABLE A-6: CITY OF ORANGE CITY PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT DETAIL	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
Orange City	OC-1	Education Efforts	Irrigation ordinance, pamphlets, website, illicit discharge program	Ongoing	1.3	0.2
Orange City	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**1.3**	**0.2**
Orange City	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**0.0**	**0.0**
Orange City	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**1.3**	**0.2**

TABLE A-7: CITY OF SANFORD PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT DETAIL	TREATMENT ACRES	PROJECT COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
Sanford	S-1	Cloud Branch Phase I	Wet detention pond	Drainage/water quality improvements	187.0	$3,491,375	05/2007	Completed	647.3	173.9
Sanford	S-2	Cloud Branch Phase II	Wet detention pond	Drainage/water quality improvements	379.7	$3,072,693	05/2007	Completed	1,390.1	405.6
Sanford	S-3	Street Sweeping	Street sweeping	Street sweeping throughout the city	N/A	Unknown	Ongoing	Ongoing	8,866.5	3,993.3
Sanford	S-4	Education Efforts	Education	FYN, landscaping ordinance, irrigation ordinance, PSAs, pamphlets, website, illicit discharge program	N/A	Unknown	Ongoing	Ongoing	2,069.9	324.5
Sanford	**N/A**	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**12,973.8**	**4,897.3**
Sanford	**N/A**	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**10,360.0**	**1,339.6**
Sanford	**N/A**	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**N/A**	**N/A**	**N/A**	**2,613.8**	**3,557.7**

TABLE A-8: FDOT PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	TREATMENT ACRES	START DATE	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
FDOT	FDOT-1	79070-3547-02 (Pond 2)	Wet detention pond	21.6	N/A	6/2007	Completed	19.7	2.2
FDOT	FDOT-2	79070-3547-03 (Pond 3)	Wet detention pond	24.9	N/A	6/2007	Completed	11.7	0.6
FDOT	FDOT-3	79070-3547-04 (Pond 4)	Wet detention pond	35.2	N/A	6/2007	Completed	15.8	0.8
FDOT	FDOT-4	79070-3547-06 (Pond 6)	Wet detention pond	18.8	N/A	6/2007	Completed	13.6	0.7
FDOT	FDOT-5	79070-3546-03 (Pond 9)	Wet detention pond	13.4	N/A	6/2007	Completed	13.3	8.6
FDOT	FDOT-6	79070-3546-02 (Pond 8)	Wet detention pond	44.3	N/A	6/2007	Completed	25.4	6.2
FDOT	FDOT-7	79070-3547-05 (Pond 5)	Wet detention pond	33.1	N/A	6/2007	Completed	25.2	2.7
FDOT	FDOT-8	79070-3546-01 (Pond 7)	Wet detention pond	26.9	N/A	6/2007	Completed	19.9	1.4
FDOT	FDOT-9	79070-3546-04 (Pond 10)	Wet detention pond	3.6	N/A	6/2007	Completed	3.8	2.7
FDOT	FDOT-10	79110-xxx3-08 (Pond 4)	Wet detention pond	8.4	N/A	10/2008	Completed	8.2	1.6
FDOT	FDOT-11	79110-xxx3-09 (Pond 5)	Wet detention pond	22.6	N/A	10/2008	Completed	27.2	6.2
FDOT	FDOT-12	79110-xxx3-10 (Pond 6)	Wet detention pond	10.7	N/A	10/2008	Completed	13.6	2.8
FDOT	FDOT-13	79110-xxx3-11 (Pond 7)	Wet detention pond	30.0	N/A	10/2008	Completed	38.3	7.7
FDOT	FDOT-14	79110-xxx4-01 & 02 (Pond 1 & 1A)	Wet detention pond	35.6	N/A	Unknown	Completed	54.4	11.0
FDOT	FDOT-15	79110-xxx4-03 & 04 (Pond 2 & 2A)	Wet detention pond	38.7	N/A	Unknown	Completed	65.3	13.3
FDOT	FDOT-16	79110-xxx4-05 (Pond 14)	Wet detention pond	24.5	N/A	Unknown	Completed	43.8	8.0
FDOT	FDOT-17	SR 415 - missing from model	Swales	133.9	N/A	Unknown	Completed	90.1	28.3
FDOT	FDOT-18	SR 44 - missing from model	Swales	43.5	N/A	Unknown	Completed	34.1	10.5
FDOT	FDOT-19	SR 46 - missing from model	Swales	48.2	N/A	Unknown	Completed	32.8	7.4
FDOT	FDOT-20	77160-3404-02 (Pond 1-NW)	Retention BMPs	25.5	N/A	05/2004	Completed	94.2	13.4
FDOT	FDOT-21	77160-3404-06 (Pond 4-11)	Wet detention pond	38.5	N/A	05/2004	Completed	102.5	24.4
FDOT	FDOT-22	77160-3404-05 (Pond 4-1)	Wet detention pond	32.4	N/A	05/2004	Completed	44.9	12.4
FDOT	FDOT-23	77160-3404-07 (Pond 5)	Wet detention pond	30.5	N/A	05/2004	Completed	47.4	8.6
FDOT	FDOT-24	77160-3436	Swales	56.5	N/A	Unknown	Completed	147.5	19.8
FDOT	FDOT-25	77160-3439-01 (Pond 1)	Wet detention pond	20.3	N/A	00/2006	Completed	7.4	0.7
FDOT	FDOT-26	79110-3404-04 & 05 (Pond QQ3 & QQ-5)	Wet detention pond	47.6	N/A	10/2004	Completed	56.4	11.7
FDOT	FDOT-27	79110-3404-06 (RR-3)	Wet detention pond	53.1	N/A	10/2004	Completed	68.1	16.9
FDOT	FDOT-28	79110-3404-07 (Pond SS-2)	Wet detention pond	87.5	N/A	02/2006	Completed	91.9	26.3
FDOT	FDOT-29	Roadside Swale	Swales	35.0	N/A	10/2004	Completed	93.8	13.5
FDOT	FDOT-30	Roadside swale	Swales	13.3	N/A	02/2006	Completed	39.5	5.7
FDOT	FDOT-31	SR 415 - missing from model	Swales	65.1	N/A	Unknown	Completed	39.1	8.5
FDOT	FDOT-32	Education Efforts	Education	N/A	N/A	Ongoing	Ongoing	101.1	13.3
FDOT	FDOT-33	Street Sweeping	Street sweeping	N/A	N/A	Ongoing	Ongoing	103.7	67.7

Entity	Project Number	Project Name	Project Type	Treatment Acres	Start Date	End Date	Status	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)
FDOT	FDOT-34	Noncontributing Area in DeBary	Noncontributing area	39.2	N/A	N/A	N/A	194.9	27.9
FDOT	FDOT-35	Noncontributing Area in Volusia County	Noncontributing area	22.7	N/A	N/A	N/A	117.6	19.0
FDOT	FDOT-36	SR 415 – Pond A	Wet detention pond	4.3	2012	2015	Construction	6.8	1.5
FDOT	FDOT-37	SR 415 – Pond B	Wet detention pond	8.5	2012	2015	Construction	7.9	0.8
FDOT	FDOT-38	SR 415 – Exfiltration Trench	Retention BMPs	22.0	2012	2015	Construction	11.6	0.4
FDOT	FDOT-39	SR 415 – Pond H	Wet detention pond	9.9	2012	2015	Construction	10.2	2.4
FDOT	FDOT-40	SR 46 – Pond 1	Wet detention pond	18.0	2012	Unknown	Design Complete, Not Funded for Construction	25.8	6.3
FDOT	FDOT-41	SR 46 – Pond 2	Wet detention pond	11.6	2012	Unknown	Design Complete, Not Funded for Construction	18.8	5.4
FDOT	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**1,987.3**	**429.3**
FDOT	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**1,231.8**	**0.0**
FDOT	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**N/A**	**N/A**	**N/A**	**755.5**	**429.3**

TABLE A-9: SEMINOLE COUNTY PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT DETAIL	TREATMENT ACRES	PROJECT COST	ANNUAL O&M	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
Seminole County	SC-1	Club II Regional Stormwater Facility (RSF)	Wet detention pond	RSF to collect and treat stormwater runoff	422.7	$2,334,682	$20,095	02/2007	Completed	1,333.3	395.6
Seminole County	SC-2	Midway RSF	Wet detention pond	RSF to collect and treat stormwater runoff	121.8	$2,163,151	$26,662	01/2009	Completed	408.4	118.4
Seminole County	SC-3	Elder Creek RSF	Wet detention pond	RSF to collect and treat stormwater runoff	229.7	$3,884,496	$19,251	11/2007	Completed	519.2	134.4
Seminole County	SC-4	Lockhart-Smith RSF	Wet detention pond	RSF to collect and treat stormwater runoff	2,757.0	$3,504,755	Unknown	01/2007	Completed	3,201.1	840.1
Seminole County	SC-5	Street Sweeping	Street sweeping	Street sweeping throughout the county	N/A	Unknown	Unknown	Ongoing	Ongoing	300.0	135.1
Seminole County	SC-6	Education Efforts	Education	FYN, landscaping ordinance, irrigation ordinance, pet waste ordinance, PSAs, pamphlets, website, illicit discharge program	N/A	Unknown	Unknown	Ongoing	Ongoing	1,875.8	282.3
Seminole County	**N/A**	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**7,637.8**	**1,905.9**
Seminole County	**N/A**	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**3,973.6**	**155.5**
Seminole County	**N/A**	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**3,664.2**	**1,750.4**

TABLE A-10: TURNPIKE AUTHORITY PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT DETAIL	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
Turnpike Authority	T-1	Street Sweeping	Sweep 120 lane miles per year	Ongoing	21.6	14.4
Turnpike Authority	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**21.6**	**14.4**
Turnpike Authority	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**0.0**	**0.0**
Turnpike Authority	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**21.6**	**14.4**

TABLE A-11: VOLUSIA COUNTY PROJECTS

N/A = Not applicable

ENTITY	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	TREATMENT ACRES	PROJECT COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
Volusia County	VC-1	Education and Outreach	Education	N/A	Unknown	Ongoing	Ongoing	1,391.9	201.0
Volusia County	VC-2	Street Sweeping	Street sweeping	N/A	Unknown	Ongoing	Ongoing	115.5	52.0
Volusia County	VC-3	Lemon Bluff Road	Swales	1.8	$145,000	2011	Completed	6.6	1.1
Volusia County	VC-4	Lemon Bluff Boat Ramp	Swales	0.2	$55,550	02/2011	Completed	0.7	0.1
Volusia County	VC-5	DeBary Avenue – Doyle Road Expansion	Wet detention pond	123.3	Unknown	Unknown	Completed	41.0	10.3
Volusia County	VC-6	Lake Winnemissett Noncontributing Basin	Noncontributing basin	1003.3	N/A	N/A	N/A	657.9	93.8
Volusia County	**N/A**	**N/A**	**Total Projects Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**2,213.6**	**358.3**
Volusia County	**N/A**	**N/A**	**Total BMAP 1 Required Reduction**	**N/A**	**N/A**	**N/A**	**N/A**	**1,632.9**	**0**
Volusia County	**N/A**	**N/A**	**Credit for Future BMAPs**	**N/A**	**N/A**	**N/A**	**N/A**	**580.7**	**358.3**

APPENDIX B: MSJR BASIN PHYTOPLANKTON SUMMARY 2007-2013

(Analysis and summary completed for SJRWMD by Water & Air Research, Inc.)

ST. JOHNS RIVER: STATION SRN

Algal populations at station SRN were relatively low with all total biovolume values less than 2.5 million μm^3/mL. The peak total biovolume value in August 2007 was about evenly distributed between cyanobacteria (primarily *Microcystis firma* and *Planktothrix agardhii*) and Chlorophyta (unidentified uniflagellated cells less than 5 microns in length). Total algal biovolume values remained low during the fall and winter months from 2007 until February 2008 when Bacillariophyceae peaked at over 1 million μm^3/mL, and then again declined during March and April. The February Bacillariophyceae peak was primarily two taxa: *Entomoneis costata* with a biovolume of 614,788μm^3/mL and *Thalassiosira lacustris* with 455,325 μm^3/mL). Bacillariophyceae again had the highest biovolume values present from January through March 2009 with *Entomoneis costata* again accounting for the greatest biovolume. This taxon was again present in February and March of both 2010 and 2011 and in August and September 2011. Total biovolume values remained low from August 2009 to July 2010 when cyanobacteria increased to more than 500,000 μm^3/mL. *Anabaena oumiana*, a filamentous cyanobacteria with bead shaped cells, was the most abundant cyanobacteria present with a biovolume of 592,958 μm^3/mL. Bacillariophyceae again had the greatest biovolume values of the algae present in August 2010 and June 2011. The large pennate diatoms *Nitzschia sclaris* and *Nitzschia sigma* had the greatest values for these months, respectively. In 2012 the Bacillariophyceae peak (746,906 μm^3/mL of the total 783,938 μm^3/mL biovolume) occurred three months earlier in March. The large (as the name implies) pennate diatom, *Surirella robusta*, had the greatest biovolume value (611,605 μm^3/mL) of the algal taxa present.

ST. JOHNS RIVER: STATION OW-SJR-1

Station OW-SJR-1 (downstream from Lake Harney, not far upstream from the confluence with Lake Jesup, and upstream from Lake Monroe) had relatively low phytoplankton total biovolume values during the fall and winter months of 2007 and 2008 with total biovolume values usually less than 500,000 μm^3/mL. The peak value (about 2 million μm^3/mL) in August 2007 was predominately made up of cyanobacteria (primarily *Chroococcus disperses* – 112,234 μm^3/mL and *Cylindrospermopsis raciborskii* – 611,276 μm^3/mL) and Bacillariophyceae (primarily the centric diatom *Stephanocyclus meneghiniana* – biovolume 413,970 μm^3/mL). *Cylindrospermopsis raciborskii* is a potentially toxin producing species

(produces cylindrospermopsin, saxitoxin, and anatoxin-a) and was abundant at this station in May – July 2007. Phytoplankton total biovolume values peaked again in June and July 2008 and went even higher in April and May 2009 with cyanobacteria accounting for the greatest biovolumes. *Aphanocapsa holsatica* (a colonial algal taxa with cells about 1 micron in diameter) accounted for the greatest biovolumes in April (694,995 μm^3/mL). In May, *Anabaena affinis*, *Aphanocapsa holsatica*, *Cylindrospermopsis raciborskii*, and *Microcystis wesenbergii* all had biovolumes greater than 300,000 μm^3/mL.

Total algal biovolumes remained very low during most of August 2009 through April 2011 with Cryptophyta biovolume values only slightly higher than the other groups. Taxa accounting for the greatest biovolumes included small flagellate species of *Chroomonas* and *Cryptomonas*. These genera are ubiquitous in temperate lakes, reservoirs, and steams and are more common in cooler waters. Total biovolume values rose rapidly to 4 to 10 million μm^3/mL during May through July 2011. *Cylindrospermopsis raciborskii* (cyanobacteria) accounted for the greatest percentage of algal biovolume during May and June and *Anabaena flos-aqua* and *Cylindrospermopsis raciborskii* accounted for most of the total algal biovolume in June 2011. As noted below in the discussion for Lake Harney, *Anabaena flos-aqua* biovolume was greater than 12 million μm^3/mL at LH-OW-SW in May 2011.

Biovolume values again peaked in April and June of 2012 to about 5,500,000 μm^3/mL and 3,200,000 μm^3/mL, respectively. The cyanobacteria taxa present that accounted for the greatest biovolumes in these two months were *Cylindrospermopsis raciborskii* in April and *Cylindrospermopsis raciborskii* and *Microcystis smithii* in June. *Discostella pseudostelligera* (Bacillariophyceae) accounted for the greatest diatom biovolume in June.

The second highest total algal biovolume peak at this station was in April 2013 with *Cylindrospermopsis raciborskii* (8,209,189 μm^3/mL) accounting for 88.6 percent of the total biovolume. *Entomoneis costata* (Bacillariophyceae) was present at this station in the spring of 2008 (February – April), in February and March 2009, and in March 2011. These are generally the same periods noted below for Lake Harney which is located between stations SRN and OW-SJR-1.

ST. JOHNS RIVER: STATIONS SJR-415

Station SJR-415, which is directly downstream from Lake Jesup, generally had the highest total phytoplankton biovolume values of any St. Johns River stations. The peak total biovolume values at it were from January through May 2008 and ranged from about 6 million to 25 million μm^3/mL.

Cyanobacteria (primarily *Cylindrospermopsis raciborskii*) accounted for the greatest percentage of these peaks. This taxon also accounted for the even higher cyanobacteria biovolumes in Lake Jesup during this period. Thus, it is reasonable to assume that the outflow of Lake Jesup just upstream of SJR-415 was the primary source of the algal populations at this station.

Total biovolume values at station SJR-415 were significantly lower from August 2008 – February 2011 with all values less than 8 million μm^3/mL. Although cyanobacteria were again dominant (based on biovolumes) from February through May 2009 and November 2009 through January 2010, the taxa present were more diverse. During March through July 2011, cyanobacteria biovolumes ranged from about 5 to 10 million μm^3/mL with *Cylindrospermopsis raciborskii* accounting for most of the total algal biovolume present in each month. This taxon was again the most dominant taxon present in March 2012 and accounted for about 5.8 million μm^3/mL of the total biovolume at this station. The second highest total algal biovolume peak at this station was in March 2013 with *Cylindrospermopsis raciborskii* (16,989,087 μm^3/mL) accounting for 87.8 percent of the total biovolume. As discussed in the section on Lake Jesup below, this taxon occurs in two forms – straight and coiled filaments. Most of the filaments observed for this taxon at this station were straight with only a few coiled filaments present.

LAKE HARNEY: STATIONS LH-OW-SW, LH-OW-NE, AND CLH

Lake Harney is the most upstream lake sampled for phytoplankton in the MSJR Basin. Total mean phytoplankton biovolume values in Lake Harney during most of August 2007 through July 2010 were consistently less than 1 million μm^3/mL. The increases in August 2007, July 2008, February 2009, and summer 2009 were caused by increases in the diverse algal community present in the lake. The obvious spike in total biovolume in June 2008 was from a bloom of *Anabaena circinalis* var. *crassa*. Biovolume values for this taxon at LH-OW-NE and LH-OW-SW were over 13 million μm^3/mL and 18 million μm^3/mL, respectively. Total biovolume values from August 2010 through July 2011 generally averaged slightly higher than in previous years with the peak in May 2011 accounted for by *Anabaena flos-aquae* with a biovolume value of 12.3 million μm^3/mL at LH-OW-SW.

Algal biovolumes remained generally low from August 2011 through July 2013 with a diversity of taxa observed. A comparison of total biovolume values between the two Lake Harney stations sampled from August 2007 through July 2011 indicates that both stations generally had comparable levels.

As noted above for SRN and OW-SJR-1, *Entomoneis costata* (Bacillariophyceae) was also present in late winter through early spring of 2008, 2009, and 2011 in Lake Harney. Because Lake Harney is

located downstream of station SRN and upstream of OW-SJR-1, SRN probably acted as a source for this taxon in Lake Harney and it in turn acted as a source for OW-SJR-1. Populations of *Entomoneis costata* were generally lower in Lake Harney than at SRN except in May 2008 when total biovolume values at stations LH-OW-NE and LH-OW-SW were actually higher than at station SRN.

LAKE ASHBY: STATION LA-OW-S

Lake Ashby, located in the northeast part of the MSJR Basin had relatively low total biovolume values during the six-year period except in September 2007, July 2011, and August 2012 when values rose to about 3 million μm^3/mL. Cyanobacteria accounted for most of the biovolume in each of these months. In September 2007, *Cylindrospermopsis raciborskii* accounted for the highest biovolume value (2.2 million μm^3/mL). In contrast, the peak in July 2011 was caused by an abundance of six different species of *Anabaena*. In August 2012 *Anabaena affinis* and *Anabaena flos-aquae* accounted for 71.2 percent of the cyanobacteria peak and 44.9 percent of the total biovolume peak.

Smaller peaks in March and July 2008 and June 2009 were dominated by Cryptophyta (primarily species of *Cryptomonas* and *Chilomonas*). Peaks in May 2008 and 2010 were dominated by Bacillariophyceae, primarily the centric diatom *Aulacoseira ambigua*. Total biovolume values for Lake Ashby from August 2010 through July 2013 were generally slightly higher than in the previous three years with biovolume dominance shifting from one group of algae to another but frequently dominated by Cryptophyta.

LAKE MONROE: STATIONS LM-OW-S, LM-OW-NE, AND LMAC

Total mean phytoplankton biovolume values in Lake Monroe declined in the fall of each of the first three years (August 2007 – July 2010) of the study as cyanobacteria densities declined because of the cooler temperatures. Total mean phytoplankton biovolume values declined from about 3 million μm^3/mL in August 2007 to about 300,000 μm^3/mL in November 2007. Monthly total mean biovolume values then rapidly increased to a peak of over 6 million μm^3/mL in March 2008 when the lake was dominated by cyanobacteria (primarily *Cylindrospermopsis raciborskii* with a mean biovolume of 2.4 million μm^3/mL) and Bacillariophyceae. At LM-OW-S *Stephanocyclus meneghiniana* (biovolume 1.8 million μm^3/mL) and *Aulacoseira ambigua* (biovolume 729,545 μm^3/mL) were the dominant Bacillariophyceae while *Stephanocyclus meneghiniana* (biovolume 1.3 million μm^3/mL) and *Thalassiosira lacustris* (biovolume 768,717 μm^3/mL) were the dominants at LM-OW-NE. All three of these taxa are centric diatoms commonly found in the plankton.

The highest total biovolume value (almost 12 million µm^3/mL) during the first three years (August 2007 – July 2010) was in July 2008 with *Cylindrospermopsis raciborskii* (almost 6 million µm^3/mL) and *Microcystis flos-aquae* (almost 7 million µm^3/mL) accounting for most of the biovolume at station LM-OW-NE. Both of these taxa can potentially produce toxins (Landsberg 2002). *Cylindrospermopsis raciborskii* potentially produces cylindrospermopsin, saxitoxin, and anatoxin-a and *Microcystis flos-aquae* can potentially produce microcystin. This cyanobacteria peak in Lake Monroe occurred one month after the peak in Lake Harney. Algal populations in Lake Monroe then crashed in August 2008 and remained low through November 2008 after Tropical Storm Fay crossed Florida on August 20 - 21, 2008 with large amounts of rainfall (Note: Lake Monroe was sampled August 25, 2008, after the storm passed.). Algal populations again rose in the spring of 2009 to levels observed the previous spring.

Bacillariophyceae accounted for the greatest percentage of the total mean biovolume from January through March 2010. In June, July, and August 2010, cyanobacteria again became dominant as water temperatures increased to higher summer levels with *Anabaena affinis*, *Cylindrospermopsis raciborskii*, *Microcystis smithii*, and *Planktothrix agardhi* accounting for the greatest amount of the cyanobacteria biovolume.

In contrast to the first three years (August 2007 – July 2010) of the project, biovolume values rose exponentially during the spring of 2011 with values of 20 to 26 million µm^3/mL from April through July 2011. *Cylindrospermopsis raciborskii* accounted for most of the cyanobacteria biovolume in all samples during this period. These biovolume values and distribution of taxa were comparable to those usually observed in Lake Jesup. Biovolume values dropped again in August 2011 and through July 2013 remained more consistent with previous years. It is likely that the dry 2011 summer conditions facilitated the development of intense algal blooms as a result of reduced flushing and clearer water.

Comparison of total biovolume values between the two Lake Monroe stations indicates that total biovolume values were consistently higher at the upstream station (LM-OW-S) from October 2007 through May 2008 but the downstream station (LM-OW-NE) biovolume values were usually higher from August 2008 through July 2011 or levels were about equal. The higher total biovolume values at LM-OW-S in 2007 – 2008 were probably because of the much higher values at upstream stations. The largest peak at SJR-415 (just upstream of Lake Monroe) was also from January 2008 – June 2008 and also in Lake Jesup from September 2007 – June 2008. Likewise, total biovolume values at SJR-415 were greater during spring 2011 as indicated previously.