

BASIN MANAGEMENT ACTION PLAN

**for the Implementation of Total Maximum Daily Loads for Nutrients
Adopted by the Florida Department of Environmental Protection**

in the

Indian River Lagoon Basin North Indian River Lagoon

developed by the
North Indian River Lagoon Stakeholders

in cooperation with the
Florida Department of Environmental Protection
Division of Environmental Assessment and Restoration
Bureau of Watershed Restoration
Tallahassee, Florida 32399

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Volusia County	Florida Farm Bureau Federation	Applied Technology and Management
City of Cocoa	IRL National Estuary Program	BSE Consultants
City of Edgewater	St. Johns River Water Management District	Cape Canaveral Scientific, Inc.
City of Indian Harbour Beach	-	CDM Smith
City of Melbourne	-	Citizens
City of Oak Hill	-	E Sciences, Inc.
City of Rockledge	-	Eco Sense International
City of Titusville	-	England Thims and Miller
Florida Department of Transportation District 5	-	Indian Riverkeeper
Kennedy Space Center	-	Jones Edmunds and Associates
Town of Indialantic	-	Marine Resources Council
Town of Palm Shores	-	Masteller and Moler, Inc.
Town of Melbourne Village	-	SAIC
Florida Power and Light – Cape Canaveral Power Plant	-	Wildwood Consulting, Inc.
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LIST OF ACRONYMS

BMAP	Basin Management Action Plan
BMP	Best Management Practice
BRL	Banana River Lagoon
CCMP	Comprehensive Conservation Management Plan
CDS	Continuous Deflective Separation (Unit)
EMC	Event Mean Concentration
EPA	U. S. Environmental Protection Agency
ERP	Environmental Resource Permit
F.A.C.	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
F.S.	Florida Statutes
FWRA	Florida Watershed Restoration Act
FYN	Florida Yards and Neighborhoods
GIS	Geographic Information Systems
HSPF	Hydrologic Simulation Program – FORTRAN (model)
IRL	Indian River Lagoon
IWR	Impaired Surface Waters Rule
LID	Low Impact Development
LIDAR	Light Detection and Ranging
MAPS	Managed Aquatic Plant Systems
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
NELAC	National Environmental Laboratory Accreditation Council
NELAP	National Environmental Laboratory Accreditation Program
NEP	National Estuary Program
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OAWP	Office of Agricultural Water Policy
PLSM	Pollutant Load Screening Model
PSA	Public Service Announcement
QA/QC	Quality Assurance/Quality Control
RO	Reverse Osmosis
ROC	Runoff Coefficient
SJRWMD	St. Johns River Water Management District
SOP	Standard Operating Procedure
STORET	STOrage and RETrieval (Database)
SWIM	Surface Water Improvement and Management
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
UF-IFAS	University of Florida-Institute of Food and Agricultural Sciences
USGS	U.S. Geological Survey
WBID	Waterbody Identification
WLA	Wasteload Allocation
WWTF	Wastewater Treatment Facility

EXECUTIVE SUMMARY

THE NORTH INDIAN RIVER LAGOON BASIN

This basin management action plan (BMAP) represents a long-term plan to restore deeper water seagrass habitats in the Indian River Lagoon (IRL) Basin through the reduction of watershed loadings of total nitrogen (TN) and total phosphorus (TP) (nutrients). In 2011, an algal superbloom occurred in the North IRL and Banana River Lagoon, with a separate bloom affecting part of the Central IRL. Then, a brown algal bloom affected much of the IRL during 2012. The full impact to seagrasses from these blooms will not be known for a number of years, but there are documented losses of seagrasses in the North IRL linked to the blooms. Research is underway to understand the causes of these blooms; however, they appear to be due, in part, to legacy loads in the lagoon from past nutrient discharges. Removing sources of nutrient from the lagoon's watershed will help remediate the legacy load.

The IRL Basin is a 156-mile-long estuary located on Florida's east coast. There are 6 coastal Florida counties in the IRL watershed including Volusia, Brevard, Indian River, St. Lucie, Martin, and Palm Beach counties. The impaired portions of the IRL watershed start just south of the Ponce De Leon Inlet in Volusia County and end just north of the Fort Pierce Inlet at the Indian River County – St. Lucie County boundary line. Due to the large geographical extent of the IRL Basin and the hydrological differences throughout the basin, the Florida Department of Environmental Protection (FDEP) determined the best way to address the total maximum daily loads (TMDLs) for the IRL Basin would be to divide the watershed into 3 subbasins: (1) North IRL, (2) Central IRL, and (3) Banana River Lagoon. Separate BMAPs were developed for each subbasin; this document focuses solely on the North IRL. The main stem of the North IRL subbasin extends from Turnbull Creek in Volusia County to the Melbourne Causeway in Brevard County.

In addition to dividing the overall IRL Basin into subbasins, the North IRL was further divided into "project zones." The project zone boundaries are based upon distinct hydrology in different areas of the subbasin and their corresponding annual residence times. These zones are important because the flushing times vary greatly among locations and consequently affect how nutrient reductions will impact these distinct areas of the subbasin. The project zones identify large areas where projects should be implemented to ensure that the load reductions achieve the desired response for each subbasin. The North IRL subbasin was split into 2 project zones as follows:

- *North A – Turnbull Creek to NASA Causeway (State Road 405); and*
- *North B – NASA Causeway to Melbourne Causeway (U.S. 192).*

TOTAL MAXIMUM DAILY LOADS

TMDLs are water quality targets, based on state water quality standards, for specific pollutants (such as nitrogen and phosphorus). The nutrient TMDLs for the main stem of the IRL Basin were adopted by FDEP in March 2009. The TMDLs focus upon the water quality conditions necessary for seagrass re-growth at water depth limits where seagrass historically grew in the basin, based on a multi-year composite of seagrass coverage. The median depth limits of seagrass coverage in the IRL Basin decreased over the years due to changes in water quality conditions resulting from anthropogenic influences. As polluted runoff reaches the lagoon, it creates conditions that prevent the seagrass from growing in deeper water. To determine the amount of nutrient reductions needed to improve lagoon water quality in each subbasin, the TMDLs regressed 3 years of loading levels against the same years' seagrass coverage to

calculate the restoration target of 10% less than the multi-year composite of historical seagrass depth limit coverage. This target is based on 7 years of historical seagrass data from the period of 1943 to 1999 to determine at what depths the deep edge of the seagrass beds previously grew. Since changes in the IRL Basin will likely prevent 100% restoration of seagrass at these depths, the TMDL allowed for a 10% reduction in the target seagrass depth. The 10% reduction in target depths was selected to be consistent with the water quality criteria in Chapter 62-302, F.A.C., which allows for up to a 10% reduction in the photo-compensation point. This target should result in nutrient reductions that allow seagrass to grow almost to the depths previously seen in the area. For assessment purposes, FDEP divided the North IRL subbasin into water assessment polygons with a waterbody identification (WBID) number for each watershed or stream reach. **Table ES-1** lists the TMDLs and pollutant load allocations adopted by rule for the WBIDs in the North IRL for total nitrogen (TN) and total phosphorus (TP).

TABLE ES-1: TMDLS IN THE NORTH INDIAN RIVER LAGOON SUBBASIN

WBID NUMBER	WBID NAME	PROJECT ZONE	PARAMETER	TMDL (LBS/YR)	WASTEWATER FACILITIES ALLOCATION (LBS/YR)	STORMWATER ALLOCATION (LBS/YR)	ATMOSPHERIC DEPOSITION ALLOCATION (LBS/YR)
2963F	Indian River above Max Brewer	North A	TN	177,220	N/A	88,322	88,898
2963E	Indian River above NASA Causeway	North A	TN	173,232	N/A	95,932	77,300
2963D	Indian River above 520 Causeway	North B	TN	147,524	8,111	73,882	65,531
2963B+2963C	Indian River above Melbourne Causeway	North B	TN	189,068	9,200	114,458	65,410
TN Total	North IRL TN Total	N/A	TN	687,044	17,311	372,594	297,139
2963F	Indian River above Max Brewer	North A	TP	9,320	N/A	7,307	2,013
2963E	Indian River above NASA Causeway	North A	TP	14,793	N/A	13,042	1,751
2963D	Indian River above 520 Causeway	North B	TP	11,845	1,609	8,752	1,484
2963B+2963C	Indian River above Melbourne Causeway	North B	TP	20,592	225	18,886	1,481
TP Total	North IRL TP Total	N/A	TP	56,550	1,834	47,987	6,729

THE NORTH INDIAN RIVER LAGOON BASIN MANAGEMENT ACTION PLAN

Paragraph 403.067(7)(a)1, Florida Statutes (F.S.), authorizes FDEP to adopt BMAPs that provide for phased implementation of the strategies necessary to ultimately achieve the associated TMDLs. This approach allows stakeholders to incrementally plan, budget, and execute projects while simultaneously assessing progress towards the seagrass depth limit targets. For the North IRL, the total required reductions are spread over a 15-year timeframe. Reductions will be implemented in 3, 5-year BMAP iterations, which align with FDEP's approach to evaluate basin health every 5 years. This BMAP is the first 5-year iteration for the North IRL subbasin.

The intent of the TMDLs is to recover the deeper water seagrass habitats, with the biological response of the seagrass being the most important factor in evaluating success in achieving TMDL targets. To assess progress for the IRL Basin towards the median seagrass depth limit target, a 2-step process was used. Step 1 is a seagrass frequency distribution analysis and Step 2 is a median seagrass depth evaluation. If seagrass in a project zone passes both evaluation steps, no nutrient reductions are required by the stakeholders in that project zone.

FDEP conducted this 2-step evaluation using seagrass data from 2003, 2005, 2006, 2007, and 2009, which were the latest datasets available at the time of the analysis, to evaluate seagrass for this first BMAP iteration. Seagrass depths in both the North A and North B project zones did not pass the Step 1 or Step 2 evaluations. Therefore, the TMDL depth limit targets were not being achieved and the stakeholders in the North IRL were required to make additional reductions in this first BMAP iteration.

In the first 5-year iteration of the BMAP, the required activities are not expected to achieve the TMDL. Rather, this BMAP only calls for projects and other activities necessary to achieve reductions of 33,279.4 lbs/yr of TN and 7,808.5 lbs/yr of TP, which is 15% of the TMDL total required reductions, by the end of the first 5-year iteration. Compliance with the seagrass depth limit targets will be reevaluated before the second 5-year BMAP iteration using seagrass mapping data from 2007, 2009, 2011, and 2013, which will likely be the latest data available at that time. Neither of the North IRL project zones are meeting the seagrass depth limit targets for 2007 or 2009; therefore, a second iteration of the North IRL BMAP will be required to implement additional management actions to achieve the TMDL seagrass depth limit targets.

MANAGEMENT ACTIONS AND BMAP ENFORCEMENT

To achieve the required reductions for this iteration of the BMAP, stakeholders submitted structural and nonstructural management actions. The management actions had to meet several criteria to be considered eligible for credit in the BMAP. The activities submitted were required to address nutrient loads and be located in the appropriate North IRL project zone. Management actions were only given credit for the portion of the load reduction that was over and above any permit requirements, to ensure an improvement of water quality in the North IRL. In addition, completed projects since January 1, 2000 were eligible for BMAP credit because the land uses in the TMDL model are from 2000; therefore, benefits of management actions since this time were not reflected in the TMDL model. The actions included in this first iteration of the BMAP have been completed or are planned within the next 5 years. These projects are the “low hanging fruit” and future BMAP iterations will require planning for additional projects.

The stakeholders submitted the projects included in the BMAP to provide reasonable assurance to FDEP that the entity has a plan on how they will meet their allocation. This list of projects is meant to be flexible enough to allow for changes that may occur over time, provided that the reductions are still met within the specified timeframe. For point sources, both wastewater treatment facilities (WWTFs) and municipal separate storm sewer systems (MS4s), the BMAP required reductions are enforceable through the National Pollutant Discharge Elimination System (NPDES) permits. For non-MS4s, the BMAP requirements are enforceable through the BMAP itself, and FDEP also has the option to designate a non-MS4 as a Phase II MS4 to ensure the reductions occur. For the agricultural sources, applicable best management practices (BMPs) must be implemented or water quality monitoring must occur to demonstrate that the property is not having an impact on water quality. Overall, there must be sufficient projects and reductions to demonstrate that water quality criteria will be met and if sources of TN and TP do not comply, enforcement action can be taken.

ECONOMIC BENEFITS OF THE IRL SYSTEM

The IRL is a valuable ecological and economic asset for the state of Florida and the counties that border the lagoon and its tributaries. It is a biologically diverse area considered the most diverse estuary in North America, and was recognized as part of the National Estuary Program (NEP) in 1990. The lagoon directly and indirectly supports a large part of the region's and the state's economy. A significant increase in the amount and diversity of wildlife on the lagoon and improved water quality in the entire IRL Basin would increase the recreational use value by about \$80 million per year. The economic value of the entire IRL Basin's seagrass beds was

estimated as \$329 million per year for 72,400 acres of seagrass. Therefore, investing in projects and programs to improve the lagoon's water quality and seagrass beds is not only important for environmental considerations but also to improve the economy.

ANTICIPATED OUTCOMES OF BMAP IMPLEMENTATION

With implementation of the projects outlined in this BMAP, reductions in TN and TP loads to the North IRL are expected to improve water quality conditions and seagrass depths. The following outcomes are expected from BMAP implementation:

- *Improved water quality trends in the North IRL, which will help improve seagrass depth limits;*
- *Decreased loading of the target pollutants (TN and TP);*
- *Decreased loading in total suspended solids (TSS) from some of the projects implemented to reduce TN and TP loads;*
- *Increased coordination between state and local governments and within divisions of local governments when solving problems for surface water quality restoration;*
- *Additional state and local funding secured for water quality restoration;*
- *Improved identification of effective projects through stakeholder decision-making and priority-setting processes;*
- *Enhanced public awareness of pollutant sources, pollutant impacts on water quality, and corresponding corrective actions; and*
- *Enhanced understanding of basin hydrology, water quality, and pollutant sources.*

KEY ELEMENTS OF THE BMAP

This BMAP addresses key elements required by the Florida Watershed Restoration Act (FWRA), Chapter 403.067, F.S., including the following:

- *Document how the public and other stakeholders were encouraged to participate or participated in developing the BMAP (**Section 1.3.1**);*
- *Allocate pollutant reductions in the basin equitably (**Chapter 4**);*
- *Identify the mechanisms by which potential future increases in pollutant loading will be addressed (**Section 1.5**);*
- *Document management actions/projects to achieve the TMDLs (**Chapter 5** and **Appendix E**);*
- *Document the implementation schedule, funding, responsibilities, and milestones (**Appendix E**); and*
- *Identify monitoring, evaluation, and a reporting strategy to evaluate reasonable progress over time (**Section 6.3**).*

BMAP COST

Costs were provided for 51.0% of the activities identified in the BMAP, with an estimated total cost of more than \$29.2 million. In addition, annual operation and maintenance costs were provided for 21.8% of the projects for a total of \$479,479. It is important to note that many of

the BMAP projects were built to achieve multiple objectives, not just nutrient reduction; therefore, this should be a consideration when estimating a cost per pound of nutrient removal from these projects. The funding sources range from local contributions to legislative appropriations. Funding sources include Section 319 grants, TMDL grants, St. Johns River Water Management District cost-share, and IRL National Estuary Program cost-share. IRL stormwater treatment has benefitted significantly over the past 2 decades through numerous Section 319 grants from the U.S. Environmental Protection Agency that are administered by FDEP. Stakeholders will continue to explore new sources of funding to ensure that the activities listed in this BMAP can be achieved at the necessary level of effort.

BMAP FOLLOW-UP

FDEP will work with the stakeholders to monitor trends in seagrass distribution and water quality, as well as track project implementation. The results will be used to evaluate compliance with the seagrass depth limit targets. The technical stakeholders will meet at least every 12 months after BMAP adoption to follow up on plan implementation, share new information, and continue to coordinate efforts to address TMDL-related issues.

COMMITMENT TO BMAP IMPLEMENTATION

The stakeholders have committed to implementing the projects and activities included in this BMAP. The entities are also providing to FDEP, as needed, letters of commitment or resolutions of support to ensure that as staff and board members change over time, the entity has a way to show support for the BMAP and the efforts included.

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

The Indian River Lagoon (IRL) system is a nationally renowned estuary that supports both remarkable biological diversity and recreational resources. However, the seagrass beds in the lagoon system have been impacted over time by loss of wetlands, excessive freshwater discharges, and discharges of pollutants through stormwater and wastewater (FDEP, 2009). To address the nutrient impacts to the seagrass beds, the Florida Department of Environmental Protection (FDEP) adopted total maximum daily loads (TMDLs) to reduce the watershed nutrient inputs to the lagoon. This Basin Management Action Plan (BMAP) focuses on the North IRL subbasin, which extends from Turnbull Creek to the Melbourne Causeway (U.S. 192).

This BMAP represents a long-term plan to restore deeper water seagrass habitats in the IRL Basin through the reduction of watershed loadings of total nitrogen (TN) and total phosphorus (TP) (nutrients). In 2011, an algal superbloom occurred in the North IRL and Banana River Lagoon, with a separate bloom affecting part of the Central IRL. Then, a brown algal bloom affected much of the IRL during 2012. The full impact to seagrasses from these blooms will not be known for a number of years, but there are documented losses of seagrasses in the North IRL linked to the blooms. Research is underway to understand the causes of these blooms; however, they appear to be due, in part, to legacy loads in the lagoon from past nutrient discharges. Removing sources of nutrient from the lagoon's watershed will help address the legacy loads.

This BMAP represents the joint efforts of multiple stakeholders to prepare a restoration plan for the North IRL to work towards the adopted TMDLs to achieve seagrass regrowth. This BMAP includes projects to reduce watershed nutrient loading to the lagoon to improve seagrass extent, and a monitoring plan to guide effective long-term restoration efforts. The BMAP was developed as part of the State of Florida TMDL program.

Stakeholder involvement is critical to success of the entire TMDL program. Stakeholder involvement is particularly essential to develop, gain support for, and secure commitments in a BMAP. FDEP invited all interested stakeholders to participate in the North IRL BMAP development, and facilitated participation to ensure that all voices were heard and opinions considered. This approach resulted in a BMAP that is expected to achieve discernible results through the use of a 15-year, phased implementation.

This chapter describes the TMDL program, stakeholder involvement in BMAP development, BMAP purpose and scope, BMAP approach, TMDLs addressed, assumptions and considerations identified during BMAP development, and future growth in the basin.

1.1 WATER QUALITY STANDARDS AND TOTAL MAXIMUM DAILY LOADS

Florida's water quality standards are designed to ensure that surface waters can be used for their designated purposes, such as drinking water, recreation, and shellfish harvesting. For assessment purposes, FDEP divided the North IRL subbasin into water assessment polygons with a WBID number for each watershed or stream reach. **Figure 1** shows the North IRL main stem WBIDs discussed in this BMAP.

In the North IRL, waterbody identification (WBID) numbers 2963C and 2963F are categorized as Class II waters, which have a designated use of shellfish propagation or harvesting. WBIDs 2963B, 2963D, and 2963E are categorized as Class III waters, which mean they must be suitable for recreation and must support the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. **Table 1** shows all designated use categories.

Under Section 303(d) of the federal Clean Water Act, every 2 years each state must identify its “impaired” waters, including estuaries, lakes, rivers, and streams, that do not meet their designated uses and are not expected to meet applicable water quality standards within the subsequent 2 years. FDEP is responsible for developing this “303(d) list” of impaired waters.



FIGURE 1: NORTH INDIAN RIVER LAGOON SUBBASIN

TABLE 1: DESIGNATED USE ATTAINMENT CATEGORIES FOR FLORIDA SURFACE WATERS

* Class I and II waters include the uses of the classifications listed below them.

** Surface water classification for waters in the IRL Basin.

CATEGORY	DESCRIPTION
Class I*	Potable water supplies
Class II**	Shellfish propagation or harvesting
Class III**	Recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife
Class IV	Agricultural water supplies
Class V	Navigation, utility, and industrial use (<i>no current Class V designations</i>)

Florida's 303(d) list identifies hundreds of waterbody segments that fall short of water quality standards. The 3 most common water quality concerns are coliforms, nutrients, and oxygen-demanding substances. The listed waterbody segments are candidates for more detailed assessments of water quality to determine whether they are impaired according to state statutory and rule criteria. FDEP develops and adopts TMDLs for the waterbody segments it identifies as impaired. A TMDL is the maximum amount of a specific pollutant that a waterbody can assimilate while maintaining its designated uses.

The water quality evaluation and decision-making processes for listing impaired waters and establishing TMDLs are authorized by Section 403.067, Florida Statutes (F.S.), known as the Florida Watershed Restoration Act (FWRA), and contained in Florida's Identification of Impaired Surface Waters Rule (IWR), Rule 62-303, Florida Administrative Code (F.A.C.). TMDLs have been established for these waters, identifying the amount of TN and TP they can receive and still maintain Class III designated uses.

TMDLs are developed and implemented as part of a watershed management cycle that rotates through the state's 52 river basins every 5 years (see **Appendix A**) to evaluate waters, determine impairments, and develop and implement management strategies to restore impaired waters to their designated uses. **Table 2** summarizes the 5 phases of the watershed management cycle.

TABLE 2: PHASES OF THE WATERSHED MANAGEMENT CYCLE

PHASE	ACTIVITY
Phase 1	Preliminary evaluation of water quality
Phase 2	Strategic monitoring and assessment to verify water quality impairments
Phase 3	Development and adoption of TMDLs for waters verified as impaired
Phase 4	Development of management strategies to achieve the TMDL(s)
Phase 5	Implementation of TMDL(s), including monitoring and assessment

1.2 TMDL IMPLEMENTATION

Rule-adopted TMDLs may be implemented through BMAPs, which contain strategies to reduce and prevent pollutant discharges through various cost-effective means. During Phase 4 of the TMDL process, FDEP and the affected stakeholders in the various basins jointly develop BMAPs or other implementation approaches. A basin may have more than one BMAP, based on practical considerations, such as hydrologic connections and stakeholder involvement. The FWRA contains provisions that guide the development of BMAPs and other TMDL implementation approaches. **Appendix B** summarizes the statutory provisions related to BMAP development.

Stakeholder involvement is critical to the success of the TMDL Program, and varies with each phase of implementation to achieve different purposes. The BMAP development process is structured to achieve cooperation and consensus among a broad range of interested parties.

Under statute, FDEP invites stakeholders to participate in the BMAP development process and encourages public participation to the greatest extent practicable. FDEP must hold at least 1 noticed public meeting in the basin to discuss and receive comments during the planning process. Stakeholder involvement is essential to develop, gain support for, and secure commitments to implement the BMAP.

1.3 THE NORTH INDIAN RIVER LAGOON BASIN MANAGEMENT ACTION PLAN

1.3.1 STAKEHOLDER INVOLVEMENT

In June 2009, FDEP initiated BMAP technical meetings involving key stakeholders. The purpose of the technical meetings was to organize and review the technical information that is the basis of the BMAP, gather information to aid in the development of the BMAP, and identify management actions that improve water quality. Additional details about the discussions held at these meetings can be found in the meeting summaries, which are posted at <http://publicfiles.dep.state.fl.us/DEAR/BMAP/IndianRiverLagoon/>. The technical meetings were held regularly throughout the BMAP development process on the following dates:

- *June 12, 2009;*
- *July 10, 2009;*
- *September 11, 2009;*
- *December 11, 2009;*
- *February 12, 2010;*
- *June 18, 2010;*
- *August 13, 2010;*
- *January 14, 2011;*
- *April 8, 2011;*
- *June 16, 2011;*
- *September 21, 2011;*
- *December 2, 2011;*
- *March 2, 2012;*
- *April 26, 2012;*
- *June 7, 2012;*
- *August 2, 2012; and*
- *September 20, 2012.*

In addition, FDEP periodically held policy briefings to obtain feedback on the BMAP process from the policy makers from each of the responsible entities. Policy briefings were held on the following dates:

- *February 1, 2012;*
- *October 9, 2012;*
- *November 12, 2012; and*

- *November 13, 2012.*

All technical meetings and policy briefings were open to the public and noticed in the *Florida Administrative Weekly*. Public comment was invited during the policy briefings and technical meetings were open to anyone interested in participating in the technical discussions. Public meetings on the proposed verified list and the IRL Basin TMDLs were held before each was adopted. In addition, a public workshop on the BMAP was held on November 10, 2012.

Except as specifically noted in subsequent sections, this BMAP document reflects the input of the technical stakeholders, along with public input from workshops and meetings held to discuss key aspects of TMDL and BMAP development.

1.3.2 PLAN PURPOSE AND SCOPE

The purpose of this BMAP is to implement the TN and TP TMDLs for the North IRL subbasin to achieve the seagrass median depth limit targets. The plan outlines specific actions and an implementation schedule for load reductions. This BMAP also details a monitoring approach to measure progress toward meeting load reductions and the seagrass depth limit targets. The stakeholders will meet at least annually to review progress made towards achieving the TMDLs.

FDEP adopted nutrient TMDLs for the main stems of the IRL and the Banana River Lagoon (BRL) in 2009. TMDLs are based on allowable nutrient loadings from the watershed that will not cause water quality impairments in the lagoon. Due to the large geographical extent of the IRL Basin and the diversity of hydrological differences throughout the basin, FDEP determined the best way to address the TMDLs would be to divide the watershed into 3 subbasins: (1) North IRL, (2) Central IRL, and (3) BRL. Separate BMAPs were developed for each of these subbasins; this BMAP focuses only on the North IRL. The main stem of the North IRL subbasin extends from Turnbull Creek to the Melbourne Causeway.

1.3.3 BMAP APPROACH

Paragraph 403.067(7)(a)1, F.S., authorizes FDEP to adopt BMAPs that provide for phased implementation of the strategies necessary to ultimately achieve the associated TMDLs. Phased BMAPs are reevaluated every 5 years as part of FDEP's rotating basin approach. This BMAP provides for such phased implementation, which allows for the implementation of projects designed to achieve incremental reductions, while simultaneously monitoring to assess progress towards the seagrass depth limit targets.

The total required reductions from the TMDLs are spread over a 15-year timeframe. In the first 5-year iteration of the BMAP, the required activities are not expected to achieve the TMDL. Rather, this BMAP only calls for projects and other activities necessary to achieve reductions of 33,279.4 lbs/yr of TN and 7,808.5 lbs/yr of TP, which is 15% of the TMDL total required reductions, by the end of the first, 5-year iteration. A second iteration of the North IRL BMAP will be required to implement additional management actions to achieve the TMDL seagrass depth limit targets. The amount of reductions documented in this BMAP will be more difficult for the stakeholders to achieve in the second BMAP iteration. In this first iteration, projects since January 1, 2000, projects planned in the next 5 years, and provisional credit for ordinances and outreach programs designed to reduce the sources of stormwater pollution were assigned credit. To achieve the seagrass depth limit targets in future BMAP iterations, the stakeholders will have to identify new management actions to achieve the necessary reductions because past and continuing efforts will already have been accounted for.

In addition to dividing the overall IRL Basin into subbasins, the North IRL was further divided into "project zones." The project zone boundaries are based upon the distinct hydrology in

different areas of the subbasin and their corresponding annual residence times. These zones are important because the flushing times vary greatly among locations and consequently affect how nutrient reductions will impact these distinct areas of the subbasin. The project zones identify large areas where projects should be implemented to ensure that the load reductions achieve the desired response for each subbasin. The North IRL subbasin was split into 2 project zones as follows:

- *North A – Turnbull Creek to NASA Causeway (State Road 405); and*
- *North B – NASA Causeway to Melbourne Causeway (U.S. 192).*

Figure 2 and **Figure 3** show the stakeholders in each of these project zones.

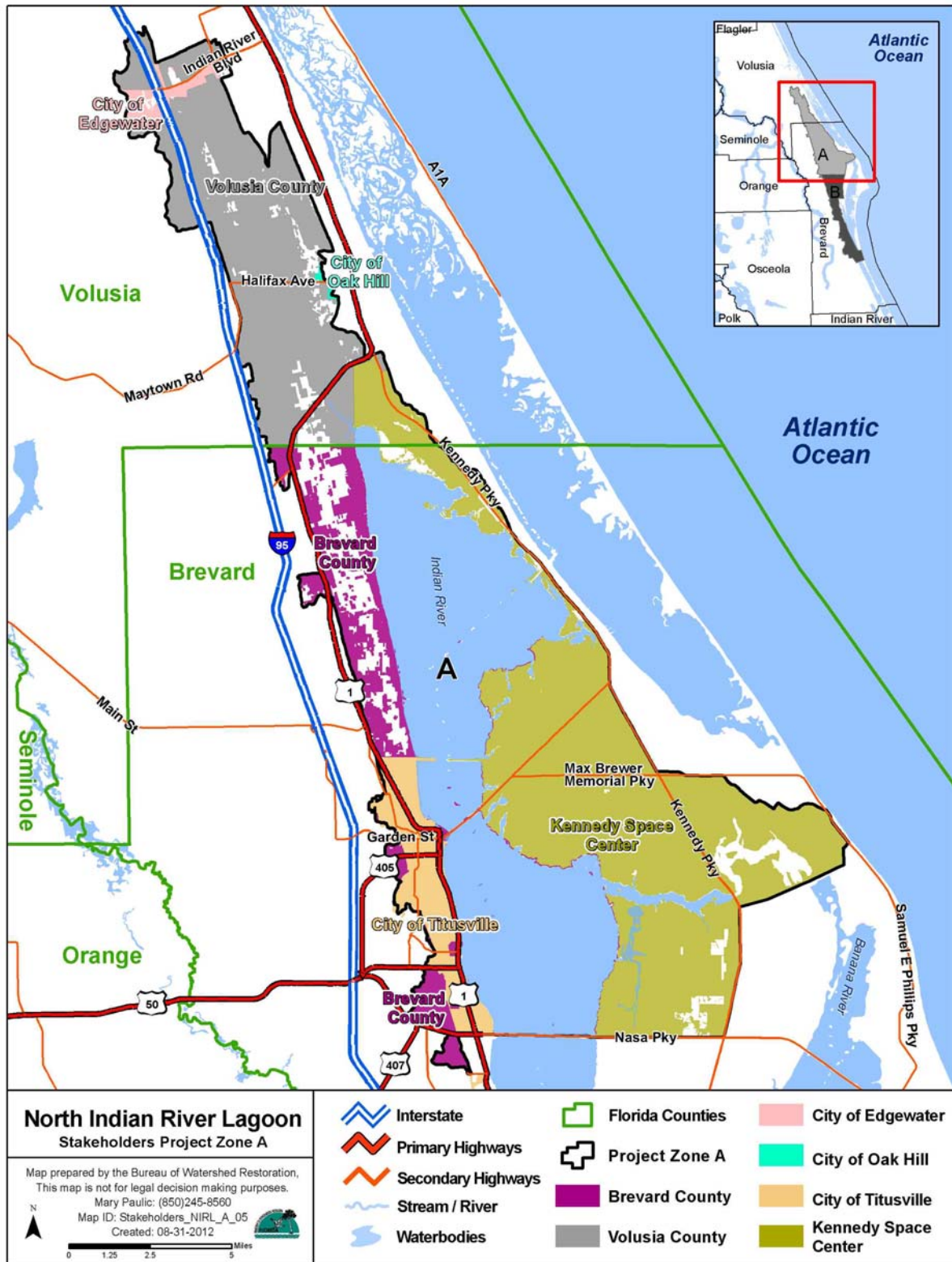


FIGURE 2: STAKEHOLDERS IN THE NORTH A PROJECT ZONE

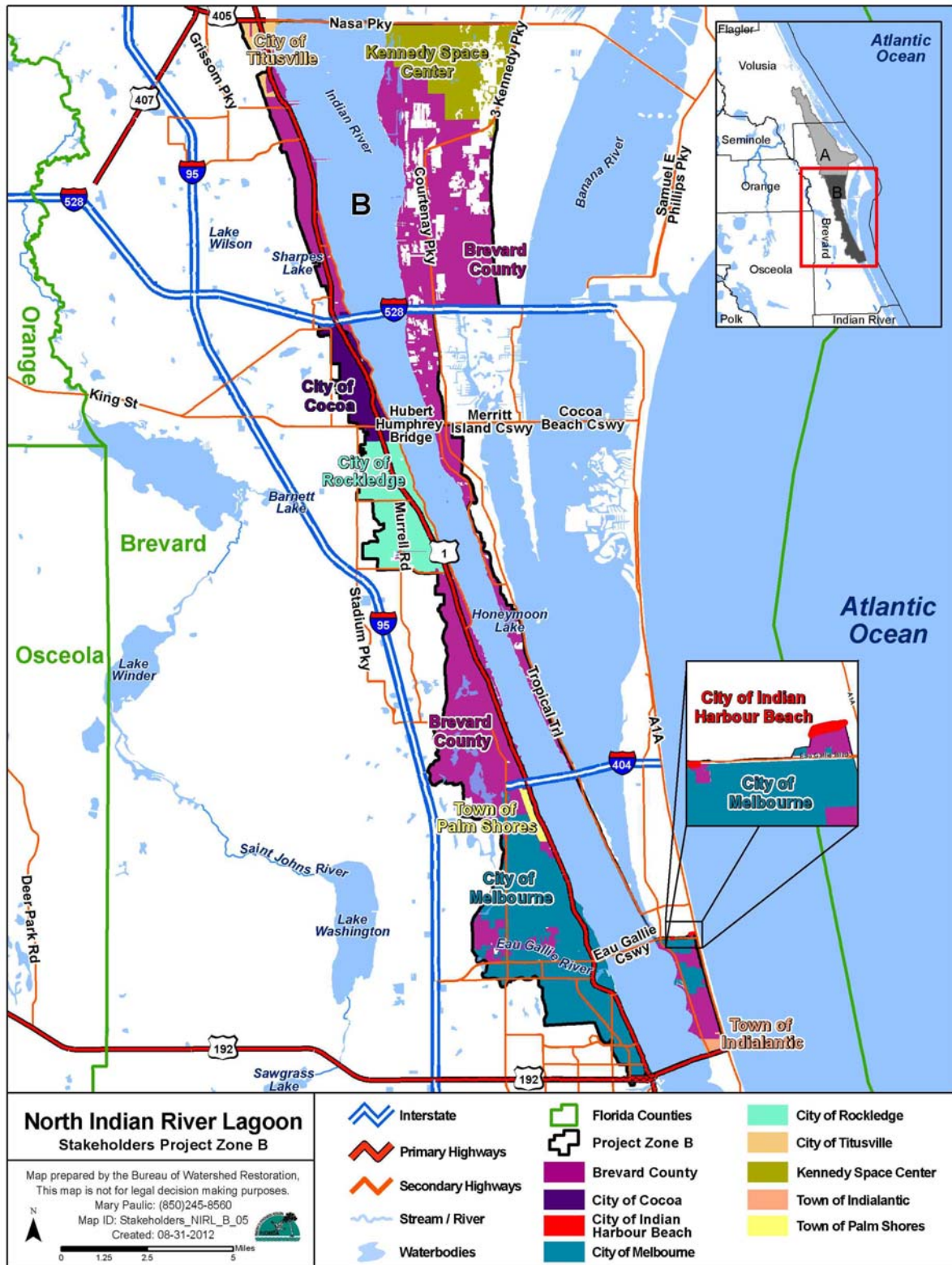


FIGURE 3: STAKEHOLDERS IN THE NORTH B PROJECT ZONE

1.3.4 POLLUTANT REDUCTION AND DISCHARGE ALLOCATIONS

1.3.4.1 Categories for Rule Allocations

The rules adopting TMDLs must establish reasonable and equitable allocations that will alone, or in conjunction with other management and restoration activities, attain the TMDL. Allocations may be to individual sources, source categories, or basins that discharge to the impaired waterbody. The allocations in rule identify either how much pollutant discharge in pounds per year (lbs/yr) each source designation may continue to contribute (discharge allocation), or the lbs/yr or percent of its loading the source designation must reduce (reduction allocation). Currently, the TMDL allocation categories are as follows:

- *Wasteload Allocation (WLA) – The allocation to point sources permitted under the National Pollutant Discharge Elimination System (NPDES) Program includes the following:*
 - o **Wastewater Allocation** is the allocation to industrial and domestic wastewater facilities.
 - o **NPDES Stormwater Allocation** is the allocation to NPDES stormwater permittees that operate municipal separate storm sewer systems (MS4s). These permittees are treated as point sources under the TMDL Program.
- *Load Allocation is the allocation to nonpoint sources, including agricultural runoff and stormwater from areas that are not covered by an MS4.*

1.3.4.2 Initial and Detailed Allocations

Under the FWRA, the TMDL allocation in rule may be an “initial” allocation among point and nonpoint sources. In such cases, the “detailed” allocation to specific point sources and specific categories of nonpoint sources must be established in the BMAP. The FWRA further states that the BMAP may make detailed allocations to individual “basins” (i.e., sub-basins) or to all basins as a whole, as appropriate. Both initial and detailed allocations must be determined based on a number of factors listed in the FWRA, including cost-benefit, technical and environmental feasibility, implementation timeframes, and others (see **Appendix B**).

1.3.5 TMDLS IN THE NORTH INDIAN RIVER LAGOON BASIN

The nutrient TMDLs for the main stem of the North IRL were adopted by FDEP in March 2009. The TMDLs focus on the water quality conditions necessary for seagrass re-growth at water depth limits that seagrass historically grew in the basin based on a multi-year composite of seagrass coverage. The median depth limits for seagrass coverage in the North IRL subbasin decreased over the years due to changes in water quality conditions resulting from anthropogenic influences. As polluted runoff reached the lagoon, it created conditions that prevented the seagrass from growing in deeper water. To calculate the amount of nutrient reductions needed to improve lagoon water quality in each subbasin, the TMDLs regressed loading estimates for nonpoint and point sources and data for seagrass depth limits for years with all available data. Years that met data requirements were 1943, 1996, 1999, and 2001. Target nutrient loadings were established by substituting a median depth limit target that was 10% less than the seagrass restoration depth into the established regression equations. This median depth target limit is based on 7 years of historical seagrass data from the period of 1943 to 1999 to determine at what depths the deep edge of the seagrass beds previously grew. Since changes in the IRL Basin will likely prevent 100% restoration of seagrass at these depths, the TMDL allowed for a 10% reduction in the target seagrass depth. The 10% reduction in target depth was selected to be consistent with the water quality criteria in Chapter 62-302,

F.A.C., which allows for up to a 10% reduction in the photo-compensation point. This target should result in nutrient reductions that allow seagrass to grow almost to the depths previously seen in the area. **Table 3** lists the TMDLs and pollutant load allocations adopted by rule for the North IRL.

TABLE 3: TMDLS IN THE NORTH INDIAN RIVER LAGOON SUBBASIN

WBID NUMBER	WBID NAME	PROJECT ZONE	PARAMETER	TMDL (LBS/YR)	WASTEWATER FACILITIES ALLOCATION (LBS/YR)	STORMWATER ALLOCATION (LBS/YR)	ATMOSPHERIC DEPOSITION ALLOCATION (LBS/YR)
2963F	Indian River above Max Brewer	North A	TN	177,220	N/A	88,322	88,898
2963E	Indian River above NASA Causeway	North A	TN	173,232	N/A	95,932	77,300
2963D	Indian River above 520 Causeway	North B	TN	147,524	8,111	73,882	65,531
2963B+2963C	Indian River above Melbourne Causeway	North B	TN	189,068	9,200	114,458	65,410
TN Total	North IRL TN Total	N/A	TN	687,044	17,311	372,594	297,139
2963F	Indian River above Max Brewer	North A	TP	9,320	N/A	7,307	2,013
2963E	Indian River above NASA Causeway	North A	TP	14,793	N/A	13,042	1,751
2963D	Indian River above 520 Causeway	North B	TP	11,845	1,609	8,752	1,484
2963B+2963C	Indian River above Melbourne Causeway	North B	TP	20,592	225	18,886	1,481
TP Total	North IRL TP Total	N/A	TP	56,550	1,834	47,987	6,729

1.4 ASSUMPTIONS AND CONSIDERATIONS REGARDING TMDL IMPLEMENTATION

Projected water quality benefits of BMAP implementation are based on some fundamental assumptions about the pollutants targeted by the TMDLs, modeling approaches, waterbody response, and natural processes. In addition, there are important considerations to keep in mind about the nature of the BMAP and its long-term implementation. These assumptions and considerations are discussed below.

1.4.1 ASSUMPTIONS

The following assumptions were used during the BMAP process:

- *The TMDL requires TN and TP reductions from the watershed to improve water quality in the North IRL to allow seagrass to grow at greater depths. High watershed nutrient loadings result in high chlorophyll-a concentrations in the lagoon, which reduce light availability to the seagrass and limits the depth at which seagrass can grow. Therefore, reducing nutrient loading to the North IRL is the most important factor to improving seagrass depth limits.*
- *Some of the best management practices (BMPs) that are listed in the project tables that reduce TN and TP will also result in total suspended solids (TSS) reductions. TSS is another factor that limits light penetration in the lagoon; therefore, reductions in TSS, in conjunction with reductions in nutrients, should allow seagrass to grow at deeper depths in the North IRL to achieve the TMDL seagrass depth limit targets.*

- *The allocations do not include required load reductions from atmospheric deposition because it is considered a background, uncontrollable source. The focus of the TMDL allocations is on the point source facilities and urban and agricultural stormwater sources in the North IRL subbasin.*
- *Certain BMPs were assigned provisional credit for load reductions in this iteration of the BMAP while additional research is conducted to quantify the effectiveness. These estimated reductions may change, as additional research results become available. Activities that qualified for provisional credit included floating islands, public education and outreach, muck removal, aquatic plant harvesting, and water control structures (refer to **Section 5.3** for additional details).*

1.4.2 CONSIDERATIONS

This BMAP requires stakeholders to implement their projects within the specified time period to achieve reductions. However, full implementation of this BMAP will be a long-term process, adaptively managed in 5-year cycles. While some projects and activities contained in the BMAP were previously completed or are currently ongoing, multiple projects require time for design, permitting, construction, and to secure funding. Although project funding can be problematic, funding limitations do not affect the requirement that every entity must implement the activities committed to in the BMAP. Achieving water quality standards in the North IRL is not an optional objective.

Since BMAP implementation is a long-term process, the TMDL targets established for the North IRL subbasin most likely will not be achieved in the first 5-year cycle. Regular follow-up and continued coordination and communication by the stakeholders is essential to ensure the implementation of management strategies and assessment of their incremental benefits. Additional management actions required to achieve TMDLs, as necessary, will be developed as part of the second and perhaps third BMAP iterations.

During the BMAP process, several items were identified that should be addressed in future watershed management cycles to ensure that future BMAPs use the most accurate information:

- Land uses – *The loading estimates in the TMDL are based on land uses at a particular point in time, which allows the model to be validated and calibrated. Land uses, however, change over time and, depending on local trends, can change significantly. The loading estimates for this iteration of the TMDL and BMAP were based on 2000 land use data. Future iterations should consider more recent land use information and whether allocations should be adjusted accordingly.*
- Soil types – *The Natural Resources Conservation Service released a new soil coverage for Florida in February 2010, which includes some significant changes in soil types throughout the IRL Basin. During the next iteration of the BMAP, FDEP will review the updated soil coverage and make adjustments to the Pollutant Load Screening Model (PLSM), as needed.*
- Basin boundaries – *Since the PLSM was developed, additional and more accurate data about the topography of the North IRL subbasin have been collected, such as Volusia County's Light Detection and Ranging (LIDAR) data. Adjustments were made to the drainage basins for the City of Cocoa, City of Rockledge, and City of Titusville during this iteration of the BMAP in response to requests from these stakeholders. During the next iteration of the BMAP, FDEP will review available data and make any additional adjustments to the drainage basin, as needed.*

- Areas with stormwater treatment – The PLSM incorporates a factor to represent areas with stormwater treatment. At the time of TMDL development, areas with ERP stormwater treatment areas were not well mapped. During the next BMAP iteration, FDEP will review available data and make adjustments to the treated areas in the model, as needed.
- Event mean concentrations (EMCs) and runoff coefficients (ROCs) – Subsequent to PLSM development, more accurate and extensive EMCs for pollutant concentrations in stormwater runoff and ROCs for stormwater runoff have been added to FDEP's database. During the next BMAP iteration, FDEP will review available data and make adjustments to the EMCs and ROCs in the model, as needed.
- County roads – Stakeholders expressed concern during the BMAP process that county roads were included as part of the loading to each municipality. Geographic Information Systems (GIS) coverages for the county roads were not available for the entire basin; therefore, these roads and associated loadings could not be defined and assigned to the appropriate county for the allocations in this BMAP iteration. If the county road coverages are available for the next BMAP iteration, FDEP will use this information to refine the allocations at that time.
- Atmospheric deposition – The TMDL assumed that no reduction in atmospheric deposition would occur over time. However, there are two power plants located in the North IRL subbasin, Cape Canaveral Power Plant and Reliant Energy Indian River Power Plant, and contributions from these sources could be reduced in the future. In July 2009, the Cape Canaveral Power Plant obtained a permit to dismantle the existing oil and gas-fueled steam units and construct a natural gas-fueled combined cycle unit, and construction is underway (FDEP website, 2012). This upgrade should result in fewer emissions in the IRL Basin and a subsequent reduction in atmospheric deposition loads to the lagoon. For future BMAP iterations, FDEP will evaluate any changes in atmospheric deposition in the basin and adjust the estimated loading to the lagoon, as appropriate.
- Ground water loads – The TMDL states that ground water input from the Floridan aquifer does not represent a significant portion of the water budget for the IRL system but, depending on the season, input from the surficial aquifer could be important. The nutrient loading from the surficial aquifer was implicitly included in the modeling as part of the watershed flow and loadings (FDEP, 2009). The stakeholders expressed concern during the BMAP process that the ground water loads were not sufficiently accounted for in the modeling process. In future iterations, FDEP will evaluate any available ground water data and utilize this information, to the extent possible, in the modeling.
- Progress towards seagrass depth limit targets – FDEP will continue to assess progress towards the seagrass depth limit targets for the North IRL subbasin (refer to **Section 6.1** for details). Adjustments will be made to the required TN and TP reductions in future BMAP iterations, as needed, based on seagrass response to BMAP implementation.
- Allocations – During the BMAP process, stakeholders requested that FDEP remove undeveloped land use types from the allocation process since nutrient reductions are not required on these lands. While FDEP agreed with the stakeholders that this was the most scientific approach, when the undeveloped lands were removed from the allocations, stakeholders with mainly undeveloped lands received reduction requirements that seemed disproportionately high given their small amount of

development. For this reason, FDEP determined that the best allocation approach for this BMAP iteration, based on the existing PLSM, was to assign reductions using a target load per acre approach that included all land uses, except water, in the allocations (see **Chapter 4**). In the next BMAP iteration, FDEP will consider allocating any required reductions needed to achieve the seagrass depth limit targets using an allocation approach that does not include the undeveloped land uses.

- **Tributary water quality impairments** – FDEP has identified nutrient and DO impairments in many of the North IRL tributaries, but has not yet set water quality targets with TMDLs. These waters include Turnbull Creek marine (WBID 2942A), Turnbull Creek freshwater (WBID 2942B), and Horse Creek (WBID 3081). FDEP has proposed a DO TMDL for Addison Creek (WBID 3028) and a nutrient and DO TMDL for the Eau Gallie River (WBID 3082). The relation between the tributary loads and the targets set for the lagoon proper will be defined as tributary TMDLs are developed. As a general principle, when FDEP establishes upstream TMDLs, downstream water quality targets are considered. In this case, when FDEP establishes North IRL tributary TMDLs, meeting the lagoon's seagrass depth targets will be considered. Future tributary TMDLs may allow the targeting of specific watersheds for nutrient load reductions.
- **Integration of new understandings** – An algal superbloom occurred in the North IRL and Banana River Lagoon in 2011 while a secondary bloom occurred in the Central IRL. These blooms were followed by a brown algae bloom in 2012. Research is underway to understand the causes of these blooms as part of the Indian River Lagoon 2011 Superbloom Plan of Investigation. Any improved understanding of the cause of these bloom events obtained from this research and its implications for management of the IRL should be incorporated into the BMAP during the earliest practical time frame.

1.5 FUTURE GROWTH IN THE BASIN

This BMAP does not include a specific allocation for new development because of Environmental Resource Permit (ERP) program requirements. The ERP program requires that all new discharges into the basin cannot increase existing loads. All ERP applications must include documentation demonstrating compliance with state water quality standards, as well as showing that the project does not adversely affect the quality of receiving waters resulting in water quality standards violations. Since the North IRL is an impaired water that does not currently meet state water quality standards, new development in the basin cannot increase nutrient loads to the North IRL.

Starting on July 1, 2012, developers have the option of obtaining a general permit for construction of surface water management systems serving a project area of up to 10 acres, with less than 2 acres of impervious area and no wetlands impacts. This "10/2" general permit would be in lieu of an ERP for areas up to 10 acres. To obtain the general permit, the developer must demonstrate that the project does not cause adverse impacts, including violations of state water quality standards. This evaluation must be signed by a registered professional; however, state agency review is not required. With this new rule in place, the local governments cannot require that the developer obtain a permit from a state or federal agency as a condition of issuing a permit. In addition, efforts are underway to streamline the ERP process; however, the implications of this streamlining are unknown as of the date of this report.

Since the TMDL reductions are based on decreasing loads from past development, it is important that loads from new development are well controlled. Although future development may be meeting state stormwater standards, the development may still have a load to the

lagoon. To ensure that future growth does not add to the degradation of the North IRL, the local governments must be proactive in controlling loads from future growth.

Options to address future loading include low impact development (LID) standards and Florida friendly landscaping to further minimize the impacts of existing development and new development through local development regulations. LID is an approach to development that employs land planning, design practices, and technologies to conserve natural resources and reduce infrastructure costs. These activities could offset loads from future growth and, therefore, may reduce the reductions needed from the entities in future BMAP iterations. FDEP will continue to research how nutrient reduction credits should be quantified for use of LID BMPs.

1.6 RELATION OF BMAP TO OTHER RESTORATION PLANS

The IRL is a designated Estuary of National Significance and a Surface Water Improvement and Management (SWIM) waterbody. The National Estuary Program (NEP) is a federal program and as such has a specific organizational structure and purpose. SWIM is a state program focused on restoration of specific identified impaired ecosystems. These programs address broader lagoon restoration goals and issues such as habitat restoration, land acquisition, and fisheries that are not directly related to TMDLs, through a Comprehensive Conservation Management Plan (CCMP) and a SWIM plan. All 3 plans (CCMP, SWIM, and BMAP) identify the restoration of seagrass in deeper water habitats as their goal, but the SWIM and CCMP have a broader series of goals and objectives designed to attain and maintain a functioning macrophyte-based ecosystem that supports fish and wildlife. The focus of the BMAP is on addressing water quality impacts to seagrass from TN and TP loadings entering the lagoon, while the CCMP and SWIM plan address additional issues such as freshwater diversion to the IRL from the St. Johns River basin. The CCMP Update from 2008 includes 3 new actions to assist in TMDL development and implementation. The 3 plans complement and support each other. Research activities and water quality improvement projects initiated through the SWIM Program or CCMP support the implementation of IRL TMDLs. The BMAP provides specific reduction targets for nutrients to achieve seagrass success and, unlike the SWIM and CCMP, has a mechanism to enforce the actions specified in the BMAP.

1.7 ECONOMIC BENEFITS OF THE IRL SYSTEM

The IRL is a valuable ecological and economic asset for the state of Florida and the counties that border the lagoon and its tributaries. It is a biologically diverse area considered the most diverse estuary in North America, and was recognized as part of the National Estuary Program (NEP) in 1990. The lagoon directly and indirectly supports a large part of the region's and the state's economy. The basin supports the multi-million dollar Indian River citrus industry and boat and marine sales industries. Finfish and shellfish harvesting from the lagoon contribute to local economies.

An economic study was prepared in 2008 (Hazen and Sawyer, P.C.) on behalf of the IRL NEP to provide estimates of the value of the entire IRL system. The study found that the total value of the lagoon's benefits to residents and visitors was estimated at \$3.725 billion measured in 2007 dollars. The Impact Analysis for Planning Regional Economic Input Output Model was used to estimate the economic contribution of lagoon-related expenditures. More than \$1.3 billion of economic benefit was generated from money spent on recreational activities, both from residents and visitors, includes items such as boat purchases, boat repairs, and marina slip rental and dockage fees. There is an additional \$762 million Recreational Use Value, which is the amount that people would be willing to pay for the opportunity to engage in a recreational

activity on the lagoon. Therefore, the total value for 2007 for lagoon-related recreation was close to \$2.1 billion.

A significant increase in the amount and diversity of wildlife on the lagoon and improved water quality in the basin would increase the recreational use value of the entire IRL system by about \$80 million per year. Other recreational expenditures and real estate values may also increase under improved environmental conditions, but were not estimated during the study. The increase in value reflects a greater willingness by residents and visitors to pay to improve the environmental quality of the lagoon (Hazen and Sawyer, 2008).

The economic value of the entire IRL Basin's seagrass beds was estimated as \$329 million per year for 72,400 acres of seagrass. Seagrass habitats are an important component of the lagoon's ecology and are the foundation of the food web for many of the animals that live in the IRL by providing nursery and feeding areas. This is particularly true for many of the recreational and commercial fish species. Seagrass may provide additional economic value related to water quality and aesthetics (Hazen and Sawyer, 2008).

Therefore, investing in projects and programs to improve the lagoon's water quality and seagrass beds is not only important for environmental considerations but also to improve the economy.

CHAPTER 2: NORTH INDIAN RIVER LAGOON BASIN SETTING

Understanding the conditions in a basin is an important component for identifying an appropriate restoration and management plan. This chapter describes the hydrology, land uses, and seagrass evaluation in the North IRL subbasin.

2.1 BASIN HYDROLOGY

Circulation in the North IRL is influenced by winds, freshwater inflows from tributaries, and tidal exchange via direct connections to the Atlantic Ocean. Freshwater inflows come from direct overland runoff, drainage canals, ground water seepage, and rainfall directly on to the surface (FDEP, 2009). In addition, stream inflows also affect the North IRL. From north to south, the major tributaries to the North IRL include Turnbull Creek, Canaveral Barge Canal, the valley between Ten Mile Ridge and the Atlantic Coastal Ridge, and the Eau Gallie River, which receives drainage from the City of Melbourne (FDEP, 2008).

2.2 LAND USE COVERAGE

As shown in **Table 4**, the North IRL watershed covers a total of about 141,311 acres (not including lagoon surface areas). Based on 2000 land uses, which were included in the TMDL model, urban areas including low-, medium-, and high-density residential; transportation, communication, and utilities; and other urban and built-up land uses comprise 25.8% of the drainage area. In addition to these areas, agricultural lands account for about 8.3% of the watershed area. Therefore, human land uses occupy 34.1% of the North IRL watershed.

The dominant land use in the watershed is wetland, which accounts for 40.2% of the total drainage area. Upland forest makes up 8.8% of the watershed. In addition, 11.7% of the North IRL is comprised of rangeland (FDEP, 2009). **Figure 4** shows the distribution of land uses in the North IRL watershed.

TABLE 4: 2000 LAND USES IN THE NORTH IRL SUBBASIN

LAND USE TYPE	ACRES	PERCENT
Wetland	56,760	40.2%
Rangeland	16,501	11.7%
Upland Forest	12,379	8.8%
Agriculture	11,772	8.3%
Urban and Built-Up	9,978	7.1%
Medium Density Residential	8,780	6.2%
High Density Residential	8,107	5.7%
Water	6,104	4.3%
Low Density Residential	5,723	4.0%
Transportation, Communication, Utilities	3,905	2.8%
Barren Land	1,302	0.9%
TOTAL	141,311	100.0%

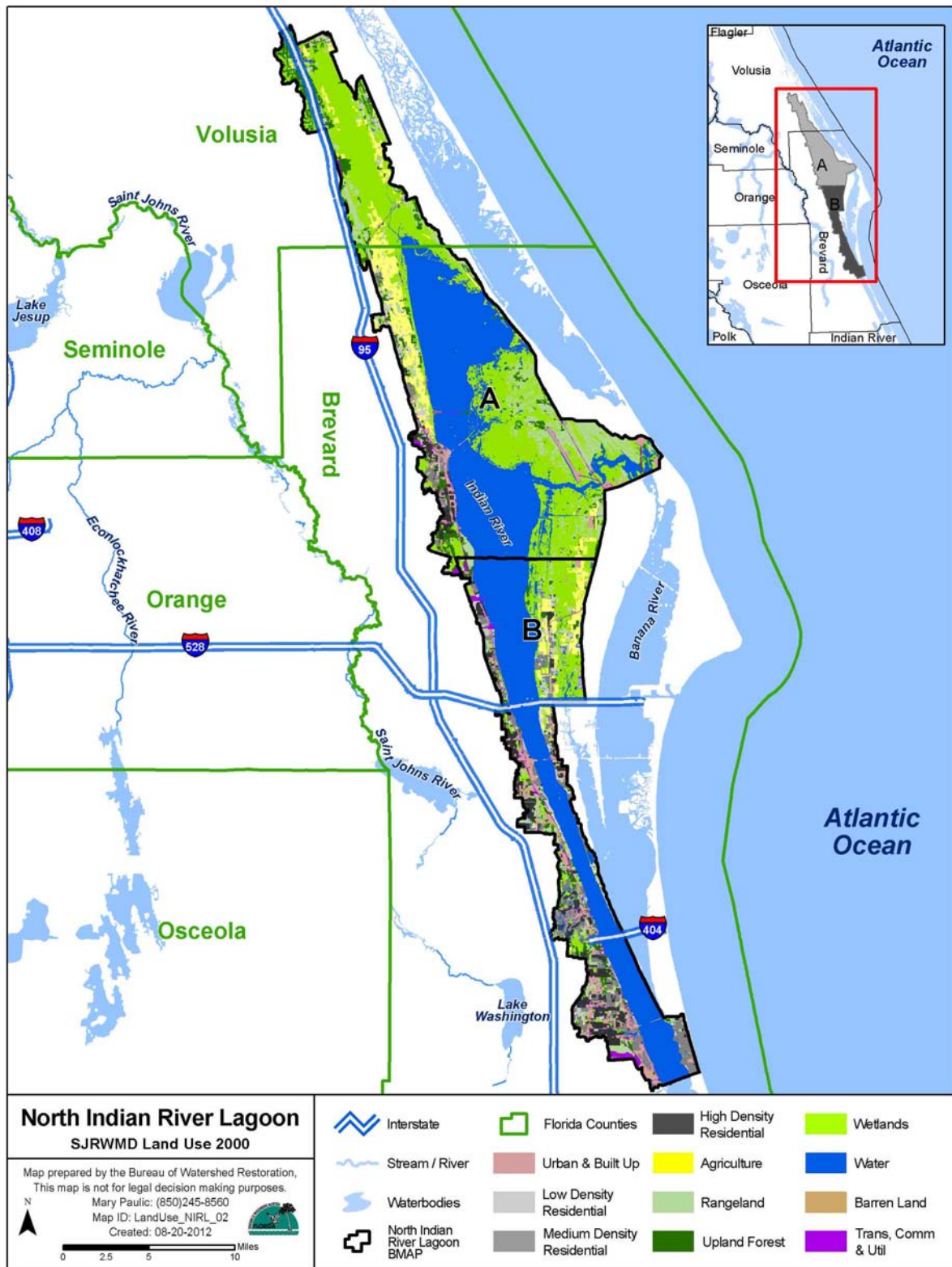


FIGURE 4: 2000 LAND USES IN THE NORTH INDIAN RIVER LAGOON SUBBASIN

2.3 SEAGRASS DEPTH LIMIT CHANGES

The goal of the TMDLs is to recover the deeper water seagrass habitats. The biological response of the seagrass is the most important factor to evaluate the success of the TMDLs. To assess progress towards the median seagrass depth limit target for the IRL Basin, a 2-step process is used.

Step 1 in this process is a cumulative frequency distribution analysis. The 4 most recent mapped seagrass datasets from the St. Johns River Water Management District (SJRWMD) for each project zone are used to create a union coverage of the assessment years in GIS. Using this union coverage, a 15.8-meter buffer zone is applied to the perimeter of the coverage to establish the deep edge of the seagrass beds. This buffer coverage shows the deepest edge that seagrass grew at any time during the data period, and is used to create a cumulative frequency distribution curve of the depths of the deep edge at which seagrass exist within the IRL Basin. This curve is then compared to the TMDL depth limit target curve. Compliance is reached when 50% or more of the assessment years' frequency distribution curve (including its 50th percentile value) lies on or to the right of the TMDL depth limit target curve for each project zone.

Step 2 is conducted by calculating the median depth of seagrass growth for the 4 most recent years, with each year's median compared to the TMDL median depth limit target. Three of the 4 medians for the assessment years must meet or exceed the median TMDL depth limit target for a project zone to be Step 2 compliant. If the project zone is both Step 1 and Step 2 compliant, it is considered to be meeting the TMDL seagrass depth limit target. If the project zone fails to meet either Step 1 or Step 2, then it is not considered to be meeting the TMDL seagrass depth limit target for that set of assessment years.

FDEP conducted this 2-step evaluation process using the 2003, 2005, 2006, 2007, and 2009 mapping years, which were the latest datasets available at the time of this analysis. Based on this time period, neither the North A and North B project zones were Step 1 compliant (**Figure 5** through **Figure 8**) nor Step 2 compliant (refer to **Table 5**) for the periods of 2003-2007 or 2005-2009. Therefore, reductions are needed from the stakeholders in this basin, as outlined in **Section 4.5**. The next steps in the TMDL seagrass evaluation for the North IRL subbasin are described in **Section 6.1**.

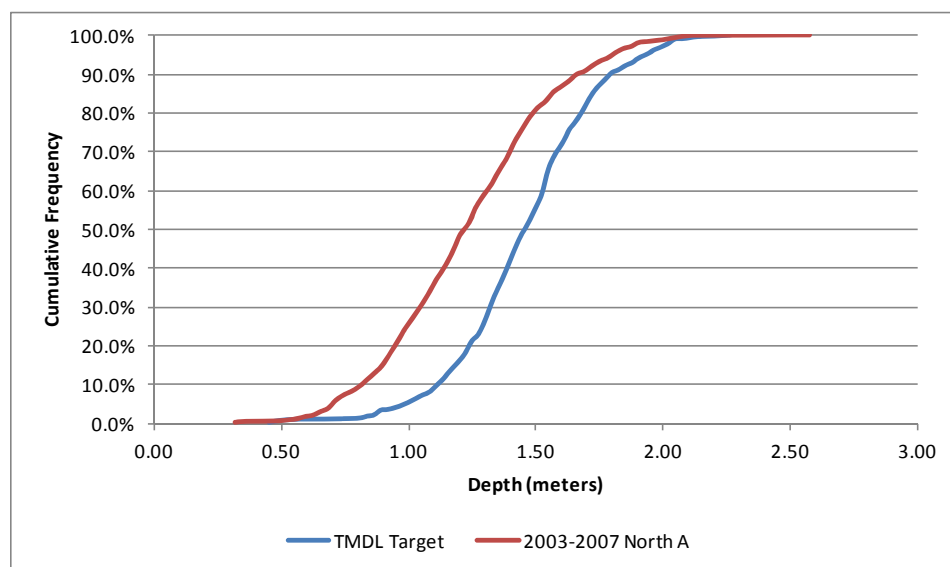


FIGURE 5: STEP 1 COMPLIANCE EVALUATION FOR THE NORTH A PROJECT ZONE FOR 2003-2007

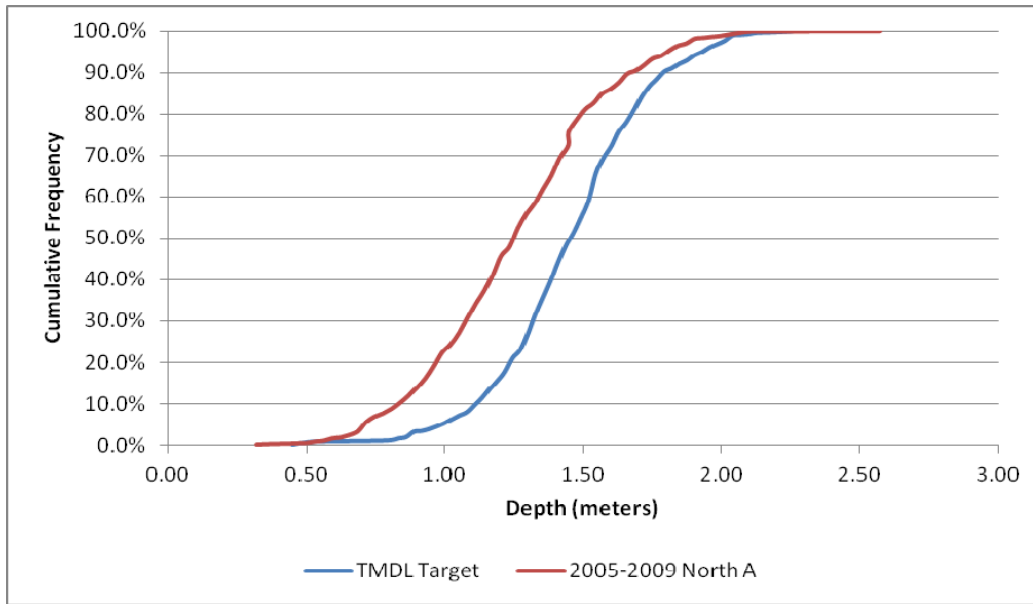


FIGURE 6: STEP 1 COMPLIANCE EVALUATION FOR THE NORTH A PROJECT ZONE FOR 2005-2009

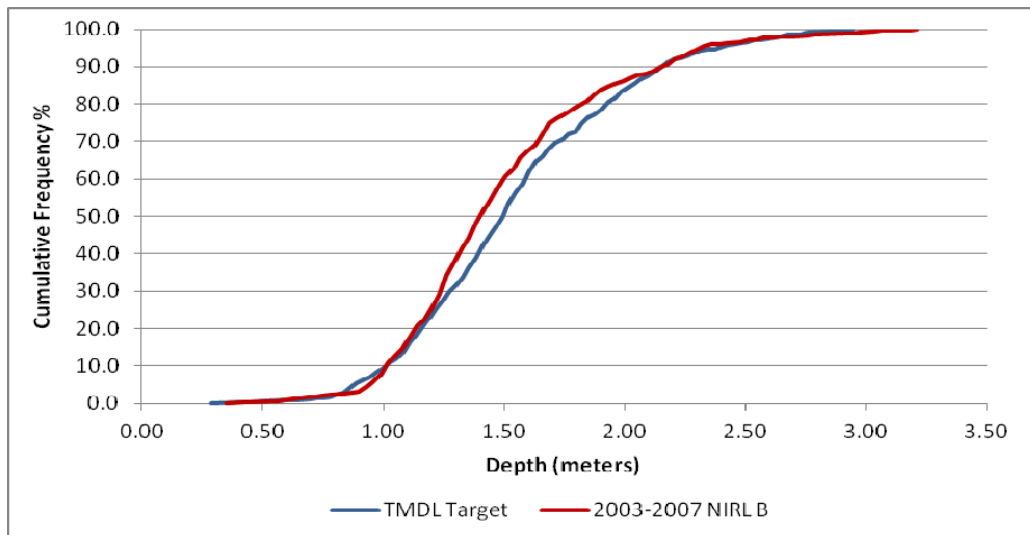


FIGURE 7: STEP 1 COMPLIANCE EVALUATION FOR THE NORTH B PROJECT ZONE FOR 2003-2007

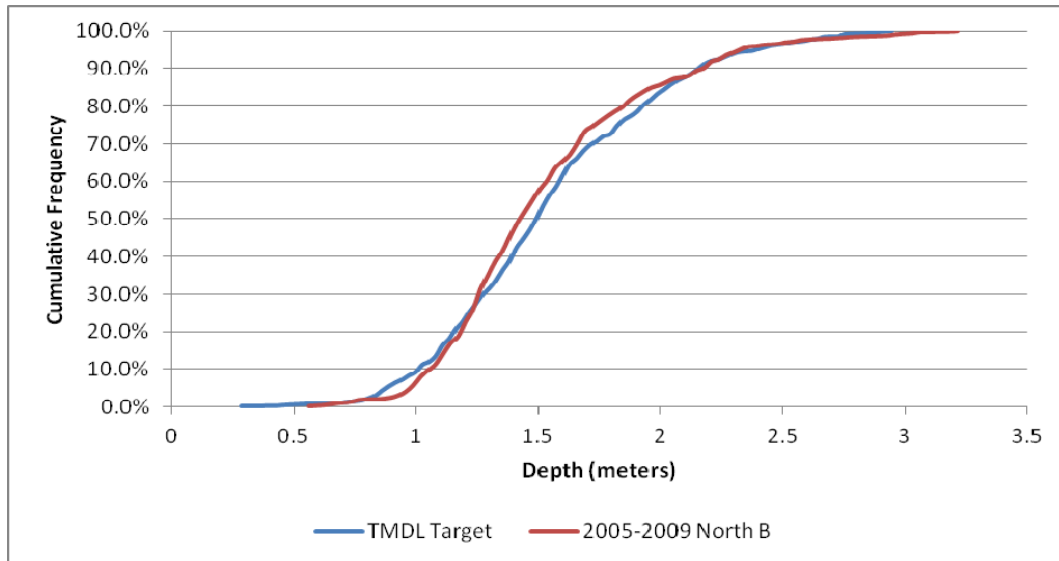


FIGURE 8: STEP 1 COMPLIANCE EVALUATION FOR THE NORTH B PROJECT ZONE FOR 2005-2009

TABLE 5: STEP 2 COMPLIANCE EVALUATION FOR THE NORTH IRL SUBBASIN

YEAR	NORTH A MEDIAN DEPTH (METERS)	NORTH B MEDIAN DEPTH (METERS)
TMDL Median	1.44	1.51
2003	1.17	1.32
2005	1.08	1.35
2006	1.20	1.45
2007	1.23	1.39
2009	1.17	1.39
Step 2 Compliant?	No	No

CHAPTER 3: POLLUTANT SOURCES AND ANTICIPATED OUTCOMES

The TMDL includes estimates of TN and TP loading to the North IRL from point source facilities, urban and agricultural stormwater sources, and atmospheric deposition. Atmospheric deposition was considered a background, uncontrollable source; therefore, the TMDL did not require any reductions from this source. The TMDL focus is on load reductions from point source facilities and stormwater sources. The starting loads, target loads, and required reductions in the TMDL are shown in **Table 6** and **Table 7**. Additional details about the sources that are included in this BMAP are provided in the subsections below.

TABLE 6: TN REQUIRED REDUCTIONS BY SOURCE FROM THE NORTH IRL TMDL

SOURCE	TN STARTING LOAD (LBS/YR)	TN TMDL TARGET LOAD (LBS/YR)	TN REQUIRED REDUCTION (LBS/YR)
Point Source Facilities	12,705	17,311	-4,606
Stormwater	576,413	372,594	203,819
Atmospheric Deposition	297,139	297,139	0
TOTAL	886,257	687,044	199,213

TABLE 7: TP REQUIRED REDUCTIONS BY SOURCE FROM THE NORTH IRL TMDL

SOURCE	TP STARTING LOAD (LBS/YR)	TP TMDL TARGET LOAD (LBS/YR)	TP REQUIRED REDUCTION (LBS/YR)
Point Source Facilities	683	1,834	-1,151
Stormwater	93,507	47,987	45,520
Atmospheric Deposition	6,729	6,729	0
TOTAL	100,919	56,550	44,369

3.1 POINT SOURCE FACILITIES

Point sources include both domestic and industrial wastewater treatment facilities. Chapter 62-620, F.A.C., defines domestic wastewater facilities as those facilities that are principally designed “to collect and treat sanitary wastewater or sewage from dwellings or homes, business buildings, institutions, and the like.” This rule defines industrial wastewater as “process and non-process wastewater from manufacturing, commercial, mining, and silvicultural facilities or activities, including the runoff and leachate from areas that receive pollutants associated with industrial or commercial storage, handling or processing, and all other wastewater not otherwise defined as domestic wastewater.”

In 1995, the U.S. Environmental Protection Agency (EPA) authorized the FDEP to implement the NPDES Program to permit wastewater discharges to state surface water, including industrial and domestic wastewater facilities. Permits are issued under the applicable provisions of Chapter 403, F.S., and appropriate rules in Chapter 62-600, F.A.C., with applicable sections of 40 Code of Federal Regulations incorporated by reference. These regulations, rules, and statutes give FDEP the authority to regulate domestic and industrial wastewater facilities.

3.2 MUNICIPAL SEPARATE STORM SEWER SYSTEMS

Many of the municipalities across the basin are regulated by the Florida NPDES Stormwater Program because they discharge stormwater and qualify as a “municipal separate storm sewer system (MS4).” MS4 means a conveyance or system of conveyances such as roads with

stormwater systems, municipal streets, catch basins, curbs, gutters, ditches, constructed channels, or storm drains:

- *Owned or operated by a state, city, town, county, special district, association, or other public body (created by or pursuant to State Law) having jurisdiction over management and discharge of stormwater and which discharges to surface waters of the state;*
- *Designed or used for collecting or conveying stormwater;*
- *Which is not a combined sewer; and*
- *Which is not part of a Publicly Owned Treatment Works. Publicly Owned Treatment Works means any device or system used in the treatment of municipal sewage or industrial wastes of a liquid nature which is owned by a "state" or "municipality." This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a Publicly Owned Treatment Works providing treatment.*

The basic requirements of this program serve as a foundation for the stormwater management efforts of these communities. EPA developed the federal NPDES stormwater permitting program in 2 phases. Phase I, which began in 1990, addresses large and medium MS4s located in incorporated areas and counties with populations of 100,000 or more, as well as specific industrial activities. Phase II, which started in 1999, addresses small MS4s that are designated according to population and other criteria established in Federal and state rules. Small MS4s include MS4s that serve a population of 1,000 or more and are located within an urbanized area.

In October 2000, EPA authorized FDEP to implement the NPDES stormwater permitting program in the state. This permitting has remained separate from state stormwater/ERP programs and local stormwater/water quality programs, which have their own regulations and permitting requirements. Florida's rules for MS4s can be found in Chapters 62-4, 62-620, 62-621 and 62-624, F.A.C.

3.2.1 NPDES MS4 PHASE II STORMWATER PERMIT REQUIREMENTS

All of the MS4s in the North IRL subbasin are Phase II, as listed in **Table 8**.

TABLE 8: MS4S IN THE NORTH IRL SUBBASIN

PERMITTEE	PERMIT #
Brevard County	FLR04E052
Volusia County	FLR04E033
City of Cocoa	FLR04E032
City of Edgewater	FLR04E016
City of Indian Harbour Beach	FLR04E026
City of Melbourne	FLR04E027
City of Oak Hill	FLR04E130
City of Rockledge	FLR04E047
City of Titusville	FLR04E079
Town of Indialantic	FLR04E030
Florida Department of Transportation (FDOT) District 5	FLR04E024

Under a generic permit, operators of regulated Phase II MS4s must develop a stormwater management program that includes BMPs, with measurable goals, to effectively implement the following 6 minimum control measures:

1. **Public Education and Outreach:** Perform educational outreach regarding the harmful impacts of polluted stormwater runoff.
2. **Public Participation/Involvement:** Comply with state and local public notice requirements and encourage other avenues for citizen involvement.
3. **Illicit Discharge Detection and Elimination:** Implement a plan to detect and eliminate any non-stormwater discharges to the MS4, and create a system map showing outfall locations. Section 62-624.200(2), F.A.C., defines an illicit discharge as "...any discharge to an MS4 that is not composed entirely of stormwater..." except discharges pursuant to a NPDES permit, or those listed in rule that do not cause a violation of water quality standards. Illicit discharges can include septic/sanitary sewer discharge, car wash wastewater, laundry wastewater, improper disposal of auto and household toxics, and spills from roadway accidents.
4. **Construction Site Runoff Control:** Implement and enforce an erosion and sediment control program for construction activities.
5. **Post-construction Runoff Control:** Implement and enforce a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. (NOTE: This minimum control is met through state stormwater permitting requirements under Part IV, Chapter 373, F.S., as a qualifying alternative program.)
6. **Pollution Prevention/Good Housekeeping:** Implement a program to reduce pollutant runoff from municipal operations and property and perform staff pollution prevention training.

The generic permit [Section 62-621.300(7)(a), F.A.C.] also states: *If a TMDL is approved for any water body 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.*

3.3 NON-MS4 STORMWATER SOURCES

Reductions in loads carried by urban stormwater that are separate from discharges by a permitted MS4 were established in the "load allocation" component of the TMDL. The non-MS4 entities in the North IRL subbasin include Kennedy Space Center and the Town of Palm Shores.

Section 403.067 (7)(b)2.f, F.S., prescribes the pollutant reduction actions required for nonagricultural pollutant sources that are not subject to NPDES permitting. These "non-MS4 sources" must also implement the pollutant reduction requirements detailed in a BMAP and are subject to enforcement action by FDEP or a water management district based upon a failure to implement their responsibilities under the BMAP.

Load reductions, and the responsibility for meeting them, were assigned to the entity that governs and permitted development on these non-MS4 urban lands. The entities evaluated the loadings from these areas and determined projects to reduce the stormwater pollutant loads. The detailed project tables are included in **Appendix E**. Failure to reduce these loadings can result in enforcement action by FDEP pursuant to Section 403.067(7)(b)2(h).

FDEP can designate an entity as a regulated Phase II MS4 if their 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 Phase II MS4 discharges the pollutant(s) of concern. If an entity is designated as a regulated Phase II MS4, it will be subject to the conditions of the Phase II MS4 Generic Permit.

3.4 AGRICULTURE

The primary agricultural land use in the North IRL subbasin is citrus. Other agricultural land uses include cow/calf (pasture), row/field crops, nurseries, and horse farms. The majority of the horse farms can be characterized as small, noncommercial hobby farms.

Due to urban encroachment, citrus health issues (freeze/disease), and the downturn in the economy, many citrus operations either have been abandoned or have significantly lowered their production acreage. In recent years, some of this acreage may have been shifted to other commodities or to non-agricultural/urban uses.

3.5 ANTICIPATED OUTCOMES OF BMAP IMPLEMENTATION

With implementation of the projects outlined in this BMAP, reductions in the TN and TP loads to the North IRL are expected to improve water quality conditions and seagrass depths. The following outcomes are expected from BMAP implementation:

- *Improved water quality trends in the North IRL, which will help improve seagrass coverage;*
- *Decreased loading of the target pollutants (TN and TP);*
- *Decreased loading in TSS from some of the projects implemented to reduce TN and TP loads;*
- *Increased coordination between state and local governments and within divisions of local governments when solving problems for surface water quality restoration;*
- *Additional state and local funding secured for water quality restoration;*
- *Improved identification of effective projects through stakeholder decision-making and priority-setting processes;*
- *Enhanced public awareness of pollutant sources, pollutant impacts on water quality, and corresponding corrective actions; and*
- *Enhanced understanding of basin hydrology, water quality, and pollutant sources.*

CHAPTER 4: DETAILED ALLOCATIONS

The process to calculate each entity's allocation is described in this chapter. The steps to calculate each entity's allocation was a GIS based process, which used the input data to the TMDL model, the PLSM, to account for the loads from each entity. The PLSM data file for the North IRL was used as the base map, and this data file contains detailed land use/land cover information for 2000, ROCs, EMCs, soils data, and the 30-year average rainfall. The process to calculate the allocations is described in the subsections below.

4.1 CALCULATING BASELINE LOADS

The TMDL included detailed allocations for the point source facilities in the basin; therefore, the BMAP process only determined detailed allocations for the stormwater, nonpoint sources. The baseline loading for the stormwater entities was calculated using the information from the TMDL model. The first step in the process was to remove the area assigned the land use code 5400, which is the lagoon itself. The watershed area was then clipped to the North A and North B project zone boundaries. Then, the following areas were clipped sequentially from the North IRL shapefile base map and saved as their own new data files:

- *FDOT roads and right-of-ways;*
- *Areas with agricultural land uses;*
- *Areas occupied by municipalities and federal facilities, each to its own jurisdictional boundary; and*
- *Areas belonging to the counties, each to its own jurisdictional boundary.*

These individual, entity-specific shapefiles were then used to calculate the baseline loads for each entity. The TP TMDL for the North IRL was based on loadings from the Hydrologic Simulation Program – FORTTRAN (HSPF) model, not the PLSM. To account for the differences in loading between the 2 models, a factor was calculated based on the proportion of the HSPF model TP loads to the PLSM TP loads for each lagoon segment. These factors were then multiplied by the TP baseline loads for each polygon in the PLSM to calculate the adjusted TP baseline loading.

The loading associated with the 5000 land uses were then removed from each entity's baseline load and set aside to determine the net loads. This land use category is surface waters and FDEP believes that any internal loading in the surface waters will decrease with the flushing of cleaner watershed runoff once the pollutant loading from the watershed is controlled. Since the focus of these reductions is on the external, watershed loading, the loading from the 5000 land uses will be set aside and reductions from the stakeholders will not be required for these loads.

Table 9 and **Table 10** show the net loads for the stakeholders in the North A and North B project zones, respectively.

TABLE 9: NET TN AND TP LOADS FOR THE STORMWATER ENTITIES IN NORTH A

ENTITY	AREA (ACRES)	5000 LAND USE ACRES	NET ACRES	TN BASELINE LOAD (LBS/YR)	5000 LAND USE TN LOAD (LBS/YR)	TN NET LOAD (LBS/YR)	TP ADJUSTED BASELINE LOAD (LBS/YR)	5000 LAND USE TP LOAD (LBS/YR)	TP NET LOAD (LBS/YR)
Agriculture	8,069	0	8,069	62,810	0	62,810	9,611.3	0.0	9,611.3
Brevard County	8,305	108	8,197	37,051	194	36,857	4,205.7	27.4	4,178.3
City of Edgewater	1,244	62	1,182	3,266	181	3,085	346.0	22.8	323.2
City of Oak Hill	127	0	127	218	0	218	15.3	0.0	15.3
City of Titusville	5,776	34	5,742	64,967	113	64,854	12,102.2	26.0	12,076.2
FDOT District 5	354	0	354	3,917	0	3,917	1,130.9	0.0	1,130.9
Kennedy Space Center	44,295	3,711	40,584	84,095	2,161	81,934	10,277.0	224.8	10,052.2
Volusia County	23,605	254	23,351	32,375	1,169	31,206	2,632.4	110.8	2,521.6
TOTAL	91,775	4,169	87,606	288,699	3,818	284,881	40,320.8	411.8	39,909.0

TABLE 10: NET TN AND TP LOADS FOR THE STORMWATER ENTITIES IN NORTH B

ENTITY	AREA (ACRES)	5000 LAND USE ACRES	NET ACRES	TN BASELINE LOAD (LBS/YR)	5000 LAND USE TN LOAD (LBS/YR)	TN NET LOAD (LBS/YR)	TP ADJUSTED BASELINE LOAD (LBS/YR)	5000 LAND USE TP LOAD (LBS/YR)	TP NET LOAD (LBS/YR)
Agriculture	3,692	0	3,692	24,477	0	24,477	5,504.2	0.0	5,504.2
Brevard County	23,829	1,431	22,398	144,429	5,318	139,111	22,517.4	803.9	21,713.5
City of Cocoa	2,111	13	2,098	26,319	40	26,279	5,224.1	7.7	5,216.4
City of Indian Harbour Beach	1	0	1	11	0	11	1.7	0.0	1.7
City of Melbourne	9,920	258	9,662	91,888	1,045	90,843	20,074.0	151.2	19,922.8
City of Rockledge	3,892	69	3,823	32,175	181	31,994	6,648.3	35.8	6,612.5
City of Titusville	588	0	588	3,013	0	3,013	279.6	0.0	279.6
FDOT District 5	929	3	926	8,743	12	8,731	2,804.1	1.7	2,802.4
Kennedy Space Center	4,136	159	3,977	5,707	366	5,341	975.3	46.4	928.9
Town of Indialantic	168	0	168	1,756	0	1,756	318.4	0.0	318.4
Town of Palm Shores	267	2	265	1,700	6	1,694	311.3	1.3	310.0
TOTAL	49,533	1,935	47,598	340,218	6,968	333,250	64,658.4	1,048.0	63,610.4

4.2 DE MINIMUS DETERMINATION

The net loads from **Table 9** and **Table 10** were then sorted for TN and TP loads, from highest to lowest, to determine whether any entity had loads low enough that reductions from these areas would have essentially no significant impact on the required reductions in the first phase of the BMAP; these entities are considered “*de minimus*.” In the North A project zone, Oak Hill was determined to be *de minimus* because the TN and TP loads were less than 0.1% of the total loads in North A (see **Table 11** and **Table 12**). In the North B project zone, Indian Harbour Beach and Palm Shores are *de minimus* because the TN and TP loads are approximately 0.5% of the total loads in North B (see **Table 13** and **Table 14**). These entities will not be assigned an allocation for either TN or TP for the first phase of the BMAP. This *de minimus* status is only for the first BMAP iteration and will be reviewed with each BMAP cycle. In future phases of the BMAP, TN and TP reductions may be needed from the *de minimus* entities; therefore, although they do not currently have a reduction responsibility, this does not exempt them from such

requirements in future BMAPs. Any actions taken by these entities during this first phase of the BMAP that result in TN and/or TP reductions should be documented by those entities for credit against any reduction requirements allocated in subsequent BMAP iterations.

TABLE 11: TN *DE MINIMUS* DETERMINATION FOR NORTH A

ENTITY	TN NET LOAD (LBS/YR)	% OF NET LOAD
Kennedy Space Center	81,934	28.76%
Titusville	64,854	22.77%
Agriculture	62,810	22.05%
Brevard County	36,857	12.94%
Volusia County	31,206	10.95%
FDOT D5	3,917	1.37%
Edgewater	3,085	1.08%
Oak Hill*	218	0.08%
TOTAL	284,881	100.00%

*De minimus stakeholder.

TABLE 12: TP *DE MINIMUS* DETERMINATION FOR NORTH A

ENTITY	TP NET LOAD (LBS/YR)	% OF NET LOAD
Titusville	12,076.2	30.26%
Kennedy Space Center	10,052.2	25.19%
Agriculture	9,611.3	24.08%
Brevard County	4,178.3	10.47%
Volusia County	2,521.6	6.32%
FDOT D5	1,130.9	2.83%
Edgewater	323.2	0.81%
Oak Hill*	15.3	0.04%
TOTAL	39,909.0	100.00%

*De minimus stakeholder.

TABLE 13: TN *DE MINIMUS* DETERMINATION FOR NORTH B

ENTITY	TN NET LOAD (LBS/YR)	% OF NET LOAD
Brevard County	139,111	41.74%
Melbourne	90,843	27.26%
Rockledge	31,994	9.60%
Cocoa	26,279	7.89%
Agriculture	24,477	7.34%
FDOT D5	8,731	2.62%
Kennedy Space Center	5,341	1.60%
Titusville	3,013	0.90%
Indianalantic	1,756	0.53%
Palm Shores*	1,694	0.51%
Indian Harbour Beach*	11	0.00%
TOTAL	333,250	100.00%

*De minimus stakeholder.

TABLE 14: TP *DE MINIMUS* DETERMINATION FOR NORTH B

ENTITY	TP NET LOAD (LBS/YR)	% OF NET LOAD
Brevard County	21,713.5	34.14%
Melbourne	19,922.8	31.32%
Rockledge	6,612.5	10.40%
Agriculture	5,504.2	8.65%
Cocoa	5,216.4	8.20%
FDOT D5	2,802.4	4.41%
Kennedy Space Center	928.9	1.46%
Indianalantic	318.4	0.50%
Palm Shores*	310.0	0.49%
Titusville*	279.6	0.44%
Indian Harbour Beach*	1.7	0.00%
TOTAL	333,250	100.00%

*De minimus stakeholder.

4.3 TARGET LOAD PER ACRE

To determine the total allowable load of TN and TP for each entity, a target load per acre for TN and TP was determined by dividing the TMDL target load (only for stormwater sources) by the total non-water area in the North IRL system. The calculated target loads per acre are shown in **Table 15** for the North A project zone and **Table 16** for the North B project zone.

TABLE 15: TARGET LOADS PER ACRE FOR TN AND TP FOR NORTH A

CATEGORY	TN	TP
Total non-water acres	86,667	86,667
TMDL target load (lbs)	184,254	20,349
Target load (lbs/acre)	2.126	0.235

TABLE 16: TARGET LOADS PER ACRE FOR TN AND TP FOR NORTH B

CATEGORY	TN	TP
Total non-water acres	42,786	42,786
TMDL target load (lbs)	188,341	27,638
Target load (lbs/acre)	4.402	0.646

When using these target loads to determine allowable loading for each entity, some of the stakeholders had a negative value for required reductions, which indicates that the net (existing) load from the PLSM is lower than the allocation based on the target load per acre. Therefore, these entities are not required to make reductions. In the North A project zone, both Kennedy Space Center and Volusia County had lower net TN loads than the allowable loads and Volusia County also had a lower net TP load than the allowable load. In the North B project zone, Kennedy Space Center's net TN and TP loads were lower than the allowable load, and the City of Titusville's net TP load was lower than the allowable load. To ensure that greater reductions were not assigned than those required by the TMDL, this difference between the allowable load and net load for Kennedy Space Center, Volusia County, and City of Titusville was spread out to the other entities based on their percentage of the net load. This adjustment reduced the stakeholders' required reductions from the initial reductions that were calculated.

4.4 ALLOCATIONS AND REQUIRED REDUCTIONS

The allocations for the MS4s, non-MS4s, and agricultural stormwater sources were calculated using the target loads per acre for TN and TP determined above. The target loads per acre for

each project zone were multiplied by each entity's acreage in the project zone to determine the allowable loading. The difference between the net loading from the model and the allowable loading resulted in each entity's required reductions. Then, each entity's total required reductions were adjusted, as described above. The revised total reductions are shown in **Table 17** and **Table 18** for North A and **Table 19** and **Table 20** for North B.

TABLE 17: TN TOTAL TMDL REQUIRED REDUCTIONS IN NORTH A

ENTITY	AREA (ACRES)	TN TARGET LOAD PER ACRE (LBS/AC/YR)	TN ALLOCATION (LBS/YR)	TN NET LOAD (LBS/YR)	TN REQUIRED REDUCTION (LBS/YR)	PORTION OF LOAD ADJUSTMENT (LBS/YR)	REVISED TN REQUIRED REDUCTION (LBS/YR)
Agriculture	8,069	2.126	17,155.1	62,810	45,654.9	8,343.9	37,311.0
Brevard County	8,197	2.126	17,427.4	36,857	19,429.6	4,896.2	14,533.3
Edgewater	1,182	2.126	2,512.9	3,085	572.1	409.8	162.2
FDOT D5	354	2.126	752.6	3,917	3,164.4	520.3	2,644.1
Kennedy Space Center	40,584	2.126	86,281.1	81,934	-4,347.1	N/A	0.0
Titusville	5,742	2.126	12,207.8	64,854	52,646.2	8,615.4	44,030.7
Volusia County	23,351	2.126	49,644.6	31,206	-18,438.6	N/A	0.0
Oak Hill – <i>de minimus</i>	127	2.126	270.5	218	N/A	N/A	N/A
TOTAL	87,607	N/A	186,252.2	284,881	98,681.3	22,785.7	98,681.3

Note: The TN total required reductions for North A and North B combined are greater than the TN TMDL required reductions shown for stormwater sources in **Table 6** because new areas were added during the BMAP process for the cities of Cocoa, Rockledge, and Titusville. These areas must also make reductions in order to achieve the TMDLs.

TABLE 18: TP TOTAL TMDL REQUIRED REDUCTIONS IN NORTH A

ENTITY	AREA (ACRES)	TP TARGET LOAD PER ACRE (LBS/AC/YR)	TP ALLOCATION (LBS/YR)	TP NET LOAD (LBS/YR)	TP REQUIRED REDUCTION (LBS/YR)	PORTION OF LOAD ADJUSTMENT (LBS/YR)	REVISED TP REQUIRED REDUCTION (LBS/YR)
Agriculture	8,069	0.235	1,896.3	9,611.3	7,715.0	856.4	6,858.6
Brevard County	8,197	0.235	1,926.4	4,178.3	2,251.9	372.3	1,879.6
Edgewater	1,182	0.235	277.8	323.2	45.4	45.4	0.0
FDOT D5	354	0.235	83.2	1,130.9	1,047.7	100.8	946.9
Kennedy Space Center	40,584	0.235	9,537.2	10,052.2	515.0	515.0	0.0
Titusville	5,742	0.235	1,349.4	12,076.2	10,726.8	1,076.0	9,650.7
Volusia County	23,351	0.235	5,487.5	2,521.6	-2,965.9	N/A	0.0
Oak Hill – <i>de minimus</i>	127	0.235	29.9	15.3	N/A	N/A	N/A
TOTAL	87,607	N/A	20,587.6	39,909.0	19,336.0	2,965.9	19,336.0

Note: The TP total required reductions for North A and North B combined are greater than the TP TMDL required reductions shown for stormwater sources in **Table 7** because new areas were added during the BMAP process for the cities of Cocoa, Rockledge, and Titusville. These areas must also make reductions in order to achieve the TMDLs.

TABLE 19: TN TOTAL TMDL REQUIRED REDUCTIONS IN NORTH B

ENTITY	AREA (ACRES)	TN TARGET LOAD PER ACRE (LBS/AC/YR)	TN ALLOCATION (LBS/YR)	TN NET LOAD (LBS/YR)	TN REQUIRED REDUCTION (LBS/YR)	PORTION OF LOAD ADJUSTMENT (LBS/YR)	REVISED TN REQUIRED REDUCTION (LBS/YR)
Agriculture	3,692	4.402	16,252.7	24,477	8,224.3	913.0	7,311.3
Brevard County	22,398	4.402	98,597.3	139,111	40,513.7	5,188.9	35,324.8
Cocoa	2,098	4.402	9,235.4	26,279	17,043.6	980.2	16,063.4
FDOT D5	926	4.402	4,075.8	8,731	4,655.2	325.7	4,329.5
Indialantic	168	4.402	741.1	1,756	1,014.9	65.5	949.4
Kennedy Space Center	3,977	4.402	17,508.5	5,341	-12,167.5	N/A	0.0
Melbourne	9,662	4.402	42,531.2	90,843	48,311.8	N/A	44,923.3
Rockledge	3,823	4.402	16,831.0	31,994	15,163.0	1,193.4	13,969.6
Titusville	588	4.402	2,589.3	3,013	423.7	112.4	311.3
Indian Harbour Beach - <i>de minimus</i>	1	4.402	6.3	11	N/A	N/A	N/A
Palm Shores – <i>de minimus</i>	265	4.402	1,165.7	1,694	N/A	N/A	N/A
TOTAL	47,335	N/A	208,368.7	331,556	123,182.7	12,167.5	123,182.6

Note: The TN total required reductions for North A and North B combined are greater than the TN TMDL required reductions shown for stormwater sources in **Table 6** because new areas were added during the BMAP process for the cities of Cocoa, Rockledge, and Titusville. These areas must also make reductions in order to achieve the TMDLs.

TABLE 20: TP TOTAL TMDL REQUIRED REDUCTIONS IN NORTH B

ENTITY	AREA (ACRES)	TP TARGET LOAD PER ACRE (LBS/AC/YR)	TP ALLOCATION (LBS/YR)	TP NET LOAD (LBS/YR)	TP REQUIRED REDUCTION (LBS/YR)	PORTION OF LOAD ADJUSTMENT (LBS/YR)	REVISED TP REQUIRED REDUCTION (LBS/YR)
Agriculture	3,692	0.646	2,385.1	5,504.2	3,119.1	154.3	2,964.8
Brevard County	22,398	0.646	14,469.3	21,713.5	7,244.2	608.8	6,635.4
Cocoa	2,098	0.646	1,355.3	5,216.4	3,861.1	146.3	3,714.8
FDOT D5	926	0.646	598.1	2,802.4	2,204.3	78.6	2,125.7
Indialantic	168	0.646	108.8	318.4	209.6	8.9	200.7
Kennedy Space Center	3,977	0.646	2,569.4	928.9	-1,640.5	N/A	0.0
Melbourne	9,662	0.646	6,241.5	19,922.8	13,681.3	558.6	13,122.7
Rockledge	3,823	0.646	2,470.0	6,612.5	4,142.5	185.4	3,957.1
Titusville	588	0.646	380.0	279.6	-100.4	N/A	0.0
Indian Harbour Beach - <i>de minimus</i>	1	0.646	0.9	1.7	N/A	N/A	N/A
Palm Shores – <i>de minimus</i>	265	0.646	171.1	310.0	N/A	N/A	N/A
TOTAL	47,335	N/A	30,578.4	63,300.4	32,721.2	1,740.9	32,721.2

Note: The TP total required reductions for North A and North B combined are greater than the TP TMDL required reductions shown for stormwater sources in **Table 7** because new areas were added during the BMAP process for the cities of Cocoa, Rockledge, and Titusville. These areas must also make reductions in order to achieve the TMDLs.

It is important to note that the total TN and TP reductions from the TMDLs may not be ultimately required. TMDL success is measured based on compliance with the seagrass depth limit targets, and once these targets are achieved, additional nutrient reductions will not be required. For this first BMAP iteration, the stormwater entities are required to achieve 15% of the total required reductions, which are 33,358.8 lbs/yr of TN and 7,829.4 lbs/yr of TP. These reductions for the stormwater entities are described in **Sections 4.5.2 through 4.5.4**.

4.5 ALLOCATIONS BY SOURCE

4.5.1 NPDES FACILITIES

The allocations for the NPDES facilities were included in the IRL Basin TMDL, and FDEP has incorporated these discharge limits into each facility's permit. The facilities located in the North IRL subbasin and their TMDL allocations are listed in **Table 21**. The wastewater treatment facilities (WWTFs) in the North IRL subbasin discharge low concentrations of nutrients that meet advanced wastewater treatment requirements. Therefore, the Cocoa J. Sellers WWTF and Melbourne reverse osmosis (RO) WWTF were assigned the 95th percentile of the TN and TP annual discharge load for the period of 2001 through 2005. The Reliant Energy Indian River Power Plant was also assigned the 95th percentile of its TP annual discharge load (the plant does not discharge additional TN). The Rockledge WWTF only discharges TN and TP when it performs mechanical integrity testing, which occurs infrequently; therefore, the facility was assigned an allocation sufficient for the load associated with this testing. The Cape Canaveral Power Plant was allocated its current permitted limits for TN and TP because there were no nutrient discharge limits before 2005 to calculate an annual discharge load (FDEP, 2009).

TABLE 21: NPDES FACILITIES AND ALLOCATIONS IN THE NORTH IRL SUBBASIN

NPDES FACILITY	PERMIT #	TN ALLOCATION (LBS/YR)	TP ALLOCATION (LBS/YR)	PROJECT ZONE
Cape Canaveral Power Plant	FL0001473	2,555	146	North B
Cocoa - J. Sellers WWTF	FL0021521	5,556	1,423	North B
Melbourne RO WWTF	FL0043443	9,170	195	North B
Reliant Energy – Indian River Power Plant	FL0000680	N/A	40	North B
Rockledge WWTF	FL0021571	30	30	North B

4.5.2 MS4s

The required reductions in this iteration of the BMAP for each of the MS4s are shown in **Table 22** for the North A project zone and **Table 23** for the North B project zone.

TABLE 22: TN AND TP REQUIRED REDUCTIONS FOR THE MS4S IN NORTH A

PERMITTEE	BMAP I TN REQUIRED REDUCTION (LBS/YR)	BMAP I TP REQUIRED REDUCTION (LBS/YR)
Brevard County	2,180.0	281.9
City of Edgewater	24.3	0.0
City of Titusville	6,604.6	1,447.6
FDOT District 5	396.6	142.0
Volusia County	0.0	0.0

TABLE 23: TN AND TP REQUIRED REDUCTIONS FOR THE MS4s NORTH B

PERMITTEE	BMAP I TN REQUIRED REDUCTION (LBS/YR)	BMAP I TP REQUIRED REDUCTION (LBS/YR)
Brevard County	5,298.7	995.3
City of Cocoa	2,409.5	557.2
City of Melbourne	6,738.5	1,968.4
City of Rockledge	2,095.4	593.6
City of Titusville	46.7	0.0
FDOT District 5	649.4	318.9
Town of Indialantic	142.4	30.1

4.5.3 NON-MS4 URBAN STORMWATER

The required reductions in this iteration of the BMAP for the non-MS4 are shown in **Table 24**.

TABLE 24: TN AND TP REQUIRED REDUCTIONS FOR THE NON-MS4 SOURCE

PROJECT ZONE	ENTITY	BMAP I TN REQUIRED REDUCTION (LBS/YR)	BMAP I TP REQUIRED REDUCTION (LBS/YR)
North A	Kennedy Space Center	0.0	0.0
North B	Kennedy Space Center	0.0	0.0

4.5.4 AGRICULTURE

The agricultural required reductions in this iteration of the BMAP are shown in **Table 25**.

TABLE 25: AGRICULTURAL TN AND TP REQUIRED REDUCTIONS IN NORTH IRL

PARAMETER	NORTH A BMAP I REQUIRED REDUCTION (LBS/YR)	NORTH B BMAP I REQUIRED REDUCTION (LBS/YR)
TN	5,596.6	1,096.7
TP	1,028.8	444.7

CHAPTER 5: MANAGEMENT ACTIONS

“Management actions” refers to the suite of activities that the North IRL BMAP allocation entities will be conducting to achieve their required TN and TP reductions. These include both structural and nonstructural activities.

Management actions had to meet several criteria to be considered eligible for credit in the BMAP. All projects, programs, and activities were required to address nutrient loads (TN, TP, or both) to receive credit. The projects are located within the North IRL subbasin in the appropriate project zone. Completed projects since January 1, 2000 were eligible for BMAP credit because the land uses in the TMDL model are from 2000; therefore, benefits of management actions since January 1, 2000 were not reflected in the TMDL model. Management actions were only given credit for the portion of the load reduction that was over and above any permit requirements. This criterion was needed since permit conditions are established to maintain the current condition (prevent further impacts from the development) and do not contribute to the improvement of water quality in North IRL.

Based on these eligibility requirements, the entities submitted structural and nonstructural projects to reduce the nonpoint source loading from stormwater. The projects submitted by the MS4s and non-MS4s are outlined in the sections below.

5.1 MS4 PROJECTS TO MEET ALLOCATIONS

All NPDES permits, including MS4 permits, must be consistent with the requirements of adopted TMDLs. Section 403.067 (7)(b), F.S., prescribes the criteria for TMDL implementation. In accordance with this section, implementation of a TMDL or BMAP for holders of NPDES MS4 permits shall be achieved to the maximum extent practicable (MEP), through the use of BMPs or other management measures. These management measures include, but are not limited to:

- *Non-regulatory and incentive based programs including best management practices, cost sharing, waste minimization, pollution prevention, public education;*
- *Non-structural best management practices;*
- *Water quality management and restoration activities;*
- *Public works including capital facilities;*
- *Land acquisition;*
- *Local ordinances; and*
- *Regulatory incentive programs.*

To comply with the MEP standard, the stormwater management program must be designed and implemented to reduce the discharge of pollutants to surface waters of the state. Implementation of BMPs consistent with the provisions of the stormwater management program required pursuant to a MS4 permit constitutes compliance with the standard of reducing pollutants to the MEP for discharges to unimpaired waters. However, MS4s must also continue to assess and adjust their list of approved projects (**Appendix E**) to achieve the greatest reduction of pollutants practicable to protect receiving waters in accordance with an adopted TMDL or BMAP.

Entities that fail to implement their list of approved projects in order to reduce pollutants to the MEP standard will be subject to enforcement action in accordance with Sections 403.061, 403.121, and 403.161, F.S., and Rule 62-650.300(4), F.A.C. In addition, both MS4 Phase I and Phase II permits include provisions for revising the effluent limitations, monitoring requirements, and stormwater management programs to meet applicable TMDL allocations that are consistent with the assumptions and requirements of the adopted BMAP.

The projects and timeframes for implementation submitted by the entities to achieve their first 5-year BMAP reductions are summarized in **Table 26** and **Table 28** and detailed in **Appendix E**. These projects were submitted to provide reasonable assurance to FDEP that the MS4 permittee 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. New projects may be substituted for those identified in **Appendix E** during the annual BMAP progress report process.

5.1.1 MS4 PROJECTS IN NORTH A

The reductions from the MS4 projects submitted in the North A project zone are summarized in **Table 26** for TN and **Table 27** for TP.

TABLE 26: SUMMARY OF MS4 LOAD REDUCTIONS FOR TN BY PROJECT TYPE IN NORTH A

ENTITY	STRUCTURAL STORMWATER	NONSTRUCTURAL STORMWATER	PUBLIC EDUCATION	STREET SWEEPING	TN TOTAL (LBS/YR)	CREDIT FOR FUTURE BMAPs (LBS/YR)
Brevard County	4,789	Not applicable	1,383	Not applicable	6,172	3,992
Volusia County	Not applicable	Not applicable	515	Not applicable	515	515
City of Edgewater	Not applicable	Not applicable	74	Not applicable	74	49.7
City of Titusville	5,704	Not applicable	609	1,699	8,012	1,407.4
FDOT District 5	Not applicable	595	39	459	1,093	696.4
Total	10,493	595	2,620	2,158	15,866	6,661

TABLE 27: SUMMARY OF MS4 LOAD REDUCTIONS FOR TP BY PROJECT TYPE IN NORTH A

ENTITY	STRUCTURAL STORMWATER	PUBLIC EDUCATION	STREET SWEEPING	TP TOTAL (LBS/YR)	CREDIT FOR FUTURE BMAPs (LBS/YR)
Brevard County	1,990.6	178.4	Not applicable	2,169.0	1,877.1
Volusia County	Not applicable	58.9	Not applicable	58.9	58.9
City of Edgewater	Not applicable	9.8	Not applicable	9.8	9.8
City of Titusville	1,794.4	117.2	765.0	2,676.6	1,229.0
FDOT District 5	Not applicable	11.3	293.9	305.2	163.2
Total	3,785.0	375.6	1,058.9	5,219.5	3,338.0

5.1.2 MS4 PROJECTS IN NORTH B

The reductions from the MS4 projects submitted in the North B project zone are summarized in **Table 28** for TN and **Table 29** for TP.

TABLE 28: SUMMARY OF MS4 LOAD REDUCTIONS FOR TN BY PROJECT TYPE IN NORTH B

ENTITY	STRUCTURAL STORMWATER	NONSTRUCTURAL STORMWATER	PUBLIC EDUCATION	STREET SWEEPING	TN TOTAL (LBS/YR)	CREDIT FOR FUTURE BMAPs (LBS/YR)
Brevard County	28,097	7	6,339	113	34,556	29,258
City of Cocoa	3,908	Not applicable	Not applicable	459	4,367	1,957.5
City of Melbourne	1,131	Not applicable	5,166	1,746	8,043	1,304.5
City of Rockledge	4,139	Not applicable	630	750	5,519	3,423.6
City of Titusville	Not applicable	Not applicable	23	26	49	2.3
FDOT District 5	393	1,552	86	1,179	3,210	2,560.6
Town of Indialantic	332	Not applicable	9	Not applicable	341	198.6
Total	38,000	1,559	12,253	4,273	56,085	38,705

TABLE 29: SUMMARY OF MS4 LOAD REDUCTIONS FOR TP BY PROJECT TYPE IN NORTH B

ENTITY	STRUCTURAL STORMWATER	NONSTRUCTURAL STORMWATER	PUBLIC EDUCATION	STREET SWEEPING	TP TOTAL (LBS/YR)	CREDIT FOR FUTURE BMAPs (LBS/YR)
Brevard County	8,363.1	2.4	1,035.0	50.8	9,451.3	8,456.0
City of Cocoa	1,260.5	Not applicable	Not applicable	206.6	1,467.1	909.9
City of Melbourne	577.3	Not applicable	1,174.4	1,163.6	2,915.3	946.9
City of Rockledge	1,726.4	Not applicable	141.8	337.9	2,206.1	1,612.5
City of Titusville	Not applicable	Not applicable	2.3	11.6	13.9	13.9
FDOT District 5	210.1	0.0	28.0	754.6	992.7	673.8
Town of Indialantic	57.8	Not applicable	1.6	Not applicable	59.4	29.3
Total	12,195.2	2.4	2,383.1	2,525.1	17,105.8	12,642.3

5.2 NON-MS4 URBAN STORMWATER PROJECTS TO MEET ALLOCATIONS

5.2.1 NON-MS4 PROJECTS IN NORTH A

The reductions from the non-MS4 projects submitted in the North A project zone are summarized in **Table 30** for TN and **Table 31** for TP.

TABLE 30: SUMMARY OF NON-MS4 LOAD REDUCTIONS FOR TN BY PROJECT TYPE IN NORTH A

ENTITY	STRUCTURAL STORMWATER	NONSTRUCTURAL STORMWATER	TN TOTAL (LBS/YR)	CREDIT FOR FUTURE BMAPs (LBS/YR)
Kennedy Space Center	3,934	5,006	8,940	8,940
Total	3,934	5,006	8,940	8,940

TABLE 31: SUMMARY OF NON-MS4 LOAD REDUCTIONS FOR TP BY PROJECT TYPE IN NORTH A

ENTITY	STRUCTURAL STORMWATER	NONSTRUCTURAL STORMWATER	TP TOTAL (LBS/YR)	CREDIT FOR FUTURE BMAPs (LBS/YR)
Kennedy Space Center	1,310.1	1,824.3	3,134.4	3,134.4
Total	1,310.1	1,824.3	3,134.4	3,134.4

5.2.2 NON-MS4 PROJECTS IN NORTH B

The reductions from the non-MS4 projects submitted in the North B project zone are summarized in **Table 32** for TN and **Table 33** for TP.

TABLE 32: SUMMARY OF NON-MS4 LOAD REDUCTIONS FOR TN BY PROJECT TYPE IN NORTH B

ENTITY	STRUCTURAL STORMWATER	NONSTRUCTURAL STORMWATER	PUBLIC EDUCATION	TN TOTAL (LBS/YR)	CREDIT FOR FUTURE BMAPs (LBS/YR)
Kennedy Space Center	701	496	Not applicable	1,197	1,197
Town of Palm Shores	Not applicable	Not applicable	21	21	21
Total	701	496	21	1,218	1,218

TABLE 33: SUMMARY OF NON-MS4 LOAD REDUCTIONS FOR TP BY PROJECT TYPE IN NORTH B

ENTITY	STRUCTURAL STORMWATER	NONSTRUCTURAL STORMWATER	PUBLIC EDUCATION	TP TOTAL (LBS/YR)	CREDIT FOR FUTURE BMAPs (LBS/YR)
Kennedy Space Center	274.6	895.0	Not applicable	1,169.6	1,169.6
Town of Palm Shores	Not applicable	Not applicable	4.2	4.2	4.2
Total	274.6	895.0	4.2	1,173.8	1,173.8

5.3 PROVISIONAL BMPs

Several of the BMP activities included in the project lists were assigned provisional reduction estimates for the purposes of this first iteration of the BMAP. These provisional BMPs are floating islands, public education and outreach efforts, muck removal, aquatic plant harvesting, and water control structures. Studies to estimate the efficiencies of these BMPs are currently being conducted across the state, which will provide better information for use in the next iteration of the BMAP to revise the project reductions. If the new BMP information indicates lower efficiencies than what was estimated for this BMAP, the entities that listed these BMPs in their project tables may need to provide additional projects to make up for the difference in reductions. If the new BMP information indicates higher efficiencies, the entities will receive additional credit if they included these BMPs on their project list.

5.3.1 FLOATING ISLANDS

As a treatment train feature, credit for floating islands or managed aquatic plant systems (MAPS) was assigned as a 20% reduction in both the TN and TP load remaining after treatment by the stormwater pond. The entities that included floating islands in their project tables are shown in **Appendix E**.

5.3.2 PUBLIC EDUCATION AND OUTREACH

Up to a 6% reduction in the baseline anthropogenic load for both TN and TP was assigned based on the education and outreach efforts conducted by each entity. The 6% load reduction estimate was determined from the Center for Watershed Protection Watershed Treatment Model. Credit was given for the following applicable education activities:

1. *Local funding to implement the Florida Yards and Neighborhoods (FYN) program within the city or county.*
2. *Local land development codes or ordinances that require Florida Friendly landscaping on all new developments; require commercial landscapers to obtain training and certification through the Green Industry BMP program;*

require irrigation systems per Sections 125.568 and 166.048, F.S. and Section 373.185, F.S.; and which specify fertilizer application rates and types. Local ordinances that control pet waste and require that residents pick up and properly dispose of pet wastes.

3. *Implementation of public service announcements (PSAs) on local cable or commercial television and radio stations.*
4. *Informational pamphlets on pollution prevention, fertilizer application, Florida Friendly Landscaping, water conservation, septic tank maintenance, etc. Presentations on these topics to civic groups, local businesses, students, and the general public.*
5. *Websites to provide information on reducing nutrient pollution for homeowners and businesses.*
6. *Inspection program and public call-in number to address illicit discharges.*

Credit was assigned to the entities for the above efforts as follows:

- *If all 6 types of activities are conducted by an entity, then the full 6% reduction was assigned.*
- *If an entity only has FYN, they received a 3% reduction credit.*
- *If an entity only has the Florida friendly ordinances (irrigation, landscaping, fertilizer, and pet waste management), they received a 2% reduction.*
- *If an entity only has the PSAs, websites, brochures, and the inspection program, they received a 1% reduction credit.*
- *Other combinations of efforts were analyzed on a case-by-case basis for credit.*

Appendix E summarizes the public education activities conducted by each entity and the associated load reductions.

5.3.3 MUCK REMOVAL

A guidance document was provided to the stakeholders, which details the requirements to receive muck removal project credit. In summary, it is recommended that the muck deposit be an average minimum thickness of 30 centimeters, the muck must be removed to the natural substrate, and the muck material must be stored away from surface waters so that the material cannot be washed back into the waterbody. The credit for muck removal is calculated by multiplying the area of muck removed by the difference in the nutrient flux rate of the muck and natural substrate. Stakeholders that receive credit for muck removal must measure post-project muck deposition rates every five years and report this information to FDEP. Project credit will be assigned for a period of up to ten years after an area is dredged. If there are not adequate source controls in place in the watershed, muck will re-accumulate at a faster rate than if the watershed loads are being controlled. As of the time of BMAP adoption, none of the North IRL stakeholders included muck removal in the project tables; however, the stakeholders do have the option of adding these efforts to their list of projects in the future.

5.3.4 AQUATIC PLANT HARVESTING

A guidance document was provided to the stakeholders, which details the requirements to receive credit for aquatic vegetation harvesting. In summary, credit is assigned based on the

type of vegetation removed, amount of plant material removed, the nutrient content for that type of plant, and the percent dry weight of material collected. Stakeholders who harvest aquatic vegetation will determine an annual average TN and TP load removal, to be included in the BMAP as credit. As of the time of BMAP adoption, none of the North IRL stakeholders included aquatic vegetation harvesting in the project tables; however, the stakeholders do have the option of adding these efforts to their list of projects in the future.

5.3.5 WATER CONTROL STRUCTURES

Credit for certain water control structures, such as tilting weir gates, was assigned a 5% TN reduction based on the load that drains to the canal containing the control structure. Available data did not show that reductions in TP occurred with the tilting weir gates. As of the time of BMAP adoption, none of the North IRL stakeholders included water control structures in the project tables; however, the stakeholders do have the option of adding these structures to the list of projects in the future.

5.4 AGRICULTURE

Table 34 and **Table 35** give a breakdown of agricultural land uses in the North A and North B project zones, respectively, according to 2000 SJRWMD land use data. **Figure 9** shows the approximate location of these agricultural lands in the North A project zone and **Figure 10** shows the same for the North B project zone.

TABLE 34: AGRICULTURAL LAND USES IN NORTH A BASED ON 2000 SJRWMD LAND USE DATA

LAND USE LAND COVER CODE	CODE DESCRIPTION	TOTAL ACRES
2120	Unimproved Pasture	72.3
2130	Woodland Pasture	148.8
2110	Improved Pasture	969.4
2140	Row Crop	74.1
2150	Field Crops	544.0
2200	Tree Crops	1.7
2210	Citrus	5,115.2
2240	Abandoned Tree Crops	936.7
2320	Poultry Feeding Operations	8.0
2430	Tree Nurseries	26.5
2431	Ornamentals	12.1
2500	Specialty Farms	0.0
2510	Horse Farms	119.7
2610	Fallow Cropland	40.7
Total	Total in North A	8,069.2

TABLE 35: AGRICULTURAL LAND USES IN NORTH B BASED ON 2000 SJRWMD LAND USE DATA

LAND USE LAND COVER CODE	CODE DESCRIPTION	TOTAL ACRES
2120	Unimproved Pasture	41.0
2130	Woodland Pasture	6.9
2110	Improved Pasture	116.3
2140	Row Crop	16.8
2150	Field Crops	26.1
2200	Tree Crops	2.8
2210	Citrus	3,364.5
2240	Abandoned Tree Crops	65.7
2320	Poultry Feeding Operations	0.0
2430	Tree Nurseries	0.0
2431	Ornamentals	43.9
2500	Specialty Farms	8.0
2510	Horse Farms	0.0
2610	Fallow Cropland	0.0
Total	Total in North B	3,692.0

Land use data are helpful as a starting point for estimating agricultural acreage and developing BMP implementation strategies; however, their inherent limitations must be noted. To begin with, the time of year during which land use data are collected (through aerial photography) affects the accuracy of photo interpretation. This can result in the inappropriate analysis of the data and can hamper decision-making. Another limitation is that the specific agricultural activity being conducted is not always apparent. For example, some acreage under the improved pasture classification may be used for cattle grazing, some may consist of forage grass that is periodically harvested and sold for hay, and/or some may comprise a fallow vegetable field awaiting planting. Operations that may fall into this land use category fertilize at different rates (e.g., hay operations and some other commodities typically fertilize at or below rates recommended by the University of Florida-Institute of Food and Agricultural Sciences [UF-IFAS]); therefore, it would be meaningful for the purposes of evaluating potential nutrient impacts to know specific land uses.

Because of error in the collection and characterization of land use data and changes in land use over time, the land use acreages are subject to adjustment, as discussed later in this section.

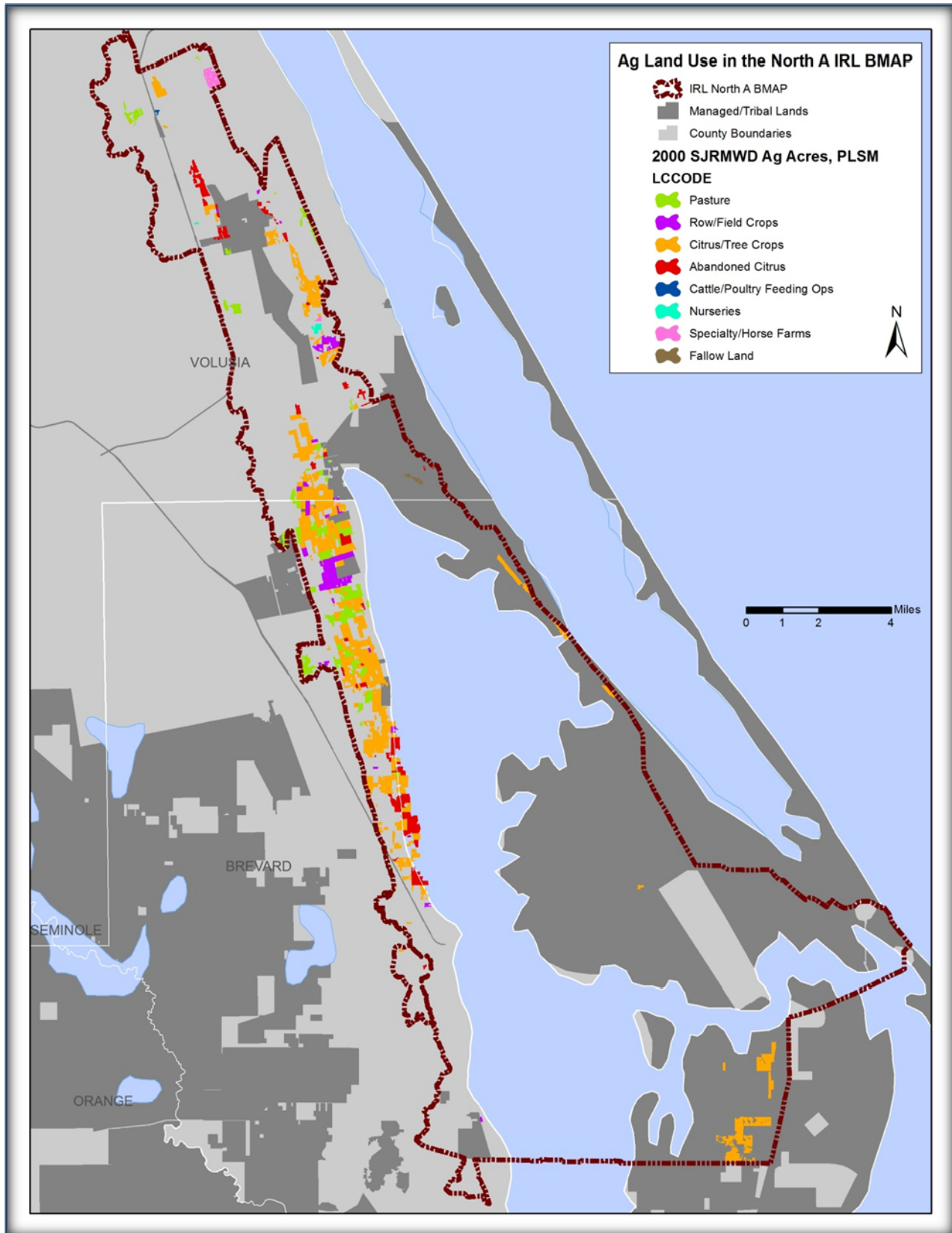


FIGURE 9: AGRICULTURAL LANDS IN THE NORTH A PROJECT ZONE

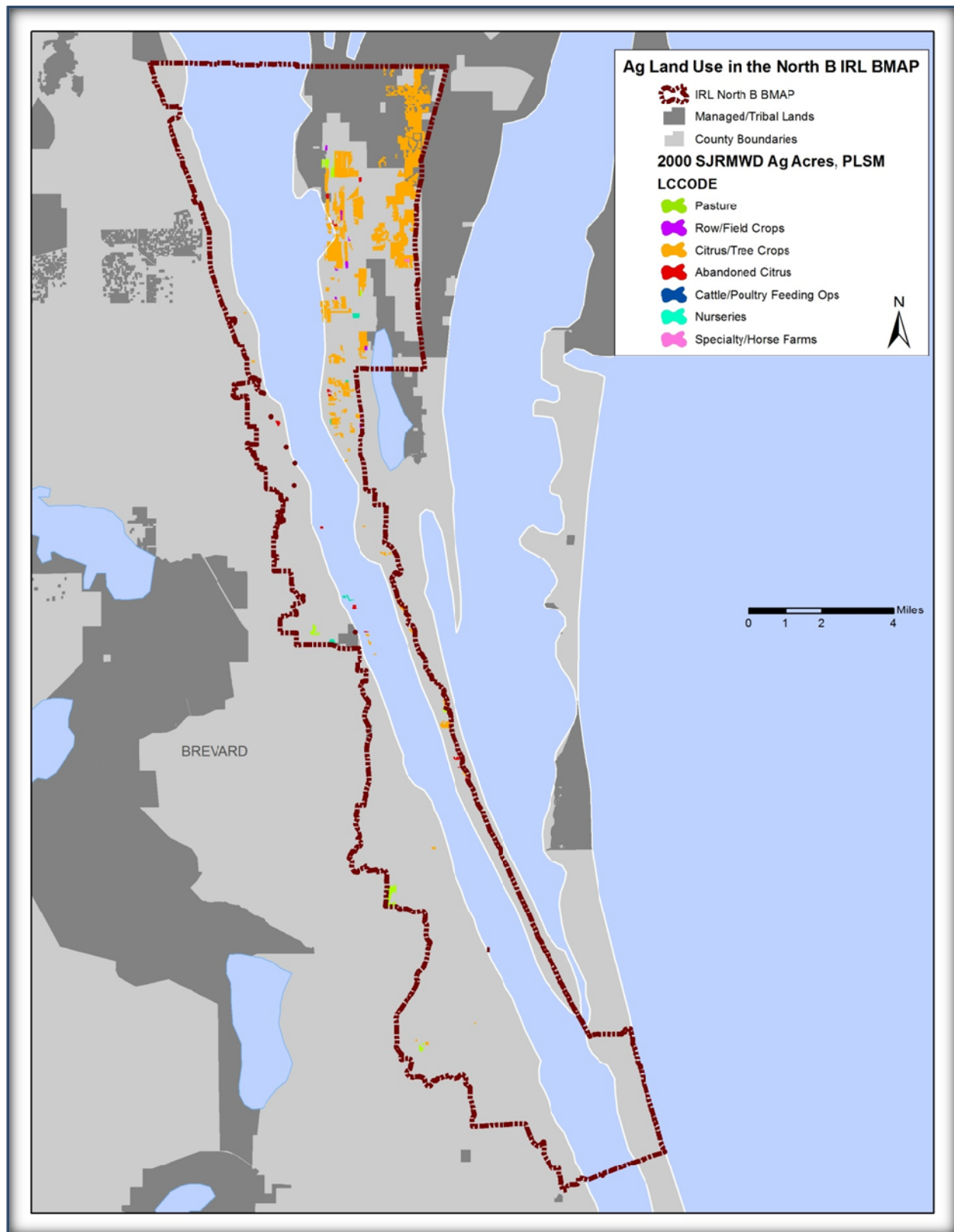


FIGURE 10: AGRICULTURAL LANDS IN THE NORTH B PROJECT ZONE

5.4.1 AGRICULTURAL PRODUCERS' RESPONSIBILITIES UNDER THE FWRA

Section 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 the Florida Department of Agriculture and Consumer Services [FDACS] or FDEP, as applicable), or conducting water quality monitoring prescribed by FDEP or the applicable water management district. If these pollutant sources do not either implement BMPs or conduct monitoring, they may be subject to enforcement by FDEP or the applicable water management district.

Pursuant to section 403.067(7)(c), F.S., implementation of FDACS-adopted, FDEP-verified BMPs in accordance with FDACS rule provides a presumption of compliance with state water quality standards. In addition, growers who implement BMPs may be eligible for cost share from FDACS, the water management district, or others. Through the Office of Agricultural Water Policy (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.

5.4.2 AGRICULTURAL BEST MANAGEMENT PRACTICES

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. Two categories of FDACS-adopted BMPs are nutrient management and irrigation management. Nutrient management includes practices related to the amount, timing, placement, and type of fertilizer. Irrigation management involves the maintenance, scheduling, and overall efficiency of irrigation systems. In several areas of the state, FDACS-funded Mobile Irrigation Labs identify and demonstrate irrigation efficiency techniques to growers. Nutrient and irrigation management are closely linked because efficient irrigation scheduling and uniform water distribution help keep nutrients in the root zone where crops can absorb them, thereby reducing nutrient runoff and leaching to surface and ground water. Therefore, the Mobile Irrigation Labs play an important role in both water conservation and water quality.

By definition, BMPs are technically and economically feasible. However, FDACS BMP manuals contain some BMPs that may only be affordable with financial assistance. The BMP checklists allow producers to indicate whether a BMP is not economically feasible, on a case-by-case basis. As BMP cost share becomes available to the basin, FDACS will work with producers to implement applicable key BMPs that otherwise are not affordable. The key nutrient and irrigation management BMPs that would most likely be applicable to agricultural operations in the basin are as follows:

- *Determining Nutrient Needs:*
 - *Soil and Tissue Testing:* *Used to base fertilizer applications on plant needs and available nutrients in the soil; helps prevent over-application of fertilizer.*
 - *Nutrient Budgeting:* *Adjustment of fertilizer regime to account for other nutrient sources, such as bio-solids, legumes, manure, and nutrient-laden irrigation water; helps prevent over-application of fertilizer.*
- *Managing Nutrient Application:*

- Precision Application of Nutrients: Use of specialized equipment for precise placement of nutrients on targeted areas at specified rates; reduces total amount used and prevents stray applications.
- Equipment Calibration/Maintenance: Ensures proper functioning of equipment; prevents misapplication or over-application of fertilizer materials.
- Split Fertilizer Applications: Multiple applications timed with optimal growth stages; allows plants to assimilate nutrients more efficiently; reduces nutrient loss in leaching and runoff.
- Fertigation: Application of fertilizer through irrigation water; allows for direct nutrient application to the crop root zone and more efficient assimilation by plants, reducing nutrient loss in leaching and runoff.
- Controlled-Release Fertilizer: Use of fertilizer formulations that have a controlled nutrient release curve; reduces nutrient loss to leaching and runoff.
- Fertilizer Application Setbacks from Waterbodies (wetlands, watercourses, sinks, springs, etc.): Establishes a zone where no fertilizer will be applied; reduces nutrient loadings to waterbodies.
- Managing Irrigation:
 - Irrigation Scheduling: Planning when to irrigate to reduce water and nutrient losses, based on available soil moisture content, evapotranspiration levels, recent rainfall, and time of day.
 - Monitoring Soil Moisture and Water Table: Use of devices that measure the water table level and the amount of water in the soil; a key component of proper irrigation scheduling.
 - Tailwater Recovery: Use of down-gradient catchment ponds to trap irrigation tailwater to be reused on cropland; reduces offsite transport of nutrients and conserves water.
- Treatment and Erosion Control:
 - Filter Strips: Vegetated strips of land designed to reduce nutrients and sediments in surface water runoff from fields, pastures, and livestock high-intensity areas before it reaches downstream waterbodies.
 - Vegetative Buffers: Establishment of riparian and/or wetland buffers to attenuate and assimilate nutrient- or sediment-laden surface flows coming from cropped/grazed areas.
 - Ditch Maintenance and Retrofits: Use of rip rap, sediment traps, staging structures, and permanent vegetative bank cover to minimize erosion and transport of nutrient-laden sediments.
- Livestock Management (applicable to cow/calf and equine operations):
 - Alternative Water Sources: Use of upland livestock watering ponds and/or water troughs; minimizes manure deposition in waterbodies.

- *Rotational Grazing: Movement of cattle to different grazing areas on a planned basis; prevents concentrated waste accumulations and denuding of pasture areas. May involve fencing.*
- *High-Intensity Areas Location: Siting of cowpens, supplemental feed areas, etc., away from waterbodies to minimize nutrient loadings.*
- *Operations Management:*
 - *Fertilizer Storage: Proper location/storage of bulk fertilizer products to prevent nutrient loadings.*
 - *Fertilizer Mix/Load: Use of appropriate dedicated or temporary mix/load areas located away from waterbodies to prevent nutrient loading.*
 - *Employee Training: Training provided to farm workers on how to implement BMPs.*
 - *Record Keeping: Proper record keeping provides accountability in the implementation of BMPs, and assists the producer in making nutrient and irrigation management decisions.*

OAWP BMPs and staff contact information are located 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.

5.4.3 FDACS OAWP ROLE IN BMP IMPLEMENTATION AND FOLLOW UP

5.4.3.1 BMP Implementation

The OAWP assists agricultural producers enrolled in its programs in implementing BMPs. The OAWP employs field staff and has contracts with service providers to work with producers to submit notices of intent (NOIs) to implement the BMPs appropriate for their operations. Depending on the region of the state, these providers include the soil and water conservation districts, UF-IFAS, and natural resource development and conservation councils. They also give technical assistance to producers and, as funding allows, help implement cost-share programs that leverage regional, state, and federal funds.

The OAWP will recruit producers within the North IRL subbasin to enroll in adopted BMP programs applicable to their operations. OAWP staff and contractors will identify existing growers, to the extent possible, with the help of grower associations, information on county agricultural exemptions, field staff knowledge, and 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.

5.4.3.2 Follow up and Reporting in BMP Enrollment and Implementation

In addition to enrolling targeted operations in the relevant BMP programs, the OAWP will:

- *Document the submitted NOIs, which will include a list of the BMPs to be implemented.*
- *Document the amount of total agricultural acreage covered by the NOIs.*
- *Assist growers in understanding and implementing BMPs properly.*

- *On a rotating basis by program, survey enrolled operations to evaluate the level of BMP implementation and update information on ownership, land use, acreage, etc.*
- *Through regional field staff and contractors, follow up on identified areas/operations of particular concern.*
- *Participate in annual BMAP reporting on enrollment efforts and estimated load reductions, new manuals adopted, and any new efforts planned.*

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 FDEP, and modify them if necessary. Continuing water quality problems will be detected through the BMAP monitoring component and other FDEP and SJRWMD activities. If a re-evaluation of the BMPs is needed, FDACS will also include SJRWMD and other partners in the process.

5.4.4 FDEP AND SJRWMD ROLES IN BMP IMPLEMENTATION

The FWRA states that nonpoint source dischargers who fail to implement either the appropriate BMPs or conduct water quality monitoring prescribed by FDEP or a water management district may be subject to enforcement action by either of those agencies.

5.4.5 BMP ENROLLMENT GOALS AND LOAD REDUCTION ESTIMATES

5.4.5.1 BMP Enrollment Goals

Table 28 and summarize the land use data figures for agriculture in the North A and North B project zones (respectively), the acres addressed by BMP manuals, the acres enrolled in BMP programs, and the goal for enrolling additional acres in the basin. The acreage used to calculate the starting point agricultural nutrient load is based on 2000 land use information from the SJRWMD. Based on aerial imagery and local staff observation, FDACS adjusted these figures to reflect the current agricultural land use acreage more accurately. The FDACS-adjusted acreage shows approximately 45% less total acreage than indicated in the 2000 figures in the North A project zone, and approximately 30% less in the North B project zone, due primarily to urban conversion and citrus freeze/disease issues. In addition, some of the acreage is no longer in production and would not be necessary to enroll in BMPs. The enrollment goal is 50% of the adjusted agricultural acres in the first 5 years. Estimated reductions associated with this goal are shown in **Table 38** and **Table 39**.

It is important to understand that, even if all targeted agricultural operations are enrolled, not all of the acreage listed as agriculture in **Table 36** and **Table 37** will be included in enrollment figures. The NOIs will document the estimated total number of acres on which applicable BMPs are implemented, not the entire parcel acreage. This is because 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 FDACS. There also may be significant amounts of acreage that do not need to be enrolled, such as lands that are not actively involved in commercial agriculture (operations conducted as a business). These areas are often low-density residential uses on large parcels of grassed land, or land that was but is no longer in commercial agricultural production. This information frequently is impossible to discern in the photo interpretation process used to generate land use data. Local government or FDEP BMPs may address these noncommercial sources.

As of March 31, 2012, 4 producers within the North A project zone had submitted a total of 5 NOIs to OAWP covering about 305 acres to implement FDACS-adopted BMPs, and all are citrus operations. Seven producers within the North B project zone had submitted a total of 8 NOIs to OAWP covering about 214 acres, of which 199 acres are citrus, and 15 acres are container nurseries. No producers are conducting water quality monitoring in lieu of implementing BMPs at this time. **Figure 11** (North A project zone) and **Figure 12** (North B project zone) are maps of the acres enrolled in BMPs as of March 31, 2012.

FDACS field staff will focus on enrolling the remaining citrus and cow/calf operations in the first phase of the BMAP. As resources allow, staff also will work to enroll other commercial agricultural operations within the basin, including nursery, row/field crops, and equine operations.

TABLE 36: AGRICULTURAL ACREAGE, BMP ENROLLMENT, AND FUTURE ENROLLMENT GOALS FOR THE NORTH A PROJECT ZONE

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.

² FDACS staff have observed no active poultry operations in the BMAP area, but will confirm this.

³ Please see discussion in **Section 5.4.5.1**

2000 SJRWMD LAND USE	2000 ACRES	FDACS ADJUSTED ACRES FOR ENROLLMENT ¹	RELATED FDACS BMP PROGRAMS	ACREAGE ENROLLED	RELATED NOIs/ CERTIFICATION
Pasture (2110, 2120, 2130)	1,190.5	1,164.5	Cow/Calf; Future (hay)	0.0	N/A
Row/Field Crops (2140, 2150)	618.1	574.2	Vegetable/Agronomic Crops	0.0	N/A
Fallow Cropland	40.7	40.7	N/A	N/A	N/A
Horse Farm	119.7	111.0	Equine	0.0	N/A
Citrus	5,115.2	3,515.4	Ridge Citrus; Flatwoods Citrus	305.0	5
Abandoned Groves	936.7	N/A	No enrollment needed	N/A	N/A
Tree Crops	1.7	1.7	Specialty Fruit and Nut	0.0	N/A
Tree Nurseries	26.5	26.5	Future Nursery; Specialty Fruit and Nut	0.0	N/A
Ornamentals	12.1	12.1	Container Nursery	0.0	N/A
Poultry Feeding ²	8.0	8.0	Conservation Plan Rule	0.0	N/A
Total	8,069.2	5,454.0	N/A	305.0	5
5-Year Enrollment Goal (50%)	N/A	2,727.0	N/A	N/A	N/A
Acreage Enrolled as of March 31, 2012	N/A	305.0	N/A	N/A	N/A
Remaining Acres to Enroll³	N/A	2,422.0	N/A	N/A	N/A

TABLE 37: AGRICULTURAL ACREAGE, BMP ENROLLMENT, AND FUTURE ENROLLMENT GOALS FOR THE NORTH B PROJECT ZONE

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 Please see discussion in **Section 5.4.5.1**.

2000 SJRWMD LAND USE	2000 ACRES	FDACS ADJUSTED ACRES FOR ENROLLMENT ¹	RELATED FDACS BMP PROGRAMS	ACREAGE ENROLLED	RELATED NOIs/ CERTIFICATION
Pasture (2110, 2120, 2130)	164.2	84.8	Cow/Calf; Future (hay)	0.0	0
Row/Field Crops (2140, 2150)	42.9	35.3	Vegetable/Agronomic Crops	0.0	N/A
Tree Crops	2.8	2.8	Specialty Fruit & Nut	0.0	N/A
Citrus	3,364.5	2,339.2	Ridge Citrus; Flatwoods Citrus	198.5	4
Abandoned Groves	65.7	N/A	No enrollment needed	N/A	N/A
Ornamentals	43.9	43.9	Container Nursery	15.1	4
Specialty Farms	8.0	8.0	Conservation Plan Rule	0.0	N/A
Total	3,692.0	2,513.9	N/A	213.6	8
5-Year Enrollment Goal (50%)	N/A	1,257.0	N/A	N/A	N/A
Acreage Enrolled as of March 31, 2012	N/A	213.6	N/A	N/A	N/A
Remaining Acres to Enroll²	N/A	1,043.4	N/A	N/A	N/A

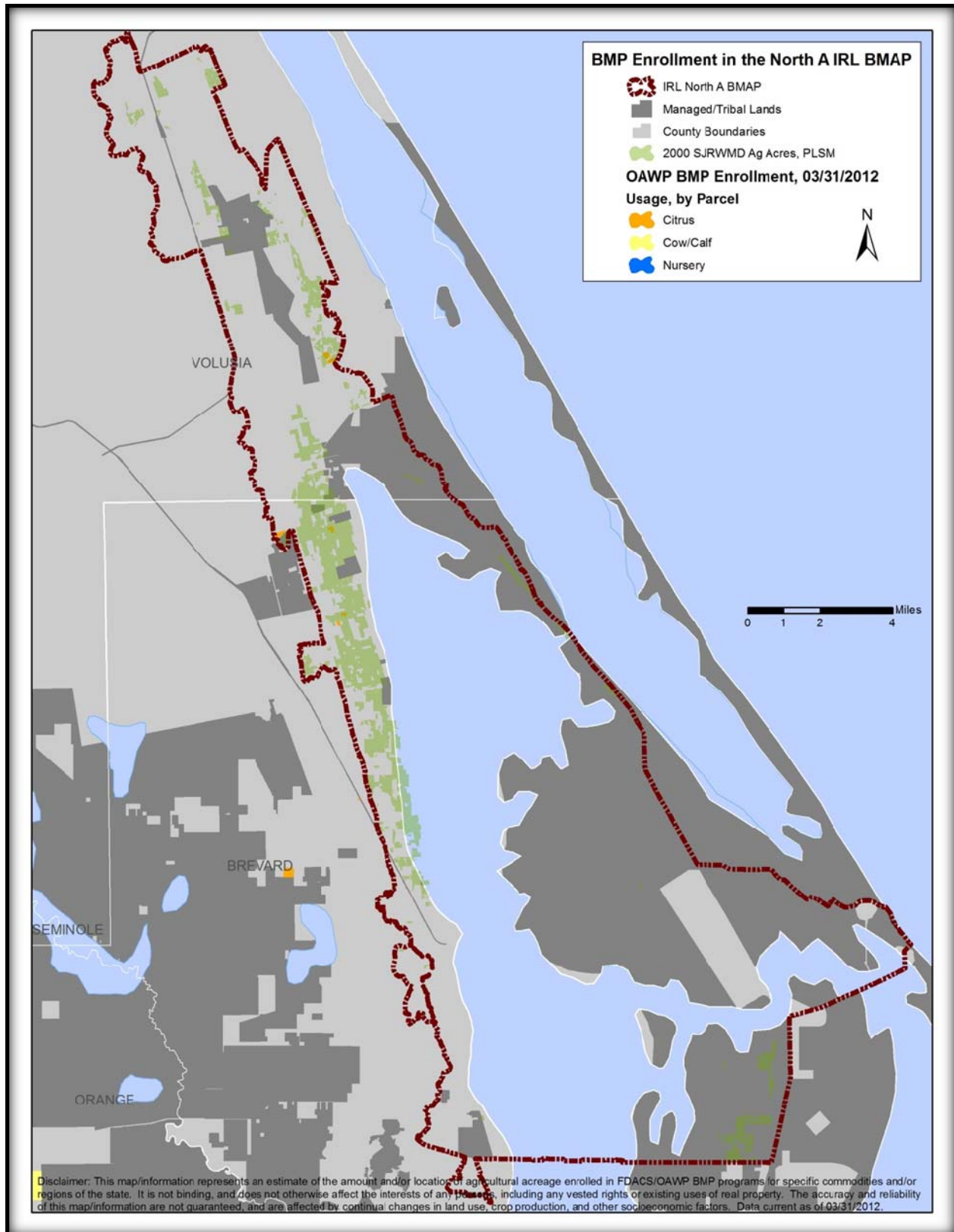


FIGURE 11: BMP ENROLLMENT IN THE NORTH A PROJECT ZONE AS OF MARCH 2012

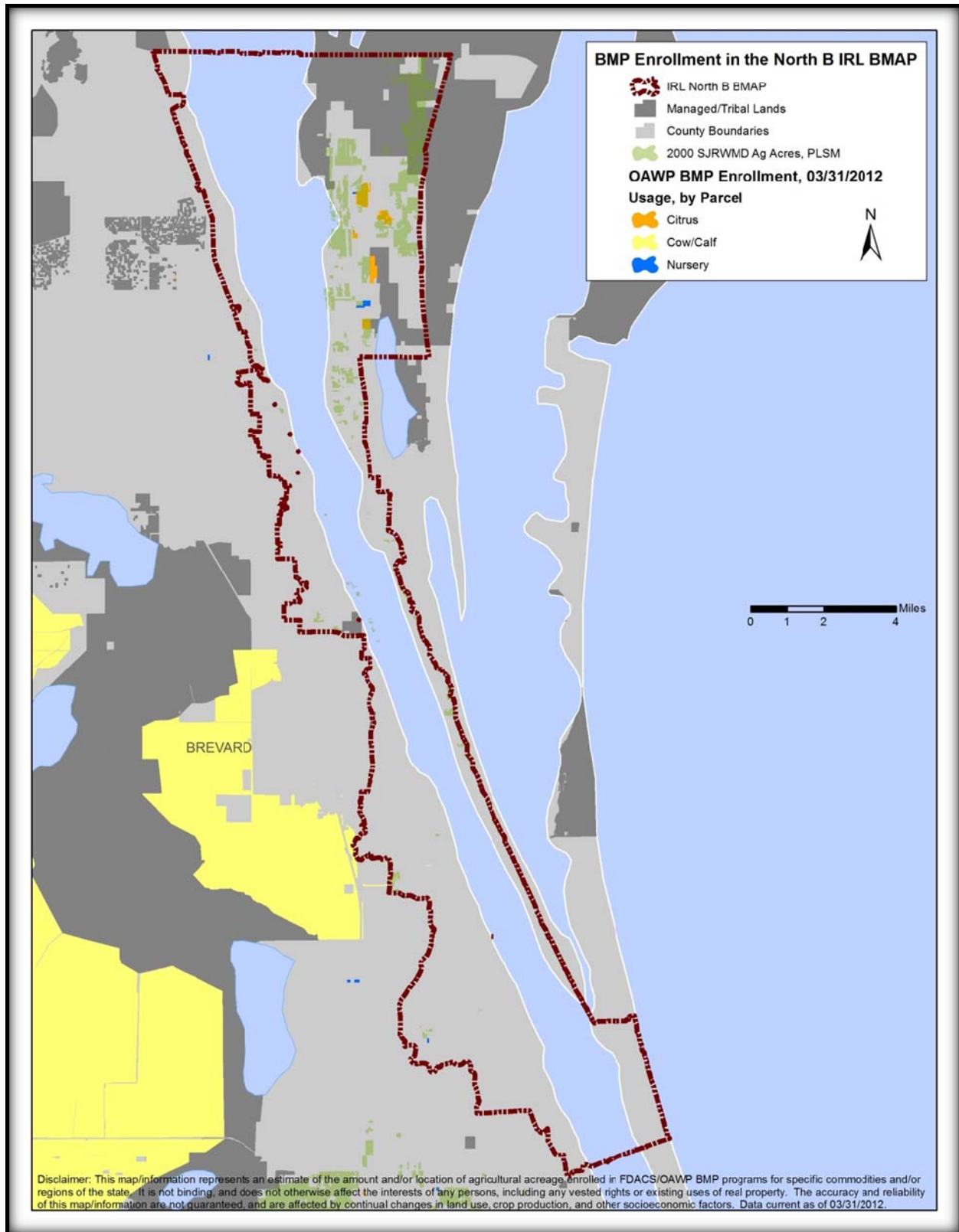


FIGURE 12: BMP ENROLLMENT IN THE NORTH B PROJECT ZONE AS OF MARCH 2012

5.4.5.2 Load Reduction Allocation and BMP Load Reduction Estimates

Due to the inaccuracies in 2000 land use information and to extensive changes in land use since 2000, agricultural loadings are likely significantly less than indicated in the TMDL. The region is expected to have continuing shifts from agricultural to residential/urban land uses, which will reduce the agricultural load further. More precise information will be incorporated into the next iteration of the BMAP, and the estimated agricultural load will be adjusted to reflect the updated acreage figure. The potential refinement of a basin- and commodity-specific agricultural loading/reduction model may be considered during the first BMAP cycle.

The estimates of agricultural load reduction due to the implementation of BMPs, shown in **Table 38** and **Table 39**, are based on commodity-specific methods developed for the Lake Okeechobee watershed because methods specific to the IRL Basin have not been developed. These values may assume conditions, such as typical nitrogen fertilization rates, that differ from actual field conditions, but are the best available information. OAWP estimates that the goal of 50% enrollment within the first 5 years (Phase 1) will achieve a combined reduction of 6,103 lbs/yr of TN and 709 lbs/yr of TP. Changes from agricultural land use to urban land use represent a further combined reduction of 9,786 lbs/yr of TN and 2,449 lbs/yr of TP. This represents approximately 36% of the total required TN load reduction allocation for agriculture in the basin, and 32% of the total required TP load reduction allocation. Therefore, estimated BMP-based reductions coupled with land use changes provide more than sufficient reductions to meet the Phase 1 target.

TABLE 38: AGRICULTURAL TN AND TP LOAD REDUCTION ALLOCATIONS IN THE NORTH A PROJECT ZONE, AND ESTIMATED REDUCTIONS IN TN AND TP IN THE FIRST 5 YEARS

NORTH A ESTIMATED LOADS	TN (LBS/YR)	TP (LBS/YR)
Load Reduction Allocation for Agriculture	37,311.0	6,858.6
1 st 5-Year Load Reduction (Phase I)	5,596.6	1,028.8
Estimated Load Reductions via BMPs, 50% Target Enrollment	3,045.2	432.2
Credit for Changes in Land Use	5,047.0	1,420.3
Remaining Load Reductions Needed for BMAP in Phase I	-2,495.6 (credit)	-823.7 (credit)

TABLE 39: AGRICULTURAL TN AND TP LOAD REDUCTION ALLOCATIONS IN THE NORTH B PROJECT ZONE, AND ESTIMATED REDUCTIONS IN TN AND TP IN THE FIRST 5 YEARS

NORTH B ESTIMATED LOADS	TN (LBS/YR)	TP (LBS/YR)
Load Reduction Allocation for Agriculture	7,311.3	2,964.8
1 st 5-Year Load Reduction (Phase I)	1,096.7	444.7
Estimated Load Reductions via BMPs, 50% Target Enrollment	1,056.1	276.5
Credit for Changes in Land Use	4,739.0	1,029.4
Remaining Load Reductions Needed for BMAP in Phase I	-4,698.4 (credit)	-861.2 (credit)

5.4.5.3 Beyond BMPs

Under the FWRA, when FDEP adopts a BMAP that includes agriculture, it is the agricultural producer's responsibility to implement BMPs adopted by FDACS and verified as effective by FDEP in helping to achieve load reductions. If acreage adjustments and BMP implementation do not fully account for the current agricultural load reduction allocation, it may be necessary to develop and implement cost-assisted field- and/or regional-level treatment options that remove nutrients from farm discharges. In that case, FDACS will work with FDEP and the SJRWMD to identify appropriate options for achieving further agricultural load reductions.

CHAPTER 6: ASSESSING PROGRESS AND MAKING CHANGES

Successful BMAP implementation requires commitment and follow-up. In the Commitment to Plan Implementation (see **Chapter 7**), stakeholders have expressed their intention to carry out the plan, monitor its effect, and continue to coordinate within and across jurisdictions to achieve seagrass targets. The FWRA requires that an assessment be conducted every 5 years to determine whether there is reasonable progress in implementing the BMAP and achieving pollutant load reductions. This chapter contains details on future seagrass evaluations, tracking implementation of efforts, adaptive management of the BMAP, water quality monitoring, and research priorities that will provide information sufficient to assess progress and make the necessary changes.

6.1 SEAGRASS TARGET EVALUATION

In year 4 of the BMAP, TMDL depth limit targets will be reassessed using the 2-step approach (see **Section 2.3**) and 2007, 2009, 2011, and 2013 mapping data, which will likely be the latest data at that time. The North A and North B project zones are not achieving the seagrass depth limit targets in 2007 or 2009; therefore, 2 out of the 4 years are already noncompliant and a second BMAP with additional reductions will be required.

6.2 TRACKING IMPLEMENTATION

FDEP will work with the stakeholders to organize the monitoring data and track project implementation. This information will be presented to the stakeholders in an annual report. The stakeholders will meet at least every 12 months after the adoption of the BMAP to follow up on plan implementation, share new information, and continue to coordinate on TMDL-related issues. The following types of activities may occur at annual meetings:

- *Implementation Data and Reporting*
 - o Collect project implementation information from the stakeholders and MS4 permit reports and compare with the BMAP schedule.
 - o Discuss the data collection process, including any concerns and possible improvements to the process.
 - o Review the monitoring plan implementation, as detailed in **Section 6.3**.
- *Sharing New Information*
 - o Report on seagrass depth limit evaluation results compared to the TMDL seagrass depth limit targets, using the Step 1 and Step 2 evaluations for compliance.
 - o Report on results from water quality monitoring and trend information.
 - o Provide updates on new projects and programs in the basin that will help reduce nutrient loading.
 - o Identify and review new scientific developments on addressing nutrient loading and incorporate any new information into annual progress reports.
 - o Discuss new sampling technologies that will improve source identification.
- *Coordinating TMDL-Related Issues*

- o Provide updates from FDEP on the basin cycle and activities related to any impairments, TMDLs, and BMAPs.
- o Obtain reports from other basins where tools or other information may be applicable to the North IRL TMDLs.

Covering all of these topics at the annual meetings is not required, but they provide examples of the types of information that should be considered for the agenda to assist with BMAP implementation and improve coordination among the agencies and stakeholders. Updates on project implementation, seagrass depth limit target evaluations, and water quality data should be presented, as information becomes available.

6.3 ADAPTIVE MANAGEMENT MEASURES

Adaptive management involves setting up a mechanism for making adjustments in the BMAP when circumstances change or feedback indicates the need for a more effective strategy. Adaptive management measures include the following:

- *Procedures to determine whether additional cooperative strategies are needed;*
- *Criteria/processes for determining whether and when plan components need revision due to changes in costs, environmental impacts, social effects, watershed conditions, or other factors; and*
- *Descriptions of the stakeholders' role after BMAP completion.*

Key components of adaptive management include sharing information and expertise, tracking plan implementation, monitoring water quality and pollutant loads, and holding periodic meetings. BMAP execution will be a long-term process. Some key projects with significant source reductions will extend beyond the first 5 years of BMAP cycle. FDEP and the stakeholders will track implementation efforts and monitor water quality to measure effectiveness and ensure BMAP compliance. The stakeholders will meet at least every 12 months to discuss implementation issues, consider new information, and, if the North IRL subbasin is not projected to meet the TMDLs, determine additional corrective actions. Information on project implementation, monitoring, and other activities status will be collected annually from the participating entities. The stakeholders will review these reports to assess progress towards meeting the BMAP's goals.

6.4 SEAGRASS AND WATER QUALITY MONITORING

This monitoring plan is designed to track seagrass distribution and identify long-term water quality trends in response to BMAP project implementation. Sampling stations, parameters, frequency, and other elements of this strategy may be modified as appropriate to match changing environmental conditions, funding resources, and understanding of the IRL system. However, any modifications made will not affect the ability of the monitoring network to fulfill the objectives noted below.

6.4.1 OBJECTIVES

Focused objectives are critical for a monitoring strategy to provide the information needed to evaluate implementation success. The primary and secondary monitoring objectives for the North IRL monitoring plan are described below. The purpose of the primary monitoring is to assess progress towards the TMDL seagrass depth limit targets through the seagrass flyover

mapping and aerial photography interpretation. This information is required to determine compliance with the TMDLs, and is the only component of the monitoring plan that is required. The purpose of the secondary monitoring is to assess water quality trends in the North IRL to determine if watershed nutrient loading is decreasing resulting in improved lagoon water quality, which will allow seagrass to grow to target depths. The water quality data are used to support the seagrass evaluations, but are not required to assess compliance with the TMDL and are, therefore, not a required component of this BMAP monitoring plan.

Primary Monitoring Objective

- *Track seagrass depth limit extent responses to BMAP implementation.*

Secondary Monitoring Objective

- *Track trends in ambient water quality in the North IRL and major tributaries.*

6.4.2 MONITORING PARAMETERS, FREQUENCY, AND NETWORK

To achieve the primary monitoring objective, the main parameter that will be tracked is the seagrass depth limits by project zone, which are identified through the flyover mapping and aerial photography interpretation. FDEP, in conjunction with the SJRWMD, is taking the lead on funding and conducting the flyovers and mapping. In the past, SJRWMD typically has conducted seagrass mapping every 2 years, and FDEP will try to maintain this frequency for the BMAP monitoring plan. The aerial photography is taken in spring to mid-summer, which is during the seagrass growing season. Ground truthing efforts are conducted after the flyovers to verify the aerial images. Using the aerial photography, a map is created showing seagrass extent in the lagoon. These maps will be used in future evaluations to assess progress towards the TMDL seagrass depth limit targets for the North IRL subbasin.

To achieve the secondary monitoring objective above, the existing SJRWMD monthly stations in the North IRL subbasin will be monitored. In addition, there are 5 tributary stations and 1 lagoon station that SJRWMD is proposing to sample, if funding is available. At these stations, SJRWMD analyzes the following parameters:

- | | |
|--|-------------------------------------|
| • <i>Total Kjeldahl Nitrogen</i> | • <i>pH</i> |
| • <i>Nitrite/Nitrate</i> | • <i>Salinity</i> |
| • <i>Ammonia</i> | • <i>Secchi</i> |
| • <i>TP</i> | • <i>Depth of Collection</i> |
| • <i>Orthophosphate</i> | • <i>Total Depth of Sample Site</i> |
| • <i>Chlorophyll-a (corrected)</i> | • <i>Water Temperature</i> |
| • <i>Photosynthetically active radiation</i> | • <i>Field Conditions</i> |
| • <i>True Color</i> | • <i>Total Organic Carbon</i> |
| • <i>Turbidity</i> | • <i>Dissolved Organic Carbon</i> |
| • <i>TSS</i> | • <i>Silica</i> |
| • <i>Dissolved Oxygen</i> | • <i>Alkalinity</i> |
| • <i>Specific Conductivity</i> | • <i>Volatile Suspended Solids</i> |

In addition to the SJRWMD water quality monitoring stations, Volusia County collects monthly water quality data at 2 stations, and the U.S. Geological Survey (USGS) collects flow data at 1 station in the North IRL. **Table 40** lists the stations that SJRWMD, Volusia County, and USGS currently sample in the North IRL subbasin, and these stations are shown by project zone in **Figure 13** through **Figure 15**.

TABLE 40: MONITORING STATIONS IN THE NORTH IRL SUBBASIN

SAMPLING ENTITY	STATION ID	STATION NAME	STATION TYPE	FREQUENCY	YEAR SITE ESTABLISHED	PROJECT ZONE
SJRWMD	27010875	27010875	Water Quality	Monthly	2010	North A
SJRWMD	IRLBFR	IRLBFR	Water Quality	Monthly	2005	North A
SJRWMD	IRLI02	IRLI02	Water Quality	Monthly	1978	North A
SJRWMD	IRLI06	IRLI06	Water Quality	Monthly	1987	North A
SJRWMD	IRLI07	IRLI07	Water Quality	Monthly	1987	North A
SJRWMD	IRLTBC	IRLTBC	Water Quality	Monthly	1989	North A
Volusia County	ODIX	Turnbull Creek at Old Dixie Highway	Water Quality	Monthly	2012	North A
Volusia County	TC1	Turnbull Creek at US Highway 1 Boat Ramp	Water Quality	Monthly	2011	North A
SJRWMD	IRLEGU	IRL at Eau Gallie River at US1	Water Quality	Monthly	1990	North B
SJRWMD	IRLHUS	IRL at Horse Creek at US1	Water Quality	Monthly	1989	North B
SJRWMD	IRLI10	IRLI10	Water Quality	Monthly	1987	North B
SJRWMD	IRLI13	IRLI13	Water Quality	Monthly	1987	North B
SJRWMD	IRLI15	IRLI15	Water Quality	Monthly	1979	North B
SJRWMD	IRLI18	IRLI18	Water Quality	Monthly	1987	North B
SJRWMD	IRLI21	IRL East of Mouth of Eau Gallie River	Water Quality	Monthly	1987	North B
USGS	2249007	Eau Gallie River at Heather Glen Cir at Melbourne	Flow	Continuous	1991	North B
SJRWMD	IRLUPEGWR	IRL at Eau Gallie River Upstream at Weir	Water Quality	Monthly	Proposed, if funding is available	North B
SJRWMD	IRLUPHC	IRL at Horse Creek Upstream at Croton Rd	Water Quality	Monthly	Proposed, if funding is available	North B
SJRWMD	IRLI16	IRLI16	Water Quality	Monthly	Proposed, if funding is available	North B
SJRWMD	Barton North	Gus Hipp North	Water Quality	Monthly	Proposed, if funding is available	North B
SJRWMD	Barton South	Gus Hipp South	Water Quality	Monthly	Proposed, if funding is available	North B
SJRWMD	Bracco	Bracco Pond Outfall	Water Quality	Monthly	Proposed, if funding is available	North B

6.4.3 DISCHARGE MONITORING

SJRWMD is proposing to add 3 new water quality monitoring stations: 2 at each of the canals along Gus Hipp Boulevard and 1 at the Bracco Pond outfall. FDEP is working to obtain funding to add discharge stations at each of these 3 locations. The discharge data in conjunction with the water quality data would allow for a calculation of the nutrient loading from these areas. The discharge stations would only be needed for as long as it takes to obtain enough data to represent the usual range of conditions. Approximately 1 to 3 years of data would be needed, depending on the storm conditions during the sampling period. FDEP will be unable to fund the

discharge stations in the first year of the BMAP; however, updates on the status of this monitoring will be provided in the annual BMAP progress reports. The discharge monitoring is only needed if the water quality monitoring occurs at these locations.

6.4.4 DATA MANAGEMENT AND ASSESSMENT

The Florida STORET database serves as the primary repository of ambient water quality data for the state of Florida. FDEP pulls water quality data used for impaired water evaluations and TMDL development directly from the STORET database. Ambient water quality data collected as part of the BMAP will be uploaded into STORET for long-term storage and availability. SJRWMD, FDEP, and some local stakeholders currently upload water quality data into STORET. All BMAP data providers have agreed to upload ambient water quality data to STORET at least once every six months, upon completion of the appropriate quality assurance/quality control (QA/QC) checks.

Other data, such as biological and storm event, may also be collected, but the STORET database is not equipped to store these types of data. Stakeholders agree to provide these data to other BMAP partners upon request, and when appropriate, for inclusion in BMAP data analyses and adaptive management evaluations.

The water quality data will be analyzed after four years of BMAP implementation to determine trends in water quality in the lagoon. A wide variety of statistical methods are available for trend analyses. The selection of an appropriate data analysis method depends on the frequency, spatial distribution, and period of record available from existing data. Specific statistical analyses were not identified during BMAP development; however, commonly accepted methods of data analysis will be used that are consistent with the TMDL model.

6.4.5 QUALITY ASSURANCE/QUALITY CONTROL

Stakeholders participating in the monitoring plan must collect water quality data in a manner consistent with FDEP's standard operating procedures (SOPs) 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>. For BMAP-related data analyses, entities should use National Environmental Laboratory Accreditation Council (NELAC) National Environmental Laboratory Accreditation Program (NELAP) certified laboratories (<http://www.dep.state.fl.us/labs/cgi-bin/aams/index.asp>) or other labs that meet the certification and other requirements outlined in the SOPs. SJRWMD staff and contractors collect, process, and preserve samples according to the SJRWMD's Standard Operating Procedures for the Collection of Surface Water Quality Samples and Field Data–Feb. 13, 2004. Where SJRWMD and FDEP SOPs do not correspond to one another, SJRWMD staff and contractors defer to FDEP's SOPs.

6.5 RESEARCH PRIORITIES

During the BMAP process, the stakeholders identified several research priorities they would like to pursue, if funding becomes available. The Indian River Lagoon 2011 Superbloom Plan of Investigation addresses or complements a number of the listed priorities. These research topics include:

- *Collecting data to update the bathymetry for the IRL Basin, which would be used in the seagrass depth limit evaluations.*
- *Continuing and increasing the frequency of the monitoring along the existing seagrass transects to track seagrass composition, density, and extent.*

- *Implementing phytoplankton, drift algae, and macroalgae monitoring in the basin.*
- *Implementing storm event monitoring at the major outfalls.*
- *Tracking watershed loads by monitoring inflow and outflow nutrient concentrations for each jurisdiction.*
- *Verifying the BMP effectiveness values used in the BMAP, as needed.*
- *Testing/verifying the TN, TP, and seagrass depth regression equations using the seagrass data collected since 1999.*
- *Collecting groundwater load contribution data and conducting groundwater modeling.*
- *Assessing potential impacts to seagrass from sediment resuspension due to high boat traffic in parts of the lagoon.*

During the first iteration of the BMAP, the stakeholders will work with FDEP and IRL NEP to identify other research needs, prioritize these needs, and develop scopes of work to address each research priority. This information will be organized in a more detailed research plan that would be used to guide future efforts, as funding becomes available. These research projects are not BMAP requirements, but would provide valuable information for future assessments of the health of the North IRL.

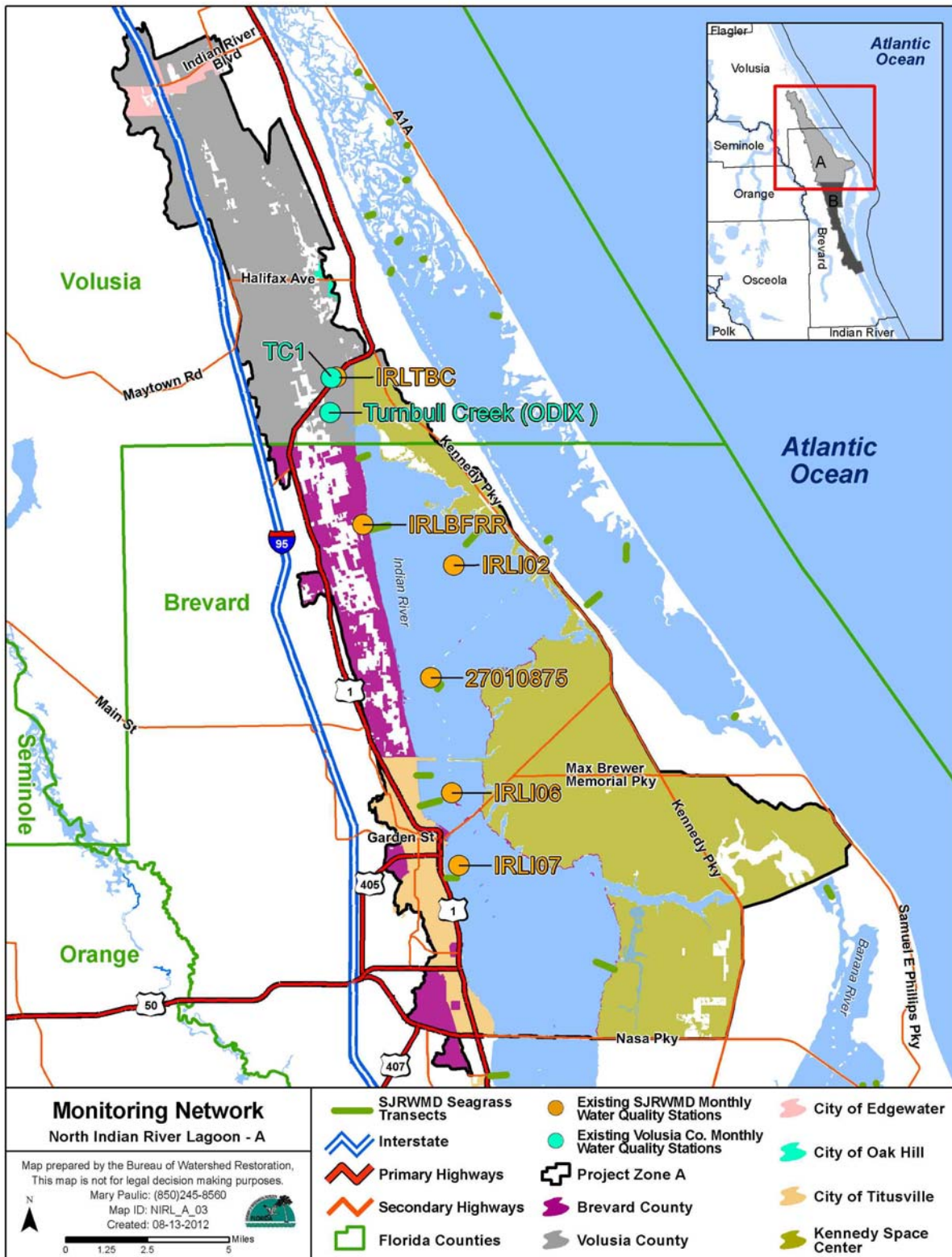


FIGURE 13: MONITORING NETWORK IN THE NORTH A PROJECT ZONE

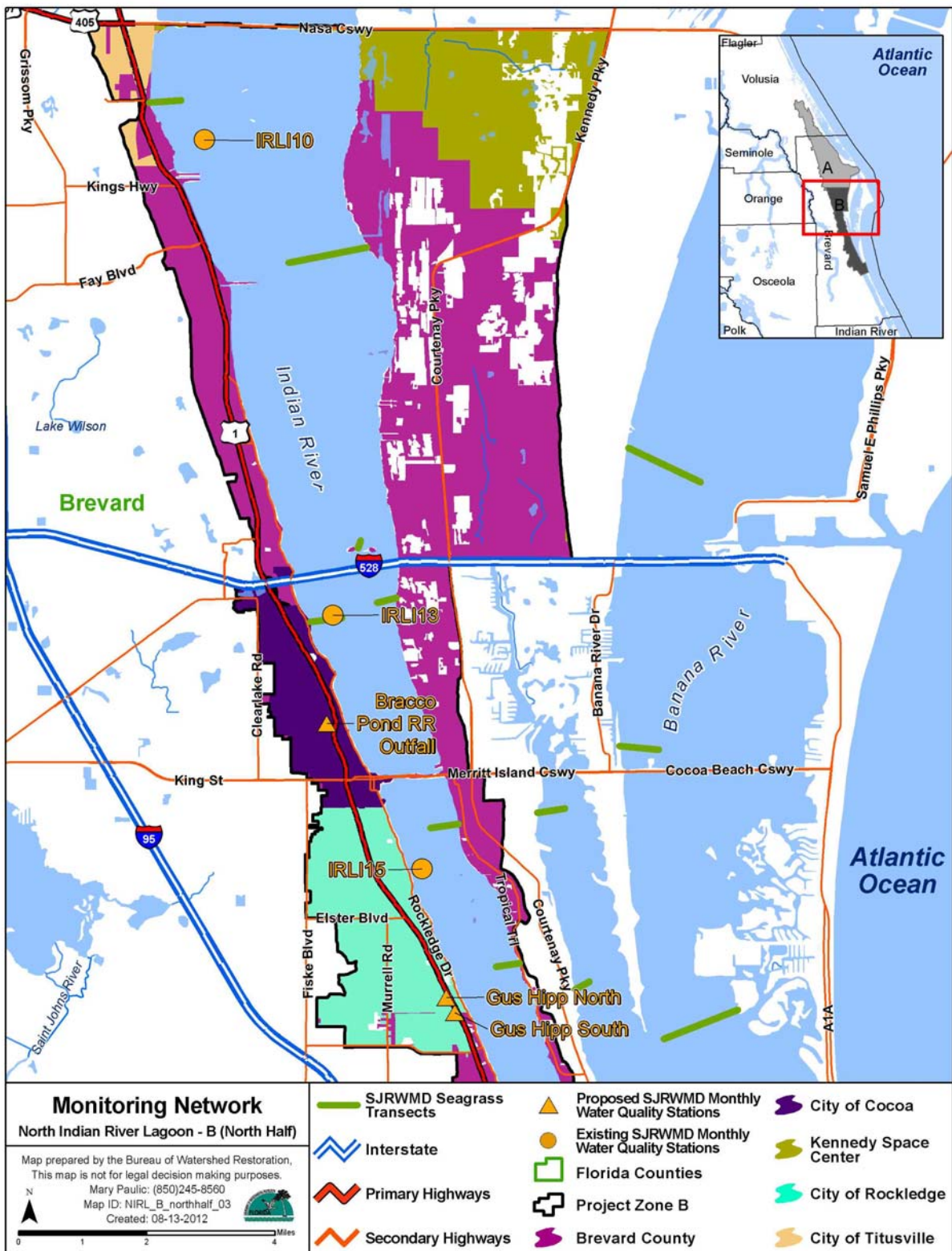


FIGURE 14: MONITORING NETWORK IN THE NORTHERN PART OF THE NORTH B PROJECT ZONE

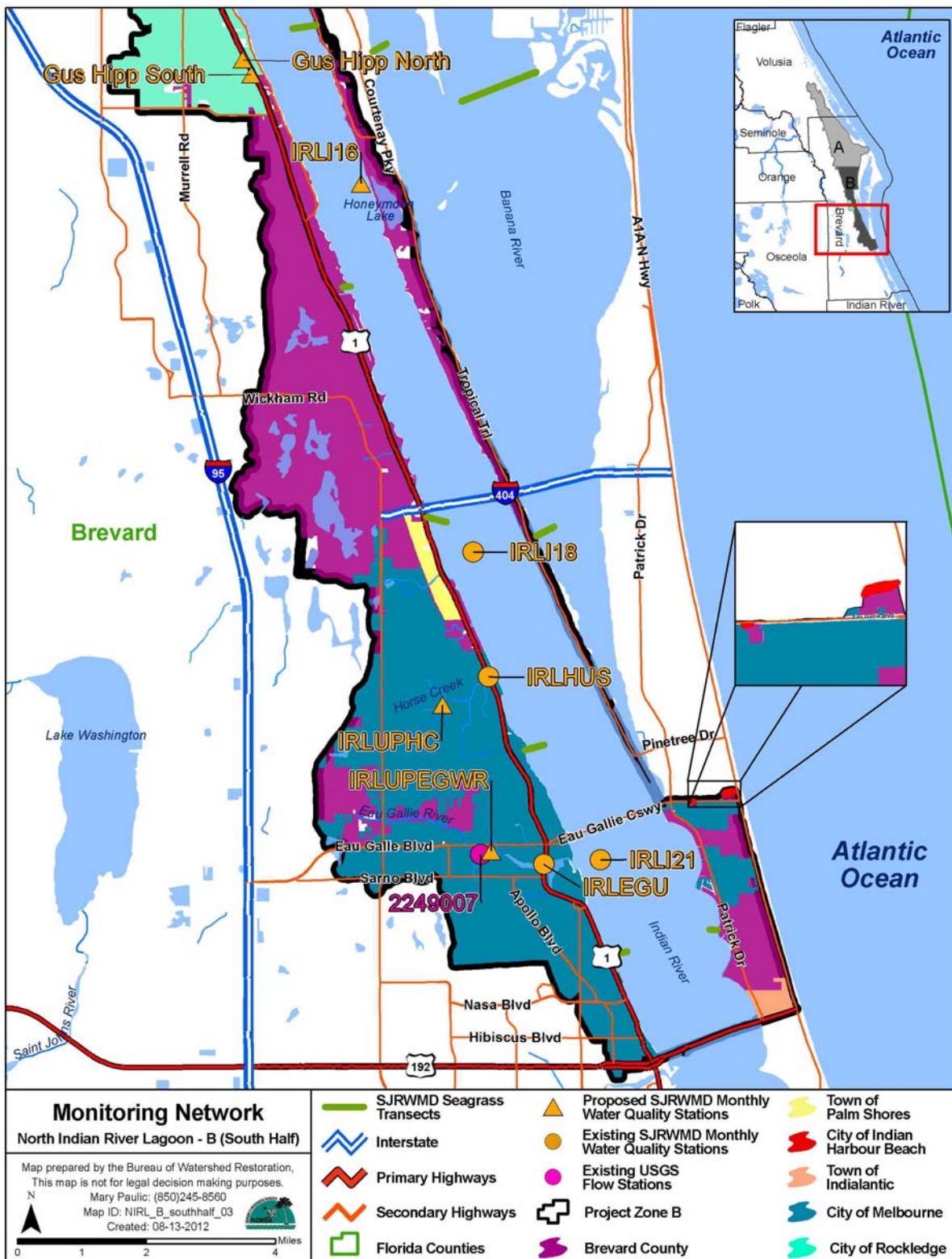


FIGURE 15: MONITORING NETWORK IN THE SOUTHERN PART OF THE NORTH B PROJECT ZONE

CHAPTER 7: COMMITMENT TO PLAN IMPLEMENTATION

Section 403.067(7), F.S., lays out the mechanisms for BMAP implementation (see **Appendix B**). While the BMAP is linked by statute to permitting and other enforcement processes that target individual entities, successful implementation mandates that local stakeholders willingly and consistently work together to attain adopted TMDLs. This collaboration fosters the sharing of ideas, information, and resources. The stakeholders have demonstrated their willingness to confer with and support each other in their efforts.

FDEP will ask for letters of commitment or resolutions of support for the BMAP from the entities to ensure that as staff and board members change over time, the entity has documentation of its support for the BMAP and associated efforts. This process will occur concurrently with BMAP adoption, and the written statements of commitment will be added to this chapter of the BMAP as they are received.

RESOLUTION NO. 26-2012

A RESOLUTION OF THE CITY OF TITUSVILLE, FLORIDA, TO SUPPORT CONTINUED REFINEMENT, DEVELOPMENT AND IMPLEMENTATION OF THE NORTH INDIAN RIVER LAGOON BASIN MANAGEMENT ACTION PLAN TO ACHIEVE TOTAL MAXIMUM DAILY LOADS FOR NUTRIENTS THAT SUPPORT A HEALTHY SUSTAINABLE AND PRODUCTIVE ESTUARINE ECOSYSTEM; AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, in an effort to improve water quality, Section 303(d) of the federal Clean Water Act requires the adoption of Total Maximum Daily Loads (TMDLs) of pollutants that may be discharged into impaired surface water bodies of the United States; and

WHEREAS, the Florida Department of Environmental Protection (FDEP) has identified waters in the North Indian River Lagoon Basin that are impaired for nutrients under Rule 62-303, Florida Administrative Code; and

WHEREAS, The Florida Department of Environmental Protection established a Total Maximum Daily Load (TMDL) for the Indian River Lagoon in March 2009; and

WHEREAS, a clean and healthy, sustainable and productive Lagoon is of utmost importance to the ecological, economic, aesthetic, and recreational welfare of all CITY OF TITUSVILLE residents, businesses, and visitors; and

WHEREAS, it is the goal of the CITY OF TITUSVILLE to find cost effective and efficient measures for implementing water quality improvements for the Indian River Lagoon; and

WHEREAS, local, regional and state entities including the CITY OF TITUSVILLE, the BREVARD COUNTY BOARD OF COUNTY COMMISSIONERS, the VOLUSIA COUNTY BOARD OF COUNTY COMMISSIONERS, the CITY OF COCOA, the CITY OF EDGEWATER, the CITY OF INDIAN HARBOR BEACH, the CITY OF MELBOURNE, the CITY OF OAK HILL, the CITY OF ROCKLEDGE, the FLORIDA DEPARTMENT OF TRANSPORTATION DISTRICT 5, the KENNEDY SPACE CENTER, the TOWN OF INDIALANTIC, the TOWN OF PALM SHORES, the TOWN OF MELBOURNE VILLAGE, the FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES, the INDIAN RIVER NATIONAL ESTUARY PROGRAM, and the ST. JOHNS RIVER WATER MANAGEMENT DISTRICT have worked together over a multiyear period with the FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP) to develop a Basin Management Action Plan (BMAP) with a goal of reducing nutrient discharges to the Indian River Lagoon; and

WHEREAS, the North Indian River Lagoon BMAP was completed in September 2012; and

WHEREAS, the BMAP stakeholders and FDEP acknowledge technical uncertainties in the model data used to develop the 2009 TMDL and allocations; and

WHEREAS, the CITY OF TITUSVILLE partnered with the BREVARD COUNTY BOARD OF COUNTY COMMISSIONERS, the FLORIDA DEPARTMENT OF TRANSPORTATION DISTRICT 5, and other local municipalities within Brevard County, coupled with additional support from the Patrick Air Force Base, to update and refine the model data; and

WHEREAS, the update and refinement of the model is anticipated to result in revisions to the TMDL and BMAP; and

NOW THEREFORE, BE IT RESOLVED BY THE CITY OF TITUSVILLE, FLORIDA, as follows:

Section 1. The CITY OF TITUSVILLE supports implementation of the BMAP, and will seek the necessary approvals and funding to carry out management actions for which the CITY OF TITUSVILLE has responsibility.

Section 2. The CITY OF TITUSVILLE supports continued refinement of the TMDL modeling and revisions to the BMAP to ensure management actions are effective in achieving a clean and healthy Indian River Lagoon.

Section 3. The CITY OF TITUSVILLE endorses a coordinated and comprehensive watershed management approach to address and achieve nutrient load reductions as necessary.

Section 4. The CITY OF TITUSVILLE will identify and advise FDEP of any issues or concerns that could be obstacles to carrying out management actions identified in the BMAP, including technical, funding, and legal difficulties.

Section 5. The CITY OF TITUSVILLE will continue to communicate and coordinate actions and funding across community organizations, agencies, and programs with regard to BMAP implementation.

Section 6. This Resolution shall take effect immediately upon adoption.

PASSED AND ADOPTED this 9th day of October, 2012.

ATTEST:

Wanda Wells
Wanda Wells, City Clerk

James H. Tulley, Jr.
James H. Tulley, Jr., Mayor



RESOLUTION NO. 26-2012

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PASSED AND ADOPTED this 9th day of October, 2012.

James H. Tulley, Jr., Mayor

ATTEST:

Wanda Wells, City Clerk



INDIAN RIVER LAGOON NATIONAL ESTUARY PROGRAM

525 Community College Parkway S.E.
Palm Bay, FL 32909
(321)984-4950
ItsYourLagoon.com

Thomas Frick, Chief
Bureau of Watershed Restoration
Florida Department of Environmental Protection Mail Station #3510
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Indian River Lagoon Basin Management Action Plans—North IRL, Central IRL, Banana River Lagoon

The Indian River Lagoon National Estuary Program (IRLNEP) Advisory Board thanks the Florida Department of Environmental Protection (FDEP) for the periodic updates and presentations regarding the status of Basin Management Action Plans (BMAPs) for the three sub-basins with water quality targets established under the total maximum daily load (TMDL) program. We also look forward to receiving additional updates on the status of the BMAP for the St. Lucie River Estuary as it is drafted and adopted.

FDEP and stakeholders from around the lagoon have expended considerable time and energy to prepare these BMAPs for adoption. Adoption represents the first milestone in a series of critical steps to restore the lagoon's water quality through mandated reductions of external nutrient loads and implementation of projects to address existing, internal legacy loads. We understand the need to consider technical and economic feasibility as we move toward the reductions needed to recover deeper seagrass habitats, with this biological response being the sole metric for evaluating success in the first phase. In recognition of these realities, the BMAP extends over a 15-year timeframe in three, 5-year phases or iterations. We acknowledge that it will require time to assemble and apply the resources needed to complete projects that will reduce external and internal loads.

Along with the adoption and support of the BMAP, we strongly recommend that all stakeholders take additional actions due to the unexpected and unprecedented phytoplankton blooms that occurred in 2011 and 2012 that have led to significant seagrass losses (30,000+ acres) in the northern, central and Banana River lagoons. The St. Johns River Water Management District has organized a scientific consortium of academic and research organizations to investigate the impacts of these blooms and plan to report findings early next year. In the meantime, all stakeholders should recognize an increased sense of urgency regarding potential damage to the Indian River Lagoon ecosystem, which is the core resource generating \$3.7 billion of environmental, economic and cultural value in the region each year.

In this regard, we specifically request that FDEP support actions among stakeholders whereby they identify priorities for responses beyond those specified for in the first phase of the TMDL process. Such priorities should include plans to move beyond seagrasses as the sole metric of ecosystem health. Furthermore, we ask that the state work with the US Army Corp of Engineers and the South Florida community to lessen, or optimally to prevent, future harmful discharges from Lake Okeechobee of nutrient-rich, polluted water into the St. Lucie River and southern IRL. From stakeholders, we request expedited implementation of nutrient reduction projects to the extent practicable and a commitment to champion a call for resources from their agencies to address the chosen priorities. For its part, the IRLNEP remains committed to working with stakeholders to identify priorities, address priorities directly

Working to restore one of the most biodiverse estuaries in the United States

by funding rigorous and relevant technical and educational projects, and collaborate with stakeholders to obtain the financial and logistical resources needed to address their chosen priority actions.

Again, we thank the FDEP for their efforts to keep us informed, and we look forward to approval and implementation of the BMAPs, along with auxiliary efforts to create and implement sustainable management for the nation's most bio-diverse estuary, the Indian River Lagoon.

This letter does not represent the individual views of the member agencies or organizations, but the collective assessment of the program, and simply lists the member organizations of the Advisory Board. The member organizations of the Indian River Lagoon National Estuary Program Advisory Board are:

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Department of Agriculture/NRCS
U.S. Army Corps of Engineers
National Aeronautics and Space Administration
The Nature Conservancy
Bill Kerr (member emeritus)
Citizens Action Committee
Technical Action Committee
St. Johns River Water Management District
South Florida Water Management District
Volusia County
Brevard County
Indian River County
St. Lucie County
Martin County
Florida Department of Agriculture and Consumer Services
Florida Fish and Wildlife Conservation Commission
Florida Inland Navigation District

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U.S. Department of Agriculture/NRCS
U.S. Army Corps of Engineers
National Aeronautics and Space Administration
The Nature Conservancy
Bill Kerr (member emeritus)
Citizens Action Committee
Technical Advisory Committee
St. Johns River Water Management District
South Florida Water Management District
Volusia County
Brevard County
Indian River County
St. Lucie County
Martin County
Florida Department of Agriculture and Consumer Services
Florida Fish and Wildlife Conservation Commission
Florida Inland Navigation District*

National Aeronautics and Space Administration
Kennedy Space Center
Kennedy Space Center, FL 32899



December 12, 2012

Reply to Attn of: TA-A4

Mary Paulic, Basin Coordinator
Florida Department of Environmental Protection
Watershed Planning and Coordination Section
2600 Blair Stone Road, Mail Station No. 3565
Tallahassee, FL 32399-2400

Subject: National Aeronautics and Space Administration (NASA) John F. Kennedy Space Center (KSC) Commitment to Support and Work on the North Indian River Lagoon and Banana River Basin Management Action Plans (BMAPs) Implementation

In an effort to improve water quality, Federal Clean Water Act Section 303(d), requires adoption of Total Maximum Daily Loads (TMDLs) of pollutants that may be discharged into impaired surface water bodies of the United States. The Florida Department of Environmental Protection (FDEP) identified waters in the North Indian River Lagoon and Banana River impaired for nutrients under the Florida Administrative Code, Rule 62-303.

To reduce lagoon nutrient discharges and improve seagrass extent, basin stakeholders (local, regional, state, Federal, and private entities) developed BMAPs over a multiyear period for selected water bodies in the impaired areas. These BMAPs provide for implementation of water quality improvement projects and strategic monitoring to assess water quality and seagrass improvement.

NASA KSC is committed to the following actions to ensure the success of this endeavor:

1. Support an equitable and cost effective watershed management approach to address and achieve TMDLs related pollutant load reductions and seagrass improvements.
2. Support the necessary approvals and funding needed to implement the NASA management actions identified in the BMAPs and assist action implementation as required approvals and funding are secured.
3. Track implementation of management actions NASA is responsible for.
4. Identify and advise FDEP of any issues or concerns of possible obstacles to carrying out BMAPs identified management actions, including technical, funding, and legal obstacles.

5. Continue to communicate and coordinate actions and funding across community organizations, agencies, and programs with regard to BMAPs implementation.

If you have any questions, please contact Doug Durham at (321) 867-8429.



Denise R. Thaller
Chief, NASA Environmental and Medical Division

National Aeronautics and Space Administration
Kennedy Space Center
Kennedy Space Center, FL 32899

December 12, 2012

Reply to Attn of: TA-A4

Mary Paulic, Basin Coordinator
Florida Department of Environmental Protection
Watershed Planning and Coordination Section
2600 Blair Stone Road, Mail Station No. 3565
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If you have any questions, please contact Dough Durham at (321) 867-8429.

Denise R. Thaller
Chief, NASA Environmental and Medical Division

APPENDICES

APPENDIX A: TMDL BASIN ROTATION SCHEDULE

TMDLs are developed, allocated, and implemented through a watershed management approach (managing water resources within their natural boundaries) that addresses the state's 52 major hydrologic basins in 5 groups, on a rotating schedule. **Table A-1** shows the hydrologic basins within each of the 5 groups, with the FDEP District office of jurisdiction.

TABLE A-1: MAJOR HYDROLOGIC BASINS BY GROUP AND FDEP DISTRICT OFFICE

FDEP DISTRICT	GROUP 1 BASINS	GROUP 2 BASINS	GROUP 3 BASINS	GROUP 4 BASINS	GROUP 5 BASINS
NW	Ochlockonee–St. Marks	Apalachicola–Chipola	Choctawhatchee–St. Andrews Bay	Pensacola Bay	Perdido Bay
NE	Suwannee	Lower St. Johns	Not applicable	Nassau–St. Marys	Upper East Coast
Central	Ocklawaha	Middle St. Johns	Upper St. Johns	Kissimmee	Indian River Lagoon
SW	Tampa Bay	Tampa Bay Tributaries	Sarasota Bay–Peace–Myakka	Withlacoochee	Spring Coast
S	Everglades West Coast	Charlotte Harbor	Caloosahatchee	Fisheating Creek	Florida Keys
SE	Lake Okeechobee	St. Lucie–Loxahatchee	Lake Worth Lagoon–Palm Beach Coast	Southeast Coast–Biscayne Bay	Everglades

Each group will undergo a cycle of 5 phases on a rotating schedule:

Phase 1: Preliminary evaluation of water quality

Phase 2: Strategic monitoring and assessment to verify water quality impairments

Phase 3: Development and adoption of TMDLs for waters verified as impaired

Phase 4: Development of basin management action plan (BMAP) to achieve the TMDL

Phase 5: Implementation of the BMAP and monitoring of results

The Indian River Lagoon Basin is a Group 5 basin and the Cycle 1 list of verified impaired waters was developed in 2007 with revisions made in 2009. The Cycle 2 list of verified impaired waters was adopted in 2012. Subsequent TMDL and BMAP development is occurring on a schedule driven by the 1998 303(d) list (see <http://www.dep.state.fl.us/water/tmdl/> for more information) and FDEP staff resource availability. FDEP will re-evaluate impaired waters every 5 years to determine whether improvements are being achieved and to refine loading estimates and TMDL allocations using new data. If any changes in a TMDL are required, the applicable TMDL rule may be revised. Changes to a TMDL would prompt revisions to the applicable BMAP, which will be revisited at least every 5 years and modified as necessary, regardless of whether the TMDL is modified.

APPENDIX B: SUMMARY OF STATUTORY PROVISIONS GUIDING BMAP DEVELOPMENT AND IMPLEMENTATION

SECTIONS 403.067(6) AND (7), FLORIDA STATUTES - *Summary of Excerpts*

ALLOCATIONS

- The TMDL shall include reasonable and equitable allocations of the TMDL between or among point and nonpoint sources that will alone, or in conjunction with other management and restoration activities, provide for the attainment of pollutant reductions established pursuant to paragraph (a) to achieve applicable water quality standards.
- The allocations may establish the maximum amount of the pollutant that may be discharged or released in combination with other discharges or releases.
- Allocations may also be made to individual basins and sources or as a whole to all basins and sources or categories of sources of inflow to the water body or water body segments.
- An initial allocation of allowable pollutant loads may be developed as part of the TMDL; in such cases detailed allocations to specific point sources and categories of nonpoint sources shall be established in the basin management action plan.
- The initial and detailed allocations shall be designed to attain pollutant reductions established pursuant to paragraph 403.067(6)(a) (calculation of total maximum daily load) and shall be based on consideration of:
 1. Existing treatment levels and management practices;
 2. Best management practices established and implemented pursuant to paragraph (7)(c);
 3. Enforceable treatment levels established pursuant to state or local law or permit;
 4. Differing impacts pollutant sources may have on water quality;
 5. The availability of treatment technologies, management practices, or other pollutant reduction measures;
 6. Environmental, economic, and technological feasibility of achieving the allocation;
 7. The cost benefit associated with achieving the allocation;
 8. Reasonable timeframes for implementation;
 9. Potential applicability of any moderating provisions such as variances, exemptions, and mixing zones; and
 10. The extent to which non-attainment of water quality standards is caused by pollution sources outside of Florida, discharges that have ceased, or alterations to water bodies prior to the date of this act.

GENERAL IMPLEMENTATION

- **DEP is the lead agency** in coordinating TMDL implementation, through existing water quality protection programs.
- **Application of a TMDL by a water management** district does not require WMD adoption of the TMDL.
- **TMDL implementation may include**, but is not limited to:
 - o Permitting and other existing regulatory programs
 - o Non-regulatory and incentive-based programs
 - o Other water quality management and restoration activities, such as Surface Water Improvement and Management (SWIM) plans or **basin management action plans**
 - o Pollutant trading or other equitable economically based agreements
 - o Public works
 - o Land acquisition

BASIN MANAGEMENT ACTION PLAN DEVELOPMENT

- DEP may develop a basin management action plan that addresses some or all of the

watersheds and basins tributary to a TMDL waterbody.

- A basin management action plan **shall**:
 - Integrate appropriate management strategies available to the state through existing water quality protection programs.
 - Equitably allocate pollutant reductions to individual basins, all basins, each identified point source, or category of nonpoint sources, as appropriate.
 - Identify the mechanisms by which potential future increases in pollutant loading will be addressed.
 - Specify that for nonpoint sources for which BMPs have been adopted, the initial requirement shall be BMPs developed pursuant to paragraph (c).
 - Establish an implementation schedule.
 - Establish a basis for evaluating plan effectiveness.
 - Identify feasible funding strategies.
 - Identify milestones for implementation and water quality improvement, and an associated water quality monitoring component to evaluate reasonable progress over time.
 - Be adopted in whole or in part by DEP Secretarial Order, subject to chapter 120.
- A basin management action plan **may**:
 - Give load reduction credits to dischargers that have implemented load reduction strategies (including BMPs) prior to the development of the BMAP. (*Note: this assumes the related reductions were not factored into the applicable TMDL.*)
 - Include regional treatment systems or other public works as management strategies.
 - Provide for phased implementation to promote timely, cost-effective actions.
- An assessment of progress in achieving milestones shall be conducted every 5 years and the basin management action plan revised, as appropriate, in cooperation with basin stakeholders, and adopted by secretarial order.
- DEP shall assure that key stakeholders are invited to participate in the basin management action plan development process, holding at least one noticed public meeting in the basin to receive comments, and otherwise encouraging public participation to the greatest practicable extent.
- A basin management action plan shall not supplant or alter any water quality assessment, TMDL calculation, or initial allocation.

BASIN MANAGEMENT ACTION PLAN IMPLEMENTATION

- NPDES Permits
 - Management strategies related to a discharger subject to NPDES permitting shall be included in subsequent applicable NPDES permits or permit modifications when the permit expires (is renewed), the discharge is modified (revised), or the permit is reopened pursuant to an adopted BMAP.
 - Absent a detailed allocation, TMDLs shall be implemented through NPDES permit conditions that include a compliance schedule. The permit shall allow for issuance of an order adopting the BMAP within five years. (**Note:** *Intended to apply to individual wastewater permits – not MS4s*)
 - Once the BMAP is adopted, the permit shall be reopened, as necessary, and permit conditions consistent with the BMAP shall be established.
 - Upon request by a NPDES permittee, DEP may establish individual allocations prior to the adoption of a BMAP, as part of a permit issuance, renewal, or modification (revision).
 - To the maximum extent practicable, MS4s shall implement a TMDL or BMAP through the use of BMPs or other management measures.
 - A BMAP does not take the place of NPDES permits or permit requirements.
 - Management strategies to be implemented by a DEP permittee shall be completed according to the BMAP schedule, which may extend beyond the 5-year term of an NPDES permit.

- o Management strategies are not subject to challenge under chapter 120 when they are incorporated in identical form into a NPDES permit or permit modification (revision).
- Management strategies assigned to nonagricultural, non-NPDES permittees (state, regional, or local) shall be implemented as part of the applicable permitting programs.
- Nonpoint source dischargers (e.g., agriculture) included in a BMAP shall demonstrate compliance with the applicable TMDLs by either implementing appropriate BMPs established under paragraph 7(c), or conducting water quality monitoring prescribed by **DEP or a WMD**. (*Note: this is not applicable to MS4s, as they are considered point sources under the federal Clean Water Act and TMDL Program.*)
 - o Failure to implement BMPs or prescribed water quality monitoring may be subject to **DEP or WMD** enforcement action.
- Responsible parties who are implementing applicable BMAP strategies shall not be required to implement additional pollutant load reduction strategies, and shall be deemed in compliance with this section. However, this does not limit DEP's authority to amend a BMAP.

BEST MANAGEMENT PRACTICES

- DEP, in cooperation with WMDs and other interested parties, may develop interim measures, BMPs, or other measures for non-agricultural nonpoint sources to achieve their load reduction allocations.
 - o These measures may be adopted by **DEP or WMD** rule. If adopted, they shall be implemented by those responsible for non-agricultural nonpoint source pollution.
- DACS may develop and adopt by rule interim measure, BMPs, or other measures necessary for agricultural pollutant sources to achieve their load reduction allocations.
 - o These measures may be implemented by those responsible for agricultural pollutant sources. **DEP, the WMDs, and DACS** shall assist with implementation.
 - o In developing and adopting these measures, DACS shall consult with DEP, DOH, the WMDs, representatives of affected farming groups, and environmental group representatives.
 - o The rules shall provide for a notice of intent to implement the practices and a system to ensure implementation, including recordkeeping.
- Verification of Effectiveness and Presumption of Compliance -
 - o DEP shall, at representative sites, verify the effectiveness of BMPs and other measures adopted by rule in achieving load reduction allocations.
 - o DEP shall use best professional judgment in making the initial verification of effectiveness, and shall notify **DACS and the appropriate WMD** of the initial verification prior to the adoption of a rule proposed pursuant to this paragraph.
 - o Implementation of rule-adopted BMPs or other measures initially verified by DEP to be effective, or verified to be effective by monitoring at representative sites, provides a presumption of compliance with state water quality standards for those pollutants addressed by the practices.
- Reevaluation –
 - o Where water quality problems are demonstrated despite implementation, operation, and maintenance of rule-adopted BMPs and other measures, **DEP, a WMD, or DACS**, in consultation with DEP, shall reevaluate the measures. If the practices require modification, the revised rule shall specify a reasonable time period for implementation.

APPENDIX C: SUMMARY OF EPA-RECOMMENDED ELEMENTS OF A COMPREHENSIVE WATERSHED PLAN

The following is an excerpt on the 9 elements of a watershed plan from the EPA's "Draft Handbook for Developing Watershed Plans to Restore and Protect Our Waters." Additional information regarding these elements can be found in the full version of the handbook located online at: http://www.epa.gov/owow/nps/watershed_handbook/.

NINE MINIMUM ELEMENTS TO BE INCLUDED IN A WATERSHED PLAN FOR IMPAIRED WATERS FUNDED USING INCREMENTAL SECTION 319 FUNDS

Although many different components may be included in a watershed plan, EPA has identified a minimum of 9 elements that are critical for achieving improvements in water quality. EPA requires that these 9 elements be addressed for watershed plans funded using incremental section 319 funds and strongly recommends that they be included in all other watershed plans that are intended to remediate water quality impairments.

The 9 elements are provided below, listed in the order in which they appear in the guidelines. Although they are listed as *a* through *i*, they do not necessarily take place sequentially. For example, element *d* asks for a description of the technical and financial assistance that will be needed to implement the watershed plan, but this can be done only after you have addressed elements *e* and *i*.

Explanations are provided with each element to show you what to include in your watershed plan.

NINE ELEMENTS

a. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. Sources that need to be controlled should be identified at the significant subcategory level along with estimates of the extent to which they are present in the watershed (e.g., X number of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).

What does this mean?

Your watershed plan should include a map of the watershed that locates the major sources and causes of impairment. Based on these impairments, you will set goals that will include (at a minimum) meeting the appropriate water quality standards for pollutants that threaten or impair the physical, chemical, or biological integrity of the watershed covered in the plan.

b. An estimate of the load reductions expected from management measures.

What does this mean?

You will first quantify the pollutant loads for the watershed. Based on these pollutant loads, you'll determine the reductions needed to meet the water quality standards.

You will then identify various management measures (see element c below) that will help to reduce the pollutant loads and estimate the load reductions expected as a result of these management measures to be implemented, recognizing the difficulty in precisely predicting the performance of management measures over time.

Estimates should be provided at the same level as that required in the scale and scope component in paragraph a (e.g., the total load reduction expected for dairy cattle feedlots, row crops, or eroded streambanks). For waters for which EPA has approved or established TMDLs, the plan should identify and incorporate the TMDLs.

Applicable loads for downstream waters should be included so that water delivered to a downstream or adjacent segment does not exceed the water quality standards for the pollutant of concern at the water segment boundary. The estimate should account for reductions in pollutant loads from point and nonpoint sources identified in the TMDL as necessary to attain the applicable water quality standards.

c. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in paragraph 2, and a description of the critical areas in which those measures will be needed to implement this plan.

What does this mean?

The plan should describe the management measures that need to be implemented to achieve the load reductions estimated under element b, as well as to achieve any additional pollution prevention goals called out in the watershed plan. It should also identify the critical areas in which those measures will be needed to implement the plan. This can be done by using a map or a description.

d. Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.

What does this mean?

You should estimate the financial and technical assistance needed to implement the entire plan. This includes implementation and long-term operation and maintenance of management measures, I/E activities, monitoring, and evaluation activities. You should also document which relevant authorities might play a role in implementing the plan. Plan sponsors should consider the use of federal, state, local, and private funds or resources that might be available to assist in implementing the plan. Shortfalls between needs and available resources should be identified and addressed in the plan.

e. An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.

What does this mean?

The plan should include an I/E component that identifies the education and outreach activities or actions that will be used to implement the plan. These I/E activities may support the adoption and long-term operation and maintenance of management practices and support stakeholder involvement efforts.

f. Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.

What does this mean?

You need to include a schedule for implementing the management measures outlined in your watershed plan. The schedule should reflect the milestones you develop in *g*.

g. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.

What does this mean?

You'll develop interim, measurable milestones to measure progress in implementing the management measures for your watershed plan. These milestones will measure the implementation of the management measures, such as whether they are being implemented on schedule, whereas element *h* (see below) will measure the effectiveness of the management measures, for example, by documenting improvements in water quality.

h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.

What does this mean?

Using the milestones you developed above, you'll develop a set of criteria (or indicators) with interim target values to be used to determine whether progress is being made toward reducing pollutant loads. These interim targets can be direct measurements (e.g., fecal coliform concentrations) or indirect indicators of load reduction (e.g., number of beach closings). You must also indicate how you'll determine whether the watershed plan needs to be revised if interim targets are not met and what process will be used to revise the existing management approach. Where a nonpoint source TMDL has been established, interim targets are also needed to determine whether the TMDL needs to be revised.

*i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item *h* immediately above.*

What does this mean?

The watershed plan must include a monitoring component to determine whether progress is being made toward attainment or maintenance of the applicable water quality standards. The monitoring program must be fully integrated with the established schedule and interim milestone criteria identified above. The monitoring component should be designed to determine whether loading reductions are being achieved over time and substantial progress in meeting water quality standards is being made. Watershed-scale monitoring can be used to measure the effects of multiple programs, projects, and trends over time. Instream monitoring does not have to be conducted for individual BMPs unless that type of monitoring is particularly relevant to the project.

APPENDIX D: PROCESS TO CONDUCT THE SEAGRASS DEPTH LIMIT COMPLIANCE EVALUATION

The goal of the IRL Basin TMDLs is to recover the deeper seagrass habitats. The seagrass response is the most important factor to evaluate the success of the nutrient TMDLs. Even if the relationship among the nutrient loads and the seagrass recovery is not as predicted by the regression model, the load reduction requirements themselves will not determine TMDL success. Assessment of success is based on whether the seagrass grow at sufficient depths.

The TMDL seagrass depth limit targets are based on a union coverage of the seagrass mapping data from the years 1943, 1986, 1989, 1992, 1994, 1996 and 1999. This union coverage was created by the SJRWMD when they set Pollutant Load Reduction Goals for the IRL Basin. The TMDL targets are not based on a full restoration of seagrass depths represented by this union coverage; instead, the TMDL targets were set at 10% less than full restoration. These targets allow for seagrass growth almost to the depths previously seen in the lagoon, while accounting for the fact that changes have been made to the lagoon system, which may limit seagrass growth in some areas.

Compliance with the TMDL seagrass depth limit targets is assessed on a project zone scale using the latest 4 years of seagrass mapping data. For the BMAP, 2 separate 4-year assessment periods were used in the evaluation: (1) seagrass mapping years from 2003, 2005, 2006, and 2007; and (2) seagrass mapping years from 2005, 2006, 2007, and 2009. In order for the assessment years to be compliant with the TMDL seagrass depth limit targets, the data must meet the requirements of the 2-step evaluation process. The first step is a comparison of the TMDL union coverage cumulative frequency distribution curve to the assessment years union cumulative frequency distribution curve. The cumulative distribution curves show what percentage of the seagrass deep edge is located at different depths. In order to be compliant, at least 50% of the assessment years curve, including the median, must be on or to the right of the TMDL curve. The second step in the evaluation process is a comparison of the TMDL union coverage median value to each assessment year's median value. To be compliant in the second step, at least 3 of the 4 assessment year medians must be equal to or greater than the TMDL median. If the seagrass data from the 4 assessment years are compliant with both steps of the test, the project zone is achieving the TMDL depth limit target.

A series of GIS steps must be conducted to obtain the data necessary to complete the 2-step evaluation process. These steps are:

- *Start with the seagrass GIS shapefiles for the 4 latest assessment years and edit these files to include only categories 9113 and 9116, which represent seagrass. Other categories in the GIS shapefiles represent algae cover, which should not be included in this assessment. The seagrass shapefiles only represent the location of the seagrass beds.*
- *Use the dissolve function in GIS to create the union file of the assessment years. This union file results in a coverage of where seagrass beds were located during all 4 assessment years.*
- *Transform the polygons to a polyline in the assessment years union file. This polyline represents the edges of the seagrass beds.*

- *Use the erase function to remove points within dredged areas from the bathymetry shapefile. The bathymetry shapefile provides the depth information for the lagoon system. The dredged areas are removed from this coverage because seagrass are not expected to grow in areas that have been dredged.*
- *Intersect the updated bathymetry shapefile with the seagrass coverage file that was transformed into a polyline. This intersection correlates the depth data with the seagrass locations so that depths along the seagrass bed edge can be determined.*
- *Draw a 15.8-meter buffer around the seagrass polyline, which 7.9 meters inside and 7.9 meters outside the seagrass bed. The bathymetry layer was created by SJRWMD in 1996 and the bathymetry was measured every 15.2 meters. The 15.8-meter buffer around the seagrass polyline ensures that one bathymetry point will be captured in the GIS analysis.*
- *Remove points that fall below 0.5 meters and above 3.5 meters from the coverage. This step is needed because seagrass growing at depths less than 0.5 meters are likely not light-limited, and seagrass are not expected to grow at depths greater than 3.5 meters.*
- *Remove points from the intersections of holes or bare areas, which do not represent the deep edge of the seagrass bed.*
- *Clip the resulting deep edge file to each project zone (BRL A, BRL B, North A, North B, Central A, Central SEB, and Central B).*

These steps are also followed separately for each assessment year so that the median value can be calculated.

The final points that represent the seagrass deep edge boundary for the assessment years union coverage are then exported from GIS into Excel to conduct the 2-step evaluation. The depths points are sorted from highest to lowest and the count of the number of points at each depth are determined. The cumulative count is determined by taking the count for the shallowest depth and adding it to the count for the next shallowest point until the counts for all the depths are added together to yield the total number of depth points. The cumulative count at each depth is divided by the total points to determine the percentage of the seagrass points at each depth. These points are then plotted as a curve on a graph for comparison to the TMDL cumulative distribution curve. For the Step 2 evaluation, the median depth point is calculated for each assessment year using Excel. These medians are then compared to the TMDL median to determine compliance.

As noted in Chapter 2, both the North A and North B project zones were noncompliant for the Step 1 and Step 2 evaluations. Therefore, the TMDL seagrass depth limit targets are not being achieved based on the latest 4 seagrass mapping years, and the stakeholders in the North IRL subbasin were required to make reductions in this first iteration of the North IRL BMAP.

APPENDIX E: PROJECTS TO ACHIEVE THE TMDL

The projects and timeframes for implementation submitted by the entities to achieve their TMDL allocations for the first iteration of the BMAP are summarized in the tables below. 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 FDEP that the 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.

NORTH A PROJECT ZONE

BREVARD COUNTY

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	TREATMENT ACRES	PROJECT COST	ANNUAL O&M COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
BC-1	Old Dixie Highway 601	Sediment Trap	N/A	Unknown	Unknown	Unknown	Completed	4	1.2
BC-2	Chain of Lakes Pond	Wet detention pond	1,072.5	\$2,051,405	Unknown	2010	Completed	2,699	1,109.4
BC-3	FYN, fertilizer and pet waste ordinances, PSAs, pamphlets, website, illicit discharge program	Education	N/A	Unknown	Unknown	Ongoing	Ongoing	1,383	178.4
BC-4	Scottsmoor I	Wet detention pond	530.9	\$601,664	\$1,000	2013	Planned, Funded	1,013	194.3
BC-5	Chain of Lakes Southern Expansion Phase 1	Wet detention pond	575.2	\$693.100	\$1,000	2013	Funded	575	622.5
BC-6	Chain of Lakes Reuse	Stormwater reuse	N/A	Unknown	Unknown	2005	Completed	498	63.2
N/A	Total Project Reductions	N/A	N/A	N/A	N/A	N/A	N/A	6,172	2,169.0
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	N/A	N/A	2,180	281.9
N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	N/A	N/A	3,992	1,877.1

CITY OF EDGEWATER

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	ANNUAL O&M COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
EW-1	FYN; landscaping, irrigation, and pet waste ordinances; pamphlets, website, illicit discharge program	Education	\$15,000	Ongoing	Ongoing	74	9.8
N/A	Total Project Reductions	N/A	N/A	N/A	N/A	74	9.8
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	24.3	0.0
N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	49.7	9.8

CITY OF TITUSVILLE

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT DETAIL	TREATMENT ACRES	PROJECT COST	ANNUAL O&M COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
TV-1	Area 1 Stormwater Improvements	Wet detention pond	Upsize existing storm pipes and enclose the Florida Ditch; water directed to TV-2	432.2	\$2,151,510	\$4,797	2010	Completed	1,019	411.8
TV-2	Chain of Lakes Regional Stormwater Pond	Wet detention pond	Construction of a regional park, featuring wetlands, treatment ponds, and recreational features	339.8	Unknown	\$15,620	2010	Completed	360	159.6
TV-3	Draa Field Stormwater Park	Wet detention pond	Water quality treatment for Area 2 drainage basin	281.4	\$149,506	Unknown	12/2012	Started	1,598	618.7
TV-4	St. Johns Basin Stormwater Improvements	Wet detention pond	Construction of a 3.5 acre wet detention pond to treat runoff from mixed use lands prior to discharge to the IRL	882.1	\$1,854,254	Unknown	7/2012	Started	79	12.5
TV-5	St. Johns Basin Stormwater Improvements	2 nd generation baffle box	Installation of a baffle box downstream of the pond to treat runoff from mixed use lands prior to discharge to the IRL	882.1	\$167,343	Unknown	2011	Completed	1,495	213.9
TV-6	Spaceview Park	Alum treatment	Alum treatment	110.6	\$2,300,000	\$15,000	2007	Completed	1,153	377.9
TV-7	Public Education and Outreach	Education	PSAs, pamphlets, pet waste stations, illicit discharge program, newsletter, website	N/A	\$2,200	\$1,000	Ongoing	Ongoing	609	117.2
TV-8	Street Sweeping	Street sweeping	Removes debris from 328 curb miles per cycle at a frequency of 12 cycles per year, for a total of 3,936 miles swept annually	N/A	\$188,120	\$63,106	Ongoing	Ongoing	1,699	765.0
N/A	N/A	N/A	Total Project Reductions	N/A	N/A	N/A	N/A	N/A	8,012.0	2,676.6
N/A	N/A	N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	N/A	6,604.6	1,447.6
N/A	N/A	N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	N/A	1,407.4	1,229.0

FDOT DISTRICT 5

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
FDOT-1	Illicit discharge detection and elimination training, brochures, NDPES flyer	Education efforts	Ongoing	Ongoing	39	11.3
FDOT-2	Street Sweeping	Street sweeping	Ongoing	Ongoing	459	293.9
FDOT-3	Fertilizer Cessation	Fertilizer Cessation	2005	Completed	595	0.0
N/A	Total Project Reductions	N/A	N/A	N/A	1,093	305.2
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	396.6	142.0
N/A	Credit for Future BMAPs	N/A	N/A	N/A	696.4	163.2

KENNEDY SPACE CENTER

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT DETAIL	TREATMENT ACRES	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
KSC-1	Landscape Fertilizer Reduction	Fertilizer reduction	Fertilizer use reduced from 60 tons/yr in 2000 to 20 tons/yr in 2010; formula changed from rapid nitrogen release 16-4-8 to slow nitrogen release, phosphate free 15-0-15	N/A	Ongoing	Ongoing	312	44.2
KSC-2	Citrus Grove Termination Roberts Rd	Fertilizer reduction	Grove lease termination resulted in previously fertilized areas abandoned.	418.9	2010	Completed	140	557.2
KSC-3	Citrus Grove Termination Schwartz Rd	Fertilizer reduction	Grove lease termination resulted in previously fertilized areas abandoned	216.5	2010	Completed	256	308.1
KSC-4	Storage Building L5-0734	Facility demolition	Demolition of facility resulted in loss of impervious area and change of land use	0.02	2010	Completed	0	0.1
KSC-5	Support Building L5-0683	Facility demolition	Demolition of facility resulted in loss of impervious area and change of land use	0.2	2010	Completed	3	1.0
KSC-6	Shuttle Landing Facility - missing from model	Wet detention pond	Runoff is captured and treated before discharging to the IRL	617.8	Unknown	Completed	2,566	1,005.0
KSC-7	Launch Pad 39A	Closed basin	This area is a closed basin	456.5	N/A	Completed	1,255	326.3
KSC-8	Launch Pad 39B	Closed basin	This area is a closed basin	549.0	N/A	Completed	3,043	588.5
KSC-9	Schwartz Road Drainage System - missing from model	Impoundment	Closed system that ultimately drains to the northwest before discharging to an impoundment area adjacent to the IRL	1,614.1	Unknown	Completed	1,290	270.8
KSC-10	Warehouse/Processing Area - missing from model	Wet detention pond	Receives treatment from permitted stormwater treatment systems	15.2	Unknown	Completed	75	33.2
N/A	N/A	N/A	Total Project Reductions	N/A	N/A	N/A	8,940	3,134.4
N/A	N/A	N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	0	0.0
N/A	N/A	N/A	Credit for Future BMAPs	N/A	N/A	N/A	8,940	3,134.4

VOLUSIA COUNTY

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
VC-1	FYN; landscaping, irrigation, pet waste ordinances; pamphlets, website, illicit discharge program	Education	Ongoing	Ongoing	515	58.9
N/A	Total Project Reductions	N/A	N/A	N/A	515	58.9
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	0	0.0
N/A	Credit for Future BMAPs	N/A	N/A	N/A	515	58.9

NORTH B PROJECT ZONE

BREVARD COUNTY

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	TREATMENT ACRES	PROJECT COST	ANNUAL O&M COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
BC-8	Twin Lakes North	Baffle Box	7.7	\$20,082	Unknown	2005	Completed	10	1
BC-9	Twin Lakes South	Baffle Box	8.5	\$20,082	Unknown	2005	Completed	10	1
BC-10	Lucas Place 640 Baffle Box	Baffle Box	5.2	\$36,835	Unknown	2003	Completed	8	0.8
BC-11	Rockledge Drive 2055	Baffle Box	2.4	\$61,094	Unknown	2008	Completed	2	0.1
BC-12	Rockledge and Riverwoods BB	Baffle Box	3.8	\$47,686	Unknown	2000	Completed	3	0.3
BC-13	Anchor Lane	Baffle Box	29.4	\$49,560	Unknown	2000	Completed	47	5.4
BC-14	Kelmore BB	Baffle Box	9.7	\$21,817	Unknown	2003	Completed	10	1.8
BC-15	Puesta Del Sol 735 BB	Baffle Box	2.2	\$24,953	Unknown	2003	Completed	2	0.2
BC-16	Tequesta Harbor Baffle Box	Baffle Box	13.1	\$27,582	Unknown	2009	Completed	21	2.4
BC-17	Broadway Blvd Pond	Pond	85.7	\$553,169	Unknown	2000	Completed	272	55.7
BC-18	Fairglen Elementary School Pond	Pond	80.2	\$730,869	Unknown	2003	Completed	350	111.1
BC-19	Lake George	Pond	719.0	\$347,255	Unknown	2010	Completed	1,261	414.6
BC-20	Merritt Island Courthouse Pond	Pond	7.0	\$95,584	Unknown	2003	Completed	8	2.5
BC-21	Parkway Drive Phase 2 Pond	Pond	1,796.9	\$1,817,720	Unknown	2004	Completed	4,041	1,598.9
BC-22	Street Sweeping	Street Sweeping	N/A	Unknown	Unknown	Ongoing	Ongoing	113	50.8
BC-23	Education Efforts	Education Efforts	N/A	Unknown	Unknown	Ongoing	Ongoing	6,339	1,035.0
BC-24	Pine Island Phase I and II	Wet detention pond	6,232.9	\$3,010,402	\$69,600	2014	Planned, Funded	10,948	3,217.9
BC-25	Merritt Island Airport	Wet detention pond	49.9	\$652,056	Unknown	2011	Completed	5	1.4
BC-26	Pines Industrial	Wet detention pond	56.0	\$500,000	Unknown	Unknown	Planned, Funded	306	92.0
BC-27	Johnson Jr High	MAPS	133.4	\$43,999	\$19,744	2012	Planned, Funded	318	74.4
BC-28	Florida Boulevard	MAPS	88.4	\$40,772	\$18295	2012	Planned, Funded	197	21.0
BC-29	Fairglen Elementary	MAPS	80.2	\$34996	\$15,703	2014	Planned, Funded	123	12.2
BC-30	Port St. John B	MAPS	57.9	\$16,308	\$7315	2013	Planned, Funded	237	41.5
BC-31	Wickham Park North	MAPS	1,796.9	\$75,428	\$33,846	2016	Planned, Funded	2,804	597.8
BC-32	West Avenue 6600 MI	Type 1 baffle box retrofit	50.7	\$15,000	Unknown	Unknown	Planned, Funded	120	12.0
BC-33	Merritt Winter (Magnolia 441 MI)	Type 1 baffle box retrofit	2.7	\$15,000	Unknown	Unknown	Planned, Funded	12	1.6
BC-34	Plat Avenue MI	Type 1 baffle box retrofit	7.3	\$15,000	Unknown	Unknown	Planned, Funded	14	2.2
BC-35	Granada Street1030 East MI	Type 1 baffle box retrofit	38.6	\$15,000	Unknown	Unknown	Planned, Funded	99	16.4
BC-36	Haverhill Avenue PSJ	Type 1 baffle box retrofit	47.5	\$15,000	Unknown	Unknown	Planned, Funded	80	8.0
BC-37	Manth Avenue PSJ	Type 1 baffle box retrofit	69.1	\$15,000	Unknown	Unknown	Planned, Funded	226	29.0

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PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	TREATMENT ACRES	PROJECT COST	ANNUAL O&M COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
BC-38	Rockledge and Riverwoods Blvd. Rockledge	Type 1 baffle box retrofit	3.8	\$15,000	Unknown	Unknown	Planned, Funded	3	0.2
BC-39	Alamanda Indian Harbour Bch.	Type 1 baffle box retrofit	2.8	\$15,000	Unknown	Unknown	Planned, Funded	3	0.3
BC-40	River Shore 1848 Indialantic	Type 1 baffle box retrofit	2.7	\$15,000	Unknown	Unknown	Planned, Funded	3	0.3
BC-41	River Shore 1925 Indialantic	Type 1 baffle box retrofit	7.4	\$15,000	Unknown	Unknown	Planned, Funded	7	0.8
BC-42	Cedar Lane Indialantic	Type 1 baffle box retrofit	3.8	\$15,000	Unknown	Unknown	Planned, Funded	6	0.6
BC-43	Riverview 9856 Indialantic	Type 1 baffle box retrofit	5.7	\$15,000	Unknown	Unknown	Planned, Funded	9	0.9
BC-44	Riverview 9864 Indialantic	Type 1 baffle box retrofit	98.5	\$15,000	Unknown	Unknown	Planned, Funded	202	33.4
BC-45	Oak Ridge Indialantic	Type 1 baffle box retrofit	126.5	\$15,000	Unknown	Unknown	Planned, Funded	257	38.8
BC-46	Kingsmill-Aurora Ph 2	Wet detention pond	1,220.4	\$1,600,000	\$1,000	Unknown	Planned, Funded	4,059	1,589.8
BC-47	Sediment Trap, Grated Inlet Basket, Inlet Weir Cleaning	BMP clean out	N/A	\$392,105	Unknown	Ongoing	Ongoing	7	2.4
BC-48	Alum Pond MAPS	MAPS	92.6	\$100,362	Unknown	Unknown	Planned, Funded	217	22.4
BC-49	Lake George FVI	MAPS	719.0	\$51,200	Unknown	2015	Funded	505	51.3
BC-50	Wickham Park	Stormwater reuse	43.8	Unknown	Unknown	2010	Completed	75	4.6
BC-51	Ellington Park	Stormwater reuse		Unknown	Unknown	2005	Completed	409	87.0
BC-52	Rockledge Barton Park Reuse	Stormwater reuse	736.6	Unknown	Unknown	2009	Completed	262	24.1
BC-53	Florida Boulevard Pond	Wet detention pond	88.4	\$350,384	N/A	2002	Completed	545	185.4
N/A	Total Project Reductions	N/A	N/A	N/A	N/A	N/A	N/A	34,556.0	9,451.3
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	N/A	N/A	5,298.0	995.3
N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	N/A	N/A	29,258.0	8,456.0

CITY OF COCOA

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	TREATMENT ACRES	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
CC-1	Bracco Pond B	Wet detention pond	591.8	Unknown	Completed	2,328	1,049.6
CC-2	Bracco Expansion Area	Wet detention pond	775.2	Unknown	Completed	156	41.8
CC-3	Cocoa Village Park	Dry detention pond	13.5	Unknown	Completed	37	6.9
CC-4	Morris Pond	Wet detention pond	16.2	Unknown	Completed	128	46.7
CC-5	N Brevard Ave Stormwater Treatment Facility	CDS unit	11.3	Unknown	Completed	0	4.8
CC-6	North Fiske Stormwater Retention Facility	100% on-site retention	33.9	Unknown	Completed	42	2.4
CC-7	Suntree Baffle Box #1	2 nd generation baffle box	5.9	Unknown	Completed	7	0.7
CC-8	Street Sweeping	Street sweeping	N/A	Unknown	Completed	459	206.6
CC-9	Bracco Supplemental Water Supply	Stormwater reuse	N/A	Unknown	Completed	1,102	107.6
CC-10	Diamond Square CRA Stormwater Improvements	Wet detention pond	95.4	2011	Completed	108	0.0
N/A	Total Project Reductions	N/A	N/A	N/A	N/A	4,367.0	1,467.1
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	2,409.5	557.2
N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	1,957.5	909.9

CITY OF MELBOURNE

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT DETAIL	TREATMENT ACRES	PROJECT COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
MEL-1	Fee & Apollo Drainage Improvements	Wet detention pond	No treatment is provided within the existing development; completely a water quality addition	43.6	\$525,161	2010	Completed	28	78.8
MEL-2	Dove Street Pond	Wet detention pond	No treatment is provided within the existing development; completely a water quality addition	14.9	\$156,164	2003	Completed	69	31.3
MEL-3	Charles Drive Pipe Replacement	Wet detention pond	Replaced failing stormwater pipe and created wet detention pond; little to no treatment is provided within existing developments	143.3	\$462,644	2010	Completed	183	161.6
MEL-4	Wickham Park Pond	Wet detention pond	Ponds along with piping upgrades help eliminate flooding within the area along with treatment	1,796.9	\$250,000	Unknown	Completed	627	248.3
MEL-5	Babcock Street Realignment	Retention BMPs	Additional treatment was provided for the adjacent drainage basins	42.3	\$1,757,186	Unknown	Completed	163	41.9
MEL-6	Garfield Street Ponds - Lot 12 (North)	Dry detention	Two small dry detention ponds within an existing subdivision (with MEL-7)	24.8	\$181,605	2003	Completed	37	9.2
MEL-7	Garfield Street Ponds - Lot 24 (South)	Dry detention	Two small dry detention ponds within an existing subdivision (with MEL-6)	16.3	Part of MEL-6	2003	Completed	24	6.2
MEL-8	Education Efforts	Education	Irrigation, fertilizer, pet waste management, and landscaping ordinances; pamphlets, presentations, website, illicit discharge program	N/A	Unknown	Ongoing	Ongoing	2,583	587.2
MEL-9	Street Sweeping	Street sweeping	Street sweeping in the basin	N/A	Unknown	Ongoing	Ongoing	873	581.8
MEL-10	Future Street Sweeping	Street sweeping	Additional street sweeping in the basin	N/A	Unknown	Unknown	Planned	873	581.8
MEL-11	Participation in FYN	Education	Future participation in FYN	N/A	Unknown	2017	Planned	2,583	587.2
N/A	N/A	N/A	Total Project Reductions	N/A	N/A	N/A	N/A	8,043.0	2,915.3
N/A	N/A	N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	6,738.5	1,968.4
N/A	N/A	N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	1,304.5	946.9

CITY OF ROCKLEDGE

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	TREATMENT ACRES	PROJECT COST	ANNUAL O&M COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
ROCK-1	Orange Ave Baffle Box	2 nd generation baffle box	10.4	\$8,600	\$2,555	2009	Completed	17	2.3
ROCK-2	Barton Ave Baffle Box	2 nd generation baffle box	14.6	\$9,350	\$2,555	2009	Completed	20	2.9
ROCK-3	Hardee Circle Baffle Box	2 nd generation baffle box	14.6	\$43,420	\$2,555	2009	Completed	17	2.0
ROCK-4	Rockledge Ave Baffle Box	2 nd generation baffle box	29.8	Unknown	\$3,682	2004	Completed	65	13.4
ROCK-5	Bougainvillea Drive Baffle Box	2 nd generation baffle box	27.9	\$29,495	\$2,566	2000	Completed	69	11.9
ROCK-6	Park Ave Baffle Box	2 nd generation baffle box	9.1	\$52,529	\$2,555	2007	Completed	6	0.6
ROCK-7	Little John Lane Baffle Box	2 nd generation baffle box	7.8	\$60,000	\$2,555	2004	Completed	11	1.3
ROCK-8	Fernwood Dr Baffle Box	2 nd generation baffle box	13.2	\$55,750	Unknown	Unknown	Completed	14	1.6
ROCK-9	Valencia Dr Baffle Box	2 nd generation baffle box	9.6	\$58,960	\$2,555	2008	Completed	10	1.2
ROCK-10	Knollwood Baffle Box	2 nd generation baffle box	25.9	\$68,248	\$3,682	2002	Completed	23	2.6
ROCK-11	Sutton St Baffle Box	2 nd generation baffle box	5.1	Unknown	Unknown	2011	Completed	6	0.6
ROCK-12	River Groves Baffle Box	2 nd generation baffle box	8.9	Unknown	Unknown	2011	Completed	5	0.5
ROCK-13	Summer Pl Baffle Box	2 nd generation baffle box	10.6	Unknown	Unknown	2011	Completed	7	0.7
ROCK-14	Sweet St Swale	Swale	6.3	Unknown	Unknown	2011	Completed	30	4.3
ROCK-15	Community Park of Rockledge Regional Facility Phase 1	Wet detention pond	37.4	\$50,000	\$23,974	2004	Completed	8	1.3
ROCK-16	Pineland Park Unit three	Wet detention pond	24.1	\$100,000	\$6,234	2009	Completed	0	0.1
ROCK-17	Barton Park Regional Detention System	Wet detention pond	736.6	\$2,600,000	\$40,000	2010	Completed	2,493	1,136.7
ROCK-18	Florida Ave Stormwater Facility	Wet detention pond	28.0	\$435,000	\$40,950	2010	Completed	88	64.7
ROCK-19	Police Department Pond	Wet detention pond	5.6	\$350,000	\$7,035	2010	Completed	1	0.1
ROCK-20	Huntington Lakes II	Wet detention pond	37.2	\$950,000	Unknown	Unknown	Completed	1	0.3
ROCK-21	Street Sweeping	Street Sweeping	N/A	Unknown	\$54,000	Ongoing	Ongoing	750	337.9
ROCK-22	Treatment Missing from PLSM	Wet detention ponds – missing from model	383.2	Unknown	Unknown	1986-1999	Completed	1,248.0	477.3
ROCK-23	Irrigation, landscaping, and pet waste management ordinances; pamphlets, website, storm drain markings, illicit discharge program	Education	N/A	Unknown	Unknown	Ongoing	Ongoing	630	141.8
N/A	N/A	Total Project Reductions	N/A	N/A	N/A	N/A	N/A	5,519.0	2,206.1
N/A	N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	N/A	2,095.4	593.6
N/A	N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	N/A	3,423.6	1,612.5

CITY OF TITUSVILLE

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT COST	ANNUAL O&M COST	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
TV-9	PSAs, pamphlets, pet waste stations, illicit discharge program, newsletter, website	Education	\$2,200	\$1,000	Ongoing	Ongoing	23	2.3
TV-10	Street Sweeping	Street sweeping	\$188,120	\$63,106	Ongoing	Ongoing	26	11.6
N/A	Total Project Reductions	N/A	N/A	N/A	N/A	N/A	49.0	13.9
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	N/A	46.7	0.0
N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	N/A	2.3	13.9

FDOT DISTRICT 5

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT DETAIL	TREATMENT ACRES	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
FDOT-4	70100-3517-01 French Drains - missing from model	100% on-site retention	French Drain system along SR 5 from University Blvd to Aurora Road – missing from model	21.3	1996	Completed	57	34.2
FDOT-5	70100-3544-01 French Drains- missing from model	100% on-site retention	Add lanes E. of H. Humphrey Bridge to Sykes Creek Parkway – missing from model	7.0	1995	Completed	26	13.6
FDOT-6	70020-3501-01 Pond 1- missing from model	Wet detention pond	SR 5 -Add lanes and reconstruct from Aurora Rd to Post Rd	17.1	2004	Completed	38	22.4
FDOT-7	70020-3501-02A Pond 2A- missing from model	Wet detention pond	SR 5 -Add lanes and reconstruct from Aurora Rd to Post Rd	12.6	2004	Completed	35	19.2
FDOT-8	70020-3501-02B Pond 2B- missing from model	Wet detention pond	SR 5 -Add lanes and reconstruct from Aurora Rd to Post Rd	4.8	2004	Completed	10	5.2
FDOT-9	70020-3501-03 Pond 3- missing from model	Wet detention pond	SR 5 -Add lanes and reconstruct from Aurora Rd to Post Rd	8.4	2004	Completed	18	10.4
FDOT-10	70020-3501-04 Pond 4- missing from model	Dry detention	SR 5 -Add lanes and reconstruct from Aurora Rd to Post Rd	7.9	2004	Completed	17	8.8
FDOT-11	70020-3549-01 Pond 1- missing from model	Wet detention pond	SR 5 - Add lanes and reconstruct from Post Road to SR 404	9.9	2005	Completed	28	14.2
FDOT-12	70020-3549-02 Pond 2- missing from model	Wet detention pond	SR 5 - Add lanes and reconstruct from Post Road to SR 404	18.9	2005	Completed	34	18.2

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FDOT-13	70020-3549-03 Pond 3-missing from model	Wet detention pond	SR 5 - Add lanes and reconstruct from Post Road to SR 404	11.2	2005	Completed	32	16.5
FDOT-14	70020-3549-04 Pond 4-missing from model	Wet detention pond	SR 5 - Add lanes and reconstruct from Post Road to SR 404	3.4	2005	Completed	14	7.0
FDOT-15	70020-3549-05 Pond 5-missing from model	Wet detention pond	SR 5 - Add lanes and reconstruct from Post Road to SR 404	3.4	2005	Completed	11	6.0
FDOT-16	70140-3514-01 Pond A-missing from model	Dry detention	SR 3 - Replace Christa McAuliffe Bridge – missing from model	1.5	1997	Completed	4	2.4
FDOT-17	70140-3514-02 Pond B-missing from model	Wet detention pond	SR 3 - Replace Christa McAuliffe Bridge – missing from model	5.9	1997	Completed	18	7.5
FDOT-18	70120-3518-01 Pond 7 - missing from model	Wet detention pond	SR 518 at SR 513	9.9	1984	Completed	45	21.1
FDOT-19	70008-3505-01 Pond 1 - missing from model	Wet detention pond	From south of SR 518 (Eau Gallie Causeway) to Banana River Drive	2.3	1992	Completed	6	3.4
FDOT-20	Education Efforts	Education	Illicit Discharge Detection and Elimination training, stormwater brochures, NDPES flyer	N/A	Ongoing	Ongoing	86	28.0
FDOT-21	Street Sweeping	Street Sweeping	Street sweeping in the basin	N/A	Ongoing	Ongoing	1,179	754.6
FDOT-22	Fertilizer Cessation	Fertilizer Cessation	Elimination of fertilizer use along the right-of-ways	N/A	2005	Completed	1,552	0.0
N/A	N/A	N/A	Total Project Reductions	N/A	N/A	N/A	3,210.0	992.7
N/A	N/A	N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	649.9	318.9
N/A	N/A	N/A	Credit for Future BMAPs	N/A	N/A	N/A	2,560.6	673.8

KENNEDY SPACE CENTER

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	PROJECT DETAIL	TREATMENT ACRES	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
KSC-11	KSC Landscape Fertilizer Reduction	Fertilizer reduction	Fertilizer use reduced from 60 tons/yr in 2000 to 20 tons/yr in 2010; formula changed from rapid nitrogen release 16-4-8 to slow nitrogen release, phosphate free 15-0-15	155.0	Ongoing	Ongoing	312	44.2
KSC-12	KSC Citrus Grove Termination Jerome Rd West	Fertilizer reduction	Grove lease termination resulted in previously fertilized areas abandoned	715.7	2010	Completed	184	850.8
KSC-13	KARS II Racquetball Court M6-0328A	Facility demolition	Demolition of facility resulted in loss of impervious area and change of land use	0.1	2010	Completed	1	0.2
KSC-14	Visitor Center Storage Building M6-0503	Facility demolition	Demolition of facility resulted in loss of impervious area and change of land use	0.1	2010	Completed	1	0.3
KSC-15	Causeway Wetland Mitigation - missing from model	Wet detention pond	Missing from PLSM - existing permitted stormwater treatment pond	12.6	Unknown	Completed	8	3.8
KSC-16	Visitors Complex/ NASA Badging Center - missing from model	Wet detention pond	Missing from PLSM - existing permitted stormwater treatment pond	131.7	Unknown	Completed	452	169.4
KSC-17	NASA Parkway West - missing from model	Swales	Missing from PLSM - ditch along south side of NASA Parkway West, ends before the IRL	135.8	Unknown	Completed	239	100.9
N/A	N/A	N/A	Total Project Reductions	N/A	N/A	N/A	1,197	1,169.6
N/A	N/A	N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	0	0.0
N/A	N/A	N/A	Credit for Future BMAPs	N/A	N/A	N/A	1,197	1,169.6

TOWN OF INDIALANTIC

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	TREATMENT ACRES	END DATE	STATUS	TN REDUCTION (LBS/YR)	TP REDUCTION (LBS/YR)
TI-1	Swales North of US192 Causeway	Swales	29.2	2001	Completed	297	51.7
TI-2	100% On-Site Retention	Retention	3.5	2001	Completed	35	6.1
TI-3	Pamphlet, website	Education	N/A	2001	Completed	9	1.6
N/A	Total Project Reductions	N/A	N/A	N/A	N/A	341.0	59.4
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	N/A	142.4	30.1
N/A	Credit for Future BMAPs	N/A	N/A	N/A	N/A	198.6	29.3

TOWN OF PALM SHORES

PROJECT NUMBER	PROJECT NAME	PROJECT TYPE	END DATE	STATUS	TN REDUCTION	TP REDUCTION
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					(LBS/YR)	(LBS/YR)
PS-1	Fertilizer and landscaping ordinances, pamphlets, presentations	Education	Ongoing	Ongoing	21	4.2
N/A	Total Project Reductions	N/A	N/A	N/A	21	4.2
N/A	Total BMAP I Required Reductions	N/A	N/A	N/A	0	0.0
N/A	Credit for Future BMAPs	N/A	N/A	N/A	21	4.2

APPENDIX F: GLOSSARY OF TERMS

303(d) List: The list of Florida's waterbodies that do not meet or are not expected to meet applicable water quality standards with technology-based controls alone.

305(b) Report: Section 305(b) of the federal Clean Water Act requires states to report biennially to the EPA on the quality of the waters in the state.

Background: The condition of waters in the absence of human-induced alterations.

Baffle box: An underground stormwater management device that uses barriers (or baffles) to slow the flow of untreated stormwater, allowing particulates to settle out in the box before the stormwater is released into the environment.

Baseline loading: The quantity of pollutants in a waterbody, used as a basis for later comparison.

Basin Management Action Plan (BMAP): The document that describes how a specific TMDL will be implemented; the plan describes the specific load and wasteload allocations as well as the stakeholder efforts that will be undertaken to achieve an adopted TMDL.

Basin Status Report: For the IRL Basin, this document was published in 2006 by FDEP. The report documents the water quality issues, list of water segments under consideration for a TMDL and data needs in the basin.

Best Available Technology (BAT) Economically Achievable: As defined by 40 CFR, §125.3, outlines technology-based treatment requirements in permits.

Best Management Practices (BMPs): Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

Clean Water Act (CWA): The Clean Water Act is a 1977 amendment to the Federal Water Pollution Control Act of 1972, which set the basic structure for regulating discharges of pollutants to waters of the United States.

Continuous deflective separation (CDS) Unit: A patented stormwater management device that uses the available energy of the storm flow to create a vortex to cause a separation of solids from fluids. Pollutants are captured inside the separation chamber, while the water passes out through the separation screen.

Designated use: Uses specified in water quality standards for each waterbody or segment (such as drinking water, swimmable, fishable).

Detention Pond: A stormwater system that delays the downstream progress of stormwater runoff in a controlled manner, typically by using temporary storage areas and a metered outlet device.

Domestic Wastewater: Wastewater derived principally from dwellings, business buildings, institutions and the like; sanitary wastewater; sewage.

Effluent: Wastewater that flows into a receiving stream by way of a domestic or industrial discharge point.

Environmental Protection Agency (EPA): The agency was created in December 1970 to address the nation's environmental problems and to protect the public health. The majority of FDEP's regulatory programs has counterparts at the EPA or is delegated from the EPA.

Event mean concentration: The flow-weighted mean concentration of an urban runoff pollutant measured during a storm event.

Exfiltration: Loss of water from a drainage system as the result of percolation or absorption into the surrounding soil.

External loading: Pollutants originating from outside a waterbody that contribute to the pollutant load of the waterbody.

Florida Department of Environmental Protection (FDEP): FDEP is Florida's principal environmental and natural resources agency. The Florida Department of Natural Resources and the Florida Department of Environmental Regulation were merged together to create FDEP effective July 1, 1993.

Ground Water or Groundwater: Water below the land surface in the zone of saturation where water is at or above atmospheric pressure.

Impairment: The condition of a waterbody that does not achieve water quality standards (designated use) due to pollutants or an unknown cause.

Load Allocations (LA): The portions of a receiving water's loading capacity that are allocated to one of its existing or future nonpoint sources of pollution.

Load Capacity: The greatest amount of loading that a waterbody can receive without violating water quality standards.

Loading: The total quantity of pollutants in stormwater runoff that contributes to the water quality impairment.

Margin of safety (MOS): An explicit or implicit assumption used in the calculation of a TMDL, which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. An explicit MOS is typically a percentage of the assimilative capacity or some other specific amount of pollutant loading (e.g., the loading from an out-of-state source). Most FDEP-adopted TMDLs include an implicit MOS based on the fact that the predictive model runs incorporate a variety of conservative assumptions (they examine worst-case ambient flow conditions, worst-case temperature, and assume that all permitted point sources discharge at their maximum permittable amount).

National Pollutant Discharge Elimination System (NPDES): The permitting process by which technology based and water quality-based controls are implemented.

Nonpoint Source (NPS): Diffuse runoff without a single point of origin that flows over the surface of the ground by stormwater and is then introduced to surface or ground water. NPS

includes atmospheric deposition and runoff or leaching from agricultural lands, urban areas, unvegetated lands, OSTDS, and construction sites.

Nonpoint Source Pollution: Nonpoint source pollution is created by the flushing of pollutants from the landscape by rainfall and the resulting stormwater runoff, or by the leaching of pollutants through the soils into the ground water.

Outfall (general): The place where a sewer, drain, or stream discharges.

Outfall (MS4): A point source at the location where a MS4 discharges to water of the state and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels, or other conveyances which connect segments of the same stream or other waters of the state and are used to convey waters of the state.

Particulate: A minute separate particle, as of a granular substance or powder.

Pollutant Load Reduction Goals (PLRGs): PLRGs are defined as the estimated numeric reductions in pollutant loadings needed to preserve or restore designated uses of receiving waterbodies and maintain water quality consistent with applicable state water quality standards. PLRGs are developed by the water management districts.

Point Source: An identifiable and confined discharge point for one or more water pollutants, such as a pipe, channel, vessel, or ditch.

Pollutant: Generally any substance, such as a chemical or waste product, introduced into the environment that adversely affects the usefulness of a resource.

Pollution: An undesirable change in the physical, chemical, or biological characteristics of air, water, soil, or food that can adversely affect the health, survival, or activities of humans or other living organisms.

Removal efficiency: A description of how much of a given substance (metals, sediment, etc.) has been extracted from another substance.

Retention Pond: A stormwater management structure whose primary purpose is to permanently store a given volume of stormwater runoff, releasing it by infiltration and /or evaporation.

Reuse: The deliberate application of reclaimed water for a beneficial purpose. Criteria used to classify projects as “reuse” or “effluent disposal” are contained in Subsection 62-610.810, F.A.C.

Quality Assurance (QA): An integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, product, or service meets defined standards of quality.

Quality Control (QC): The overall system of technical activities that measures the attributes and performance of a process, product, or service against defined standards to verify that they meet the established data quality objectives.

Septic Tank: A watertight receptacle constructed to promote the separation of solid and liquid components of wastewater, to provide the limited digestion of organic matter, to store solids,

and to allow clarified liquid to discharge for further treatment and disposal in a soil absorption system.

STORET: The EPA's STORage and RETrieval database, used nationally for water quality data storage.

Stormwater runoff: The portion of rainfall that hits the ground and is not evaporated, percolated, or transpired into vegetation, but rather flows over the ground surface seeking a receiving water body.

Surface Water: Water on the surface of the earth, whether contained in bounds created naturally or artificially or diffused. Water from natural springs is classified as surface water when it exits the spring onto the earth's surface.

Surface Water Improvement and Management (SWIM) Waterbody: A waterbody designated by statute or by a water management district for priority management to restore and maintain water quality, habitat, and other natural features of the waterbody. The IRL Basin has this special designation.

Total Maximum Daily Load (TMDL): The sum of the individual wasteload allocations for point sources and the load allocations for nonpoint sources and natural background. Prior to determining individual wasteload allocations and load allocations, the maximum amount of a pollutant that a waterbody or waterbody segment can assimilate from all sources while still maintaining its designated use must first be calculated. TMDLs are based on the relationship between pollutants and instream water quality conditions.

Wasteload Allocations (WLAs): Pollutant loads allotted to existing and future point sources, such as discharges from industry and sewage facilities.

Wastewater: The combination of liquid and pollutants from residences, commercial buildings, industrial plants, and institutions, together with any ground water, surface runoff, or leachate that may be present.

Waterbody Identification (WBID) Numbers: WBIDs are numbers assigned to hydrologically based drainage areas in a river basin.

Water Quality Standards (WQSs): (1) Standards that comprise the designated most beneficial uses (classification of water), the numeric and narrative criteria applied to the specific water use or classification, the Florida Anti-degradation Policy, and the moderating provisions contained in Rules 62-302 and 62-4, F.A.C. (2) State-adopted and EPA-approved ambient standards for waterbodies. The standards prescribe the use of the waterbody (such as drinking, fishing and swimming, and shellfish harvesting) and establish the water quality criteria that must be met to protect designated uses.

Watershed: Topographic area that contributes or may contribute runoff to specific surface waters or an area of recharge.

Watershed management approach: The process of addressing water quality concerns within their natural boundaries, rather than political or regulatory boundaries. The process draws together all the participants and stakeholders in each basin to decide what problems affect the water quality in the basin, which are most important, and how they will be addressed.

APPENDIX G: BIBLIOGRAPHY OF KEY REFERENCES AND WEBSITES

REFERENCES:

Florida Department of Environmental Protection.

- 2006. *Water Quality Status Report: Indian River Lagoon.*
- 2008. *Water Quality Assessment Report: Indian River Lagoon.*
- 2009. *TMDL Report: Nutrient and Dissolved Oxygen TMDLs for the Indian River Lagoon and Banana River Lagoon.*

Hazen and Sawyer, P.C. 2008. *Indian River Lagoon Economic Assessment and Analysis Update.* Prepared for the Indian River Lagoon National Estuary Program in cooperation with St. Johns River Water Management District and South Florida Water Management District.

Indian River Lagoon 2011 Superbloom Plan of Investigation. June 2012.

WEBSITES:

TABLE G-1: STORMWATER AND WATER QUALITY PROTECTION WEBSITES

WEBSITE	URL
LOCAL AND REGIONAL SITES	-
SJRWMD IRL Basin	http://floridaswater.com/itsyourlagoon/
<i>IRL CCMP, originally published in 1996</i>	http://floridaswater.com/itsyourlagoon/pdfs/IRL_CCMP.pdf
<i>IRL CCMP Update, published in 2008</i>	http://floridaswater.com/itsyourlagoon/pdfs/CCMP_Update_2008_Final.pdf
<i>IRL SWIM Plan 2002 Update</i>	http://www.floridaswater.com/SWIMplans/2002_IRL_SWIM_Plan_Update.pdf
STATE SITES	-
General Portal for Florida	http://www.myflorida.com
FDEP	http://www.dep.state.fl.us/
<i>Watershed Management</i>	http://www.dep.state.fl.us/water/watersheds/index.htm
<i>TMDL Program</i>	http://www.dep.state.fl.us/water/tmdl/index.htm
<i>BMPs, public information</i>	http://www.dep.state.fl.us/water/nonpoint/pubs.htm
<i>NPDES Stormwater Program</i>	http://www.dep.state.fl.us/water/stormwater/npdes/index.htm
<i>NPS funding assistance</i>	http://www.dep.state.fl.us/water/nonpoint/319h.htm
<i>IRL Basin Water Quality Assessment Report</i>	http://www.dep.state.fl.us/water/basin411/indianriver/assessment.htm
<i>Adopted BMAPs</i>	http://www.dep.state.fl.us/water/watersheds/bmap.htm
<i>IRL FTP Site</i>	http://publicfiles.dep.state.fl.us/DEAR/BMAP/IndianRiverLagoon/
FDACS Office of Agricultural Water Policy	http://www.floridaagwaterpolicy.com/
NATIONAL SITES	-
Center for Watershed Protection	http://www.cwp.org/
EPA Office of Water	http://www.epa.gov/water
<i>EPA Region 4 (Southeast US)</i>	http://www.epa.gov/region4
<i>Clean Water Act history</i>	http://www.epa.gov/lawsregs/laws/cwahistory.html
USGS: Florida Waters	http://sofia.usgs.gov/publications/reports/floridawaters/#options