# 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, FL 32399*

**January 2013**

**ACKNOWLEDGMENTS**: The *North Indian River Lagoon Basin Management Action Plan* was prepared as part of a statewide watershed management approach to restore and protect Florida's water quality. It was developed by the North Indian River Lagoon stakeholders, identified below, with participation from affected local, regional, and state governmental interests; elected officials and citizens; and private interests.

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| ALLOCATION ENTITIES | AGENCIES | OTHER INTERESTED PARTIES |
|---|---|---|
| Agricultural Producers | Florida Department of Agriculture and Consumer Services | Algae Collection Technology, Inc. |
| Brevard County | Florida Department of Environmental Protection | Applied Ecology |
| Volusia County | Florida Farm Bureau Federation | Applied Technology and Management |
| City of Cocoa | Indian River Lagoon 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. |
| Reliant Energy – Indian River Power Plant | - | - |

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| | |
|---|---|
| **AWT** | Advanced Wastewater Treatment |
| **BMAP** | Basin Management Action Plan |
| **BMP** | Best Management Practice |
| **BRL** | Banana River Lagoon |
| **CCMP** | Comprehensive Conservation Management Plan |
| **CDS** | Continuous Deflective Separation (Unit) |
| **CERP** | Comprehensive Everglades Restoration Plan |
| **DO** | Dissolved Oxygen |
| **DOC** | Dissolved Organic Carbon |
| **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 System |
| **HSPF** | Hydrologic Simulation Program – FORTRAN (model) |
| **IRL** | Indian River Lagoon |
| **IWR** | Impaired Surface Waters Rule |
| **LA** | Load Allocation |
| **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 |
| **NRCS** | Natural Resources Conservation Service |
| **O&M** | Operation and Maintenance |
| **OAWP** | Office of Agricultural Water Policy |
| **PAR** | Photosynthetically Active Radiation |
| **PLRG** | Pollutant Load Reduction Goal |
| **PLSM** | Pollutant Load Screening Model |
| **POTW** | Publicly Owned Treatment Works |
| **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 |

| | |
|---|---|
| **TKN** | Total Kjeldahl Nitrogen |
| **TMDL** | Total Maximum Daily Load |
| **TN** | Total Nitrogen |
| **TOC** | Total Organic Carbon |
| **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 |
| **WMA** | Water Management Area |
| **WTP** | Water Treatment Plant |
| **WWTF** | Wastewater Treatment Facility |

# EXECUTIVE SUMMARY

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 (BRL), 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 under way 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 the sources of nutrients from the lagoon's watershed will help remediate the legacy load.

## North Indian River Lagoon Basin

The IRL Basin is a 156-mile-long estuary located on Florida's east coast. There are six coastal Florida counties in the basin: Volusia, Brevard, Indian River, St. Lucie, Martin, and Palm Beach. The impaired portions of the basin 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 geographic extent of the IRL Basin and the hydrologic 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 was to divide it into three subbasins: (1) North IRL, (2) Central IRL, and (3) BRL. 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, FDEP further divided the North IRL into "project zones." The project zone boundaries are based on 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. 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 two project zones, as follows:

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

### TOTAL MAXIMUM DAILY LOADS

TMDLs are water quality targets, based on state water quality standards, for specific pollutants (including nutrients such as nitrogen and phosphorus). FDEP adopted nutrient TMDLs for the main stem of the IRL Basin in March 2009. The TMDLs focus on the water quality conditions necessary for seagrass regrowth at water depth limits where seagrass historically grew in the basin, based on a multiyear composite of seagrass coverage. The median depth limits of seagrass coverage in the IRL Basin have decreased over the years due to decreased water quality 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 TMDL analysis regressed 3 years of loading levels against the same years' seagrass coverage to calculate the restoration target of 10% less than the multiyear composite of historical seagrass depth limit coverage. This target is based on 7 years of historical seagrass data from 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 targets 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 Rule 62-302, Florida Administrative Code (F.A.C.), which allows 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 **w**ater**b**ody **id**entification (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 TN and 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 period. 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 in the IRL Basin towards the median seagrass depth limit target, FDEP used a two-step process. 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 two-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 TMDLs. 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 is 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 to 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 improvement in water quality in the North IRL. In addition, projects completed since January 1, 2000, were eligible for BMAP credit because the land uses in the TMDL model are from 2000; therefore, the 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 five 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 each entity has a plan on how it will meet its 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 period. 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 that the reductions occur. For 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 considered the most biologically 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 in the lagoon and improved water quality in the entire IRL Basin would increase 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 the 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), Section 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 (O&M) 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 the 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 (SJRWMD) cost-share, and IRL NEP cost-share. IRL stormwater treatment has benefitted significantly over the past two decades through numerous Section 319 grants from the U.S. Environmental Protection Agency (EPA) 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 the loss of wetlands, excessive freshwater discharges, and discharges of pollutants through stormwater and wastewater (Florida Department of Environmental Protection [FDEP] 2009). To address the nutrient impacts to the seagrass beds, 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. Highway 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 (BRL), 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 under way 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 the sources of nutrients 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. It 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 FDEP's TMDL Program.

Stakeholder involvement is critical to the 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 **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. **Figure 1** shows the North IRL main stem WBIDs discussed in this BMAP.

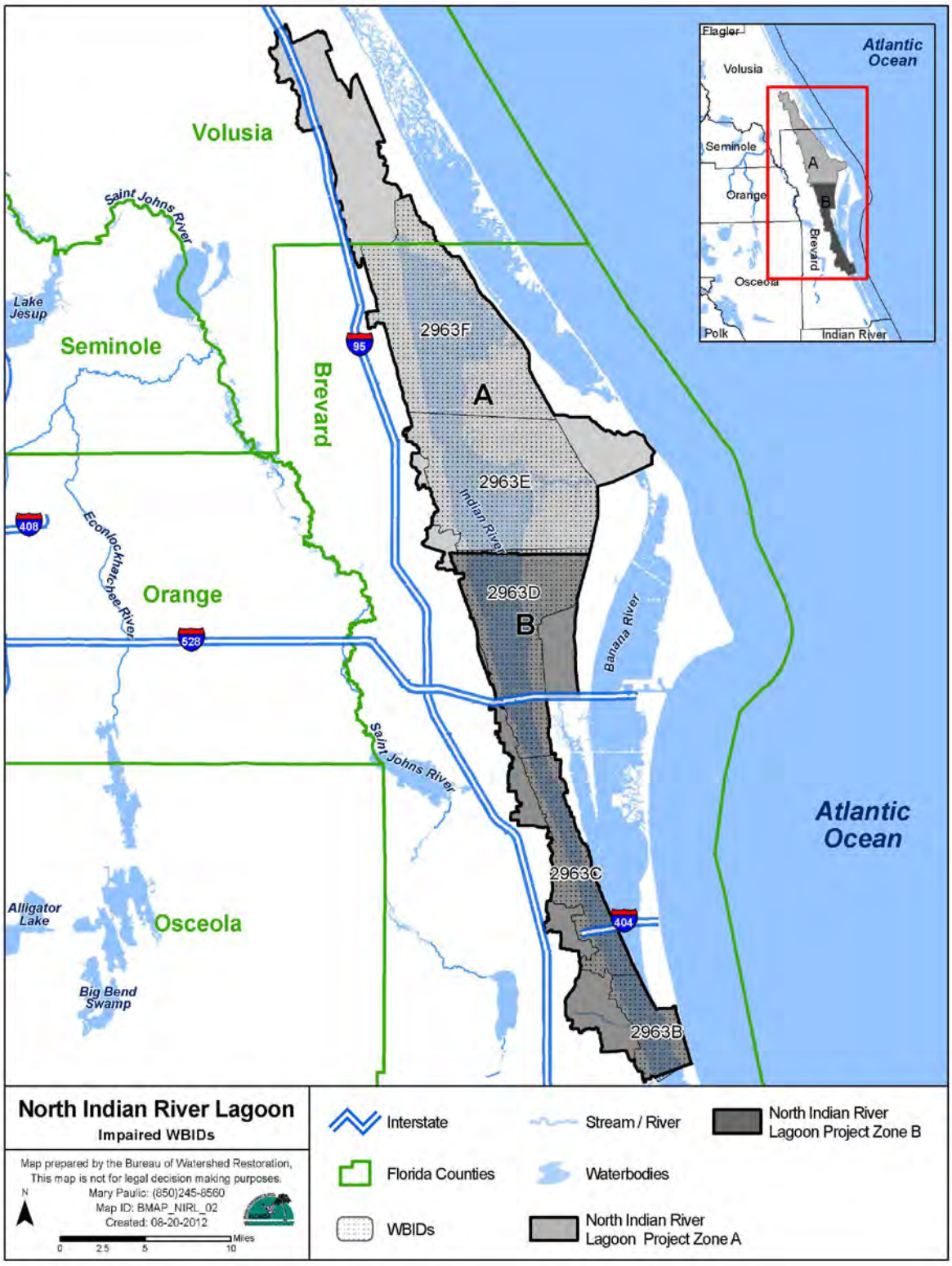


**FIGURE 1: WBIDS IN THE NORTH INDIAN RIVER LAGOON SUBBASIN**

In the North IRL, WBIDs 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, meaning 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 the state's designated use categories.

Under Section 303(d) of the federal Clean Water Act, every two 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 two years. FDEP is responsible for developing this "303(d) list" of impaired waters.

**TABLE 1: DESIGNATED USE ATTAINMENT CATEGORIES FOR FLORIDA SURFACE WATERS**

[a] Class I and II waters include the uses of the classifications listed below them.
[b] Surface water classification for waters in the IRL Basin.

| CATEGORY | DESCRIPTION |
|---|---|
| Class I[a] | Potable water supplies |
| **Class II[a, b]** | **Shellfish propagation or harvesting** |
| **Class III[b]** | **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 (*no current Class V designations*) |

Florida's 303(d) list identifies hundreds of waterbody segments that fall short of water quality standards. The three 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 TMDL(s) 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 on 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 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. It 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 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 geographic extent of the IRL Basin and the diversity of hydrologic differences throughout the basin, FDEP determined the best way to address the TMDLs was to divide the watershed into three 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 the phased implementation of the strategies necessary to ultimately achieve the associated TMDLs. Phased BMAPs are reevaluated every five 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 period. 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 pounds per year (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. In the first iteration, projects completed 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. 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. 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 on 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. 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 two project zones, as follows:

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

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

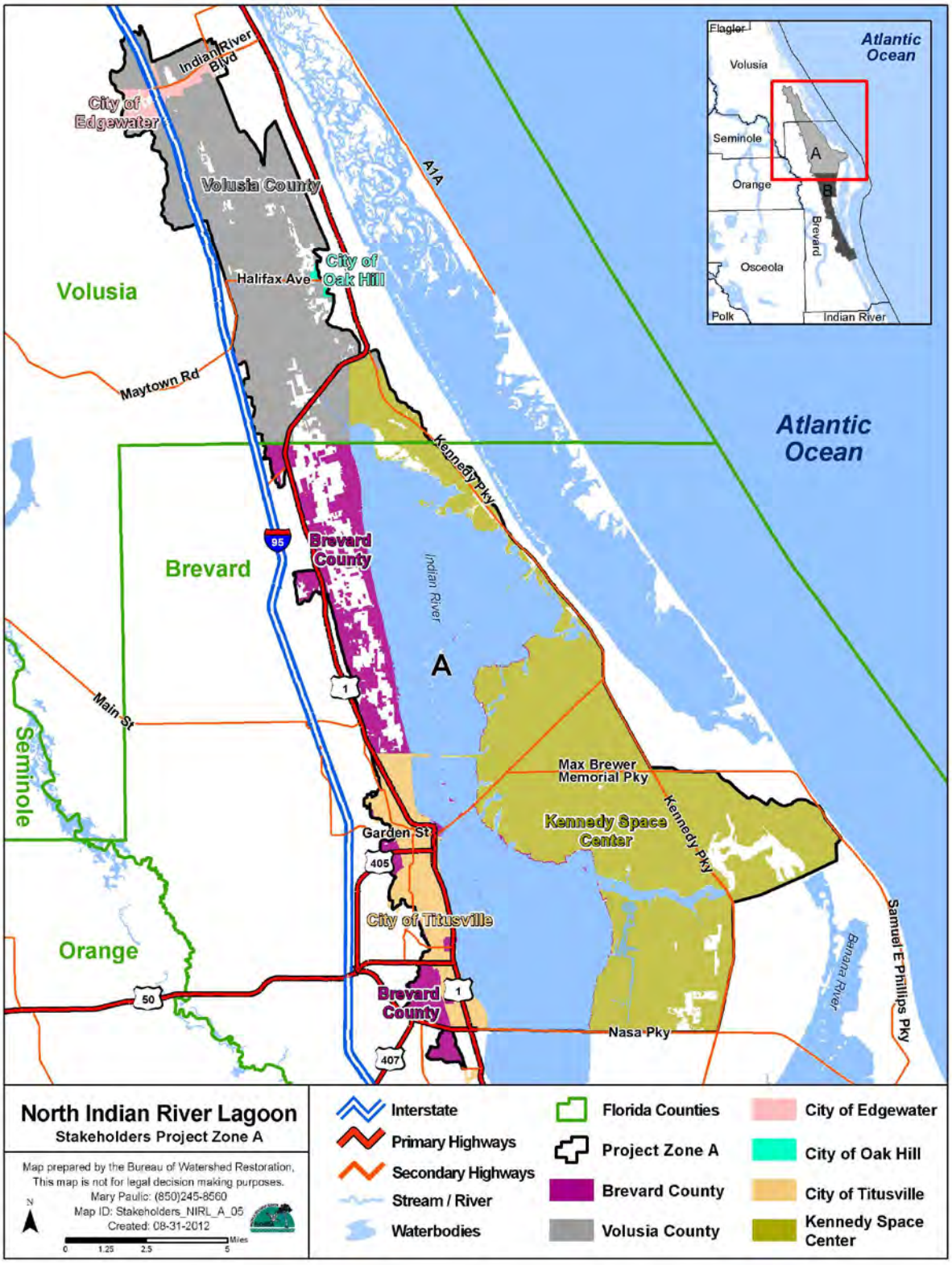


**FIGURE 2: STAKEHOLDERS IN THE NORTH A PROJECT ZONE**

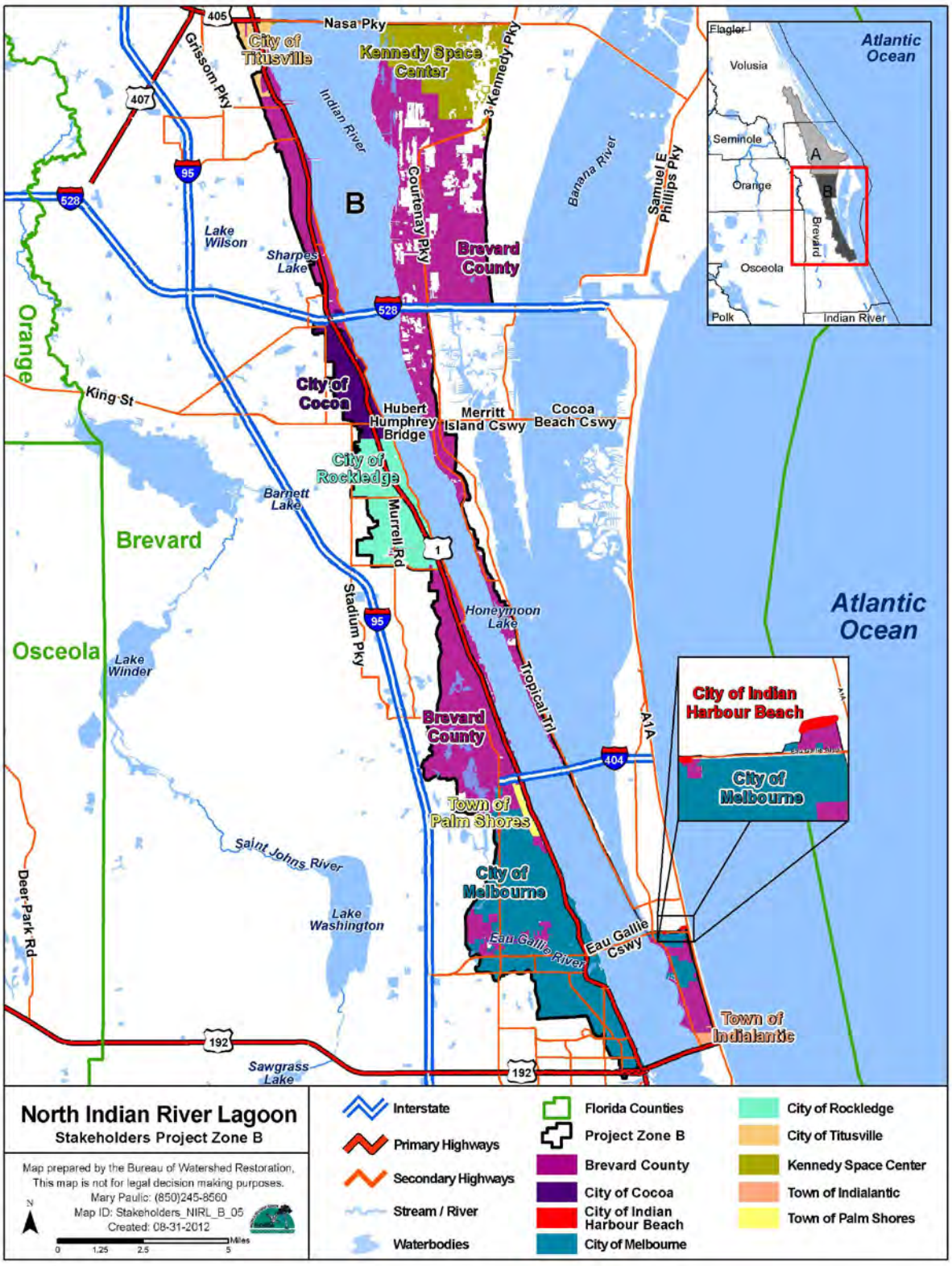


**FIGURE 3: STAKEHOLDERS IN THE NORTH B PROJECT ZONE**

### *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) is the allocation to point sources permitted under the National Pollutant Discharge Elimination System (NPDES) Program. It includes the following:*
  - **Wastewater Allocation** is the allocation to industrial and domestic wastewater facilities.
  - **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 (LA) 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., subbasins) 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 time frames, and others (see **Appendix B**).

### *1.3.5 TMDLS IN THE NORTH INDIAN RIVER LAGOON BASIN*

FDEP adopted the nutrient TMDLs for the main stem of the North IRL in March 2009. The TMDLs focus on the water quality conditions necessary for seagrass regrowth at water depth limits where seagrass historically grew in the basin based on a multiyear 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 TMDL analysis 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 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 Rule 62-302, F.A.C., which allows 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**

N/A = Not applicble

| 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 SR 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 SR 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

The 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 limit the depth at which seagrass can grow. Therefore, reducing nutrient loading to the North IRL is the most important factor in improving seagrass depth limits.*

- *Some of the best management practices (BMPs) listed in the project tables that reduce TN and TP will also reduce total suspended solids (TSS). 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 their 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 a specified period to achieve reductions. However, the full implementation of this BMAP will be a long-term process, adaptively managed in five-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, and 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 five-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 the TMDLs, as necessary, will be developed as part of the second and perhaps third BMAP iterations.

During the BMAP process, the following 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, allowing 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 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 (NRCS) 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 cities of Cocoa, Rockledge, and Titusville during this BMAP*

*iteration in response to requests from these stakeholders. During the next BMAP cycle, 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 Environmental Resource Permit (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 were 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 System (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 under way (FDEP 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 disproportionally 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 dissolved oxygen (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 Information*** *– An algal superbloom occurred in the North IRL and BRL in 2011, while a secondary bloom occurred in the Central IRL. These blooms were followed by a brown algae bloom in 2012. Research is under way to understand the causes of these blooms as part of the* Indian River Lagoon 2011 Superbloom Plan of Investigation *(SJRWMD et al. 2012). Any improved understanding of the cause of the bloom events obtained from this research and its implications for the 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 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 lagoon.

Starting on July 1, 2012, developers have the option of obtaining a general permit for the 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. The evaluation must be signed by a state of Florida registered professional; however, state agency review is not required. With this new rule in place, local governments cannot require the developer to obtain a permit from a state or federal agency as a

condition of issuing a permit. In addition, efforts are under way 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 meet state stormwater standards, the development may still contribute loading to the lagoon. To ensure that future growth does not add to the degradation of the North IRL, 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 the use of LID BMPs.

## 1.6 Relation of the 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 the restoration of specific 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 three 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 Upper St. Johns River Basin. The *CCMP Update 2008* (IRL NEP 2008) includes three new actions to assist in TMDL development and implementation. The three 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 considered the most biologically diverse estuary in North America and was recognized as part of 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 multimillion-dollar Indian River citrus industry and boat and marine sales industries. Finfish and shellfish harvesting from the lagoon contribute to local economies.

A 2008 economic study (Hazen and Sawyer) carried out for the IRL NEP estimated the total value to residents and visitors 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, including items such as boat purchases, boat repairs, and marina slip rental and dockage fees. An additional $762 million was estimated for recreational use value, which is the amount that people would be willing to pay for the opportunity to engage in 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 in 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 at $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 of 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, the 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 subbasin 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. Therefore, human land uses occupy 34.1% of the subbasin.

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

**TABLE 4: 2000 LAND USES IN THE NORTH IRL SUBBASIN**

| LAND USE TYPE | ACRES | % |
|---|---|---|
| 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%** |

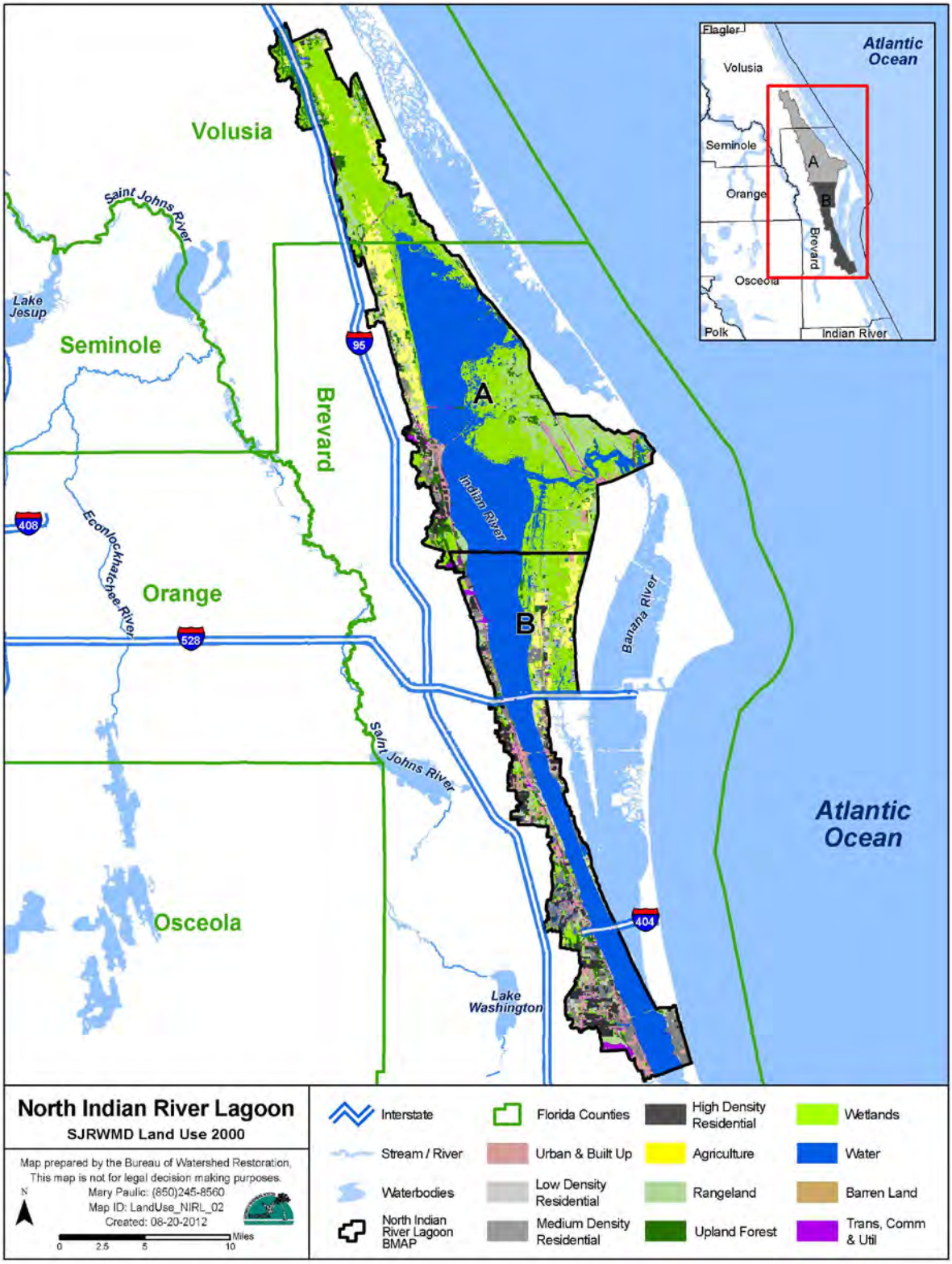


**FIGURE 4: 2000 LAND USES IN THE NORTH INDIAN RIVER LAGOON SUBBASIN**

## 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 in evaluating the success of the TMDLs. To assess progress towards the median seagrass depth limit target for the IRL Basin, FDEP uses a two-step process.

Step 1 is a cumulative frequency distribution analysis. The 4 most recent mapped seagrass datasets from the 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 where 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 with the TMDL depth limit target curve. Compliance is reached when 50% or more of the assessment years' frequency distribution curve (including its 50$^{th}$ 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 four most recent years, with each year's median compared with the TMDL median depth limit target. Three of the four 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 the two-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 the data for this period, the North A and North B project zones were neither Step 1 compliant (**Figure 5** through **Figure 8**) nor Step 2 compliant (refer to **Table 5**) for the periods 2003–07 and 2005–09. Therefore, reductions are needed from the stakeholders in the basin, as outlined in **Section 4.5**. **Section 6.1** describes the next steps in the TMDL seagrass evaluation for the North IRL subbasin.

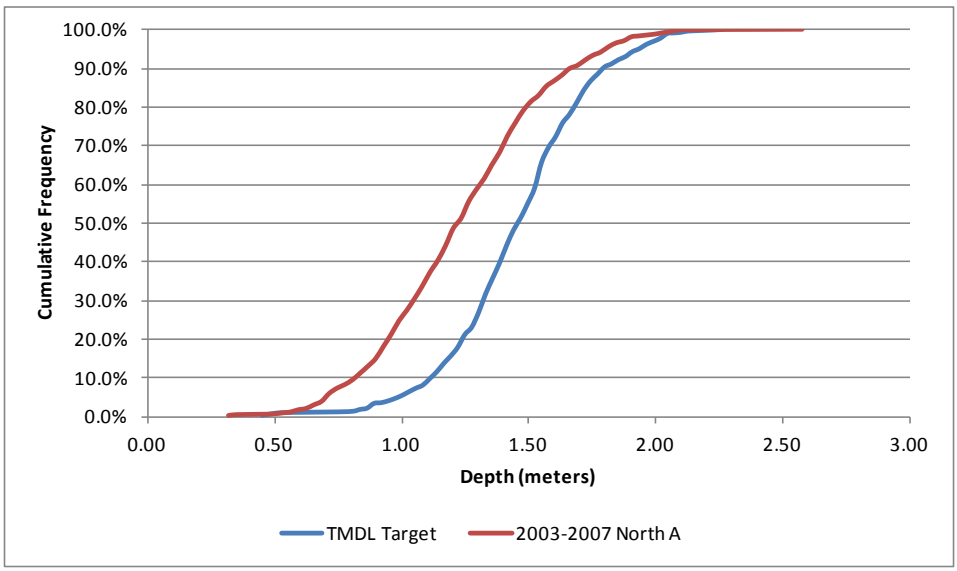


**FIGURE 5: STEP 1 COMPLIANCE EVALUATION FOR THE NORTH A PROJECT ZONE FOR 2003–07**

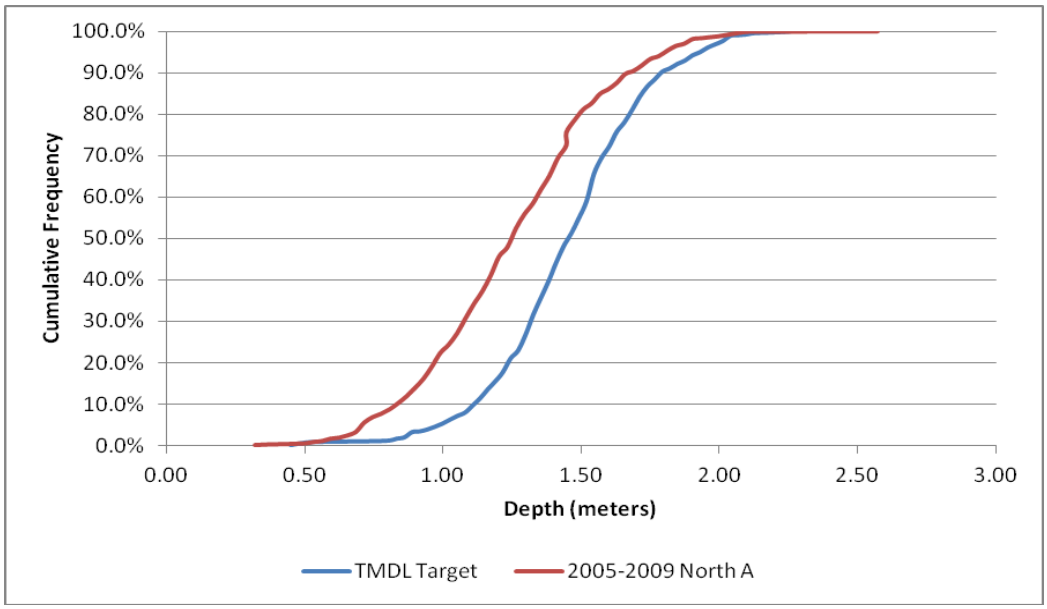


**FIGURE 6: STEP 1 COMPLIANCE EVALUATION FOR THE NORTH A PROJECT ZONE FOR 2005–09**

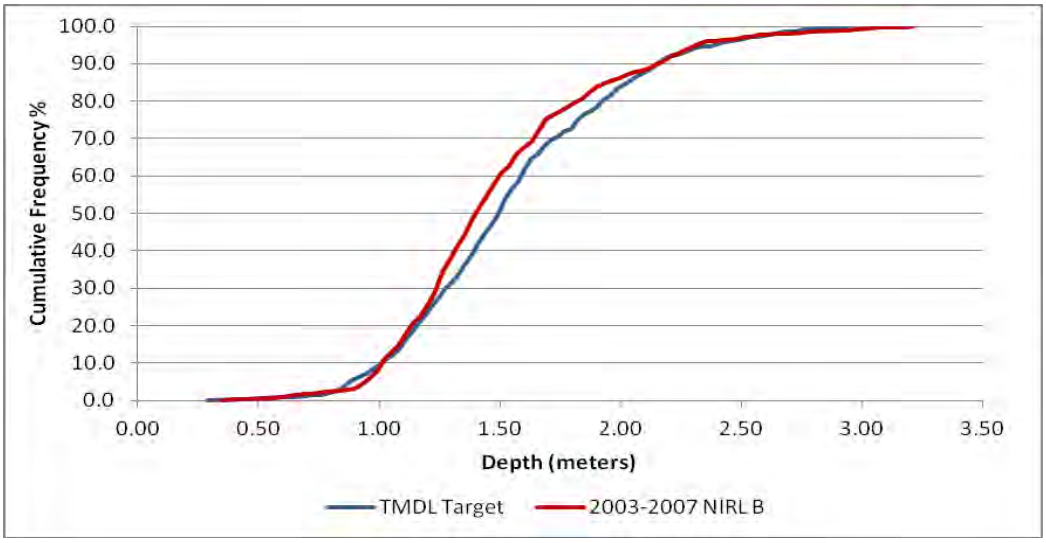


**FIGURE 7: STEP 1 COMPLIANCE EVALUATION FOR THE NORTH B PROJECT ZONE FOR 2003–07**

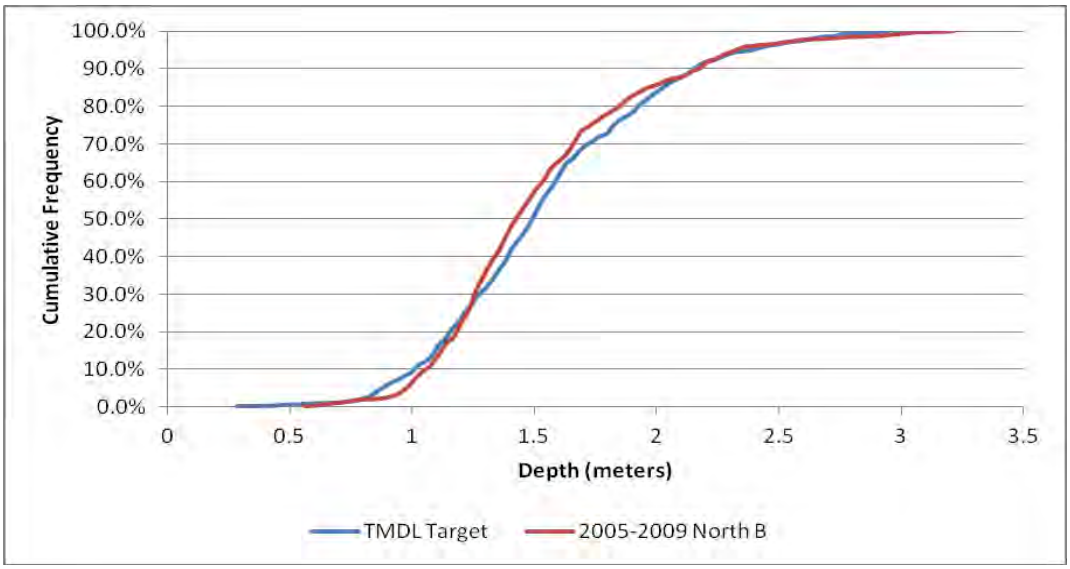


**FIGURE 8: STEP 1 COMPLIANCE EVALUATION FOR THE NORTH B PROJECT ZONE FOR 2005–09**

**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 focuses on load reductions from point source facilities and stormwater sources. **Table 6** and **Table 7** show the starting loads, target loads, and required reductions in the TMDL. 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. Rule 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 FDEP to implement the N PDES 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 Rule 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 an 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:

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

The basic requirements of this program serve as a foundation for the stormwater management efforts of these communities. The 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, the 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 Rules 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 Number |
|---|---|
| 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 six 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 nonstormwater discharges to the MS4 and create a system map showing outfall locations. Subsection 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 under an 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, the 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. ***Postconstruction Runoff Control****: Implement and enforce a program to address discharges of postconstruction 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 train staff in pollution prevention.*

The generic permit (Paragraph 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 the Kennedy Space Center and the town of Palm Shores.

Paragraph 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 on a failure to implement their responsibilities under the BMAP.

Load reductions, and the responsibility for meeting them, were assigned to the entity that governs the area generating these non-MS4 urban lands. The entities evaluated the loadings from these areas and determined which projects would reduce stormwater pollutant loads. **Appendix E** includes the detailed project tables. Failure to reduce these loadings can result in enforcement action by FDEP under Paragraph 403.067(7)(b)2(h), F.S.

FDEP can designate an entity as a regulated Phase II MS4 if its discharges are determined to be a significant contributor of pollutants to surface waters of the state in accordance with Section 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 are characterized as small, noncommercial hobby farms.

Due to urban encroachment, citrus health issues (freeze/disease), and the economic downturn, 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 nonagricultural/urban uses.

## 3.5 ANTICIPATED OUTCOMES OF BMAP IMPLEMENTATION

With the 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 TSS loading 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

This chapter describes the process used to calculate each entity's allocation. This GIS-based process 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; this file contains detailed land use/land cover information for 2000, ROCs, EMCs, soils data, and 30-year average rainfall. The process to calculate the allocations is described 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 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 rights-of-way;*
- *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–FORTRAN (HSPF) model, not the PLSM. To account for the differences in loading between the two 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 land use code 5000 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 surface waters will decrease with the flushing of cleaner watershed runoff once pollutant loading from the watershed is controlled. Since the focus of these reductions is on the external watershed loading, the loading from land use code 5000 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) | LAND USE CODE 5000 ACRES | NET ACRES | TN BASELINE LOAD (LBS/YR) | LAND USE CODE 5000 TN LOAD (LBS/YR) | TN NET LOAD (LBS/YR) | TP ADJUSTED BASELINE LOAD (LBS/YR) | LAND USE CODE 5000 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) | LAND USE CODE 5000 ACRES | NET ACRES | TN BASELINE LOAD (LBS/YR) | LAND USE CODE 5000 TN LOAD (LBS/YR) | TN NET LOAD (LBS/YR) | TP ADJUSTED BASELINE LOAD (LBS/YR) | LAND USE CODE 5000 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 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 these entities 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 the first phase of the BMAP that result in TN and/or TP reductions should be documented for credit against any reduction requirements allocated in subsequent BMAP iterations.

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

*De minimus stakeholder

| 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 District 5 | 3,917 | 1.37% |
| Edgewater | 3,085 | 1.08% |
| Oak Hill* | 218 | 0.08% |
| **TOTAL** | **284,881** | **100.00%** |

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

*De minimus stakeholder

| 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 District 5 | 1,130.9 | 2.83% |
| Edgewater | 323.2 | 0.81% |
| Oak Hill* | 15.3 | 0.04% |
| **TOTAL** | **39,909.0** | **100.00%** |

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

*De minimus stakeholder

| 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 District 5 | 8,731 | 2.62% |
| Kennedy Space Center | 5,341 | 1.60% |
| Titusville | 3,013 | 0.90% |
| Indialantic | 1,756 | 0.53% |
| Palm Shores* | 1,694 | 0.51% |
| Indian Harbour Beach* | 11 | 0.00% |
| **TOTAL** | **333,250** | **100.00%** |

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

*De minimus stakeholder

| 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 District 5 | 2,802.4 | 4.41% |
| Kennedy Space Center | 928.9 | 1.46% |
| Indialantic | 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%** |

## 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 nonwater 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 nonwater 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 nonwater 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 the allowable loading for each entity, some of the stakeholders had a negative value for required reductions, indicating 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 the 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, the 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 the 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**

N/A = Not applicable
**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.

| 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 District 5 | 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 – *de minimus* | 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** |

## TABLE 18: TP TOTAL TMDL REQUIRED REDUCTIONS IN NORTH A

N/A = Not applicable
**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.

| 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 District 5 | 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 – *de minimus* | 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** |

## TABLE 19: TN TOTAL TMDL REQUIRED REDUCTIONS IN NORTH B

N/A = Not applicable
**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.

| 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 District 5 | 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 - *de minimus* | 1 | 4.402 | 6.3 | 11 | N/A | N/A | N/A |
| Palm Shores – *de minimus* | 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** |

**TABLE 20: TP TOTAL TMDL REQUIRED REDUCTIONS IN NORTH B**

N/A = Not applicable
**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

| 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 District 5 | 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 – *de minimus* | 1 | 0.646 | 0.9 | 1.7 | N/A | N/A | N/A |
| Palm Shores – *de minimus* | 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** |

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 TMDLs, 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 (AWT) requirements. Therefore, the Cocoa J. Sellers WWTF and Melbourne reverse osmosis (RO) WWTF were assigned the 95$^{th}$ percentile of the TN and TP annual discharge load for the period from 2001 to 2005. The Reliant Energy Indian River Power Plant was also assigned the 95$^{th}$ 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: NDPES FACILITIES AND ALLOCATIONS IN THE NORTH IRL SUBBASIN**

N/A = Not applicable

| NPDES FACILITY | PERMIT NUMBER | 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 THE 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 in 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, the 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 development) and do not contribute to improved water quality in the 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. Paragraph 403.067 (7)(b), F.S., prescribes the criteria for TMDL implementation. In accordance with this section, the 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, the following:

- *Nonregulatory and incentive based programs, including BMPs, cost-sharing, waste minimization, pollution prevention, and public education;*
- *Nonstructural BMPs;*
- *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. The implementation of BMPs consistent with the provisions of the stormwater management program required under an 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 Subsection 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 time frames for implementation submitted by the entities to achieve their first five-year BMAP reductions are summarized in **Table 26** through **Table 29** and detailed in **Appendix E**. These projects were submitted to provide reasonable assurance to FDEP that each MS4 permittee has a plan on how it will meet its 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 period. 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**

N/A = Not applicable

| Entity | Structural Stormwater (lbs/yr) | Nonstructural Stormwater (lbs/yr) | Public Education (lbs/yr) | Street Sweeping (lbs/yr) | TN TOTAL (lbs/yr) | Credit for Future BMAPs (lbs/yr) |
|---|---|---|---|---|---|---|
| Brevard County | 4,789 | N/A | 1,383 | N/A | **6,172** | 3,992 |
| Volusia County | N/A | N/A | 515 | N/A | **515** | 515 |
| City of Edgewater | N/A | N/A | 74 | N/A | **74** | 49.7 |
| City of Titusville | 5,704 | N/A | 609 | 1,699 | **8,012** | 1,407.4 |
| FDOT District 5 | N/A | 595 | 39 | 459 | **1,093** | 696.4 |
| **Total** | **10,493** | **595** | **2,620** | **2,158** | **15,866** | **6,660.5** |

**Table 27: Summary of MS4 Load Reductions for TP by Project Type in North A**

N/A = Not applicable

| Entity | Structural Stormwater (lbs/yr) | Public Education (lbs/yr) | Street Sweeping (lbs/yr) | TP TOTAL (lbs/yr) | Credit for Future BMAPs (lbs/yr) |
|---|---|---|---|---|---|
| Brevard County | 1,990.6 | 178.4 | N/A | **2,169.0** | 1,877.1 |
| Volusia County | N/A | 58.9 | N/A | **58.9** | 58.9 |
| City of Edgewater | N/A | 9.8 | N/A | **9.8** | 9.8 |
| City of Titusville | 1,794.4 | 117.2 | 765.0 | **2,676.6** | 1,229.0 |
| FDOT District 5 | N/A | 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**

N/A = Not applicable

| ENTITY | STRUCTURAL STORMWATER (LBS/YR) | NONSTRUCTURAL STORMWATER (LBS/YR) | PUBLIC EDUCATION (LBS/YR) | STREET SWEEPING (LBS/YR) | 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 | N/A | N/A | 459 | **4,367** | 1,957.5 |
| City of Melbourne | 1,131 | N/A | 5,166 | 1,746 | **8,043** | 1,304.5 |
| City of Rockledge | 4,139 | N/A | 630 | 750 | **5,519** | 3,423.6 |
| City of Titusville | N/A | N/A | 23 | 26 | **49** | 2.3 |
| FDOT District 5 | 393 | 1,552 | 86 | 1,179 | **3,210** | 2,560.6 |
| Town of Indialantic | 332 | N/A | 9 | N/A | **341** | 198.6 |
| **TOTAL** | **38,000** | **1,559** | **12,253** | **4,273** | **56,085** | **38,705.1** |

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

N/A = Not applicable

| ENTITY | STRUCTURAL STORMWATER (LBS/YR) | NONSTRUCTURAL STORMWATER (LBS/YR) | PUBLIC EDUCATION (LBS/YR) | STREET SWEEPING (LBS/YR) | 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 | N/A | N/A | 206.6 | **1,467.1** | 909.9 |
| City of Melbourne | 577.3 | N/A | 1,174.4 | 1,163.6 | **2,915.3** | 946.9 |
| City of Rockledge | 1,726.4 | N/A | 141.8 | 337.9 | **2,206.1** | 1,612.5 |
| City of Titusville | N/A | N/A | 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 | N/A | 1.6 | N/A | **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 (LBS/YR) | NONSTRUCTURAL STORMWATER (LBS/YR) | 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 (LBS/YR) | NONSTRUCTURAL STORMWATER (LBS/YR) | 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**

N/A = Not applicable

| ENTITY | STRUCTURAL STORMWATER (LBS/YR) | NONSTRUCTURAL STORMWATER (LBS/YR) | PUBLIC EDUCATION (LBS/YR) | 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 | N/A | N/A | 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**

N/A = Not applicable

| ENTITY | STRUCTURAL STORMWATER (LBS/YR) | NONSTRUCTURAL STORMWATER (LBS/YR) | PUBLIC EDUCATION (LBS/YR) | TP TOTAL (LBS/YR) | CREDIT FOR FUTURE BMAPS (LBS/YR) |
|---|---|---|---|---|---|
| Kennedy Space Center | 274.6 | 895.0 | N/A | **1,169.6** | 1,169.6 |
| Town of Palm Shores | N/A | N/A | 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; the results 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 a 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 in 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 under Sections 125.568, 166.048, and 373.185, F.S.; specify fertilizer application rates and types; and control pet waste and require that residents pick up and properly dispose of pet waste.*
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 an entity conducted all six types of activities, then the full 6% reduction was assigned;*
- *An entity that only had FYN received a 3% reduction credit;*
- *An entity that only had the Florida-friendly ordinances (irrigation, landscaping, fertilizer, and pet waste management) received a 2% reduction;*
- *An entity that only had the PSAs, websites, brochures, and the inspection program received a 1% reduction credit; and*
- *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 provided to the stakeholders details the requirements to receive muck removal project credit. In summary, it is recommended that the muck deposit must 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 5 years and report this information to FDEP. Project credit will be assigned for a period of up to 10 years after an area is dredged. If adequate source controls are not in place in the watershed, muck will reaccumulate 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 provided to the stakeholders details the requirements to receive credit for aquatic vegetation harvesting. In summary, credit is assigned based on the type of vegetation removed, the amount of plant material removed, the nutrient content for that type of plant, and the percent dry weight of material collected. Stakeholders that 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** provide 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 when 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.

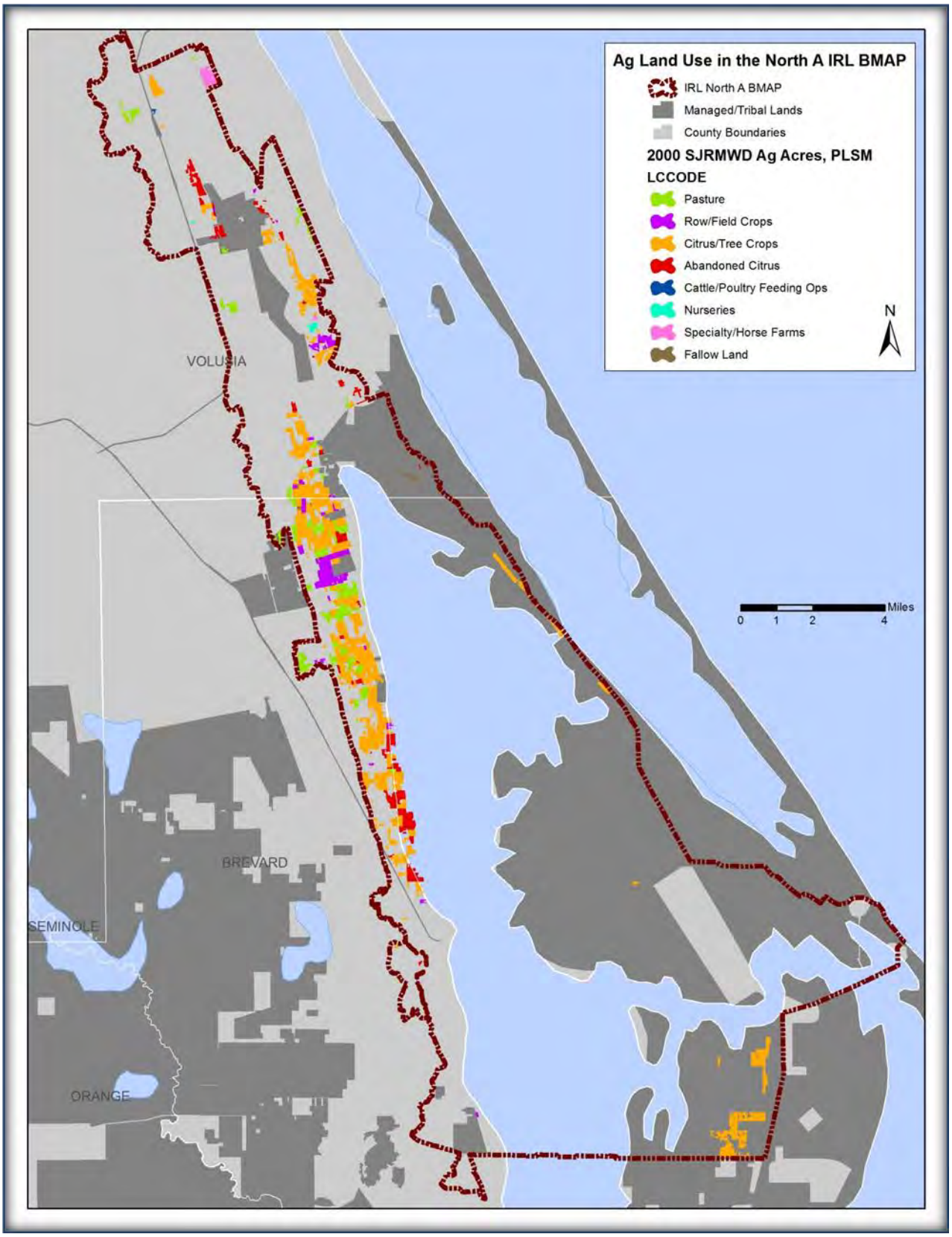


**FIGURE 9: AGRICULTURAL LANDS IN THE NORTH A PROJECT ZONE**

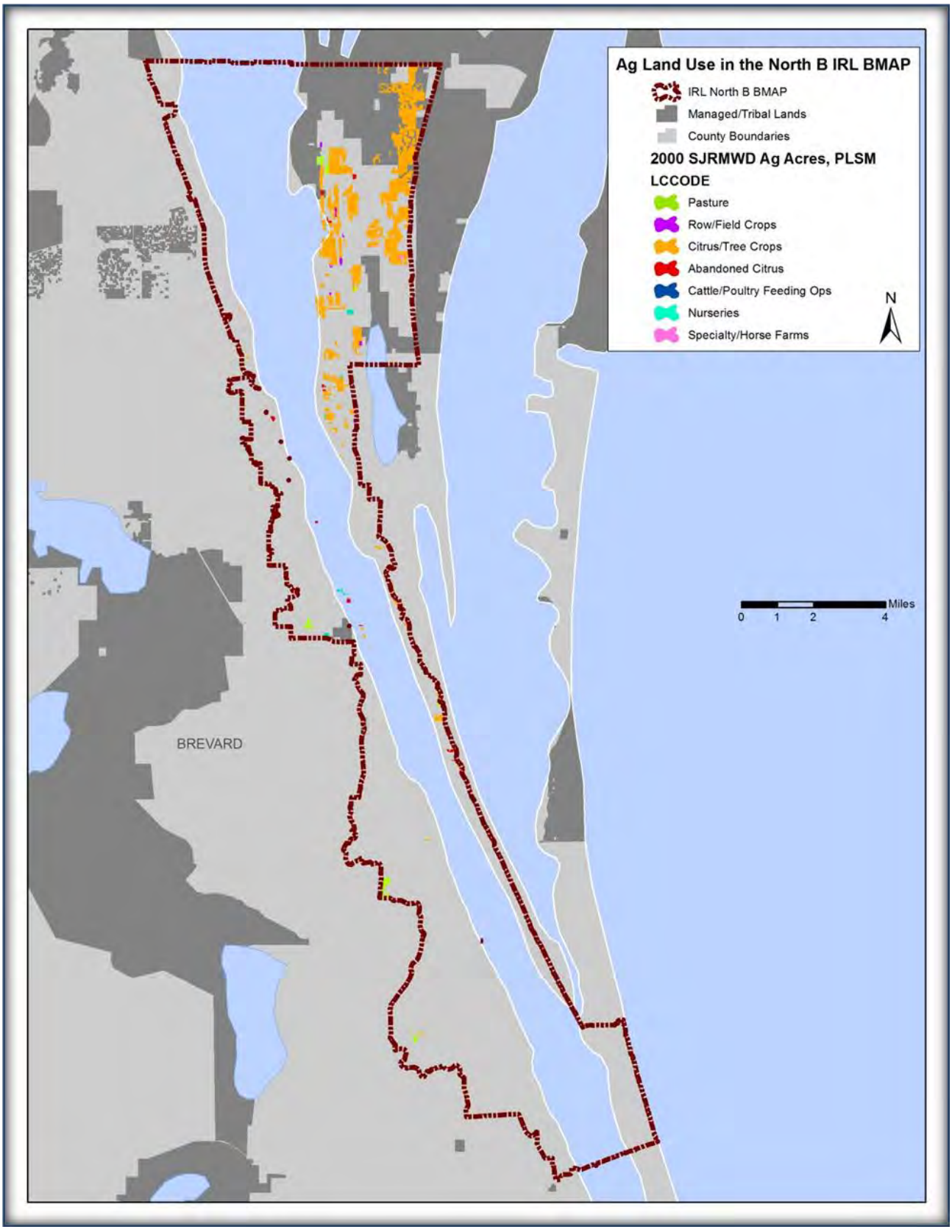


**FIGURE 10: AGRICULTURAL LANDS IN THE NORTH B PROJECT ZONE**

### 5.4.1 Agricultural Producers' Responsibilities under the FWRA

Paragraph 403.067(7)(b), F.S., requires that nonpoint pollutant sources (such as agriculture) included in a BMAP demonstrate compliance with pollutant reductions needed to meet a TMDL, either by implementing appropriate BMPs (adopted by 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.

Under Paragraph 403.067(7)(c), F.S., the 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 that 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 BMPs

BMPs are individual or combined practices determined through research, field testing, and expert review to be the most effective and practicable means for improving water quality, taking into account economic and technological considerations. 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, thus 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, FDACS will work with producers in the basin to implement applicable key BMPs that otherwise are not affordable. The following key nutrient and irrigation management BMPs are most likely applicable to agricultural operations in the basin:

- ***Determining Nutrient Needs***
    - **Soil and Tissue Testing:** Used to base fertilizer applications on plant needs and available nutrients in the soil; helps prevent the over application of fertilizer.
    - **Nutrient Budgeting:** Adjustment of fertilizer regime to account for other nutrient sources, such as biosolids, legumes, manure, and nutrient-laden irrigation water; helps prevent the 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 the 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 downgradient 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 available at http://www.floridaagwaterpolicy.com. Printed BMP manuals can be obtained in the local extension office at county agricultural extension centers, or by contacting OAWP field staff.

### *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. It 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 in 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 on BMP Enrollment and Implementation

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

- *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; and*
- *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 the 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 36** summarizes 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 need to be enrolled 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 36** and **Table 37 for** the North and North B project zones, respectively.

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—all of them citrus operations—in the North A project zone had submitted a total of 5 NOIs to OAWP covering about 305 acres to implement FDACS-adopted BMPs. Seven producers in 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) show the acres enrolled in BMPs as of March 31, 2012.

## 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 Enroll[3]** | **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

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] 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 Enroll[2]** | **N/A** | **1,043.4** | **N/A** | **N/A** | **N/A** |

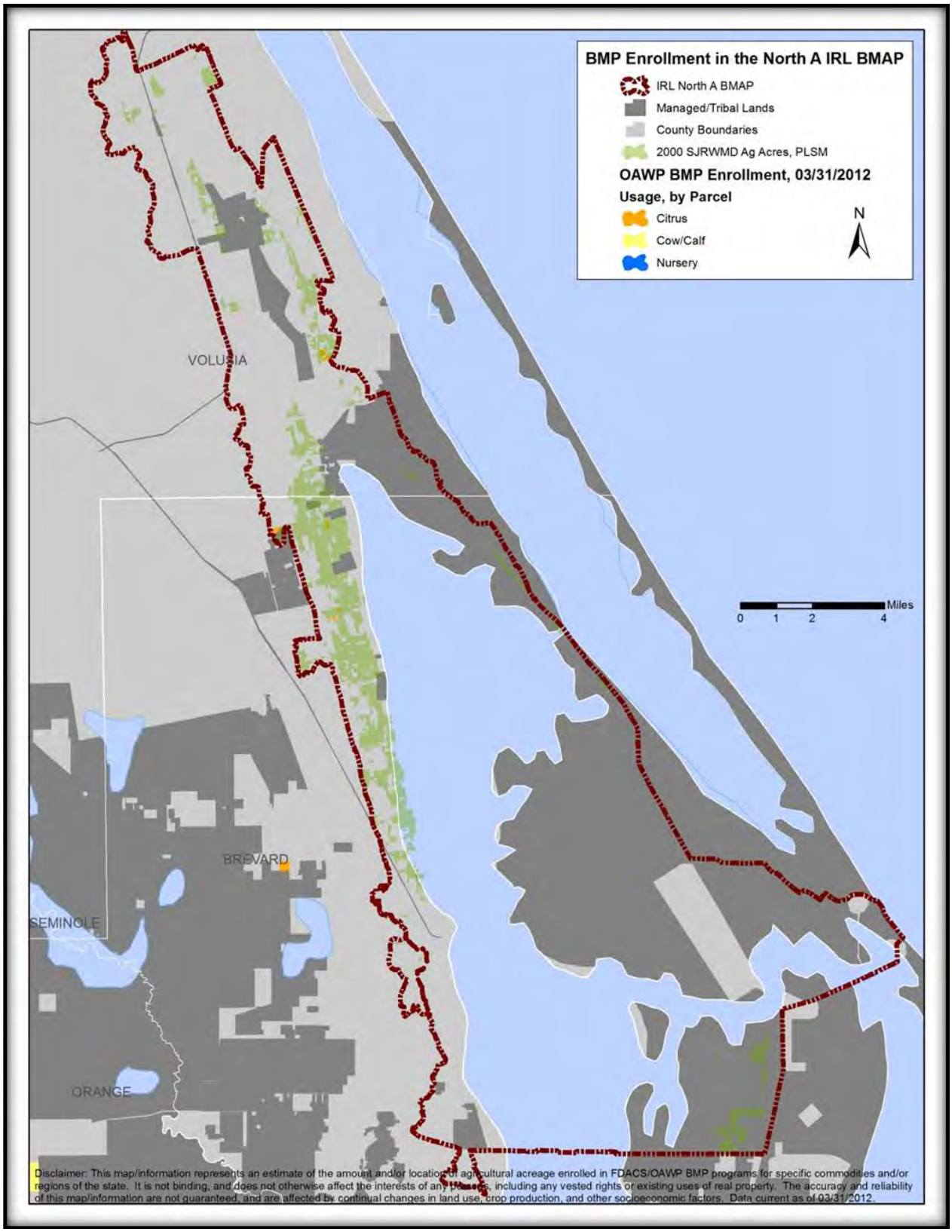


**FIGURE 11: BMP ENROLLMENT IN THE NORTH A PROJECT ZONE AS OF MARCH 2012**

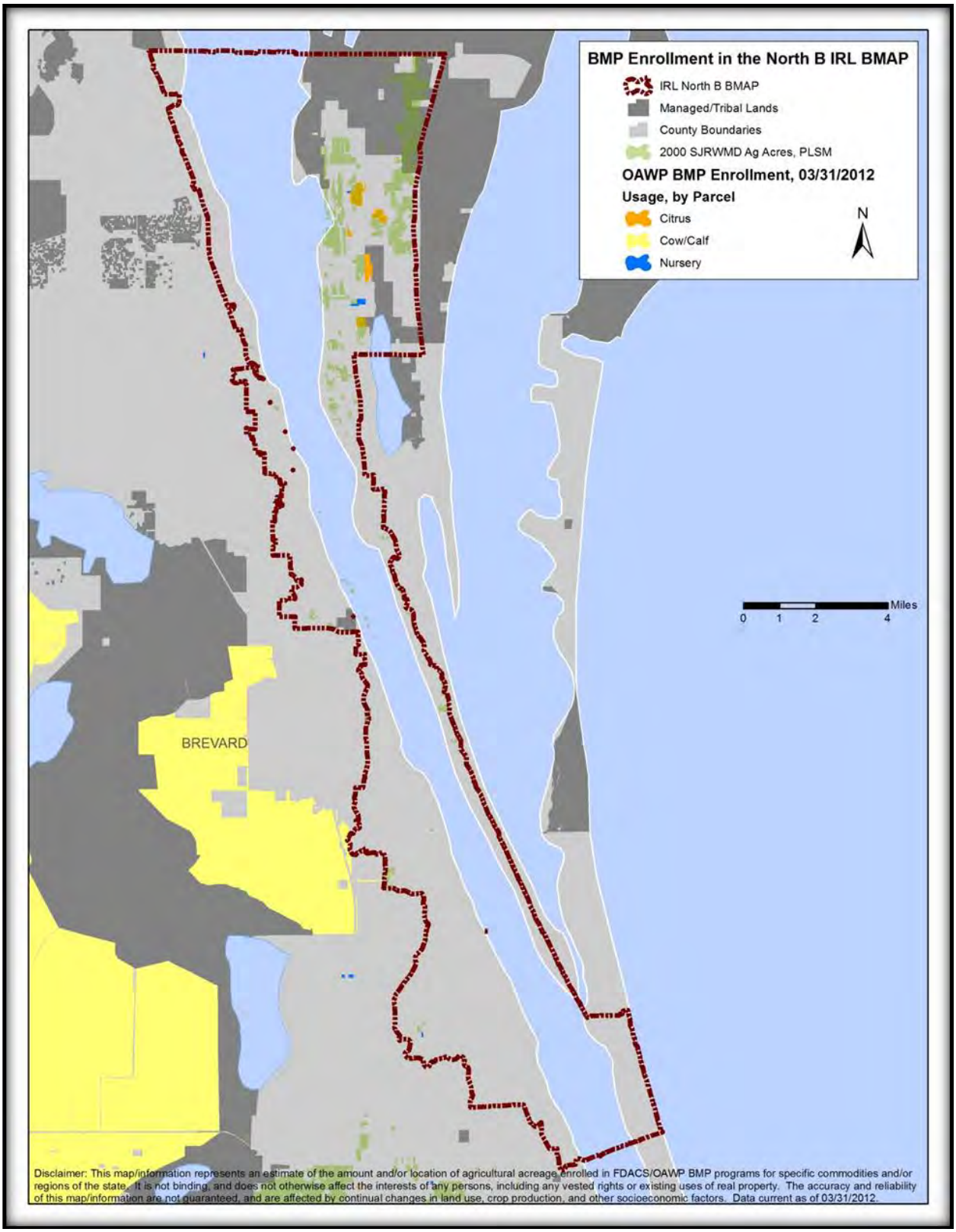


**FIGURE 12: BMP ENROLLMENT IN THE NORTH B PROJECT ZONE AS OF MARCH 2012**

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 in the basin, including nursery, row/field crops, and equine operations.

### 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 continue the shift from agricultural to residential/urban land uses, further reducing agricultural loading. 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. The 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 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 FIVE YEARS**

| NORTH A ESTIMATED LOADS | TN (LBS/YR) | TP (LBS/YR) |
|---|---|---|
| Load Reduction Allocation for Agriculture | 37,311.0 | 6,858.6 |
| 1st 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 FIVE YEARS**

| NORTH B ESTIMATED LOADS | TN (LBS/YR) | TP (LBS/YR) |
|---|---|---|
| Load Reduction Allocation for Agriculture | 7,311.3 | 2,964.8 |
| 1st 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 effects, and continue to coordinate within and across jurisdictions to achieve seagrass targets. The FWRA requires that an assessment be conducted every five 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, 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 two-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 were not achieving the seagrass depth limit targets in 2007 or 2009; therefore, two out of the four 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***
  - Collect project implementation information from the stakeholders and MS4 permit reports and compare with the BMAP schedule.
  - Discuss the data collection process, including any concerns and possible improvements to the process.
  - Review the monitoring plan implementation, as detailed in **Section 6.3**.

- ***Sharing New Information***
  - Report on seagrass depth limit evaluation results compared with the TMDL seagrass depth limit targets, using the Step 1 and Step 2 evaluations for compliance.
  - Report on results from water quality monitoring and trend information.
  - Provide updates on new projects and programs in the basin that will help reduce nutrient loading.
  - Identify and review new scientific developments on addressing nutrient loading and incorporate any new information into annual progress reports.
  - Discuss new sampling technologies that will improve source identification.

- ***Coordinating TMDL-Related Issues***
    - Provide updates from FDEP on the basin cycle and activities related to any impairments, TMDLs, and BMAPs.
    - 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 this list provides 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 the 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 the status of project implementation, monitoring, and other activities 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 purpose of the primary monitoring for the North IRL 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 ambient water quality trends in the North IRL and major tributaries 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.

### 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, 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, the SJRWMD typically has conducted seagrass mapping every two 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, the SJRWMD is proposing to sample five tributary stations and one lagoon station, if funding is available. At these stations, the SJRWMD analyzes the following parameters:

- *Total Kjeldahl Nitrogen (TKN)*
- *Nitrite/Nitrate*
- *Ammonia*
- *TP*
- *Orthophosphate*
- *Chlorophyll-a (corrected)*
- *Photosynthetically active radiation (PAR)*
- *True Color*
- *Turbidity*
- *TSS*
- *DO*
- *Specific Conductivity*
- *pH*
- *Salinity*
- *Secchi Depth*
- *Depth of Collection*

- *Total Depth of Sample Site*
- *Water Temperature*
- *Field Conditions*
- *Total Organic Carbon (TOC)*
- *Dissolved Organic Carbon (DOC)*
- *Silica*
- *Alkalinity*
- *Volatile Suspended Solids*

In addition to the SJRWMD water quality monitoring stations, Volusia County collects monthly water quality data at two stations, and the U.S. Geological Survey (USGS) collects flow data at one station in the North IRL. **Table 40** lists the stations that the SJRWMD, Volusia County, and USGS currently sample in the North IRL subbasin; 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 | IRLBFRR | IRLBFRR | 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 |

| Sampling Entity | Station ID | Station Name | Station Type | Frequency | Year Site Established | Project Zone |
|---|---|---|---|---|---|---|
| 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

The SJRWMD is proposing to add three new water quality monitoring stations: one at each of the two canals along Gus Hipp Boulevard and one at the Bracco Pond outfall. FDEP is working to obtain funding to add discharge stations at each of these 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 one to three 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 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. FDEP pulls water quality data used for impaired waters 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. The 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 the results of biological assessments and information on storm events, 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 on 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 is 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.

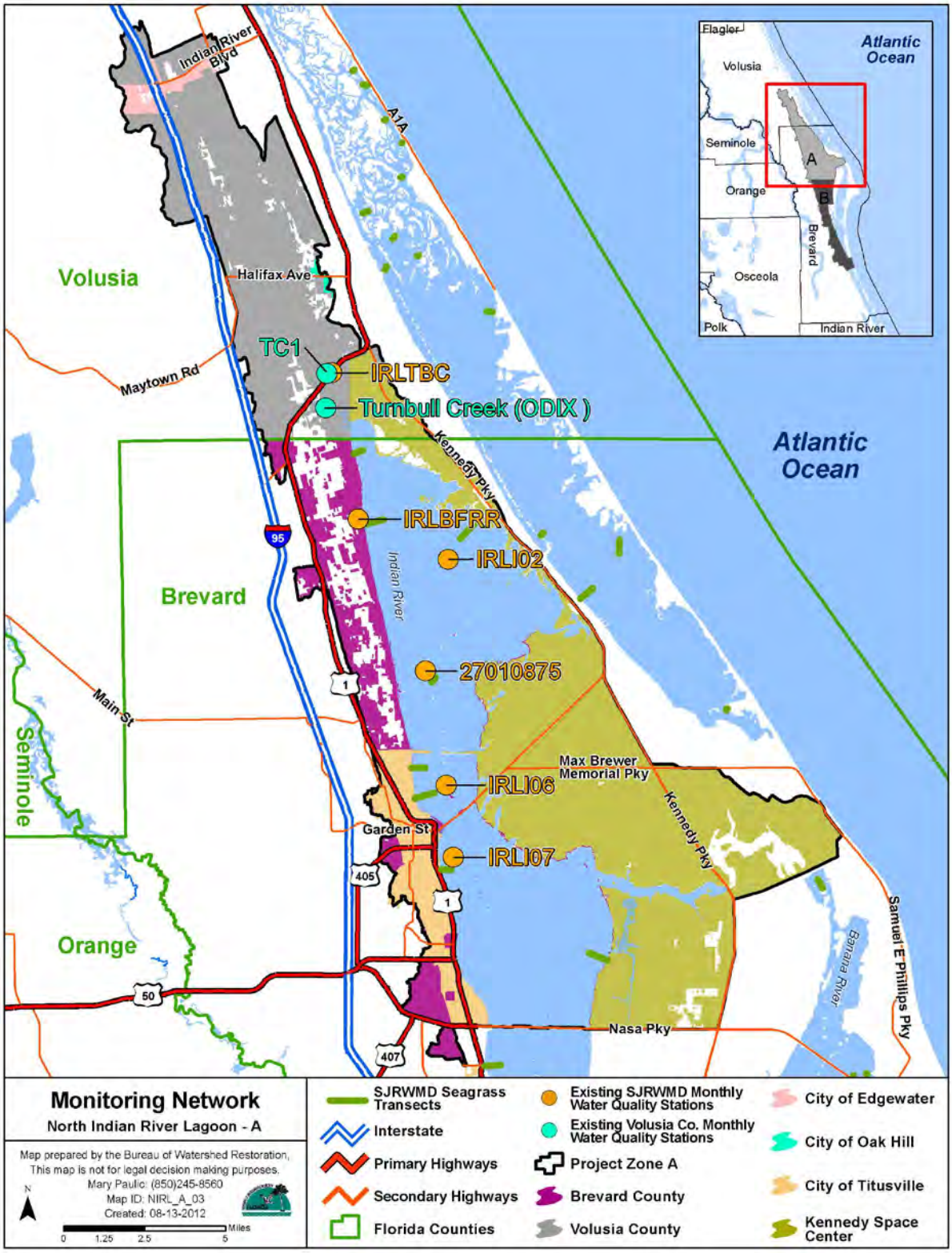


**FIGURE 13: MONITORING NETWORK IN THE NORTH A PROJECT ZONE**

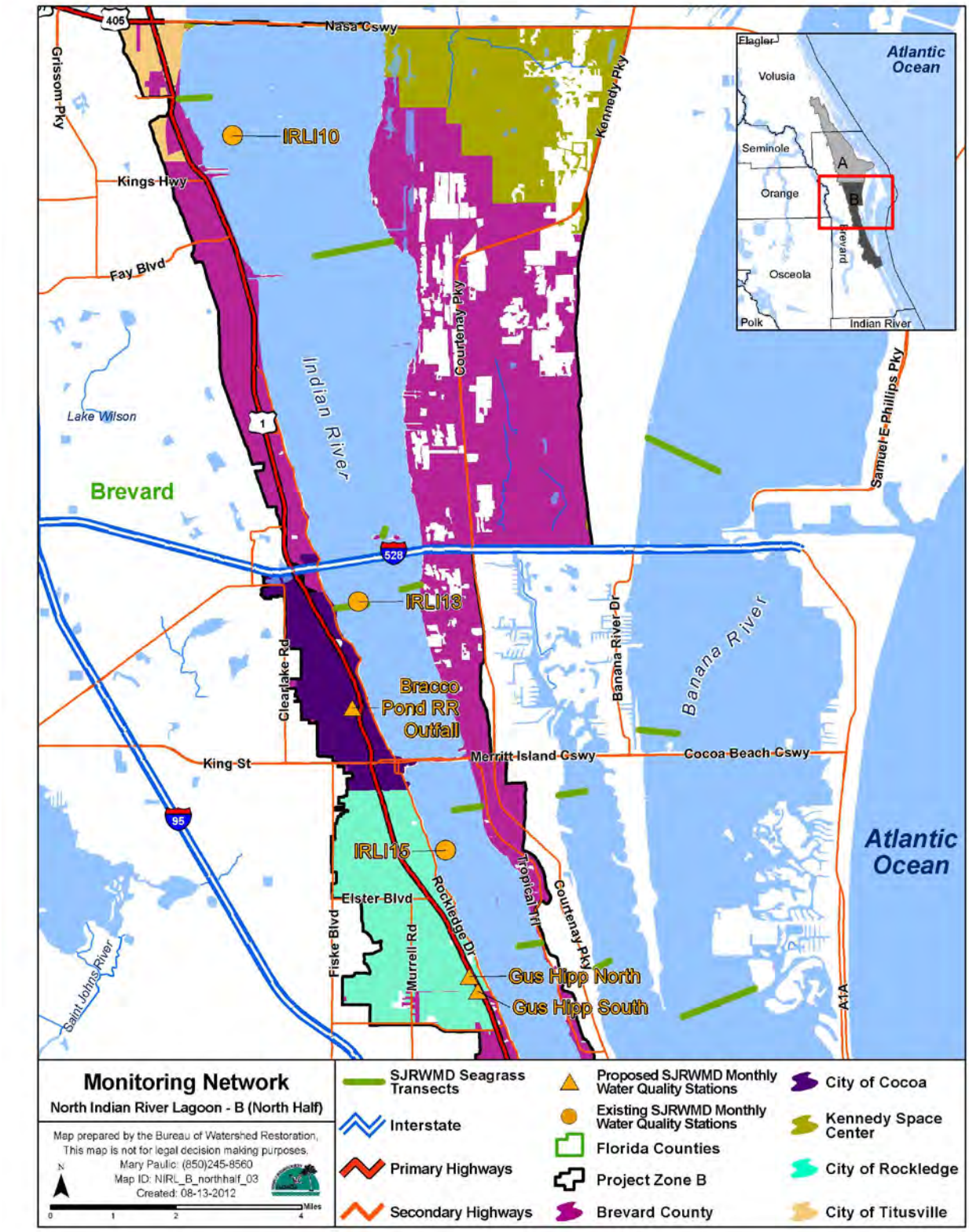


**FIGURE 14: MONITORING NETWORK IN THE NORTHERN PART OF THE NORTH B PROJECT ZONE**

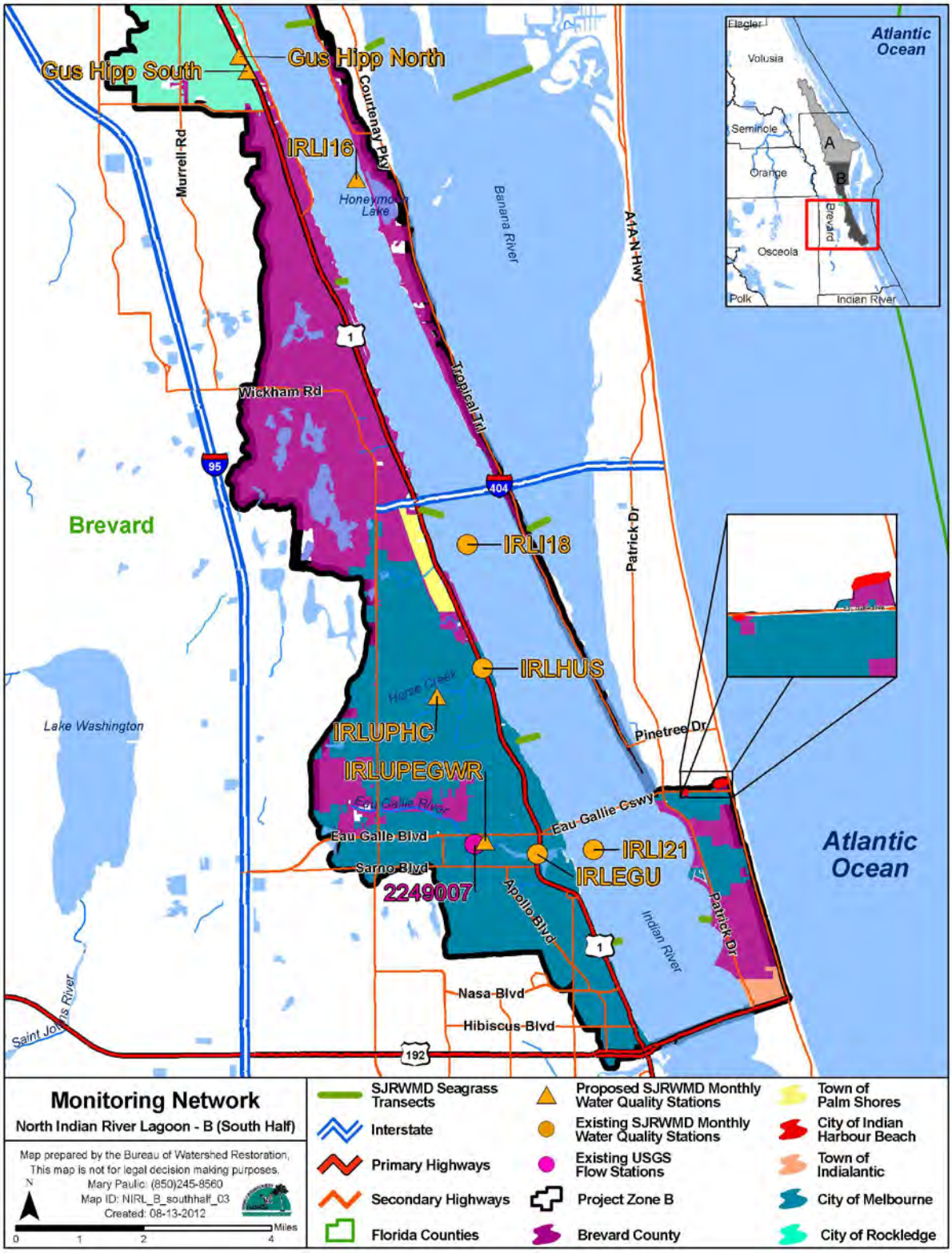


**FIGURE 15: MONITORING NETWORK IN THE SOUTHERN PART OF THE NORTH B PROJECT ZONE**

### *6.4.5 QA/QC*

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* (SJRWMD *et al.* 2012) addresses or complements a number of the listed priorities. These research topics include the following:

- *Collecting data to update the bathymetry for the IRL Basin that would be used in the seagrass depth limit evaluations;*
- *Continuing and increasing monitoring frequency 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 ground water load contribution data and conducting ground water modeling; and*
- *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.

# 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.

James H. Tulley, Jr., Mayor

ATTEST:

Wanda Wells, City Clerk

**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.**

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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

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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*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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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 in 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 | Springs 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 five 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 IRL 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 five 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 five 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:
    - Permitting and other existing regulatory programs
    - Non-regulatory and incentive-based programs
    - Other water quality management and restoration activities, such as Surface Water Improvement and Management (SWIM) plans or **basin management action plans**
    - Pollutant trading or other equitable economically based agreements
    - Public works
    - 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.

- 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*.)
  - 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.
  - 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.
  - These measures may be implemented by those responsible for agricultural pollutant sources. **DEP, the WMDs, and DACS** shall assist with implementation.
  - In developing and adopting these measures, DACS shall consult with DEP, DOH, the WMDs, representatives of affected farming groups, and environmental group representatives.
  - 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 -
  - DEP shall, at representative sites, verify the effectiveness of BMPs and other measures adopted by rule in achieving load reduction allocations.
  - 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.
  - 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 –
  - 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 in evaluating the success of the nutrient TMDLs. Even if the relationship among nutrient loads and seagrass recovery is not as predicted by the regression model, the load reduction requirements themselves will not determine TMDL success. The assessment of success is based on whether the seagrass grows at sufficient depths.

The TMDL seagrass depth limit targets are based on a union coverage of the seagrass mapping data from 1943, 1986, 1989, 1992, 1994, 1996, and 1999. The SJRWMD created this union coverage when it set PLRGs for the IRL Basin. The TMDL targets are not based on the full restoration of seagrass depths represented by this union coverage; instead, they 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 that 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 four years of seagrass mapping data. For the BMAP, two separate four-year assessment periods were used in the evaluation: (1) seagrass mapping years 2003, 2005, 2006, and 2007; and (2) seagrass mapping years 2005, 2006, 2007, and 2009. For the assessment years to be compliant with the TMDL seagrass depth limit targets, the data must meet the requirements of the two-step evaluation process. The first step is a comparison of the TMDL union coverage cumulative frequency distribution curve with 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. 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 with each assessment year's median value. To be compliant in the second step, at least three of the four assessment year medians must be equal to or greater than the TMDL median. If the seagrass data from the four 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 two-step evaluation process. These steps are as follows:

- *Start with the seagrass GIS shapefiles for the four 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 four 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, which provides the depth information for the lagoon*

*system. The dredged areas are removed from this coverage because seagrass is 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 that is 7.9 meters inside and 7.9 meters outside the seagrass bed. The bathymetry layer was created by the SJRWMD in 1996, and the bathymetry was measured every 15.2 meters. The 15.8-meter buffer around the seagrass polyline ensures that 1 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 two-step evaluation. The depth points are sorted from highest to lowest, and the count of the number of points at each depth is 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 with 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 with 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 four 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 tables below summarize the projects and time frames for implementation submitted by the entities to achieve their TMDL allocations for the first BMAP iteration. The tables provide information on the nutrient reduction attributed to each individual project, shown in lbs/yr. These projects were submitted to provide reasonable assurance to FDEP that each entity has a plan on how it will meet its 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 period.

**Notes:**
N/A = Not applicable
- = Empty cell

# 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 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 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 3.5-acre wet detention pond to treat runoff from mixed use lands prior to discharge to IRL | 882.1 | $1,854,254 | Unknown | 7/2012 | Started | 79 | 12.5 |
| TV-5 | St. Johns Basin Stormwater Improvements | 2nd generation baffle box | Installation of baffle box downstream of pond to treat runoff from mixed use lands prior to discharge to 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 frequency of 12 cycles per year, for total of 3,936 miles swept annually | N/A | $188,120 | $63,106 | Ongoing | Ongoing | 1,699 | 765.0 |
| **N/A** | **Total Project Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **8,012.0** | **2,676.6** |
| **N/A** | **Total BMAP I Required Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **6,604.6** | **1,447.6** |
| **N/A** | **Credit for Future BMAPs** | **N/A** | **N/A** | **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 IRL | 617.8 | Unknown | Completed | 2,566 | 1,005.0 |
| KSC-7 | Launch Pad 39A | Closed basin | Area is closed basin | 456.5 | N/A | Completed | 1,255 | 326.3 |
| KSC-8 | Launch Pad 39B | Closed basin | Area is 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 northwest before discharging to impoundment area adjacent to 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** | **Total Project Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **8,940** | **3,134.4** |
| **N/A** | **Total BMAP I Required Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **0** | **0.0** |
| **N/A** | **Credit for Future BMAPs** | **N/A** | **N/A** | **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 |

| 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 Beach | 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 | 2nd 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 in existing development; water quality addition | 43.6 | $525,161 | 2010 | Completed | 28 | 78.8 |
| MEL-2 | Dove Street Pond | Wet detention pond | No treatment is provided in existing development; 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 provided in 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 in 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 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 in 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 in 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 basin | N/A | Unknown | Ongoing | Ongoing | 873 | 581.8 |
| MEL-10 | Future Street Sweeping | Street sweeping | Additional street sweeping in 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** | **Total Project Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **8,043.0** | **2,915.3** |
| **N/A** | **Total BMAP I Required Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **6,738.5** | **1,968.4** |
| **N/A** | **Credit for Future BMAPs** | **N/A** | **N/A** | **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 | 2nd generation baffle box | 10.4 | $8,600 | $2,555 | 2009 | Completed | 17 | 2.3 |
| ROCK-2 | Barton Ave. Baffle Box | 2nd generation baffle box | 14.6 | $9,350 | $2,555 | 2009 | Completed | 20 | 2.9 |
| ROCK-3 | Hardee Circle Baffle Box | 2nd generation baffle box | 14.6 | $43,420 | $2,555 | 2009 | Completed | 17 | 2.0 |
| ROCK-4 | Rockledge Ave. Baffle Box | 2nd generation baffle box | 29.8 | Unknown | $3,682 | 2004 | Completed | 65 | 13.4 |
| ROCK-5 | Bougainvillea Drive Baffle Box | 2nd generation baffle box | 27.9 | $29,495 | $2,566 | 2000 | Completed | 69 | 11.9 |
| ROCK-6 | Park Ave. Baffle Box | 2nd generation baffle box | 9.1 | $52,529 | $2,555 | 2007 | Completed | 6 | 0.6 |
| ROCK-7 | Little John Lane Baffle Box | 2nd generation baffle box | 7.8 | $60,000 | $2,555 | 2004 | Completed | 11 | 1.3 |
| ROCK-8 | Fernwood Dr. Baffle Box | 2nd generation baffle box | 13.2 | $55,750 | Unknown | Unknown | Completed | 14 | 1.6 |
| ROCK-9 | Valencia Dr. Baffle Box | 2nd generation baffle box | 9.6 | $58,960 | $2,555 | 2008 | Completed | 10 | 1.2 |
| ROCK-10 | Knollwood Baffle Box | 2nd generation baffle box | 25.9 | $68,248 | $3,682 | 2002 | Completed | 23 | 2.6 |
| ROCK-11 | Sutton St. Baffle Box | 2nd generation baffle box | 5.1 | Unknown | Unknown | 2011 | Completed | 6 | 0.6 |
| ROCK-12 | River Groves Baffle Box | 2nd generation baffle box | 8.9 | Unknown | Unknown | 2011 | Completed | 5 | 0.5 |
| ROCK-13 | Summer Pl. Baffle Box | 2nd 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 | 1986–99 | 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** | **Total Project Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **5,519.0** | **2,206.1** |
| **N/A** | **Total BMAP I Required Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **2,095.4** | **593.6** |
| **N/A** | **Credit for Future BMAPs** | **N/A** | **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 Rd. 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 Rd. to SR 404 | 18.9 | 2005 | Completed | 34 | 18.2 |

| Project Number | Project Name | Project Type | Project Detail | Treatment Acres | End Date | Status | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) |
|---|---|---|---|---|---|---|---|---|
| FDOT-13 | 70020-3549-03 Pond 3 – missing from model | Wet detention pond | SR 5 – Add lanes and reconstruct from Post Rd. 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 Rd. 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 Rd. 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 basin | N/A | Ongoing | Ongoing | 1,179 | 754.6 |
| FDOT-22 | Fertilizer Cessation | Fertilizer cessation | Elimination of fertilizer use along rights-of-way | N/A | 2005 | Completed | 1,552 | 0.0 |
| **N/A** | **Total Project Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **3,210.0** | **992.7** |
| **N/A** | **Total BMAP I Required Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **649.9** | **318.9** |
| **N/A** | **Credit for Future BMAPs** | **N/A** | **N/A** | **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 IRL | 135.8 | Unknown | Completed | 239 | 100.9 |
| **N/A** | **Total Project Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **1,197** | **1,169.6** |
| **N/A** | **Total BMAP I Required Reductions** | **N/A** | **N/A** | **N/A** | **N/A** | **N/A** | **0** | **0.0** |
| **N/A** | **Credit for Future BMAPs** | **N/A** | **N/A** | **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 US 192 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 (LBS/YR) | TP REDUCTION (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:

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## WEBSITES:

### TABLE G-1: STORMWATER AND WATER QUALITY PROTECTION WEBSITES

- = Empty cell

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