# FINAL

# BASIN MANAGEMENT ACTION PLAN

**For the Implementation of Total Daily Maximum Loads for Dissolved Oxygen Adopted by the Florida Department of Environmental Protection**

*in the*

# Everglades West Coast Basin

*developed by the*
***Everglades West Coast Basin Technical Stakeholders***

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

**December 2012**

**ACKNOWLEDGMENTS**: The *Everglades West Coast 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 Everglades West Coast stakeholders, identified below, with participation from affected local, regional, and state governmental interests; elected officials and citizens; and private interests.

EVERGLADES WEST COAST BASIN PARTICIPANTS

| ENTITY |
|---|
| Florida Department of Environmental Protection |
| South Florida Water Management District |
| Florida Department of Agriculture and Consumer Services |
| Florida Department of Transportation – District 1 |
| City of Bonita Springs |
| Lee County |
| Catalina at Winkler Preserve Community Development District |

**For additional information on Total Maximum Daily Loads and the watershed management approach in the Everglades West Coast Basin, contact:**

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| | |
|---|---|
| **AWT** | Advanced Wastewater Treatment |
| **BMAP** | Basin Management Action Plan |
| **BMP** | Best Management Practice |
| **BOD5** | Biochemical Oxygen Demand |
| **CDD** | Community Development District |
| **C.F.R.** | Code of Federal Regulations |
| **CHNEP** | Charlotte Harbor National Estuary Program |
| **DMR** | Discharge Monitoring Report |
| **EPA** | U.S. Environmental Protection Agency |
| **ERP** | Environmental Resource Permit |
| **F.A.C.** | Florida Administrative Code |
| **FAW** | Florida Administrative Weekly |
| **FDACS** | Florida Department of Agriculture and Consumer Services |
| **FDEP** | Florida Department of Environmental Protection |
| **FDOH** | Florida Department of Health |
| **FDOT** | Florida Department of Transportation |
| **FLUCCS** | Florida Land Use and Cover Classification System |
| **F.S.** | Florida Statutes |
| **FWRA** | Florida Watershed Restoration Act |
| **FYN** | Florida Yards and Neighborhoods |
| **IWR** | Impaired Surface Waters Rule |
| **LA** | Load Allocation |
| **LID** | Low Impact Development |
| **MEP** | Maximum Extent Practicable |
| **MS4** | Municipal Separate Storm Sewer System |
| **NELAC** | National Environmental Laboratory Accreditation Conference |
| **NOI** | Notice of Intent |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NPS** | Nonpoint Source |
| **OAWP** | Office of Agricultural Water Policy |
| **PCS** | Permit Compliance System |
| **POTW** | Publicly Owned Treatment Works |
| **PSA** | Public Service Announcement |
| **QA/QC** | Quality Assurance/Quality Control |
| **SFWMD** | South Florida Water Management District |
| **SOP** | Standard Operating Procedure |
| **SWMP** | Stormwater Management Program |
| **TMDL** | Total Maximum Daily Load |
| **TKN** | Total Kjeldahl Nitrogen |
| **TN** | Total Nitrogen |
| **TOC** | Total Organic Carbon |
| **TSS** | Total Suspended Solids |
| **TT** | Treatment Train |
| **UF-IFAS** | University of Florida-Institute of Food and Agricultural Sciences |
| **USGS** | U.S. Geological Survey |
| **WAFR** | Wastewater Facility Regulation |
| **WBID** | Waterbody Identification |

**WLA** Wasteload Allocation
**WWTF** Wastewater Treatment Facility
**WWTP** Wastewater Treatment Plant

# EXECUTIVE SUMMARY

## EVERGLADES WEST COAST BASIN

Hendry Creek and the Imperial River are both located in the Estero Bay Planning Unit within the Everglades West Coast Basin. Estero Bay proper is a shallow, subtropical lagoon with an area of 17.7 square miles ($mi^2$) (11,317 acres) and is separated from the Gulf of Mexico by barrier islands. Seagrass beds are common in the bay, but high turbidity restricts seagrass growth to shallow depths. The Estero and Imperial Rivers and Spring, Mullock, and Hendry Creeks are the major tributaries that flow into Estero Bay.

The Estero Bay region is generally characterized by slow, sheet-flow drainage patterns that are typical of the flat, wetland-dominated, southern Florida landscape. In the past, the naturally dispersed water patterns distributed nutrients over broad areas of wetland vegetation. Seasonal fluctuations in flow from rainfall created the necessary salinity regime in Estero Bay for good estuarine productivity. Increased development since the 1960s has led to changes in the natural river systems around Estero Bay, altering freshwater inflow patterns (Florida Department of Environmental Protection [FDEP] 2003).

Hendry Creek is located in the southwest part of Lee County in southwest Florida, approximately 3 miles south of the city of Ft. Myers and approximately 3 miles southeast of the city of Cape Coral. For assessment purposes, Hendry Creek is divided into a predominantly freshwater segment and a predominantly marine segment. U.S. Route 41 runs between the two segments. Hendry Creek flows south for approximately 6 miles into north Estero Bay and drains a watershed of about 15.35 $mi^2$. Most development is in the north end of the watershed, and wetlands and water dominate the southern portion.

The Imperial River watershed covers approximately 23.1 $mi^2$ (14,784 acres), of which 6.9 $mi^2$ (4,416 acres) are surface waters. Oak Creek and Leitner Creek flow into the upstream portion of the Imperial River. Both of these drainage areas, as well as the adjacent watershed, contain extensive areas of cropland and pastureland. As the Imperial River runs adjacent to the city of Bonita Springs, it receives extensive amounts of urban runoff along the majority of its length (FDEP 2003).

As part of the Basin Management Action (BMAP) process, FDEP worked with the stakeholders to refine the basin boundaries for both the Imperial River and Hendry Creek basins to better represent actual conditions. These refined basin areas were then used for the purposes of assigning and allocating pollutant loads to the stakeholders.

## TOTAL MAXIMUM DAILY LOADS

Total Maximum Daily Loads (TMDLs) are water quality targets, based on state water quality standards, for specific pollutants (such as nitrogen and phosphorus). FDEP identified the Imperial River and Hendry Creek to be impaired for low dissolved oxygen (DO) and, in August 2008, adopted TMDLs that target reductions in total nitrogen (TN) in the river and creek segments to address the low DO condition. The table below lists the TMDLs adopted by rule for each of the impaired segments with a waterbody identification (WBID) number in the Imperial River and Hendry Creek Basins.

TABLE 1: TMDLS IN THE IMPERIAL RIVER AND HENDRY CREEK BASINS

| WBID | WATERBODY | PARAMETER | TMDL (MG/L) | WLA FOR WASTEWATER (LBS/YEAR) | WLA FOR NPDES STORMWATER (% REDUCTION) | LA (% REDUCTION) |
|---|---|---|---|---|---|---|
| 3258B | Hendry Creek | TN | 0.74 | Not applicable | 44% | 44% |
| 3258B1 | Hendry Creek | TN | 0.60 | Not applicable | 44% | 44% |
| 3258E | Imperial River | TN | 0.74 | Not applicable | 24.87% | 24.87% |

FDEP used the Impaired Surface Waters Rule (IWR) to assess water quality impairments for the freshwater portion of the Imperial River and both the freshwater and marine segments of Hendry Creek and has verified the impairments for low DO. The Imperial River was verified as impaired for DO based on data indicating that the exceedance rate is greater than or equal to 10%. The DO impairment in the two waterbody segments (freshwater and marine) of Hendry Creek was verified based on the observation that DO values for 31 out of 59 samples in the freshwater segment and 34 out of 39 samples in the marine segment collected during the verified period (January 1, 2000, through June 30, 2007) were lower than the state water quality criteria for Class III freshwater and marine systems, respectively. TN was considered the causative pollutant for impairment in both the Imperial River and Hendry Creek. The TMDLs for the Imperial River and Hendry Creek established the allowable loading of TN to that would restore them so that they meet their applicable water quality criteria for DO.

It should be noted that during the development of the BMAP document, the WBID boundaries for Hendry Creek and Imperial River were modified to better reflect the marine and freshwater interface. In particular, WBID 3258B and 3258B1 have been combined into a single marine WBID 3258B2 for Hendry Creek based on hydrology, Lee County watershed coverage, and FDEP District feedback. Also, WBID 3258E has been combined with 3258C to become 3258EA. These WBID changes will be addressed in the re-listing process for Cycle 3. Nevertheless, this BMAP considers the TMDL for the older WBID boundaries and will be modified in the future accordingly.

### THE EVERGLADES WEST COAST BASIN MANAGEMENT ACTION PLAN

The purpose of this BMAP is to implement TN reductions for the Hendry Creek and Imperial River Basins to achieve the TMDLs for DO. The BMAP provides for phased implementation under Paragraph 403.067(7)(a)1, Florida Statutes (F.S.). The management actions and adaptive management approach described in the BMAP will address TN reductions, and the process will continue until the TMDLs are attained or the DO water quality standard is met. The phased BMAP approach allows for the implementation of projects designed to achieve incremental reductions, while simultaneously monitoring and conducting studies to better understand the water quality dynamics (sources and response variables) in the watershed. The total required reductions to meet the TMDLs are spread out over a maximum 15-year time frame.

During the course of BMAP development, stakeholders reiterated concerns identified during the TMDL adoption process with regards to portions of the TMDL, including a concern that the low DO may be a naturally occurring condition. The TMDLs are scheduled to be refined over the next few years. While the TMDL modeling is refined, FDEP requested that the stakeholders provide activities and projects that would reduce the TN load to some degree. Accordingly, to the extent that the projects and other activities listed in 5.3 and 11.3 (or comparable projects and other activities approved by FDEP) are implemented on a timely basis, those applicable

entities shall be presumed to be in compliance with this BMAP. After the first 5 years of BMAP implementation, stakeholders will evaluate progress and make adjustments as needed to meet future refined TMDLs. Additionally, FDEP is currently proposing changes to the DO standard defined in Rule 62-302.520(30), Florida Administrative Code (F.A.C.). If the DO standard changes, then FDEP will review the impairment status of both Hendry Creek and the Imperial River.

### KEY ELEMENTS OF THE BMAP

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

- *Document how the public and other stakeholders were encouraged to participate or participated in developing the BMAP **(Section 1.3.1** and **Appendix C**);*
- *Equitably allocate pollutant reductions in the basin (**Sections 4 and 10**);*
- *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 (**Sections 4 and 10**);*
- *Document the implementation schedule, funding, responsibilities, and milestones (**section**); and*
- *Identify monitoring, evaluation, and a reporting strategy to evaluate reasonable progress over time (**Sections 5 and 11**).*

### ANTICIPATED OUTCOMES OF BMAP IMPLEMENTATION

Through the implementation of projects, activities, and additional source assessment in this BMAP, stakeholders expect the following outcomes:

- *Improved water quality trends in Hendry Creek and the Imperial River;*
- *Decreased loading of the target pollutant (TN);*
- *Increased coordination between state and local governments and within divisions of local governments in problem solving for surface water quality restoration;*
- *Determination of effective projects through the 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.*

### BMAP COST AND TIME FRAME

Costs totaling $4.925 million were provided for 22% of the activities identified in the BMAP. It is important to note that since the TMDL is scheduled to be refined over the next few years, stakeholders were asked to provide activities and projects that would reduce the TN load in the meantime. The large majority (88%) of projects submitted by stakeholders for this phase of the

BMAP have already been completed. Technical stakeholders will continue to explore new opportunities for funding assistance to ensure that the activities listed in this BMAP can be maintained at the necessary level of effort.

### BMAP FOLLOW-UP

FDEP will work with the technical stakeholders to organize the monitoring data and track project implementation. The results will be used to evaluate whether the plan is effective in reducing TN loads in the watershed. The technical 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.

Additionally, FDEP shall conduct post BMAP adoption workshops with Lee County and non-agricultural nonpoint sources outside the county's MS4 boundaries to encourage communication and coordination between these entities on sub-regional and regional projects, activities, and public/private partnerships. The ultimate goals of these workshops are to ensure that non-agricultural nonpoint sources are taking appropriate pollutant reduction actions and commence a dialogue on additional projects or other activities that may be appropriate to attain desired pollutant load reduction goals in future phases of this BMAP.

### COMMITMENT TO BMAP IMPLEMENTATION

The stakeholders have committed to implementing the projects and activities included in this BMAP. The entities provided 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

## 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 agriculture. Currently, most surface waters in Florida, including those in the Everglades West Coast Basin, are categorized as Class III waters, which mean they must be suitable for recreation and must support the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. **Table 2** shows all 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 improve within the subsequent two years. The Florida Department of Environmental Protection (FDEP) is responsible for developing this "303(d) list" of impaired waters.

TABLE 2: DESIGNATED USE ATTAINMENT CATEGORIES FOR FLORIDA SURFACE WATERS

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

| CATEGORY | DESCRIPTION |
|---|---|
| Class I* | Potable water supplies |
| Class II* | Shellfish propagation or harvesting |
| **Class III** | **Recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife** |
| Class IV | Agricultural water supplies |
| Class V | Navigation, utility, and industrial use (*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 fecal coliform, 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 Total Maximum Daily Loads (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.). The impaired waters in the Everglades West Coast Basin addressed in this plan are all Class III waters. TMDLs have been established for these waters, identifying total nitrogen (TN) reductions to meet the dissolved oxygen (DO) standards.

In the TMDL, the waterbodies were considered as both fresh and marine waters. According to Paragraph 62-302.530(30), F.A.C., for marine waters, the ambient DO is not to average less than 5.0 milligrams per liter (mg/L) in a 24-hour period and never less than 4.0 mg/L, and for fresh waters, the ambient DO is not supposed to be less than 5.0 mg/L.

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 3** summarizes the five phases of the watershed management cycle.

TABLE 3: PHASES OF THE WATERSHED MANAGEMENT CYCLE

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

## 1.2 TMDL IMPLEMENTATION

Rule-adopted TMDLs may be implemented through Basin Management Action Plans (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. 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 practicable extent. FDEP must hold at least one 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 EVERGLADES WEST COAST BASIN MANAGEMENT ACTION PLAN

During the TMDL development and the BMAP preparation, South Florida Water Management District (SFWMD) staff collaborated frequently with FDEP. As a result, SFWMD is considered a collaborative partner with FDEP in the preparation of the BMAP. Other agencies, governments and interested parties helped in the preparation of this BMAP, as well as stakeholders (i.e., those who provided and will provide load reductions) and interested parties (i.e., those who provided information, reviews, and/or support).

### *1.3.1 STAKEHOLDER INVOLVEMENT*

Stakeholder involvement was a key component in developing the Everglades West Coast BMAP. The BMAP process engages local stakeholders and promotes coordination and collaboration to address the reductions for TN to achieve the Imperial River and Hendry Creek TMDLs.

The following organizations and entities are key stakeholders with assigned load reductions in the Hendry Creek portion of the Everglades West Coast BMAP:

- *Catalina at Winkler Preserve Community Development District (CDD);*
- *Lee County;*
- *Florida Department of Transportation (FDOT) District 1; and*
- *Florida Department of Agriculture and Consumer Services (FDACS).*

The following organizations and entities are key stakeholders with assigned load reductions in the Imperial River portion of the Everglades West Coast BMAP:

- *City of Bonita Springs;*
- *Lee County;*
- *FDOT District 1; and*
- *FDACS.*

In September 2009, FDEP initiated the BMAP development process and held a series of technical meetings involving key stakeholders and the general public. Technical meetings were open to the public and noticed in the *Florida Administrative Weekly* (FAW). The purpose of these meetings was to consult with key stakeholders to gather information on the impaired WBIDs and their contributing areas, to aid in the development of the BMAP, and to identify specific management actions that would decrease TN loadings to Hendry Creek and the Imperial River. Beginning in 2009, a total of five technical meetings were held to gather information; identify potential sources; define programs, projects, and actions currently under way; and develop the BMAP contents and actions that will result in reduction of TN with the ultimate goal of achieving the TMDL target reductions. Stakeholder involvement is essential to develop, gain support for, and secure commitments to implement the BMAP.

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

#### 1.3.1.1 Other Support and Interested Parties

In addition to the key stakeholders previously mentioned, several other interested parties and entities participated in the Everglades West Coast BMAP as shown below in **Table 4**.

TABLE 4: EVERGLADES WEST COAST BASIN PARTICIPANTS

| ENTITY | ENTITY |
|---|---|
| Charlotte Harbor National Estuary Program (CHNEP) | Town of Ft. Myers Beach |
| Collier County | Pelican Bay Foundation, Inc. |
| Collier County Audubon Society | City of Naples |
| Conservancy of Southwest Florida | University of Florida-Institute of Food and Agricultural Sciences (UF-IFAS) |
| Florida Gulf Coast University | U.S. Geological Survey (USGS) |

### 1.3.2 Plan Purpose and Scope

The purpose of this BMAP is to implement load reductions to achieve the DO TMDLs for Hendry Creek and the Imperial River in the Everglades West Coast Basin. This plan outlines specific projects that will achieve load reductions and a schedule for implementation. The document details a monitoring approach to measure progress toward meeting load reductions and to report on how the TMDL is being accomplished. The stakeholders will meet at least annually to review progress made towards achieving the TMDLs.

In 2008, FDEP adopted DO TMDLs for Hendry Creek (waterbody identification [WBID] units 3258B (freshwater) and 3258B1 [marine]) and the Imperial River (WBID 3258E) in the Everglades West Coast Basin. The Hendry Creek TMDL includes the impaired main stem of the creek, which is located in the southwest part of Lee County in southwest Florida, approximately 3 miles south of the city of Ft. Myers and approximately 3 miles southeast of the city of Cape Coral. For the TMDL, Hendry Creek was divided into a predominantly freshwater segment and a predominantly marine segment. U.S. Route 41 runs between the 2 segments. Hendry Creek flows south for approximately 6 miles into north Estero Bay and drains a watershed of about 15.35 square miles ($mi^2$).

The Imperial River watershed covers approximately 23.1 $mi^2$ (14,784 acres), of which 6.9 $mi^2$ (4,416 acres) are surface waters. Oak Creek and Leitner Creek flow into the upstream portion of the Imperial River. As the Imperial River has both marine and freshwater portions, the TMDL was developed only for the freshwater portion.

During the BMAP process, it became evident that the actual watershed boundaries for both the Hendry Creek and Imperial River Basins differed from the WBID boundaries used for the TMDL assessment. The old and new WBID boundaries are illustrated in **Figure 1A**. For the purpose of the BMAP, the watershed boundaries are shown in **Figure 1B** for Hendry Creek. Similarly, the old and new WBID boundaries are shown in **Figures 2A** and **2B** for the Imperial River. **Appendix G** describes how the basin boundaries were refined to better represent the actual watershed area for each WBID.

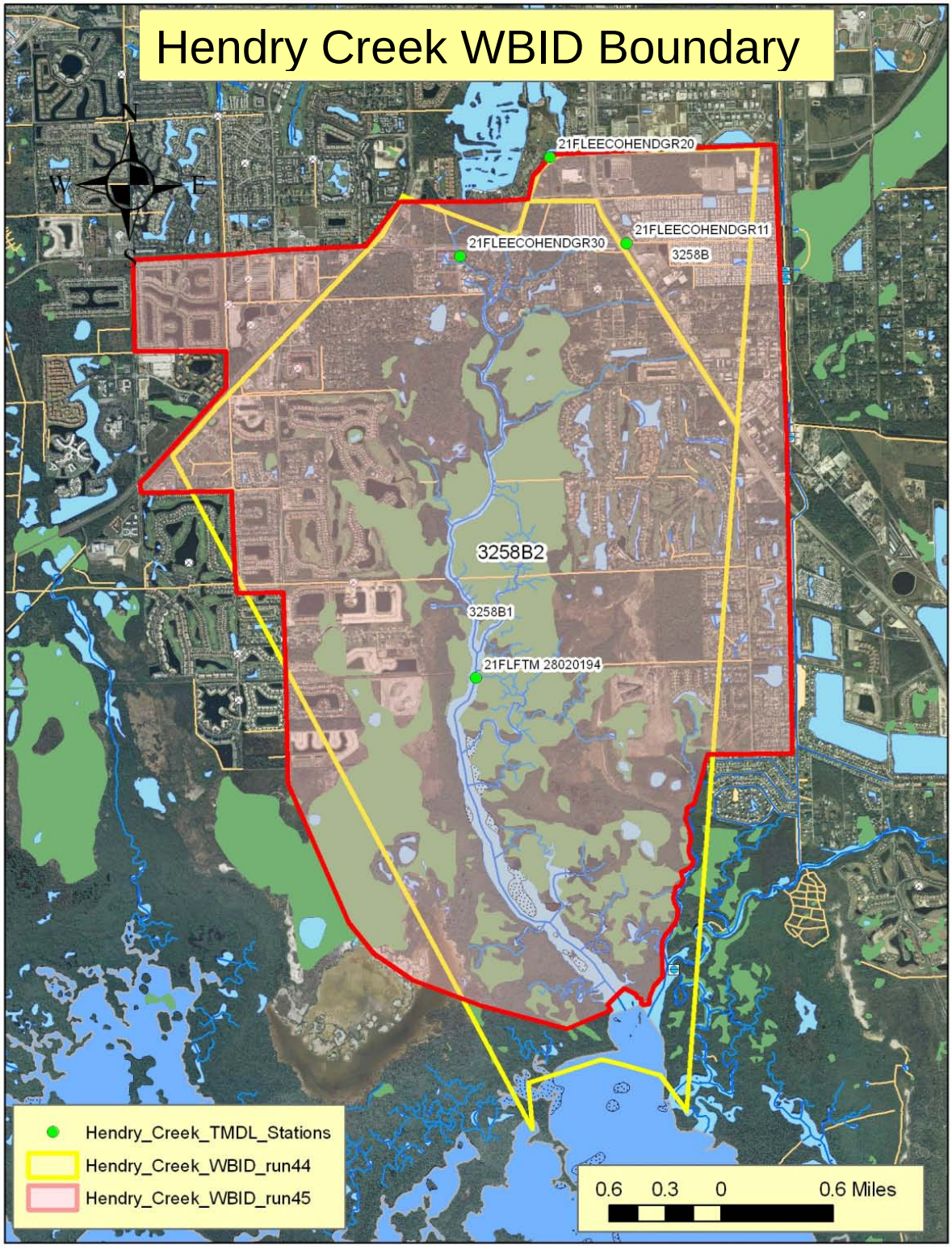



FIGURE 1A: HENDRY CREEK WBIDS

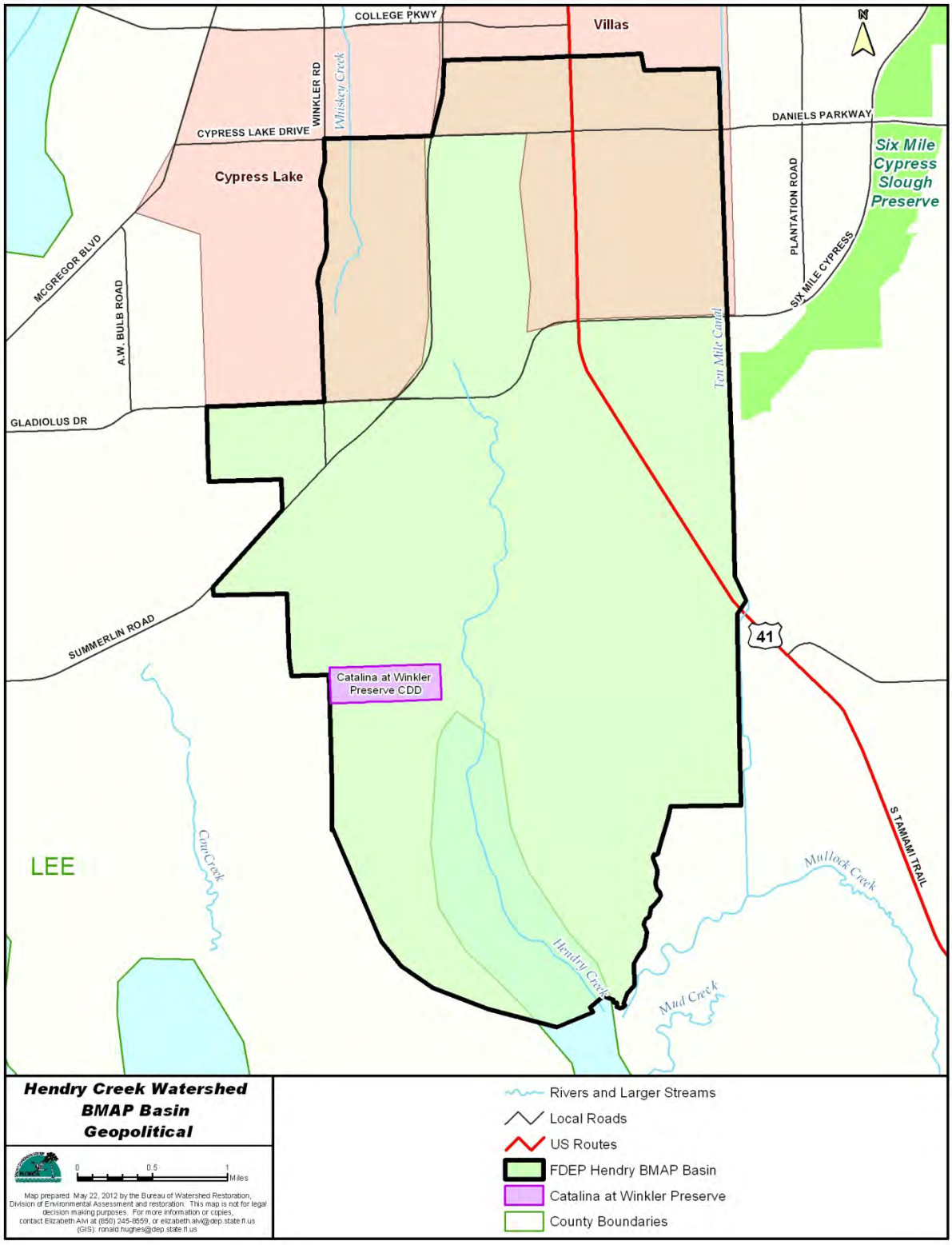



FIGURE 1B: HENDRY CREEK BASIN

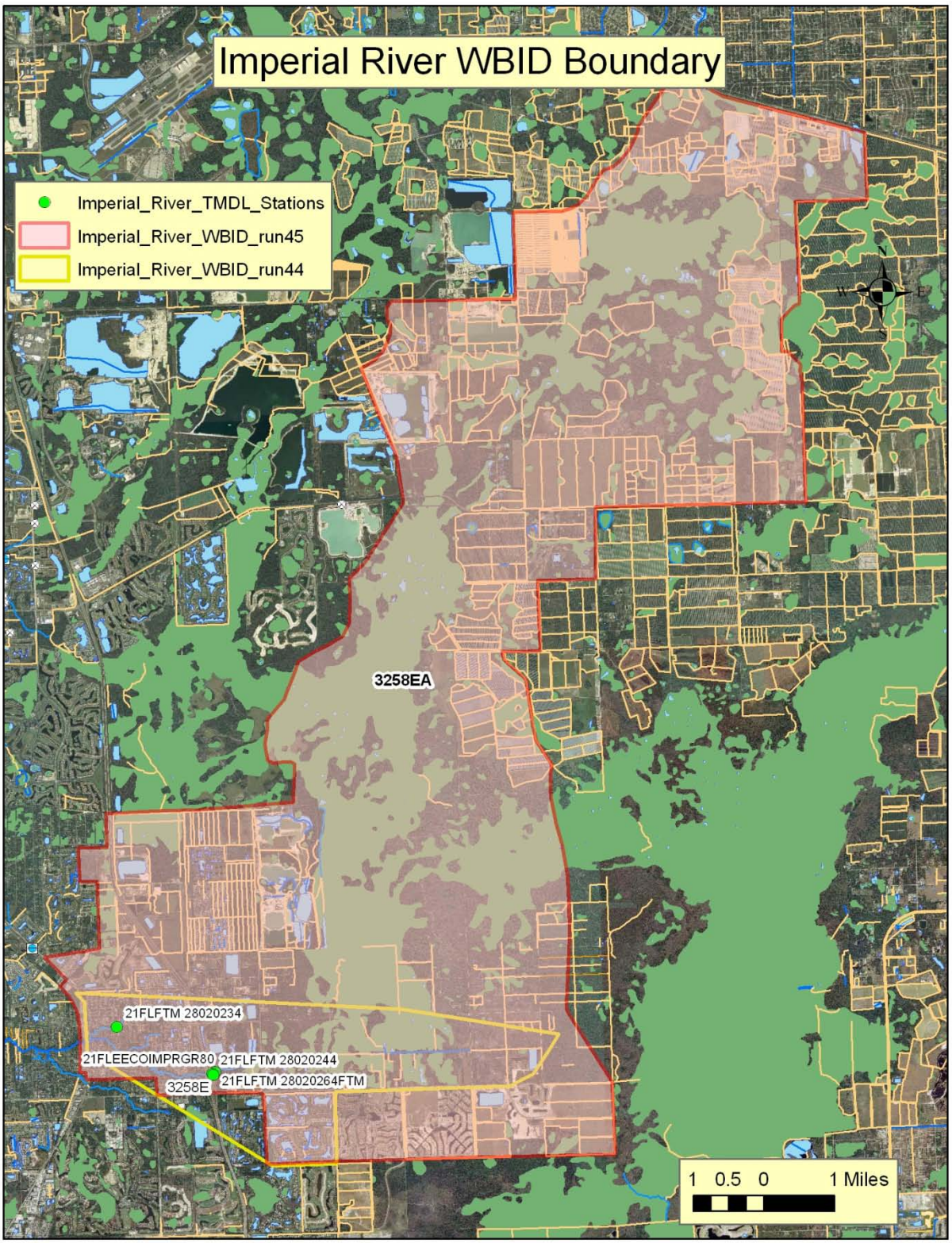



FIGURE 2A: IMPERIAL RIVER WBIDS

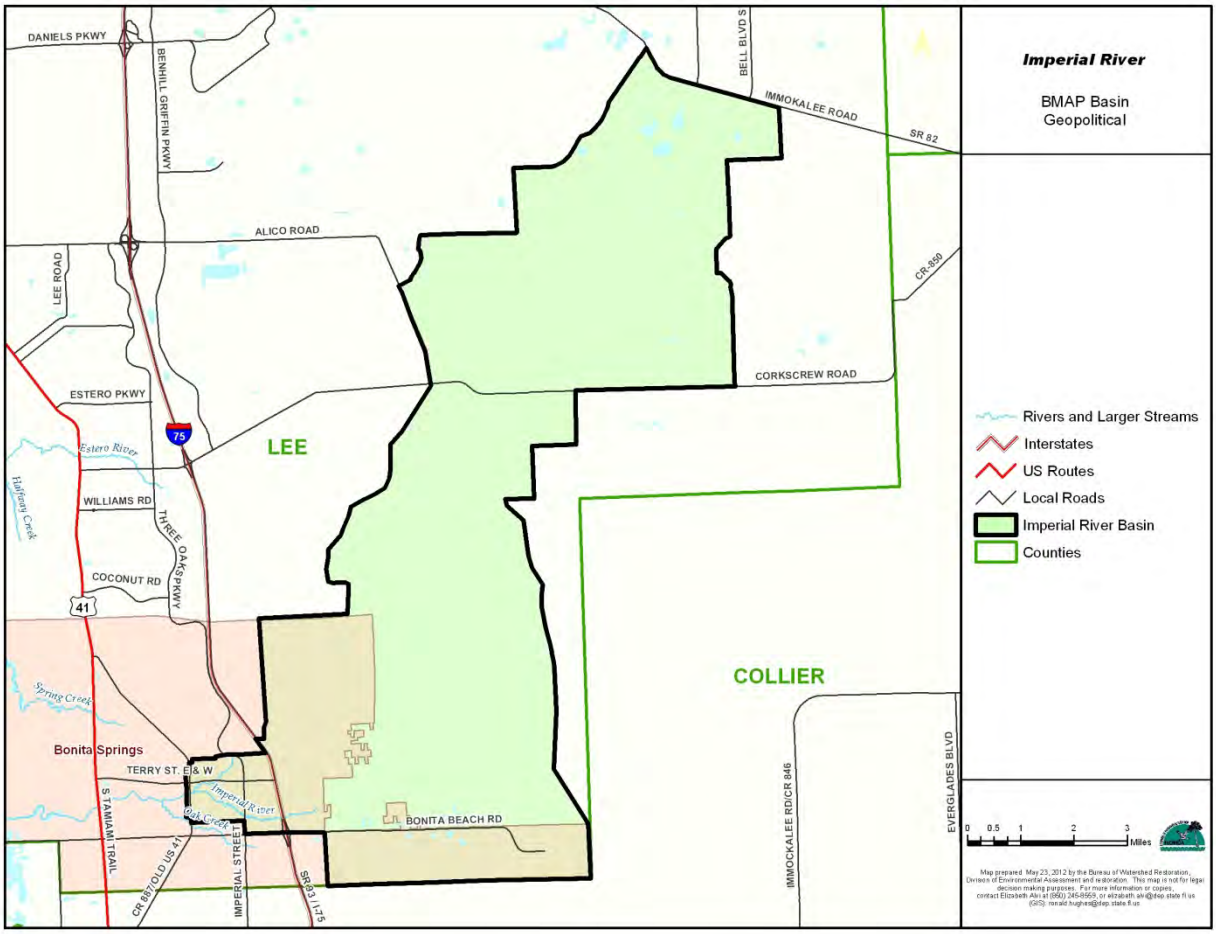



FIGURE 2B: IMPERIAL RIVER BASIN

### *1.3.3 BMAP APPROACH*

This BMAP provides for phased implementation under Subsection 403.067(7)(a)1, Florida Statutes (F.S). The management actions and adaptive management approach described in the BMAP will address nutrient reductions and the process will continue until the TMDLs are attained or the DO water quality standard is met. The phased BMAP approach allows for the implementation of projects designed to achieve incremental reductions, while simultaneously monitoring and conducting studies to better understand the water quality dynamics (sources and response variables) in the watershed. The total required reductions for the Hendry Creek and Imperial River Basins from the TMDLs are spread over a maximum 15-year time frame.

During the course of BMAP development, stakeholders reiterated concerns identified during the TMDL adoption process with regards to portions of the TMDL, including a concern that the low DO is a naturally occurring condition. FDEP will work together with stakeholders on refining the TMDL over the next few years. This refinement may affect the overall TMDL load reduction target; however, stakeholders in this BMAP will be held to their first 5-year interim targets and project commitments regardless. If that results in a higher reduction than required in the adjusted 5-year target, the overage will be credited towards future phases. This BMAP addresses projects and activities that have been completed or will be completed over a 5-year period which have a TN loading reduction. After the first 5 years of BMAP implementation, stakeholders will evaluate progress and make adjustments as needed to meet future refined

TMDLs. If necessary, a Phase II BMAP will then be developed to address the next portion of the reductions for the second 5-year iteration.

### *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 identify either how much pollutant discharge in pounds per year (lbs/yr) or the percent of its loading the source designation must reduce (reduction allocation). Currently, the TMDL allocation categories are as follows:

- ***Wasteload Allocation (WLA)**, which is the allocation to point sources permitted under the National Pollutant Discharge Elimination System (NPDES) Program, 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 adopted by rule may be an "initial" allocation among point and nonpoint sources. In such cases, the "detailed" allocation to specific point sources and specific categories of nonpoint sources must be established in the BMAP. The FWRA further states that the BMAP may make detailed allocations to individual "basins" (i.e., sub-basins) or to all basins as a whole, as appropriate. Both initial and detailed allocations must be determined based on a number of factors listed in the FWRA, including cost-benefit, technical and environmental feasibility, implementation time frames, and others (see **Appendix B**).

### *1.3.5 Everglades West Coast Basin TMDLs*

The DO TMDLs for Hendry Creek and Imperial River were adopted by FDEP in August 2008. This BMAP addresses the TMDL for the following WBIDs: WBID 3258B and WBID 3258B1 in Hendry Creek (now only WBID 3258B2) and WBID 3258E in the Imperial River (now combined with WBID 3258C to become WBID 3258EA). **Table 5** lists the TMDL and pollutant load allocations adopted by rule for the watershed.

TABLE 5: EVERGLADES WEST COAST TMDLS

| WBID | WATERBODY | PARAMETER | TMDL (MG/L) | WLA FOR WASTEWATER (LBS/YEAR) | WLA FOR NPDES STORMWATER (% REDUCTION) | LA (% REDUCTION) |
|---|---|---|---|---|---|---|
| 3258B | Hendry Creek | TN | 0.74 | Not applicable | 44% | 44% |
| 3258B1 | Hendry Creek | TN | 0.60 | Not applicable | 44% | 44% |
| 3258E | Imperial River | TN | 0.74 | Not applicable | 24.87% | 24.87% |

## 1.4 Assumptions and Considerations Regarding TMDL Implementation

The water quality impacts of BMAP implementation are based on several fundamental assumptions about the pollutants targeted by the TMDLs, modeling approaches, waterbody response, and natural processes. In addition, there are important considerations 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:

- *BMAP load reduction credits were considered only for projects and BMPs that were completed by July 1, 2000, and later and provided treatment over and above the permitted requirements. Other considerations for reduction credits included proper operation and maintenance of an existing project. Examples of BMPs that were given credit include wet detention, retention, fertilizer ordinance(s), public education, constructed wetlands, street sweeping, baffle boxes, and catch basin inserts.*
- *No credit was given to projects located outside the Hendry Creek and Imperial River watersheds, projects that did not reduce TN loading, flood control projects with no ancillary water quality benefits, maintenance projects, litter removal, pipe replacement, or conservation land purchases without a change in land use.*
- *As the DO TMDL was based on the reduction of ambient TN concentrations to a reference site TN value, modeling of loading sources did not occur during TMDL development. To assign allocations based on a load reduction, FDEP utilized simplified runoff and loading calculations to estimate the land-based TN load, and reduced the resulting value to the TMDL TN concentration. Runoff coefficients and factors were modified to those recommended by CHNEP.*
- *The 2004 Florida Land Use and Cover Classification System (FLUCCS) data for the area were used in calculating allocations.*
- *Water and wetland land uses were not removed from allocation calculations because these areas were included in the TMDL modeling.*
- *FDEP default BMP TN reduction values were applied to projects where justifiable load reduction information or monitoring data were not available or not provided by the stakeholder requesting credit. The FDEP TN removal efficiencies are shown below in* ***Table 6****.*
- *Load reduction credit was not given for repairing failed septic systems as these were not explicitly included in the TMDL. The TMDL acknowledged the potential impacts of failed septic tanks in a general way but did not explicitly include them in the TMDL analysis. It is expected that as part of the future analysis of the TMDL, septic tanks may be explicitly addressed in the modeling and/or loading analysis. If so, then the BMAP will be modified accordingly.*

TABLE 6: APPROVED TN REMOVAL EFFICIENCIES

| BMP | TN % REDUCTION |
|---|---|
| *Off-line Retention 0.25-in. treatment volume* | 40% |
| *Off-line Retention 0.50-in. treatment volume* | 62% |
| *Off-line Retention 0.75-in. treatment volume* | 75% |
| *Off-line Retention 1.00-in. treatment volume* | 84% |
| *On-line Retention 0.25-in. treatment volume* | 30% |
| *On-line Retention 0.50-in. treatment volume* | 52% |
| *On-line Retention 0.75-in. treatment volume* | 65% |
| *On-line Retention 1.00-in. treatment volume* | 74% |
| *Grass swales with swale blocks or raised culverts* | Use on-line retention BMPs above |
| *Grass swales without swale blocks or raised culverts* | 50% of value for grass swales with swale blocks or raised culverts |
| *Wet detention ponds* | % Removal = (43.75 * td)/(4.38 + td) ; where td is the mean annual residence time |
| *BMP treatment trains using a combination of BMPs* | Use BMP Treatment Train (TT) equation: BMP TT Efficiency = Eff1 +((1-Eff1)*Eff2) |
| *Dry detention* | 10% |
| *Baffle box* | 0.5% |
| *Nutrient baffle box (2nd generation)* | 19.05% |
| *Catch basins/inlet filters* | Determine kg of materials removed and multiply by 467.2 mg/kg (commercial), 773.8 mg/kg (residential), or 785.4 mg/kg (highway) |
| *Street sweeping* | Determine kg of materials removed and multiply by 429.6 mg/kg (commercial), 832.4 mg/kg (residential), or 546.4 mg/kg (highway) |
| *Alum injection* | 50% |
| *Stormwater reuse* | Estimate amount water not discharged annually because used for irrigation. |
| *Stormceptor* | 2% |
| *Continuous deflective separation (CDS) units* | Not applicable |
| *Floating islands* | 20% |
| *Public education* | 1-6%, depending on extent of program |
| *Low impact development practices* | Not quantified |

### 1.4.2 CONSIDERATIONS

This BMAP requires all stakeholders to implement their projects to achieve reductions as soon as practicable. However, full implementation of this BMAP will be a long-term process. While some of the projects and activities contained in the BMAP were recently completed or are currently ongoing, several projects require more time to design, secure funding, and construct. While funding the projects could be an issue, funding limitations do not affect the requirement that every entity must implement the activities listed in the BMAP.

Since BMAP implementation is a long-term process, the TMDLs established for this basin will not be achieved for several years. It is understood that all waterbodies can respond differently to the implementation of reduced loadings in order to meet applicable water quality standards. Regular follow-up and continued coordination and communication by the stakeholders will be essential to ensure the implementation of management strategies and assessment of incremental effects. Any additional management actions required to achieve the TMDLs, if necessary, will be developed as part of BMAP follow-up.

During the BMAP process, several items were identified that should be addressed in future watershed management cycles to ensure that future BMAPs use the most accurate information. The FDEP has agreed to remodeling and recalculating allocations in the next TMDL/BMAP cycle. It is expected that the next iteration of modeling will review and address these items:

- ***Detailed allocations.*** *During the course of the BMAP, concerns were presented by various stakeholders with regards to portions of the TMDL modeling and/or allocations. The TMDL models and allocations are scheduled to be refined over the next few years. While the TMDL modeling is refined, FDEP requested that the stakeholders provide activities and projects that would reduce the TN load to some degree—these are the projects listed in Chapters 5 and 11. The actions and remaining load reductions for Phases II and III will be decided in the future.*
- ***Allocations to a city for county roads located within city limits****. There were concerns with allocation assignments for county roads that route through city limits. Based on the FDEP's review of these data, this issue will be reviewed in the next BMAP update.*
- ***Septic tank loading****. Septic tank loading was discussed in a general way in the TMDL since at the time of TMDL development, no data were available to FDEP on nutrient loading from ground water and on sediment nutrient release as well as measured septic tank failure rate data for the watershed. It is expected that FDEP will review and re-evaluate future data in the upcoming TMDL update, and credits for the fixing or removal of failed septic tanks will be addressed at that time.*
- ***Agricultural land uses.*** *The estimates of nutrient loading from agricultural land uses are based on the types of commodities and total acreages within the basin. Growers often change commodities, allow land to be fallow, or sell land for urban development. It will be necessary, therefore, to evaluate the agricultural land uses in future BMAP iterations to adjust the loads and reductions from agricultural land uses. If more current information about specific loading rates and best management practice (BMP) effectiveness is known, those will be considered in future iterations.*
- ***Updated land uses.*** *The loading estimates in the TMDL are based on land uses at a particular point in time, which allows the model to be validated and*

*calibrated. Land uses, however, change over time and, depending on local trends, can change significantly. The loading estimates for this iteration of the TMDL and BMAP were based on 2004 land use data. Future iterations will consider more recent land use information and allocations will be adjusted accordingly.*

- ***DO research**. Due to the nature of the watershed and feedback from local stakeholders, FDEP hopes to provide additional research into the background/natural DO to help set or reset DO targets for modeling and the revisit of the TMDL.*

## 1.5 Future Growth in the Watershed

The FWRA (Paragraph 403.067[7][a][2], F.S.) requires that BMAPs "identify the mechanisms by which potential future increases in pollutant loading will be addressed." This BMAP does not include a specific allocation for new development because of Environmental Resource Permit (ERP) Program requirements. The ERP Program requires that all new discharges into the basin cannot increase existing loads. All ERP applications must include documentation demonstrating compliance with state water quality standards, as well as showing that the project does not adversely affect the quality of receiving waters resulting in water quality standards violations. The Hendry Creek and Imperial River basins include impaired waters that do not currently meet state water quality standards; therefore, new development in the basin must demonstrate net improvement in nutrient loads to the waterbodies above the existing loading condition.

To confirm that future growth does not add to the degradation of the waterbodies, local governments are encouraged to pursue 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.

# HENDRY CREEK BASIN
# CHAPTERS 2 THROUGH 7

# CHAPTER 2: HENDRY CREEK SETTING

## 2.1 LAND USE COVERAGE

As shown in **Table 7** below, the Hendry Creek watershed drains about 10,464 acres of land. The dominant land use category is urban land (urban and built-up; low-, medium-, and high-density residential; and transportation, communication, and utilities), which accounts for about 49.5 percent of the total watershed area. Of the 5,184 acres of urban land, residential areas occupy about 3,055 acres, or about 29% of the total watershed area. Natural land use areas, which include water/wetlands, upland forest, and open land, occupy about 5,182 acres, accounting for about 49.5% of the total watershed area. Land uses for the Hendry Creek Basin are shown in **Figure 3**.

TABLE 7: 2004 LAND USE CLASSIFICATIONS IN THE HENDRY CREEK WATERSHED

| LAND USE | ACRES | PERCENT TOTAL |
|---|---|---|
| Urban and Built-Up | 1842 | 17.6% |
| Low-Density Residential | 813 | 7.8% |
| Medium-Density Residential | 899 | 8.6% |
| High-Density Residential | 1,342 | 12.8% |
| Agriculture | 98 | 0.9% |
| Upland Forests/Rangeland | 1,308 | 12.5% |
| Water | 883 | 8.4% |
| Wetlands | 2,991 | 28.6% |
| Transportation, Communication, and Utilities | 288 | 2.8% |
| **Total** | **10,464** | **100%** |

## 2.2 BASIN HYDROLOGY

Hendry Creek, although small, is considered one of the major tributaries to Estero Bay. Estero Bay is a shallow, subtropical lagoon separated from the Gulf of Mexico by barrier islands. The basin is typical of low, flat, southern Florida lands dominated by wetlands and characterized by slow, sheet-flow drainage patterns (FDEP 2003). Over time, the basin's natural hydrology was altered. The Hendry Creek watershed prior to 1900 was one of the largest basins in the area. However, construction of the Ten Mile Canal dike and levees has truncated the majority of the past runoff. Almost 68 square miles that now flow through Ten Mile Canal formerly were part of the Hendry Creek watershed. Increasing development in the 1960s also led to changes in the natural river systems around Estero Bay, altering freshwater inflow patterns.

The boundaries for WBIDs 3258B and 3258B1 were used for TMDL development. During the development of the BMAP, it was apparent that the actual watershed boundaries significantly differed from the WBID boundaries used in the TMDL. Therefore, for the purposes of the BMAP, the watershed boundary previously shown in **Figure 1** was used for calculating pollutant loads and assigning allocations to the stakeholders.

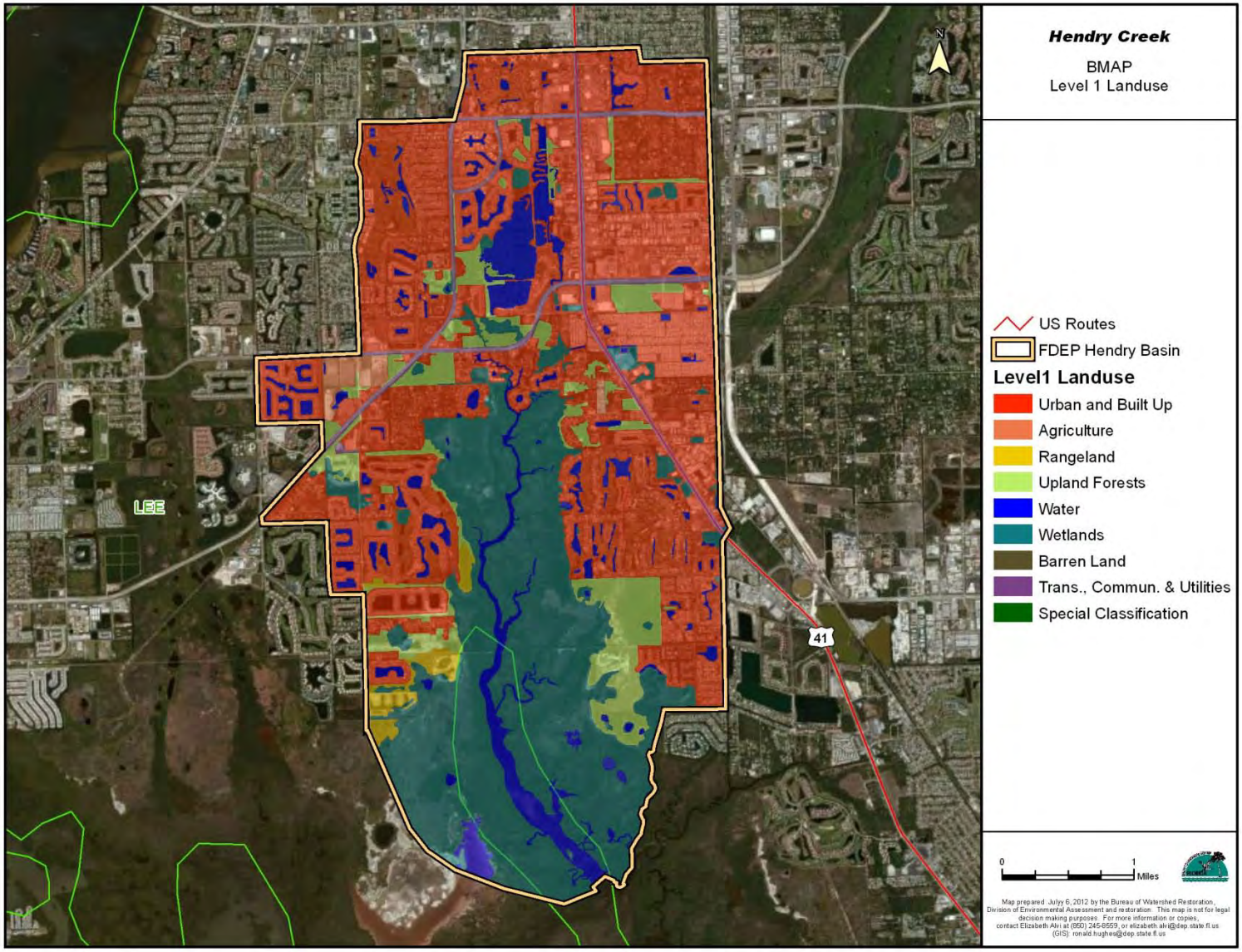



FIGURE 3: LAND USES IN THE HENDRY CREEK WATERSHED

## 2.3 Water Quality Trends

FDEP has used the IWR to assess water quality impairments in the Hendry Creek watershed and has verified the impairments listed in **Table 8**. Hendry Creek was placed on the Verified List for DO in the first basin assessment cycle (based on data collected between January 1, 1995, and June 30, 2002). During the second basin cycle, the creek was also verified as impaired for low DO based on the observation that the DO concentrations in 31 out of 59 samples in WBID 3258B and in 34 out of 39 samples in WBID 3258B1 measured during the verified period (January 1, 2000, through June 30, 2007), were lower than the state's DO criteria for Class III freshwater and marine water, respectively. **Table 9** summarizes the DO observations for the verified period for Hendry Creek.

Table 8: Verified Parameters for Hendry Creek, WBIDs 3258B and 3258B1

| Waterbody Segment | Parameters of Concern |
|---|---|
| WBID 3258B (Freshwater) | DO (TN) |
| WBID 3258B1 (Marine) | DO (TN) |

Table 9: Summary of DO Monitoring Data in the Verified Period for Hendry Creek, WBIDs 3258B and 3258B1

mg/L = Milligrams per liter; BOD = Biological oxygen demand; TP = Total phosphorus

| Parameter | WBID 3258B | WBID 3258B1 |
|---|---|---|
| Total number of samples | 59 | 39 |
| IWR required number of violations for the Verified List | 10 | 7 |
| Number of observed violations | 31 | 34 |
| Number of observed non-violations | 28 | 5 |
| Number of seasons during which samples were collected | 4 | 4 |
| Highest observation (mg/L) | 13.0 | 6.9 |
| Lowest observation (mg/L) | 1.1 | 0.5 |
| Median observation (mg/L) | 4.9 | 2.6 |
| Mean observation (mg/L) | 5.0 | 2.7 |
| Screening value for BOD (mg/L) | 2.0 | 2.1 |
| Screening value for TN (mg/L) | 1.6 | 1.0 |
| Screening value for TP (mg/L) | 0.22 | 0.19 |
| Median value for BOD observations (mg/L) | 1.5 | 1.3 |
| Median value for TN observations (mg/L) | 0.775 | 0.886 |
| Median value for TP observations (mg/L) | 0.03 | 0.054 |
| Possible causative pollutant by IWR | TN | TN |
| **Final Assessment** | **Impaired** | **Impaired** |

The TMDL for Hendry Creek analyzed the long-term seasonal variation of DO for the period of record of 2000 through 2007. This analysis used data from two water quality monitoring stations for WBID 3258B (21FLEECOHENDGR11 and 21FLEECOHENDGR20) and two stations for WBID 3258B1 (21FLEECOHENDGR30 [upstream] and 21FLFTM 28020194 [downstream]) during the verified period. DO concentrations were lower in WBID 3258B1 than in WBID 3258B.. Mean DO concentrations in Stations 21FLEECOHENDGR11, 21FLEECOHENDGR20, and 21FLEECOHENDGR30 were lower than 5.0 mg/L. In WBID 2358B1, DO at the downstream station was higher than at the upstream station. Seasonally, DO concentrations in the first quarter (January, February, and March) were higher than in the third quarter (July, August, and September) in the two WBIDs. The locations of these stations and the original (TMDL) WBID boundaries are shown in **Figure 1A**.

# CHAPTER 3: HENDRY CREEK POLLUTANT SOURCES AND ANTICIPATED OUTCOMES

## 3.1 SUMMARY OF SOURCES IN THE TMDLS

As the DO TMDL was based on the reduction of ambient TN concentrations to the chosen reference site TN value, modeling of pollutant loading sources did not occur during TMDL development for Hendry Creek. To assign allocations based on a load reduction, FDEP utilized simplified runoff and loading calculations to estimate the land-based TN load, and reduced the resulting value to the TMDL TN concentration. Runoff coefficients and factors were modified to those recommended by CHNEP.

There are NPDES-permitted wastewater facilities in the WBID but none that discharge to Hendry Creek. A domestic wastewater facility (Permit No. FL0039829, Fiesta Village Domestic Wastewater Facility) is located less than one-half mile north of the Hendry Creek watershed; this facility discharges to the Caloosahatchee River and not to Hendry Creek. As there are no major wastewater point source dischargers located in the drainage basin of Hendry Creek, it is reasonable to believe that, within the drainage basin of Hendry Creek, the majority of the anthropogenic TN loadings to Hendry Creek come from stormwater and ground water sources, including surface runoff, ground water input, failed septic tanks, and nutrient sediment release. The BMAP focus is on load reductions from stormwater sources because the TMDL did not separately quantify the various potential sources. The loads and reductions resulting from the simplified runoff and loading calculations are shown in **Table 10**. The calculation of the background and non-background load is described in more detail in **Section 4.1**. Additional details about the sources that are included in this BMAP are provided in the subsections below.

TABLE 10: TN REQUIRED REDUCTIONS IN THE HENDRY CREEK BASIN

[1] Based on FDEP spreadsheet loading model developed during the BMAP process.

| TMDL LOAD(LBS/YR) | EXISTING TN LOAD (LBS/YR)[1] | BACKGROUND LOAD(LBS/YR)[1] | NON-BACKGROUND LOAD (LBS/YR)[1] | REDUCTION REQUIRED (LBS/YR) |
|---|---|---|---|---|
| 44,414 | 54,734 | 23,801 | 30,933 | 10,320 |

### *3.1.1 STORMWATER SOURCES*

Many of the municipalities in the basin are regulated by the Florida NPDES Stormwater Program because they discharge stormwater and qualify as a "municipal separate storm sewer system." 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 has the following characteristics:

- *Is owned or operated by a state, city, town, county, special district, association, or other public body (created by or pursuant to state law) having jurisdiction over management and discharge of stormwater and which discharges to surface waters of the state;*
- *Is designed or used for collecting or conveying stormwater;*
- *Is not a combined sewer; and*

- *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 which 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 U.S. Environmental Protection Agency (EPA) developed the federal NPDES stormwater permitting program in two 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 Chapters 62-4, 62-620, 62-621 and 62-624, F.A.C. Entities in the Hendry Creek Basin that are currently designated as MS4s are listed in **Table 11**.

TABLE 11: LOCAL GOVERNMENTS IN THE HENDRY CREEK BASIN DESIGNATED AS MS4 PERMITTEES

| MS4 PERMIT PHASE | PERMITTEE | PERMIT NUMBER |
|---|---|---|
| I | Lee County | FLS000035 |
| I | Catalina at Winkler Preserve CDD | FLS000035 |
| I | FDOT District 1 | FLS000035 |

Lee County and its co-permittees are currently regulated under a Phase I MS4 permit. Phase I MS4s were subject to a two-part permit application process requiring the development of a proposed stormwater management program (SWMP) that would meet the standard of reducing (discharged) pollutants to the Maximum Extent Practicable (MEP), and incorporation of the SWMP into an individual permit issued to the MS4 operator. The SWMPs for Phase I MS4s include, but are not limited to, the following measures:

- *Identify major outfalls and pollutant loadings;*
- *Detect and eliminate non-stormwater discharges (illicit discharges) to the system;*
- *Reduce pollutants in runoff from industrial, commercial, and residential areas;*
- *Control stormwater discharges from new development and redevelopment areas; and*
- *Implement a monitoring program.*

To avoid the need for re-opening MS4 permits each time a TMDL or BMAP is adopted, the following language is included in the Phase I MS4 permits, which automatically require the implementation of any stormwater requirements in an adopted BMAP. This "TMDL clause"

states: "*In accordance with Section 403.067, F.S., NPDES permits must be consistent with the requirements of adopted Total Maximum Daily Loads (TMDLs). Therefore, when a Basin Management Action Plan (BMAP) and/or implementation plan for a TMDL for a water body into which the permitted MS4 discharges the pollutant of concern is adopted pursuant to Section 403.067(7), F.S., the MS4 operator(s) must comply with the adopted provisions of the BMAP and/or implementation plan that specify activities to be undertaken by the permittee(s) that are for the purpose of addressing discharges from the MS4 to meet the TMDL allocation."*

Also, according to Paragraph 403.067(7)(a)4, F.S., the BMAP is adopted by Secretarial Order pursuant to Chapter 120, F.S., and is therefore subject to Chapter 120 challenges.

No quantitative distinction was made in the TMDL for MS4 and non-MS4 loads so that such a distinction was not made in this BMAP. As the TMDL is studied in the future, FDEP expects to refine the sources of loading and the BMAP will be modified accordingly.

### *3.1.2 Agriculture*

The primary agricultural land uses in the Everglades West Coast Basin are cow/calf operations (pasture) and row/field crops. Other agricultural land uses include nurseries, citrus, and horse farms (specialty farms). However, there is little agricultural acreage within the Hendry Creek Basin. Due to urban encroachment, citrus health issues (freeze/disease), and the downturn in the economy, many citrus and nursery operations either have been abandoned or have significantly lowered their production acreage. In recent years, some of this acreage may have been shifted to other commodities or to non-agricultural/urban uses.

## 3.2 Anticipated Outcomes of BMAP Implementation

With implementation of the projects outlined in this BMAP, reductions in the nutrient loads to the Everglades West Coast Basin are expected to improve the conditions of the estuary such that it meets applicable water quality standards. The following outcomes are expected from BMAP implementation:

- *Improved water quality trends in the watershed tributaries and main stem of Hendry Creek;*
- *Decreased loading of the target pollutant (TN);*
- *Increased coordination between state and local governments and within divisions of local governments in problem solving for surface water quality restoration;*
- *Determination of effective projects through the 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: HENDRY CREEK DETAILED ALLOCATIONS

## 4.1 DETERMINING DETAILED ALLOCATIONS

As the DO TMDL was based on the reduction of ambient TN concentrations to the chosen reference site TN value, no modeling of loading sources was accomplished. It was, therefore, difficult to assign allocations based on load reductions. To assign allocations based on a load reduction, FDEP utilized simplified runoff and loading calculations to estimate the land-based TN load, and reduced the resulting value to the TMDL TN concentration. Runoff coefficients and factors were modified to those recommended by CHNEP. It should be recognized that this is a temporary solution to get a start on TN load reductions while the TMDL is re-evaluated. In the original TMDL, there were two distinct TN target concentrations (0.74 mg/L and 0.60 mg/L) assigned to the freshwater portion (WBID 3258B) and the marine portion (WBID 3258B1), respectively. For the purposes of the loading calculations performed by FDEP during BMAP development, 0.74 mg/L was used as the target concentration to assign allocations. This was considered a less conservative approach due to uncertainty in the TMDL.

### *4.1.1 MODEL DEVELOPMENT*

Initially, the loading model was developed based on the draft statewide stormwater rule[1] modeling concepts, including runoff coefficients and loading factors. However, based on input from the stakeholders, these coefficients and factors were modified to those recommended in documents prepared for CHNEP[2]. The model development is described below.

The raw data (entity, land use, soil type, area) were derived from GIS analysis. Loadings per acre and runoff coefficients were taken from the CHNEP report, with the following exceptions:

1. *Loadings per acre for those water-related categories for which the CHNEP report had zero values were assigned the loadings from FDEP's model, consistent with FDEP's approach of assigning loadings to water and wetlands. If the CHNEP report included loadings per acre for any given category, however, the CHNEP values were used.*
2. *Loadings for agriculture were taken from the FDEP model, as the CHNEP report did not provide definitive loading rates for different agricultural categories.*
3. *Runoff coefficients were based on "D" soils, the predominant soil type in both basins, and were weighted by the length of the wet (4 months) and dry (8 months) seasons.*

The Florida Land Use, Cover and Forms Classification System (FLUCCS) codes in the raw data were converted to the categories in the CHNEP report by assigning each FLUCCS code in the raw data to a single CHNEP report category. These categories were then used to select appropriate loading rates and runoff coefficients. The resulting land use categories and loading factors are listed in **Table 12**.

[1] *Evaluation of Current Stormwater Design Criteria with the State of Florida, Final Report*. Prepared for FDEP, Contract No. SO108, by Environmental Research & Design Inc., June 2007.
[2] *Final Water Quality Target Refinement Project, Task 4: Pollutant Loading Estimates Development, Interim Report 4*. Prepared for CHNEP by Janicki Environmental, Inc., June 2010.

TABLE 12: LAND USE CATEGORIES AND LOADING FACTORS

| KEY | CATEGORY | INCLUDED FLUCCS | LOADING #/AC | BUILT-UP | RUNOFF COEFFICIENT (APPENDIX E) |
|---|---|---|---|---|---|
| 1100 | Single-Family Residential | 1100s | 3.27 | 1 | 0.270 |
| 1200 | Medium-Density Residential | 1200s | 6.55 | 1 | 0.430 |
| 1300 | Multi-Family Residential | 1300s | 10.37 | 1 | 0.640 |
| 1400 | Commercial | 1400 | 12.87 | 1 | 0.850 |
| 1550 | Industrial | 1550 | 12.15 | 1 | 0.830 |
| 1610 | Mining | 1610, 1620, 1630, 7400, 7430 | 1.72 | 1 | 0.500 |
| 1660 | Mining - Holding Ponds | 1660 | 7.13 | 1 | 0.830 |
| 1700 | Institutional/Transportation/Utilities | 1700, 1710, 8140, 8310, 8320 | 3.60 | 1 | 0.580 |
| 1800 | Golf Courses and Parks | 1800, 1820, 1850 | 2.27 | 1 | 0.250 |
| 1900 | Rangeland | 1900, 1920, 3100, 3200, 3210, 3300 | 1.53 | 0 | 0.250 |
| 2000 | Agriculture | 2000s | 10.35 | 1 | 0.288 |
| 4000 | Upland Forested | 4000s | 0.41 | 0 | 0.210 |
| 5000 | Freshwater - Open Water | 5000s | 7.13 | 0 | 0.830 |
| 6120 | Forested - Freshwater Wetlands | 6120-6300 | 4.30 | 0 | 0.680 |
| 6410 | Non-Forested Freshwater Wetlands | 6410, 6430, 6440 | 3.47 | 0 | 0.630 |
| 6420 | Saltwater Wetlands | 6420, 6510 | 0.00 | 0 | 0.000 |

Yearly total nitrogen loadings were calculated by multiplying each polygon's acreage by its appropriate loading rate. Yearly runoffs were calculated by multiplying each polygon's area (in square meters) by rainfall (52 inches) by the appropriate runoff coefficient. Results were converted to cubic meters by multiplying by 0.0254 (meters per inch). Loadings and runoff volumes were then summed for each stakeholder for each basin.

Background loadings were calculated by substituting the "Rangeland" loading per acre for each polygon in a "Built-Up" land use category and recalculating the loadings. **Table 12** shows the land uses identified as urban or agricultural (i.e., those with "1" in the Built-Up column).

### *4.1.2 ALLOCATIONS*

As part of the TMDL, FDEP used a reference target of 0.74 mg/L for TN to achieve DO water quality standards. The target load associated with this concentration is 44,414 lbs/yr based on the total runoff from the watershed calculated in the modeling exercise previously described. Allocations to achieve this target load were then calculated as described in the following paragraphs. It should be noted that this loading condition was used to determine the allocations to various stakeholders rather than the TMDL reduction of 44%.

The first step in determining allocations was to calculate the nonpoint source (NPS) background load using the information from the modeling exercise described above. The NPS background load is defined as the load resulting from the watershed if all loads were converted to non-urban land uses. Existing land uses were modified to replace all urban and agricultural land uses with non-urban land uses. Such changes provide a basis for estimation of nonpoint source loads

from natural land uses and an evaluation of the impact of manmade changes in the watershed. Acreages of rangeland in the watershed were then used to replace the land use data in the pollutant load model in order to create the background simulation. The TN background loads by entity are shown in **Table 13**.

The second step was to determine the NPS non-background load, the difference between the Existing Load and the NPS background load. This is essentially the anthropogenic NPS load that is used to allocate load reductions. In order to assign allocations, the percent of the total NPS non-background load was determined for each entity as shown in **Table 13.**

**Table 13** shows the allocations based on the percent of the developed loads.

TABLE 13: TN ALLOCATIONS FOR THE HENDRY CREEK BASIN MS4S

| ENTITY | AREA (ACRES) | EXISTING TN (LBS/YR) | BACK-GROUND (LBS/YR) | NON-BACK-GROUND (LBS/YR) | % OF NON-BACK-GROUND | PORTION OF NON-BACK-GROUND (LBS/YR) | ALLOCATION (LBS/YR) |
|---|---|---|---|---|---|---|---|
| Lee County | 10,166 | 53,582 | 23,358 | 30,224 | 97.7% | 20,140 | 43,498 |
| Catalina CDD | 111 | 158 | 157 | 1 | 0.0% | 1 | 158 |
| FDOT | 89 | 325 | 136 | 189 | 0.6% | 126 | 262 |
| Agriculture | 98 | 668 | 150 | 518 | 1.7% | 345 | 495 |
| **Totals:** | **10,464** | **54,734** | **23,801** | **30,933** | **100.0%** | **20,613** | **44,414** |

Using the allocations in **Table 13**, load reductions for each entity, including agriculture, were calculated as shown in **Table 14**.

TABLE 14: TN REQUIRED REDUCTIONS FOR THE HENDRY CREEK BASIN MS4S

| ENTITY | AREA (ACRES) | EXISTING TN (LBS/YR) | ALLOCATION (LB/YR) | % REDUCTION | REDUCTION REQUIRED |
|---|---|---|---|---|---|
| Lee County | 10,166 | 53,582 | 43,498 | 18.8% | 10,084 |
| Catalina CDD | 111 | 158 | 158 | 0.2% | 0 |
| FDOT | 89 | 325 | 262 | 19.4% | 63 |
| Agriculture | 98 | 668 | 495 | 25.9% | 173 |
| **Totals:** | **10,464** | **54,734** | **44,414** | **18.9%** | **10,320** |

# CHAPTER 5: HENDRY CREEK MANAGEMENT ACTIONS

## 5.1 MANAGEMENT ACTIONS TYPES AND ELIGIBILITY

"Management actions" refers to the suite of activities that the entities who are assigned allocations will be conducting to achieve long-term increases in DO (by reducing TN) in Hendry Creek. These include structural and nonstructural activities.

Management actions had to meet several criteria to be considered eligible for credit under the BMAP. All projects, programs, and activities were required to address TN loads to receive credit. Projects completed after January 1, 2000, were eligible for BMAP credit. 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 new development) and do not contribute to the improvement of water quality in Hendry Creek.

Based on these eligibility requirements, the entities submitted structural and nonstructural projects to reduce the nonpoint stormwater loading. These projects were submitted to provide reasonable assurance to FDEP that each entity has a plan on how they will reduce nutrient loads. The projects submitted by the MS4s and agriculture are outlined in the sections below.

## 5.2 MS4 PROJECT REQUIREMENTS

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, implementation of a TMDL or BMAP for holders of NPDES MS4 permits shall be achieved to the MEP, through the use of BMPs or other management measures. These management measures include, but are not limited to, the following:

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

To comply with the MEP standard, the SWMP must be designed and implemented to reduce the discharge of pollutants to surface waters of the state. Implementation of BMPs consistent with the provisions of the SWMP required pursuant to a MS4 permit constitutes compliance with the standard of reducing pollutants to the MEP for discharges to unimpaired waters. However, MS4s must also continue to assess and adjust their list of approved projects 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 activities submitted by the entities to reduce TN loads are described in subsequent sections. These activities were submitted to provide reasonable assurance to FDEP that some level of TN reduction is taking place within the basin while the TMDL is re-visited. 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 time frame. New projects may be substituted for those identified in the BMAP during the annual BMAP progress report process.

## 5.3 MS4 Projects to Reduce TN Loading

The projects and time frames for implementation submitted by the entities to provide TN load reductions are summarized in **Tables 15** and **16**. These projects were submitted to provide reasonable assurance to FDEP that the MS4 permittee has a plan for how to reduce TN loads. 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 provided within the specified time frame. New projects may be substituted for those identified during the annual BMAP progress report process.

Table 15: Lee County Projects in Hendry Creek

N/A = Not applicable
- = Empty cell/no data
TBD - Load reduction benefit to be determined in later phase.

| Project Number | Project Name | Type of BMP | Acres Treated | Estimated Cost | Status | Project TN Reduction (lbs/yr) |
|---|---|---|---|---|---|---|
| LC-1 | Lakes Park WQ Restoration | Hydraulic Restoration | 1,749 | $3,500,000 | Future | 4,533 |
| LC-2 | Street Sweeping | Street Sweeping | 10,166 | N/A | Ongoing | 26 |
| LC-3 | Education/Fertilizer Ordinance | Ordinances | 10,166 | N/A | Completed | 1,980 |
| LC-4 | Island Park Filter Marsh | Hydraulic Restoration | N/A | $925,000 | Completed | TBD |
| **-** | - | - | - | - | **Total** | **6,539** |

TABLE 16: FDOT PROJECTS IN HENDRY CREEK

N/A = Not applicable
- = Empty cell/no data

| PROJECT NUMBER | PROJECT NAME | TYPE OF BMP | ACRES TREATED | ESTIMATED COST | STATUS | PROJECT TN REDUCTION (LBS/YR) |
|---|---|---|---|---|---|---|
| HC-FDOT-1 | Wet Detention Ponds (1, 2, & 3) | Wet Detention | 89 | N/A | Completed | 105 |
| HC-FDOT-2 | Roadside Swales | Swale with Ditch Blocks | N/A | N/A | Completed | N/A |
| HC-FDOT-3 | Street Sweeping | Sweeping | 89 | N/A | Ongoing | 17 |
| HC-FDOT-4 | Education/Fertilizer Ordinance | Ordinances | 89 | N/A | Completed | 3 |
| - | - | - | - | - | **Total** | **125** |

## 5.4 CREDIT PROCESS

A credit is defined as the benefit received from a BMP that results in an overall net reduction in loading to the watershed compared with the baseline condition. During the stakeholder process, it was defined what types of projects would be eligible for credit compared to those that would be ineligible. Eligible projects include traditional structural BMPs (e.g., wet detention, retention), fertilizer ordinances, education, constructed wetlands and street sweeping. Examples of ineligible projects include those outside the watershed, flood control projects that provide no water quality benefit, maintenance projects, litter removal, pipe replacements, and conservation land purchases with no change in land use. Credits were calculated by determining the existing load for the BMP treatment area and then applying the removal efficiency assigned to the BMP in order to calculate the load reduction. FDEP provided a list of pre-approved removal efficiencies for various BMPs. In the case where a BMP was not included on the list, the stakeholders were able to provide removal efficiencies based on measured data.

### *5.4.1 PUBLIC EDUCATION AND OUTREACH*

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

1. *Local funding to implement the Florida Yards and Neighborhoods (FYN) program within the city or county.*
2. *Local land development codes or ordinances that require Florida friendly landscaping on all new developments; require commercial landscapers to obtain training and certification through the Green Industry BMP Program; require irrigation systems per Sections 125.568 and 166.048, F.S., and Section 373.185, F.S.; and specify fertilizer application rates and types. Local ordinances that control pet waste and require that residents pick up and properly dispose of pet wastes.*
3. *Implementation of public service announcements (PSAs) on local cable or commercial television and radio stations.*
4. *Informational pamphlets on pollution prevention, fertilizer application, Florida friendly landscaping, water conservation, septic tank maintenance, etc.*

*Presentations on these topics to civic groups, local businesses, students, and the general public.*

5. *Websites to provide information on reducing nutrient pollution for homeowners and businesses.*
6. *Inspection program and public call-in number to address illicit discharges.*

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

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

The project tables previously summarized the public education activities conducted by each entity and the associated load reductions.

## 5.5 Agriculture Allocations

**Table 17** provides a breakdown of agricultural land uses in the Hendry Creek Basin, according to 2004 SFWMD land use data. **Figure 4** shows the approximate location of these agricultural lands in the BMAP area.

Table 17: Agricultural Land Uses in the Hendry Creek Basin (2004 SFWMD Land Use Data)

- = Empty cell/no data

| FLUCCS Code | Code Description | Total Acres |
|---|---|---|
| 2120 | Unimproved Pasture | 0.0 |
| 2130 | Woodland Pasture | 0.0 |
| 2110 | Improved Pasture | 0.2 |
| 2140 | Row Crop | 87.1 |
| 2150 | Field Crops | 0.0 |
| 2210 | Citrus | 0.0 |
| 2430 | Tree Nurseries | 0.0 |
| 2431 | Ornamentals | 10.5 |
| 2500 | Specialty Farms | 0.0 |
| 2610 | Fallow Cropland | 0.0 |
| **-** | **Total Agriculture Acres** | **97.8** |

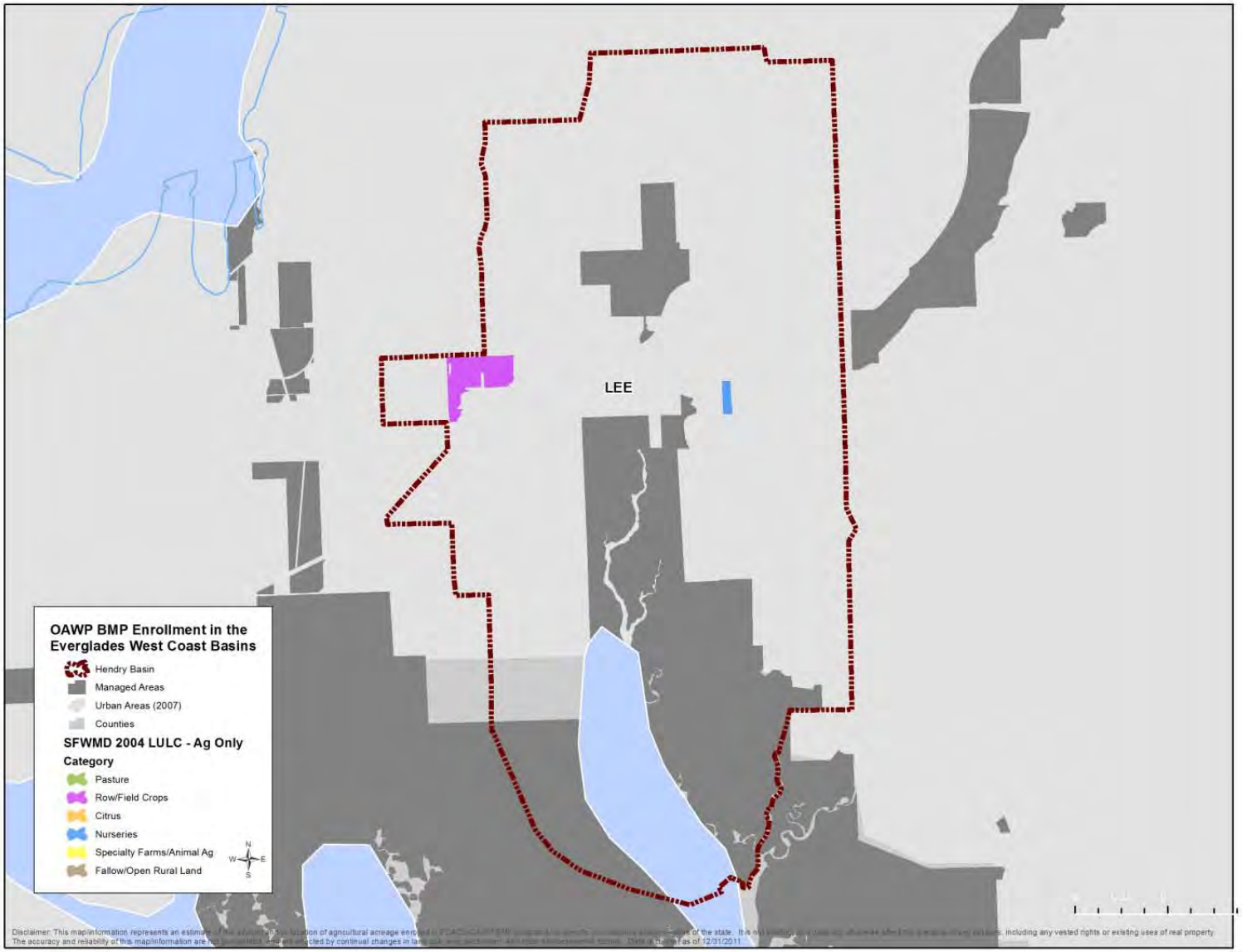



FIGURE 4: AGRICULTURAL USES IN THE HENDRY CREEK BASIN

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

### 5.5.1 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 FDACS or FDEP, as applicable), or conducting water quality monitoring prescribed by FDEP or the applicable water management district. If these pollutant sources do not either implement BMPs or conduct monitoring, they may be subject to enforcement by FDEP or the applicable water management district.

Pursuant to Paragraph 403.067(7)(c), F.S., implementation of FDACS-adopted, FDEP-verified BMPs in accordance with FDACS rule provides a presumption of compliance with state water quality standards. In addition, growers who implement BMPs may be eligible for cost-share from FDACS, the water management district, or others. Through the Office of Agricultural Water Policy (OAWP), Florida Forest Service, and Division of Aquaculture, FDACS develops, adopts, and assists producers in implementing agricultural BMPs to improve water quality and water conservation.

### 5.5.2 Agricultural BMPs

Agricultural 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 (MILs) 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 take them up, thus reducing nutrient runoff and leaching to surface and ground water. Therefore, the MILs play an important role in both water conservation and water quality.

**Table 18** identifies the key nutrient and irrigation management BMPs that would most likely be applicable to agricultural operations in the basin. 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 in the basin, FDACS will work with producers to implement applicable key BMPs that otherwise are not affordable.

TABLE 18: KEY NUTRIENT-RELATED BMPS ADOPTED BY FDACS OAWP

| Key Nutrient-Related Best Management Practices |
|---|
| **Determining Nutrient Needs** |
| *Soil and Tissue Testing*: Used to base fertilizer applications on plant needs and available nutrients in the soil; helps prevent over-application of fertilizer. |
| *Nutrient Budgeting*: Adjustment of fertilizer regime to account for other nutrient sources, such as bio-solids, legumes, manure, and nutrient-laden irrigation water; helps prevent over-application of fertilizer. |
| **Managing Nutrient Application** |
| *Precision Application of Nutrients*: Use of specialized equipment for precise placement of nutrients on targeted areas at specified rates; reduces total amount used and prevents stray applications. |
| *Equipment Calibration/Maintenance*: Ensures proper functioning of equipment; prevents misapplication or over-application of fertilizer materials. |
| *Split Fertilizer Applications*: Multiple applications timed with optimal growth stages; allows plants to assimilate nutrients more efficiently; reduces nutrient loss in leaching and runoff. |
| *Fertigation*: Application of fertilizer through irrigation water; allows for direct nutrient application to the crop root zone and more efficient assimilation by plants, reducing nutrient loss in leaching and runoff. |
| *Controlled-Release Fertilizer*: Use of fertilizer formulations that have a controlled nutrient release curve; reduces nutrient loss to leaching and runoff. |
| *Fertilizer Application Setbacks from Waterbodies (wetlands, watercourses, sinks, springs, etc.)*: Establishes a zone where no fertilizer will be applied; reduces nutrient loadings to waterbodies. |
| **Managing Irrigation** |
| *Irrigation Scheduling*: Planning when to irrigate to reduce water and nutrient losses, based on available soil moisture content, evapotranspiration levels, recent rainfall, and time of day. |
| *Monitoring Soil Moisture and Water Table*: Use of devices that measure the water table level and the amount of water in the soil; is a key component of proper irrigation scheduling. |
| *Tailwater Recovery*: Use of down-gradient catchment ponds to trap irrigation tailwater to be reused on cropland; reduces offsite transport of nutrients and conserves water. |
| **Treatment and Erosion Control** |
| *Filter Strips*: Vegetated strips of land designed to reduce nutrients and sediments in surface water runoff from fields, pastures, and livestock high-intensity areas before they reach downstream waterbodies. |
| *Vegetative Buffers*: Establishment of riparian and/or wetland buffers to attenuate and assimilate nutrient- or sediment-laden surface flows coming from cropped/grazed areas. |
| *Ditch Maintenance and Retrofits*: Use of rip rap, sediment traps, staging structures, and permanent vegetative bank cover to minimize erosion and transport of nutrient-laden sediments. |
| **Livestock Management (Applicable to Cow/Calf and Equine Operations)** |
| *Alternative Water Sources*: Use of upland livestock watering ponds and/or water troughs; minimizes manure deposition in waterbodies. |
| *Rotational Grazing*: Movement of cattle to different grazing areas on a planned basis; prevents concentrated waste accumulations and denuding of pasture areas. May involve fencing. |
| *High-Intensity Areas Location*: Siting of cowpens, supplemental feed areas, etc., away from waterbodies to minimize nutrient loadings. |
| **Operations Management** |
| *Fertilizer Storage*: Proper location/storage of bulk fertilizer products to prevent nutrient loadings. |
| *Fertilizer Mix/Load*: Use of appropriate dedicated or temporary mix/load areas located away from waterbodies to prevent nutrient loading. |
| *Employee Training*: Training provided to farm workers on how to implement BMPs. |
| *Record Keeping*: Proper record keeping provides accountability in the implementation of BMPs, and assists the producer in making nutrient and irrigation management decisions. |

OAWP BMPs and staff contact information are located at http://www.floridaagwaterpolicy.com. Printed BMP manuals can be obtained from local county agricultural extension centers, or by contacting OAWP field staff.

### *5.5.3 FDACS OAWP Role in BMP Implementation and Follow-Up*

#### 5.5.3.1 BMP Implementation

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

The OAWP will recruit producers within the Everglades West Coast Basin to enroll in adopted BMP programs applicable to their operations. OAWP staff and contractors will identify existing growers, to the greatest 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.

#### 5.5.3.2 Follow-Up and Reporting on BMP Enrollment and Implementation

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

- *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 SFWMD activities. If a re-evaluation of the BMPs is needed, FDACS also will include SFWMD and other partners in the process.

### *5.5.4 FDEP AND SFWMD ROLES IN BMP IMPLEMENTATION*

The FWRA states that nonpoint source dischargers who fail either to implement 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.

#### 5.5.4.1 BMP Enrollment Goals and Load Reduction Estimates

***BMP Enrollment Goals***

**Table 17** summarizes the land use data figures for agriculture in the BMAP area, 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 2004 land use information from the SFWMD. 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 6% less total acreage than indicated in the 2004 figures, due primarily to urban conversion and citrus freeze/disease issues. In addition, some of the acreage is no longer in production and would not be necessary to enroll in BMPs. The enrollment goal is 50% of the adjusted agricultural acres in the first 5 years.

It is important to understand that, even if all targeted agricultural operations are enrolled, not all of the acreage listed as agriculture in **Table 19** 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 December 31, 2011, two producers within the Hendry Creek Basin had submitted NOIs to OAWP, covering about 37 acres, to implement FDACS-adopted BMPs. No producers are conducting water quality monitoring in lieu of implementing BMPs at this time.

Within the Hendry Creek Basin, the majority of the remaining acreage is identified as row crop in the land use data, but the aerial imagery review of the basin shows that most of the acres are actually an in-ground nursery. The containerized portion of the nursery is already enrolled in the OAWP container nursery BMP program, and the producer will be contacted to enroll the remaining in-ground portion of the nursery once the nursery manual is revised to include in-ground operations. **Figure 5** is a map of the acres enrolled in BMPs as of December 31, 2011.

TABLE 19: AGRICULTURAL ACREAGE, BMP ENROLLMENT, AND FUTURE ENROLLMENT GOALS FOR THE HENDRY CREEK BASIN

[1] FDACS staff-adjusted acreage for purposes of enrollment is based on a review of more recent aerial imagery in the basin and local staff observations.
[2] Please see the discussion on BMP Enrollment Goals.
- = Empty cell/no data
N/A = Not applicable

| 2004 SFWMD LAND USE | 2004 ACRES | FDACS-ADJUSTED ACRES FOR ENROLLMENT1 | RELATED FDACS BMP PROGRAMS | ACREAGE ENROLLED[1] | RELATED NOIS/ *CERTIFICATION* |
|---|---|---|---|---|---|
| Pasture | 0.2 | N/A | Cow/Calf<br>Future (hay) | 0.0 | 0 |
| Row/Field/Mixed Crops | 87.1 | 50.5 | Vegetable/Agronomic Crops | 0.0 | 0 |
| Tree Nurseries | 0.0 | 5.0 | Future Nursery<br>Specialty Fruit & Nut | 0.0 | 0 |
| Ornamentals | 10.6 | 35.6 | Container Nursery | 37.3 | 2 |
| **Totals** | **97.8** | **91.1** | **-** | **37.3** | **2** |
| **Five-year Enrollment Goal (50%)** | **-** | **45.3** | **-** | **-** | **-** |
| **Acreage Enrolled (as of December 31, 2011)[1]** | **-** | **37.3** | **-** | **-** | **-** |
| **Remaining Acres to Enroll[2]** | **-** | **8.0** | **-** | **-** | **-** |

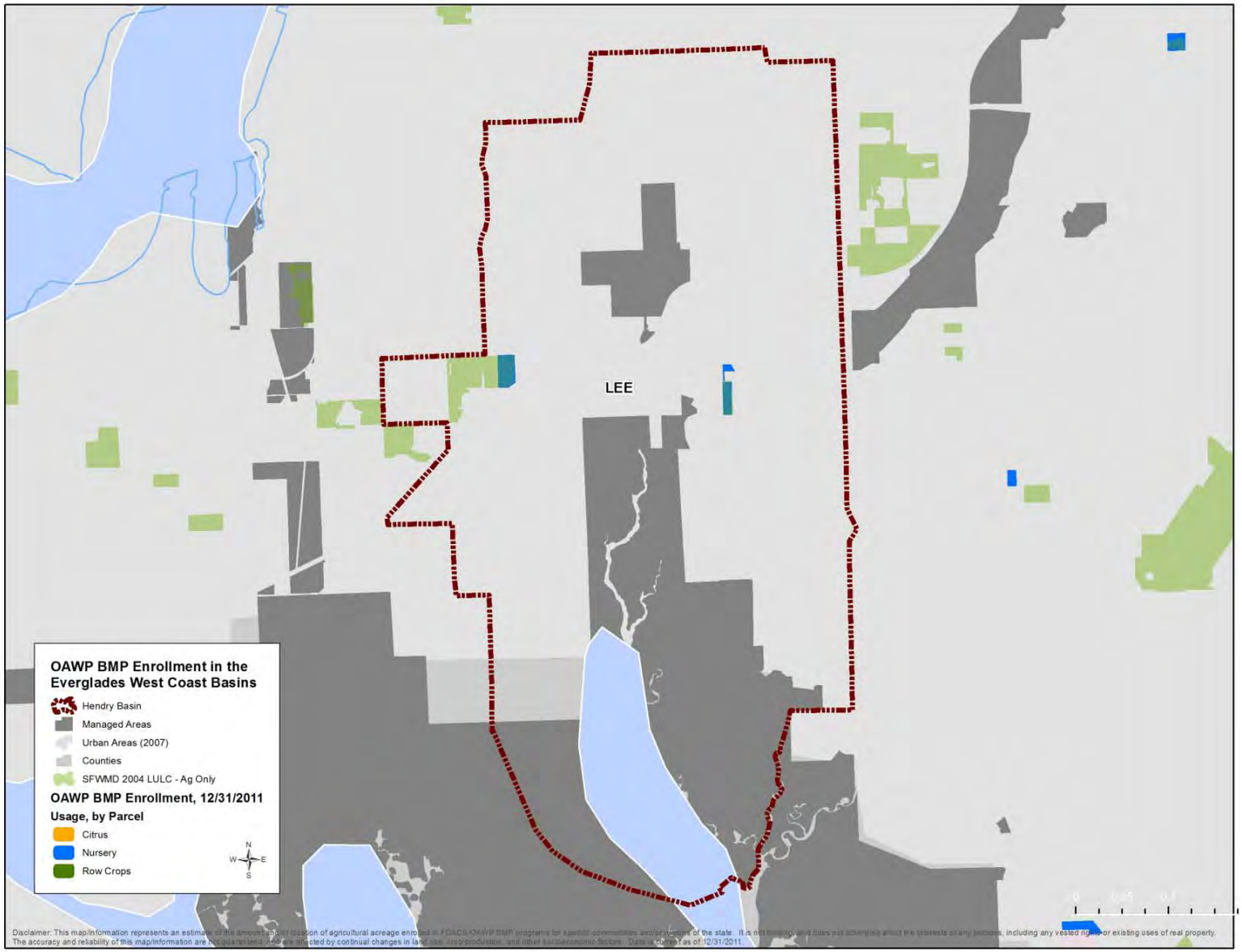



FIGURE 5: BMP ENROLLMENT THE HENDRY CREEK BASIN AS OF DECEMBER 31, 2011

#### 5.5.4.2 Agricultural Load Reduction Allocation and BMP Load Reduction Estimates

Due to the inaccuracies in 2004 land use information and to changes in land use since 2004, agricultural loadings may be less than indicated in the TMDL. The region is expected to have continuing shifts from agricultural to residential/urban land uses, which will reduce the agricultural load further. More precise information will be incorporated into the next iteration of the TMDL, 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 should be considered during the first BMAP cycle.

The estimates of agricultural load reduction due to the implementation of BMPs, shown in **Table 20**, are based on commodity-specific methods developed for the Lake Okeechobee watershed. These values may assume conditions, such as typical nitrogen fertilization rates, that differ from actual field conditions, but are the best available information. Based on an average 30% BMP effectiveness for TN reductions, OAWP estimates that the goal of 50% enrollment within the first 5 years (Phase I) will achieve a reduction of 100 pounds of TN in the Hendry Creek Basin. This represents approximately 15% of the total required load reduction allocation for agriculture in the basin. Therefore, estimated BMP-based reductions coupled with land use changes provide more than sufficient reductions to meet the Phase I target.

TABLE 20: AGRICULTURAL TN LOAD REDUCTION ALLOCATION, AND ESTIMATED REDUCTIONS IN TN LOAD IN THE FIRST FIVE YEARS – HENDRY CREEK BASIN

| ESTIMATED LOADS | HENDRY CREEK TN (LBS/YR) |
|---|---|
| Load Reduction Allocation for Agriculture | 668 |
| 1st 5-Year Load Reduction (Phase I) | 58 |
| Estimated Load Reductions via BMPs, 50% Target Enrollment | 100 |
| Credit for Changes in Land Use (urban conversion only) | **0** |
| Remaining Load Reductions Needed for BMAP in Phase I | **-42 (credit)** |

#### 5.5.4.3 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 SFWMD to identify appropriate options for achieving further agricultural load reductions.

# CHAPTER 6: ASSESSING PROGRESS AND MAKING CHANGES FOR HENDRY CREEK

Successful BMAP implementation requires commitment and follow-up. In the Commitment to Plan Implementation (see **Chapter 7**), stakeholders have expressed their intention to carry out the plan, monitor its effect, and continue to coordinate within and across jurisdictions to achieve water quality 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 the water quality monitoring component sufficient to make this evaluation.

## 6.1 TRACKING IMPLEMENTATION

FDEP will work with the stakeholders to organize the monitoring data and track project implementation. This information will be presented in an annual report. The stakeholders have agreed to 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 reporting and compare with the BMAP schedule. **Table 21** provides a sample annual reporting form on BMAP project implementation (to be completed by the entities).
  - Discuss the data collection process, including any concerns and possible improvements to the process.
  - Review the monitoring plan implementation, as detailed in **Section 6.2**.
- *Sharing New Information*
  - Report on results from water quality monitoring and trend information.
  - Provide updates on new projects and programs in the watershed that will help reduce nutrient loading.
  - Identify and review new scientific developments on addressing nutrient loads and incorporate any new information into annual progress reports.
  - Discuss 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 BMAP.
  - Obtain reports from other basins where tools or other information may be applicable to the Everglades West Coast TMDLs.

Covering all of these topics is not required for the annual meetings, but they provide examples of the types of information that should be considered for the agenda to assist with BMAP implementation and improve coordination among the agencies and stakeholders.

TABLE 21: PROPOSED BMAP ANNUAL REPORTING FORM

## *2012 Everglades West Coast BMAP – Hendry Creek*

### ___YEAR__ ANNUAL IMPLEMENTATION REPORT

**REPORTING ENTITY**: _____ **DATE**: _____

**Note:** Relevant MS4 activities, whether contained in the BMAP or not, may be included in this report.

### IMPLEMENTATION STATUS – BMAP MANAGEMENT STRATEGIES

- = Empty cell/no data

| [1] BMAP PROJECT # | AFFECTED AREA (WBID) | [2] BRIEF DESCRIPTION | [3] PROJECTED START/ END | [4] PROJECT/ ACTIVITY STATUS | [5] PROJECT MONITORING RESULTS | [6] COMMENTS |
|---|---|---|---|---|---|---|
| Shade if also an MS4 activity | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |

### NEW MANAGEMENT STRATEGIES

- = Empty cell/no data

| [1] BMAP PROJECT # | AFFECTED AREA (WBID) | [2] BRIEF DESCRIPTION | [3] PROJECTED START/ END | [4] PROJECT/ ACTIVITY STATUS | [5] PROJECT MONITORING RESULTS | [6] COMMENTS |
|---|---|---|---|---|---|---|
| Shade if also an MS4 activity | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |

**Directions for BMAP Annual Reporting Format:**

**1. BMAP PROJECTS**: This includes projects and other management strategies. Use the project number assigned in the BMAP Activities Tables (e.g., A-1). Please include all management strategies for which you have lead responsibility in the BMAP, regardless of their status. **New Management Strategies**: Include new projects/activities that are not included in the BMAP in the New Management Strategies table. Create a project number for new management strategies by using the prefix, then -N# (e.g., A-N1). **If a management action listed in either table is part of your MS4, please shade the project number box in grey**.

**2. BRIEF DESCRIPTION:** Include a brief description of the management action being reported (e.g., street sweeping removing gross debris on all streets with "L curbs" – 5 miles performed each month).

**3. PROJECTED START/END:** If applicable, include the start and end dates for the management action. If not applicable, put “N/A” or, if it is a continuous activity, put “Continuous” and indicate how often the activity takes place (e.g., for street sweeping).

**4. PROJECT ACTIVITY/STATUS:** Clearly summarize the status of the management action, in a way that makes sense for the item listed. For instance, for educational activities, list pertinent publications, events, etc., including name and/or topic for each. Include specific or general time frames (e.g., two public workshops on pet waste disposal in July 2011). Also, describe any significant changes to the management action that have taken place.

**5. PROJECT MONITORING RESULTS**: As applicable: If monitoring is required as part of a management action (e.g., in a cost-share situation), or is conducted voluntarily (e.g., as part of an effort to collect information on BMAP effectiveness), include the monitoring results to date, as practicable.

**6. COMMENTS**: Include comments on any implementation obstacles, including weather, funding, technical difficulties, etc. Include any other comments you consider important.

## 6.2 Water Quality Monitoring

The Hendry Creek Basin monitoring plan is designed to enhance the understanding of basin loads, identify areas with high TN concentrations, and track water quality trends. This information will measure progress toward achieving the TMDL and provide a better understanding of the watershed loading. Sampling stations, parameters, frequency, and other elements of this strategy may be modified as appropriate to match changing environmental conditions and funding resources. However, any modifications made shall not affect the ability of the monitoring network to fulfill the objectives noted below.

During the development of the BMAP, FDEP initiated a ground water monitoring study to establish a ground water monitoring well network in representative areas to provide information on nutrient contributions from major land uses in these basins to evaluate their potential inputs into impaired surface waters. A number of areas have been identified for the monitoring of existing wells and possible new constructed wells. Each of these areas represents one or more of the following nutrient-related sources: (1) residential septic tanks; (2) residential lawn and ornamental fertilizer; (3) golf course fertilizer; (4) reclaimed water used on golf courses; and (5) agriculture. In addition to these proposed new monitoring well locations, existing wells may also be sampled. The work would include installing the network of monitoring wells, sampling the new wells and pre-existing wells one time and analyzing the samples, and producing a summary report and data.

### *6.2.1 Water Quality Monitoring Objectives*

Focused objectives are critical for a monitoring strategy to provide the information needed to evaluate implementation success. The primary and secondary objectives of the monitoring strategy for Hendry Creek are described below. These objectives will be used to evaluate the success of the BMAP, help interpret the data collected, and provide information for potential future refinements of the BMAP.

***Primary Objective***

- *Enhance the understanding of basin loads, identify areas with high nutrient concentrations, and track water quality trends. This information will measure progress toward achieving the TMDL and provide a better understanding of the watershed loading.*

***Secondary Objective***

- *Identify areas within the basin with high loadings of TN to better focus management efforts.*

### *6.2.2 Water Quality Indicators and Resource Responses*

To achieve the objectives above, the monitoring strategy focuses on core indicators to track water quality trends (**Table 22**). The core indicators are directly related to the parameters causing impairment in the creek. At a minimum, the core parameters will be tracked to determine progress towards meeting the TMDL.

TABLE 22: WATER QUALITY INDICATORS AND FIELD PARAMETERS FOR THE HENDRY CREEK BASIN

| CORE PARAMETERS |
|---|
| Biochemical Oxygen Demand (BOD5) |
| Chlorophyll-a (corrected) |
| Color (Only required in river proper sampling stations )* |
| Dissolved Oxygen (DO) |
| Nitrate/nitrite as N |
| pH – field |
| Specific conductance |
| Temperature |
| Total Kjeldahl nitrogen (TKN) |
| Total Phosphorus |
| Turbidity |

### *6.2.3 MONITORING NETWORK*

The monitoring network for this plan builds upon existing efforts in the basin by FDEP and Lee County. **Table 23** lists the stations that are included in the BMAP monitoring network. The water quality monitoring will be conducted on a monthly basis to assess the conditions in the basin and within Hendry Creek to determine changes in water quality from the actions implemented as part of the BMAP. The stations in the monitoring network are also shown in **Figure 6**. The monitoring stations listed are separated into a tiered sampling design as follows:

- ***Tier 1:*** *Stations listed in the BMAP monitoring plan as essential and mandatory for tracking water quality trends in Hendry Creek and stations that document watershed reductions. Stations should be sampled monthly for all core parameters. Sampling stations, parameters, frequency, and other elements of this strategy may be modified as appropriate to match changing environmental conditions and funding resources. However, any modifications made shall not affect the ability of the monitoring network to fulfill the objectives noted below.*
- ***Tier 2:*** *Stations that are currently sampled either within the BMAP basin or in a tributary contributing to the overall load. These stations will help in the understanding of the total load within the watershed, and FDEP supports the continued monitoring.*

## TABLE 23: HENDRY CREEK BASIN BMAP MONITORING NETWORK

* Stations that are currently listed as an NPDES outfall station; the station data will not be included in any ambient monitoring analysis.
** Stations will continue to only be sampled every other month.

| AGENCY | TIER | NPDES OUTFALL* | TYPE | STATION ID | LATITUDE | LONGITUDE |
|---|---|---|---|---|---|---|
| FDEP & Lee County | 1 | N | River | HENDGR01 ** | 26.487611 | -81.882200 |
| FDEP & Lee County | 1 | N | River | HENDGR02 ** | 26.513306 | -81.879472 |
| Lee County | 1 | N | Watershed | ISPARK02 | 26.487800 | -81.868667 |
| Lee County | 1 | N | Watershed | ISPARK01 | 26.495382 | -81.868251 |
| Lee County | 1 | N | River | HENDGR30 | 26.521056 | -81.883313 |
| Lee County | 1 | Y | Watershed | HENDGR20* | 26.527671 | -81.875002 |
| Lee County | 1 | N | Watershed | HENDGR11A | 26.520320 | -81.868830 |
| Lee County | 1 | N | Watershed | HENDGR40 | 26.524912 | -81.889642 |
| Lee County | 1 | N | Watershed | HENDGR41 | 26.527736 | -81.887210 |
| FDEP & Lee County | 2 | N | River-Mullock | MULLGR01 ** | 26.464722 | -81.865778 |
| FDEP & Lee County | 2 | N | River-Mullock | MULLGR02 ** | 26.470583 | -81.855917 |
| Lee County | 2 | N | River-Ten Mile | 10MIGR10 | 26.481002 | -81.854534 |
| Lee County | 2 | N | Watershed-Mullock | 46B-9GR | 26.475382 | -81.836718 |
| Lee County | 2 | N | Estero Bay | EB-12 | 26.450780 | -81.870810 |

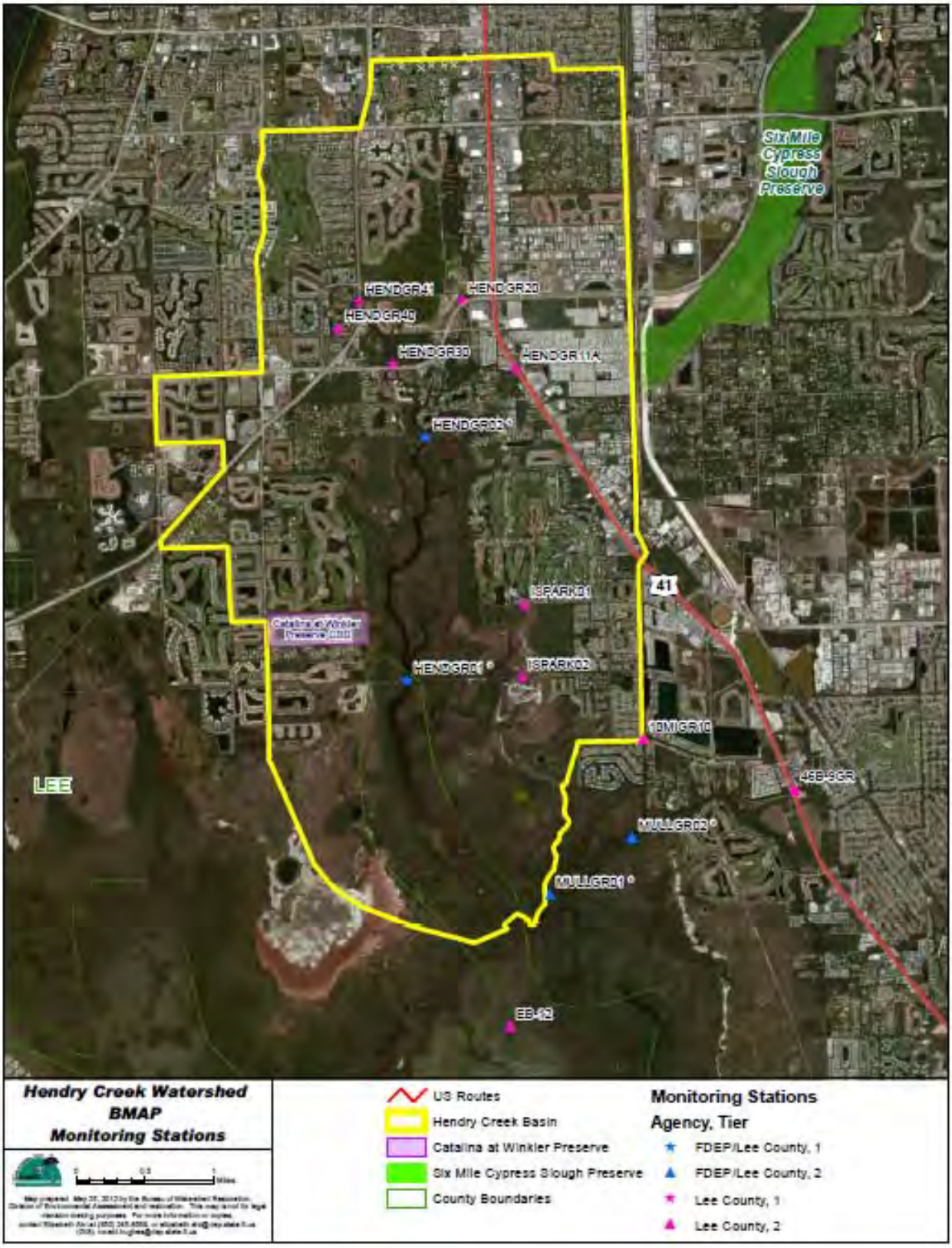



FIGURE 6: MONITORING NETWORK FOR THE HENDRY CREEK BASIN

### 6.2.4 Data Management and Assessment

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

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

The water quality data will be analyzed after four years of BMAP implementation to determine trends in water quality. 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.

### 6.2.5 Quality Assurance/Quality Control

Stakeholders participating in the monitoring plan must collect water quality data in a manner consistent with FDEP's Standard Operating Procedures (SOPs) for QA/QC. The most current version of these procedures can be downloaded from http://www.dep.state.fl.us/water/sas/sop/sops.htm. For BMAP-related data analyses, entities should use National Environmental Laboratory Accreditation Conference (NELAC) certified labs (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.

## 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 to share information and expertise are tracking plan implementation, monitoring water quality and pollutant loads, and holding periodic meetings.

BMAP execution will be a long-term process. Some projects 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 watershed is not projected to meet the TMDL, determine additional corrective actions.

Project implementation as well as program and activity status will be collected annually from the participating entities. The stakeholders will review these reports to assess progress towards meeting the BMAP's goals.

# CHAPTER 7: COMMITMENT TO PLAN IMPLEMENTATION FOR HENDRY CREEK

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 a way to show long-term support for the BMAP and the efforts included. 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.

# IMPERIAL RIVER BASIN
# CHAPTERS 8 THROUGH 13

# CHAPTER 8: IMPERIAL RIVER SETTING

## 8.1 LAND USE COVERAGE

The Imperial River watershed covers approximately 70.2 mi2 (44,960 acres), of which 35 $mi^2$ (22,539 acres) are surface waters and wetlands. The freshwater portion of the Imperial River watershed is approximately 10% urban, 48% wetlands and 26% agriculture. The remaining 16% of land use consists of rangeland, upland forests, water, transportation/utilities and mining activities. The classification and description of Level 1 2004 land use categories is provided in **Table 24** below and shown in **Figure 7**.

TABLE 24: 2004 LAND USE CLASSIFICATIONS IN THE IMPERIAL RIVER WATERSHED

| LAND USE | ACRES | PERCENT TOTAL |
|---|---|---|
| Wetland | 21,773 | 48.4% |
| Urban and Built-Up | 793 | 1.8% |
| Residential | 3,442 | 7.7% |
| Upland Forests/Rangeland | 4,843 | 10.8% |
| Water | 587 | 1.3% |
| Agriculture | 11,597 | 25.8% |
| Transportation, Communication, and Utilities | 323 | 0.7% |
| Mining | 1,602 | 3.6% |
| **Total** | **44,960** | **100%** |

## 8.2 BASIN HYDROLOGY

The Imperial River is considered one of the major tributaries to Estero Bay. Estero Bay is a shallow, subtropical lagoon separated from the Gulf of Mexico by barrier islands. Oak Creek and Leitner Creek flow into the upstream portion of the Imperial River. Both of these drainage areas, as well as the adjacent watershed, contain extensive areas of cropland and pastureland. Farther downstream, the Imperial River runs adjacent to the city of Bonita Springs, where it receives more concentrated urban runoff along its length (FDEP 2003).

The topography of the Imperial River watershed reflects its location within the Southwestern Florida Flatwoods ecological region. Elevations range from around 5 to 10 feet above sea level in the western part of the watershed near the coast and around 25 to 35 feet above sea level in the eastern part of the watershed. The predominant soil type is shelly sand and clay, which exhibits moderate to good natural drainage (FDEP 2003).

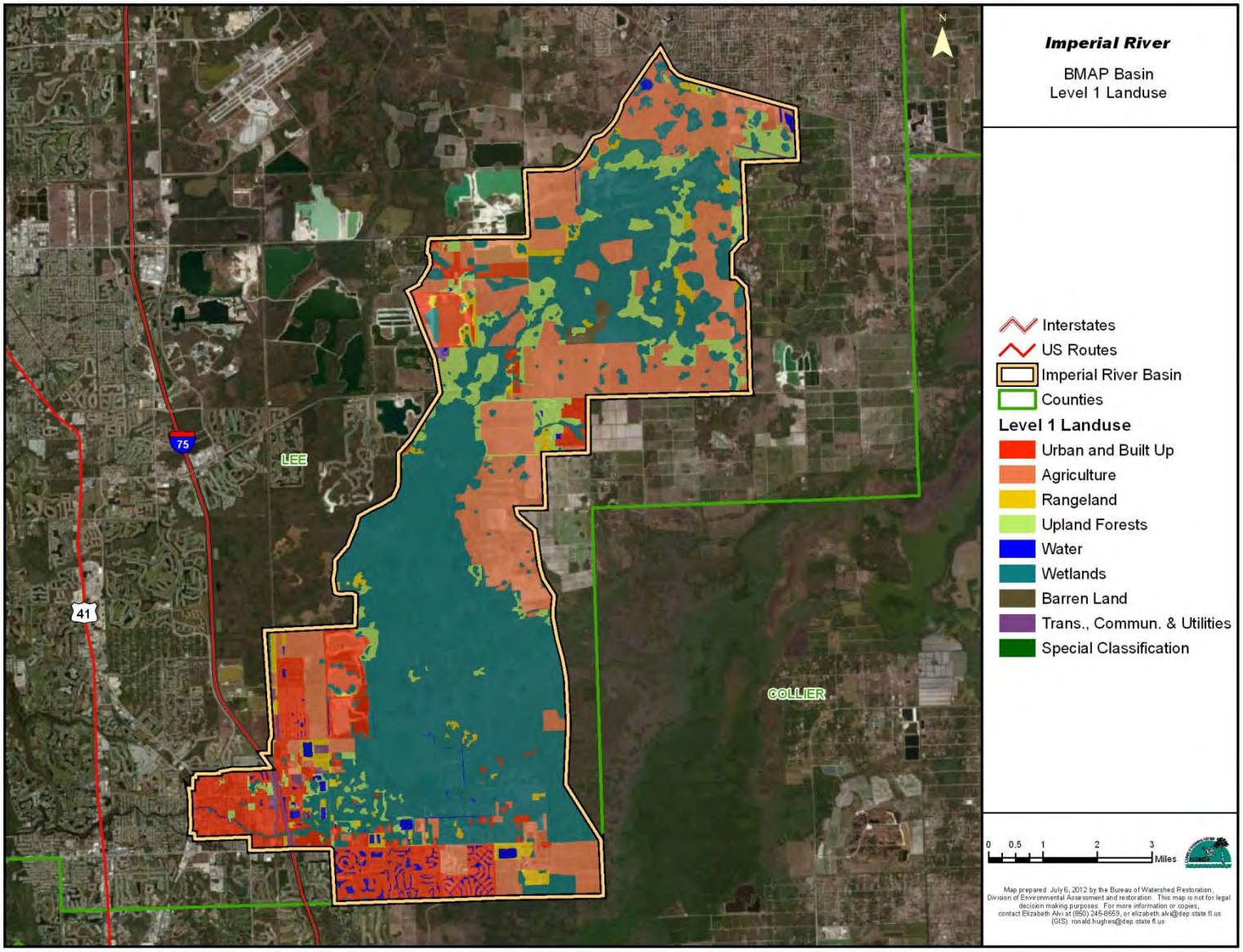



FIGURE 7: LAND USES IN THE IMPERIAL RIVER WATERSHED

## 8.3 Water Quality Trends

FDEP used the IWR to assess water quality impairments in the Imperial River and verified the impairments for low DO (**Table 25**). The Imperial River was verified as impaired for DO based on data indicating that the exceedance rate of the state's DO criterion for Class III freshwater is greater than or equal to 10%. The data are based on samples collected between January 1, 2000, and June 30, 2007. **Table 26** summarizes the DO observations for the verified period for the Imperial River.

Table 25: Verified Parameters for the Imperial River

| Waterbody Segment | Parameters of Concern |
|---|---|
| WBID 3258E | DO (TN) |

Table 26: Summary of DO Monitoring Data in the Verified Period for the Imperial River

| Parameter | Summary of Observations WBID 3258E |
|---|---|
| Total number of samples | 104 |
| IWR - required number of violations for the Verified List | 15 |
| Number of observed violations | 90 |
| Number of observed non-violations | 14 |
| Number of seasons during which samples were collected | 4 |
| Screening value for BOD (mg/L) | 2.0 |
| Screening value for TN (mg/L) | 1.6 |
| Screening value for TP (mg/L) | 0.22 |
| Median value for BOD observations (mg/L) | 1.1 |
| Median value for TN observations (mg/L) | 0.96 |
| Median value for TP observations (mg/L) | 0.03 |
| Possible causative pollutant under IWR | TN |
| **Final Assessment** | **Impaired** |

# CHAPTER 9: IMPERIAL RIVER POLLUTANT SOURCES AND ANTICIPATED OUTCOMES

## 9.1 SUMMARY OF SOURCES IN THE TMDLS

The DO TMDL was based on the reduction of ambient TN concentrations to the chosen reference site TN value. Therefore to assign allocations based on load reduction, it was decided to use simplified runoff and loading calculations to estimate the land-based TN concentration for the **entire basin** and reduce this value to the ambient TN concentration. Runoff coefficients and factors were modified to those recommended by CHNEP.

There are NPDES permitted wastewater facilities in the WBID but none that discharge directly to the Imperial River. There are three non-NPDES surface water discharge wastewater facilities in the Imperial River Basin: Glades Haven Park, Bonita Springs Utilities East, and Hunter's Ridge Wastewater Treatment Plant. The disposal system used at Glades Haven Park is extended aeration to effluent to percolation ponds. Bonita Springs Utilities East uses a membrane process known as membrane bioreactor (MBR). The Hunter's Ridge WWTP uses a 0.079 million gallon per day (mgd) extended aeration and 0.100 mgd contact stabilization (CS) process.

As the TMDL did not include a WLA for wastewater point sources, it is reasonable to believe that, within the Imperial River Basin, the majority of the anthropogenic TN loadings to the Imperial River come from stormwater and ground water sources, including surface runoff, ground water input, failed septic tanks, and nutrient sediment release. The BMAP focuses on load reductions from stormwater sources because the TMDL did not separately quantify the various potential sources. The loads and reductions resulting from the simplified runoff and loading calculations are shown in **Table 27**. The calculation of the background and non-background load was described in **Section 4.1**. Additional details about the sources that are included in this BMAP are provided in the subsections below.

TABLE 27: TN REQUIRED REDUCTIONS BY SOURCE IN THE IMPERIAL RIVER BASIN

[1] Based on FDEP spreadsheet loading model developed during the BMAP process.

| TMDL LOAD(LBS/YR)[1] | EXISTING TN LOAD (LBS/YR)[1] | BACKGROUND LOAD(LBS/YR)[1] | NON-BACKGROUND LOAD (LBS/YR)[1] | REDUCTION (LBS/YR) |
|---|---|---|---|---|
| 192,202 | 252,326 | 125,640 | 126,686 | 60,125 |

Many of the municipalities in the basin are regulated by the Florida NPDES Stormwater Program because they discharge stormwater and qualify as a "municipal separate storm sewer system." 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 have the following characteristics:

- *Is owned or operated by a state, city, town, county, special district, association, or other public body (created by or pursuant to state law) having jurisdiction over management and discharge of stormwater and which discharges to surface waters of the state;*
- *Is designed or used for collecting or conveying stormwater;*

- *Is not a combined sewer; and*
- *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 which 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 two 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 Chapters 62-4, 62-620, 62-621 and 62-624, F.A.C. Entities in the Imperial River Basin that are currently designated as MS4s are listed in **Table 28**.

TABLE 28: LOCAL GOVERNMENTS IN THE IMPERIAL RIVER BASIN DESIGNATED AS MS4 PERMITTEES

| MS4 PERMIT PHASE | PERMITTEE | PERMIT NUMBER |
|---|---|---|
| I | Lee County | FLS000035 |
| I | City of Bonita Springs | FLS000035 |
| I | FDOT District 1 | FLS000035 |

### *9.1.1 STORMWATER SOURCES*

Lee County and its co-permittees are currently regulated under a Phase I MS4 permit. Phase I MS4s were subject to a two-part permit application process requiring the development of a proposed SWMP that would meet the standard of reducing (discharged) pollutants to the MEP, and incorporation of the SWMP into an individual permit issued to the MS4 operator. The SWMPs for Phase I MS4s include, but are not limited to, to the following measures:

- *Identify major outfalls and pollutant loadings;*
- *Detect and eliminate non-stormwater discharges (illicit discharges) to the system;*
- *Reduce pollutants in runoff from industrial, commercial, and residential areas;*
- *Control stormwater discharges from new development and redevelopment areas; and*
- *Implement a monitoring program.*

To avoid the need for re-opening MS4 permits each time a TMDL or BMAP is adopted, the following language is included in the Phase I MS4 permits, which automatically require the implementation of any stormwater requirements in an adopted BMAP. This "TMDL clause" states: "*In accordance with Section 403.067, F.S., NPDES permits must be consistent with the requirements of adopted Total Maximum Daily Loads (TMDLs). Therefore, when a Basin Management Action Plan (BMAP) and/or implementation plan for a TMDL for a water body into which the permitted MS4 discharges the pollutant of concern is adopted pursuant to Section 403.067(7), F.S., the MS4 operator(s) must comply with the adopted provisions of the BMAP and/or implementation plan that specify activities to be undertaken by the permittee(s) that are for the purpose of addressing discharges from the MS4 to meet the TMDL allocation."*

Also, according to Paragraph 403.067(7)(a)4, the BMAP is adopted by Secretarial Order pursuant to Chapter 120, F.S., and is therefore subject to Chapter 120 challenges.

No quantitative distinction was made in the TMDL for MS4 and non-MS4 loads, and so that such distinction was not made in this BMAP. As the TMDL is restudied in the future, FDEP expects to refine the sources of loading and the BMAP will be modified accordingly.

Several facilities in the Imperial River Basin were identified as non-NPDES wastewater facilities in the TMDL. These facilities and their permit numbers are listed in **Table 29**. As the TMDL did not consider these sources, they will not be considered as sources that require further reductions.

TABLE 29: NON-NPDES WASTEWATER FACILITIES LOCATED IN THE IMPERIAL RIVER WATERSHED

| FACILITY NAME | TYPE | PERMIT |
|---|---|---|
| Citrus Park North | Domestic Wastewater | FLA014477: WAFR Facility # 14477 |

### *9.1.2 AGRICULTURE*

The primary agricultural land uses in the Everglades West Coast Basin are cow/calf operations (pasture) and row/field crops. Other agricultural land uses include nurseries, citrus, and horse farms (specialty farms). The majority of the horse farms can be characterized as small, noncommercial hobby farms. Most of the agricultural acreage within the Everglades West Coast Basin is within the Imperial River Basin in the BMAP. Due to urban encroachment, citrus health issues (freeze/disease), and the downturn in the economy, many citrus and nursery operations either have been abandoned or have significantly lowered their production acreage. In recent years, some of this acreage may have been shifted to other commodities or to non-agricultural/urban uses.

## 9.2 ANTICIPATED OUTCOMES OF BMAP IMPLEMENTATION

With implementation of the projects outlined in this BMAP, reductions in the nutrient loads to the Everglades West Coast Basin are expected to improve the conditions of the estuary such that it meets applicable water quality standards. The following outcomes are expected from BMAP implementation:

- *Improved water quality trends in the watershed tributaries and main stem of Imperial River;*
- *Decreased loading of the target pollutant (TN);*

- *Increased coordination between state and local governments and within divisions of local governments in problem solving for surface water quality restoration;*
- *Determination of effective projects through the 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 10: IMPERIAL RIVER DETAILED ALLOCATIONS

## 10.1 DETERMINING DETAILED ALLOCATIONS

As the DO TMDL was based on the reduction of ambient TN concentrations to a reference site TN value, modeling of loading sources did not occur during TMDL development. To assign allocations based on a load reduction, FDEP utilized simplified runoff and loading calculations to estimate the land-based TN load, and reduced the resulting value to the TMDL TN concentration. Runoff coefficients and factors were modified to those recommended by CHNEP. It should be recognized that this is a temporary solution to get a start on TN load reductions while the TMDL is re-evaluated. These calculations were previously described in **Section 4.1.1**.

### *10.1.1 ALLOCATIONS*

As part of the TMDL, FDEP used a reference target of 0.74 mg/L for TN to achieve DO water quality standards. The target load associated with this concentration is 192,202 lbs/yr based on the total runoff from the watershed calculated in the modeling exercise described in **Section 4.1.1**. Allocations to achieve this target load were then calculated as described in the following paragraphs. It should be noted that this loading condition was used to determine the allocation to the various stakeholders rather than the TMDL reduction of 24.87%.

The first step in determining allocations was to calculate the NPS background load using the information from the modeling exercise described above. The NPS background load is defined as the load resulting from the watershed if all loads were converted to non-urban land uses. Existing land uses were modified to replace all urban and agricultural land uses with non-urban land uses. Such changes provide a basis for estimation of nonpoint source loads from natural land uses and evaluation of the impact of manmade changes in the watershed. Acreages of wetland and/or upland forest areas in the watershed were then used to replace the land use data in the pollutant load model in order to create the background simulation. The TN background loads by entity are shown in **Table 30**.

The second step was to determine the NPS non-background load, the difference between the Existing Load and the NPS background load. This is essentially the anthropogenic NPS load that is used to allocate load reductions. In order to assign allocations, the percent of the total NPS non-background load was determined for each entity as shown in **Table 30**.

Using the allocations in **Table 30**, a load reduction for each entity, including agriculture, was calculated as shown in **Table 31**.

TABLE 30: TN ALLOCATIONS FOR THE IMPERIAL RIVER BASIN MS4S

| ENTITY | AREA (ACRES) | EXISTING TN (LBS/YR) | BACK-GROUND (LBS/YR) | NON-BACKGROUND (LBS/YR) | % OF NON-BACK-GROUND | PORTION OF NON-BACK-GROUND (LBS/YR) | ALLOCATION (LBS/YR) |
|---|---|---|---|---|---|---|---|
| Lee County | 26,113 | 94,469 | 91,190 | 3,279 | 2.6% | 1,723 | 92,913 |
| City of Bonita Springs | 7,154 | 37,426 | 16,560 | 20,866 | 16.5% | 10,963 | 27,524 |
| FDOT | 96 | 347 | 147 | 200 | 0.2% | 105 | 252 |
| Agriculture | 11,597 | 120,084 | 17,743 | 102,341 | 80.8% | 53,770 | 71,514 |
| **Totals:** | **44,960** | **252,326** | **125,640** | **126,686** | **100.0%** | **66,561** | **192,202** |

TABLE 31: TN REQUIRED REDUCTIONS FOR THE IMPERIAL RIVER BASIN MS4S

| ENTITY | AREA (ACRES) | EXISTING TN (LBS/YR) | ALLOCATION (LBS/YR) | % REDUCTION | REDUCTION REQUIRED |
|---|---|---|---|---|---|
| Lee County | 26,113 | 94,469 | 92,913 | 1.6% | 1,556 |
| City of Bonita Springs | 7,154 | 37,426 | 27,524 | 26.5% | 9,903 |
| FDOT | 96 | 347 | 252 | 27.4% | 95 |
| Agriculture | 11,597 | 120,084 | 71,514 | 40.4% | 48,570 |
| **Totals:** | **44,960** | **252,326** | **192,202** | **23.8%** | **60,125** |

### *10.1.2 NON-MS4 URBAN STORMWATER ALLOCATIONS*

The TMDL identified three non-NPDES wastewater facilities located within the Imperial River Basin. However, the TMDL did not assign a WLA to these facilities and therefore considered their contribution to be negligible.

# CHAPTER 11: IMPERIAL RIVER MANAGEMENT ACTIONS

## 11.1 MANAGEMENT ACTIONS TYPE AND ELIGIBILITY

"Management actions" refers to the suite of activities that the entities who are assigned allocations will be conducting to achieve long-term increases in DO (by reducing TN) in the Imperial River. These include structural and nonstructural activities.

Management actions had to meet several criteria to be considered eligible for credit under the BMAP. All projects, programs, and activities were required to address TN loads to receive credit. Projects completed after January 1, 2000, were eligible for BMAP credit. 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 new development) and do not contribute to the improvement of water quality in the Imperial River.

Based on these eligibility requirements, the entities submitted structural and nonstructural projects to reduce the nonpoint stormwater loading. These projects were submitted to provide reasonable assurance to FDEP that each entity has a plan for how to reduce nutrient loads. The projects submitted by the MS4s and agriculture are outlined in the sections below.

## 11.2 MS4 PROJECT REQUIREMENTS

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, implementation of a TMDL or BMAP for holders of NPDES MS4 permits shall be achieved to the MEP, through the use of BMPs or other management measures. These management measures include, but are not limited to, the following:

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

To comply with the MEP standard, the SWMP must be designed and implemented to reduce the discharge of pollutants to surface waters of the state. Implementation of BMPs consistent with the provisions of the SWMP required pursuant to a MS4 permit constitutes compliance with the standard of reducing pollutants to the MEP for discharges to unimpaired waters. However, MS4s must also continue to assess and adjust their list of approved projects 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 activities submitted by the entities to reduce TN loads are described in the subsequent subsections. These activities were submitted to provide reasonable assurance to FDEP that some level of TN reduction is taking place within the basins while the TMDL is re-visited. 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 time frame. New projects may be substituted for those identified in the BMAP during the annual BMAP progress report process.

## 11.3 MS4 Projects to Reduce TN Loading

The projects and time frames for implementation submitted by the entities to provide TN load reductions are summarized in **Tables 32, 33,** and **34**. These projects were submitted to provide reasonable assurance to FDEP that the MS4 permittee has a plan for how to reduce TN loads. 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 provided within the specified time frame. New projects may be substituted for those identified during the annual BMAP progress report process.

TABLE 32: LEE COUNTY PROJECTS IN THE IMPERIAL RIVER BASIN

N/A = Not available
- = Empty cell/no data

| PROJECT NUMBER | PROJECT NAME | TYPE OF BMP | ACRES TREATED | ESTIMATED COST | STATUS | PROJECT TN REDUCTION (LBS/YR) |
|---|---|---|---|---|---|---|
| LC-1 | CREW | Conservation Purchase | 15 | N/A | Completed | 0 |
| LC-2 | Pine Lake Preserve | Conservation Purchase | 129 | N/A | Completed | 1 |
| LC-3 | Street Sweeping | Street Sweeping | 26,113 | N/A | Ongoing | 7 |
| LC-4 | Imperial Marsh | Conservation Purchase | 477 | N/A | Completed | 1,440 |
| LC-5 | Education/Fertilizer Ordinance | Ordinances | 26,113 | N/A | Completed | 6 |
| - | - | - | - | - | **Total:** | **1,454** |

TABLE 33: BONITA SPRINGS PROJECTS IN THE IMPERIAL RIVER BASIN

N/A = Not available
- = Empty cell/no data

| PROJECT NUMBER | PROJECT NAME | TYPE OF BMP | ACRES TREATED | ESTIMATED COST | STATUS | PROJECT TN REDUCTION (LBS/YR) |
|---|---|---|---|---|---|---|
| BS-1 | Education/Fertilizer Ordinance | Ordinances | 7,154 | N/A | Completed | 696 |
| BS-2 | FYN Program | Ordinances | 7,154 | N/A | Future | 835 |
| BS-3 | Old 41 Catch Basin Inserts | Catch Basin Inserts | 21 | N/A | Completed | 5 |
| BS-4 | Residential Dry Detention | Dry Detention | 4 | N/A | Completed | 1 |
| BS-5 | Morton Avenue Swales | Swale with Raised Inlet | 26 | N/A | Completed | 212 |
| BS-6 | Marni Fields | Dry Detention | 16 | N/A | Completed | 6 |
| BS-7 | Felts Avenue Stormwater Treatment | Dry Retention | 31 | N/A | Future | 258 |
| BS-8 | Street Sweeping | Street Sweeping | 7,154 | N/A | Ongoing | 45 |
| - | - | - | - | - | **Total:** | **2,058** |

TABLE 34: FDOT PROJECTS IN THE IMPERIAL RIVER BASIN

N/A = Not available
- = Empty cell/no data

| PROJECT NUMBER | PROJECT NAME | TYPE OF BMP | ACRES TREATED | ESTIMATED COST | DEADLINE | PROJECT TN REDUCTION (LBS/YR) |
|---|---|---|---|---|---|---|
| IR-FDOT-1 | Wet Detention Ponds (5d, 7C, & 9B) | Wet Detention | 96 | N/A | Completed | 18 |
| IR-FDOT-2 | Roadside Swales | Swale with Ditch Blocks | N/A | N/A | Completed | N/A |
| IR-FDOT-3 | Education/Fertilizer Ordinance | Ordinances | 96 | N/A | Completed | 3 |
| - | - | - | - | - | **Total:** | **21** |

## 11.4 CREDIT PROCESS

A credit is defined as the benefit received from a BMP that results in an overall net reduction in loading to the watershed compared with the baseline condition. During the stakeholder process, it was defined what types of projects would be eligible for credit compared with those that would be ineligible. Eligible projects include traditional structural BMPs (e.g., wet detention, retention), fertilizer ordinances, education, constructed wetlands and street sweeping. Examples of ineligible projects include those outside the watershed, flood control projects that provide no water quality benefit, maintenance projects, litter removal, pipe replacements, and conservation land purchases with no change in land use. Credits were calculated by determining the existing load for the BMP treatment area and then applying the removal efficiency assigned to the BMP in order to calculate the load reduction. FDEP provided a list of pre-approved removal efficiencies for various BMPs. In the case where a BMP was not

included on the list, the stakeholders were able to provide removal efficiencies based on measured data.

### *11.4.1 Conservation Land Purchase Credit*

One of the activities proposed by the stakeholders (i.e., Lee County) in the Imperial River Basin is the purchase of lands for conservation; that is, the transfer of land from one stakeholder to another for a cost, thus eliminating the previous, potentially deleterious land use. The issue is the amount of nutrient reduction credit to be offered for this activity, if any.

In order to allow a nutrient reduction credit for the purchase of conservation lands, there must be a net reduction of nitrogen loading to the estuary. The purchase of property, with no change in land use, simply transfers the load from one stakeholder to the purchasing stakeholder. There is no credit if the land use remains the same. For this reason, in order for a credit to be achieved, the historical use of the land prior to purchase is urban or agricultural and the use of the land after purchase is natural. The credit allowed, then, is the difference in the urban or agricultural land use loading and the background load. The background load is the loading for the type of land use at the time of purchase.

As an example, suppose 1,000 acres of agricultural land is purchased by a stakeholder. Agricultural land has an average loading factor of 7.30 pounds per acre per year (lb/ac/yr) and a background loading factor of 5.34 lb/ac/yr. Thus, if the land is converted to background after purchase, then the load difference is 1,000 acres times (7.30 – 5.34 lb/ac/yr) or 1,960 lb/yr. This means that the load reduction is 1,960 lb/yr—this is assigned as a credit to the purchasing stakeholder.

Therefore, for each conservation land purchase, the urban and agricultural land uses were identified and the background loading factor was multiplied to get the new loading. The difference between the original land use loading and the new conservation land loading was assigned as a credit to the purchaser.

### *11.4.2 Public Education and Outreach*

Up to a 6% reduction in the baseline load for TN 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 FYN Program within the city or county.*
2. *Local land development codes or ordinances that require Florida friendly landscaping on all new developments; require commercial landscapers to obtain training and certification through the Green Industry BMP Program; require irrigation systems per Sections 125.568 and 166.048, F.S. and Section 373.185, F.S.; and specify fertilizer application rates and types. Local ordinances that control pet waste and require that residents pick up and properly dispose of pet wastes.*
3. *Implementation of PSAs on local cable or commercial television and radio stations.*
4. *Informational pamphlets on pollution prevention, fertilizer application, Florida friendly landscaping, water conservation, septic tank maintenance, etc. Presentations on these topics to civic groups, local businesses, students, and the general public.*

5. *Websites to provide information on reducing nutrient pollution for homeowners and businesses.*
6. *Inspection program and public call-in number to address illicit discharges.*

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

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

The project tables previously summarized the public education activities conducted by each entity and the associated load reductions.

## 11.5 Agriculture Allocations

**Table 35** provides a breakdown of agricultural land uses in the Imperial River Basin, according to 2004 SFWMD land use data. **Figure 8** shows the approximate location of these agricultural lands in the BMAP area.

Table 35: Agricultural Land Uses in the Imperial River Basin (2004 SFWMD Land Use Data)

- = Empty cell/no data

| FLUCCS Code | Code Description | Total Acres |
|---|---|---|
| 2120 | Unimproved Pasture | 1,239.3 |
| 2130 | Woodland Pasture | 44.9 |
| 2110 | Improved Pasture | 3,792.2 |
| 2140 | Row Crop | 5,058.0 |
| 2150 | Field Crops | 40.8 |
| 2210 | Citrus | 944.0 |
| 2430 | Tree Nurseries | 68.5 |
| 2431 | Ornamentals | 57.1 |
| 2500 | Specialty Farms | 29.7 |
| 2610 | Fallow Cropland | 319.4 |
| **-** | **Total Agricultural Acres** | **11,593.9** |

Land use data are helpful as a starting point for estimating agricultural acreage and developing BMP implementation strategies; however, there are inherent limitations. The time of year during

which land use data are collected (through aerial photography) affects the accuracy of photo interpretation. This can result in the inappropriate analysis of the data and can hamper decision making. Another limitation is that the specific agricultural activity being conducted is not always apparent. For example, some acreage under the improved pasture classification may be used for cattle grazing, some may consist of forage grass that is periodically harvested and sold for hay, and/or some may comprise a fallow vegetable field awaiting planting. Operations that may fall into this land use category fertilize at different rates (e.g., hay operations and some other commodities typically fertilize at or below rates recommended by UF-IFAS); therefore, it is 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, land use acreage estimates are subject to adjustment, as discussed later in this section.

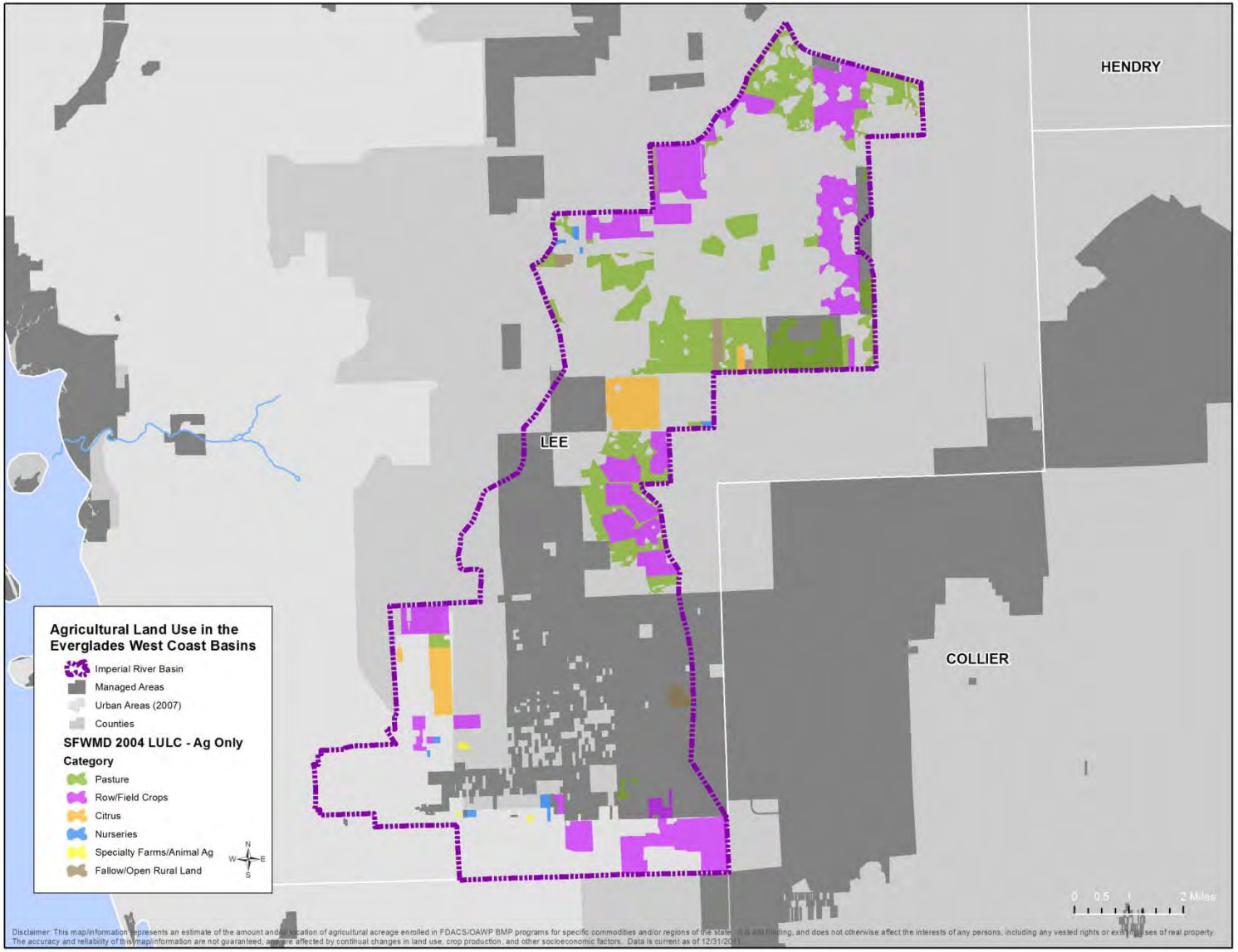



FIGURE 8: AGRICULTURAL USES IN THE IMPERIAL RIVER BASIN

### *11.5.1 Addressing Agricultural Nonpoint Pollution*

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

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

### *11.5.2 Agricultural BMPs*

Agricultural 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 MILs 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 take them up, thus reducing nutrient runoff and leaching to surface and ground water. Therefore, the MILs play an important role in both water conservation and water quality.

Table 18 previously identified the key nutrient and irrigation management BMPs that would most likely be applicable to agricultural operations in the basin. By definition, BMPs are technically and economically feasible. However, FDACS BMP manuals contain some BMPs that may only be affordable with financial assistance. The BMP checklists allow producers to indicate whether a BMP is not economically feasible, on a case-by-case basis. As BMP cost share becomes available to the basin, FDACS will work with producers to implement applicable key BMPs that otherwise are not affordable.

### *11.5.3 FDACS OAWP Role in BMP Implementation and Follow-Up*

#### 11.5.3.1 **BMP Implementation**

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

The OAWP will recruit producers within the Everglades West Coast Basin to enroll in adopted BMP programs applicable to their operations. OAWP staff and contractors will identify existing growers, to the greatest 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.

#### 11.5.3.2 Follow-Up and Reporting on BMP Enrollment and Implementation

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

- *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 SFWMD activities. If a re-evaluation of the BMPs is needed, FDACS also will include SFWMD and other partners in the process.

### *11.5.4 FDEP and SFWMD Roles in BMP Implementation*

The FWRA states that nonpoint source dischargers who fail either to implement 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.

#### 11.5.4.1 BMP Enrollment Goals and Load Reduction Estimates

***BMP Enrollment Goals***

**Table 35** previously summarized the land use data figures for agriculture in the Imperial River Basin, 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 2004 land use information from the SFWMD. 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 6% less total acreage than indicated in the 2004 figures, due primarily to urban

TABLE 36: AGRICULTURAL ACREAGE, BMP ENROLLMENT, AND FUTURE ENROLLMENT GOALS FOR THE IMPERIAL RIVER BASIN

[1] FDACS staff-adjusted acreage for purposes of enrollment is based on a review of more recent aerial imagery in the basin and local staff observations.
[2] Please see the discussion on BMP Enrollment Goals.
N/A – Not applicable
- = Empty cell/no data

| 2004 SFWMD LAND USE | 2004 ACRES | FDACS-ADJUSTED ACRES FOR ENROLLMENT[1] | RELATED FDACS BMP PROGRAMS | ACREAGE ENROLLED[1] | RELATED NOIS/ *CERTIFICATION* |
|---|---|---|---|---|---|
| Pasture | 5,076.5 | 3,245.9 | Cow/Calf<br>Future (hay) | 0.0 | 0 |
| Row/Field/Mixed Crops | 5,098.8 | 2,535.3 | Vegetable/Agronomic Crops | 128.0 | 1 |
| Fallow Cropland | 319.4 | N/A | N/A | N/A | N/A |
| Citrus | 944.0 | 717.9 | Ridge Citrus<br>Flatwoods Citrus | 0.0 | 0 |
| Tree Nurseries | 68.5 | 23.3 | Future Nursery<br>Specialty Fruit & Nut | 0.0 | 0 |
| Ornamentals | 67.7 | 51.7 | Container Nursery | 139.6 | 5 |
| Specialty Farms | 29.7 | 12.1 | Conservation Plan Rule / Equine | N/A | N/A |
| **Totals** | **11,604.5** | **6,586.2** | **-** | **267.6** | **6** |
| **Five-year Enrollment Goal (50%)** | **-** | **3,293.1** | **-** | **-** | **-** |
| **Acreage Enrolled (as of December 31, 2011)[1]** | **-** | **267.6** | **-** | **-** | **-** |
| **Remaining Acres to Enroll[2]** | **-** | **3,025.5** | **-** | **-** | **-** |

conversion and citrus freeze/disease issues. In addition, some of the acreage is no longer in production and would not be necessary to enroll in BMPs. The enrollment goal is 50% of the adjusted agricultural acres in the first 5 years.

It is important to understand that, even if all targeted agricultural operations are enrolled, not all of the acreage listed as agriculture shown in **Table 36** 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 December 31, 2011, five producers within the Imperial River Basin had submitted NOIs to OAWP, covering about 268 acres, to implement FDACS-adopted BMPs. No producers are conducting water quality monitoring in lieu of implementing BMPs at this time.

FDACS field staff will focus on enrolling agricultural operations in the Imperial River basin first, as the majority of agricultural acreage is within this basin. The primary focus will be on row/field crops, which comprise nearly 40% of the agricultural acreage in the basin. Although there appear to be more acres of pasture than row/field crops, a preliminary review of the aerial imagery and parcel data in the basin shows that the majority of the acres does not have an agricultural usage or assessment and likely does not comprise commercial operations. As resources allow, staff also will enroll other commodities, including any possible commercial cow/calf operations. **Figure 9** shows the acres enrolled in BMPs as of December 31, 2011.

#### 11.5.4.2 Agricultural Load Reduction Allocation and BMP Load Reduction Estimates

Due to the inaccuracies in 2004 land use information and to changes in land use since 2004, agricultural loadings may be less than indicated in the TMDL. The region is expected to have continuing shifts from agricultural to residential/urban land uses, which will reduce the agricultural load further. More precise information will be incorporated into the next iteration of the TMDL, 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 should be considered during the first BMAP cycle.

The estimates of agricultural load reduction due to the implementation of BMPs, previously shown in **Table 37**, are based on commodity-specific methods developed for the Lake Okeechobee watershed. These values may assume conditions, such as typical nitrogen fertilization rates, that differ from actual field conditions, but are the best available information. Based on an average 30% BMP effectiveness for TN reductions, OAWP estimates that the goal of 50% enrollment within the first 5 years (Phase I) will achieve a reduction of 18,012 pounds of TN in the Imperial River Basin. This represents approximately 37% of the total required load reduction allocation for agriculture in the basin. Therefore, estimated BMP-based reductions coupled with land use changes provide more than sufficient reductions to meet the Phase I target.

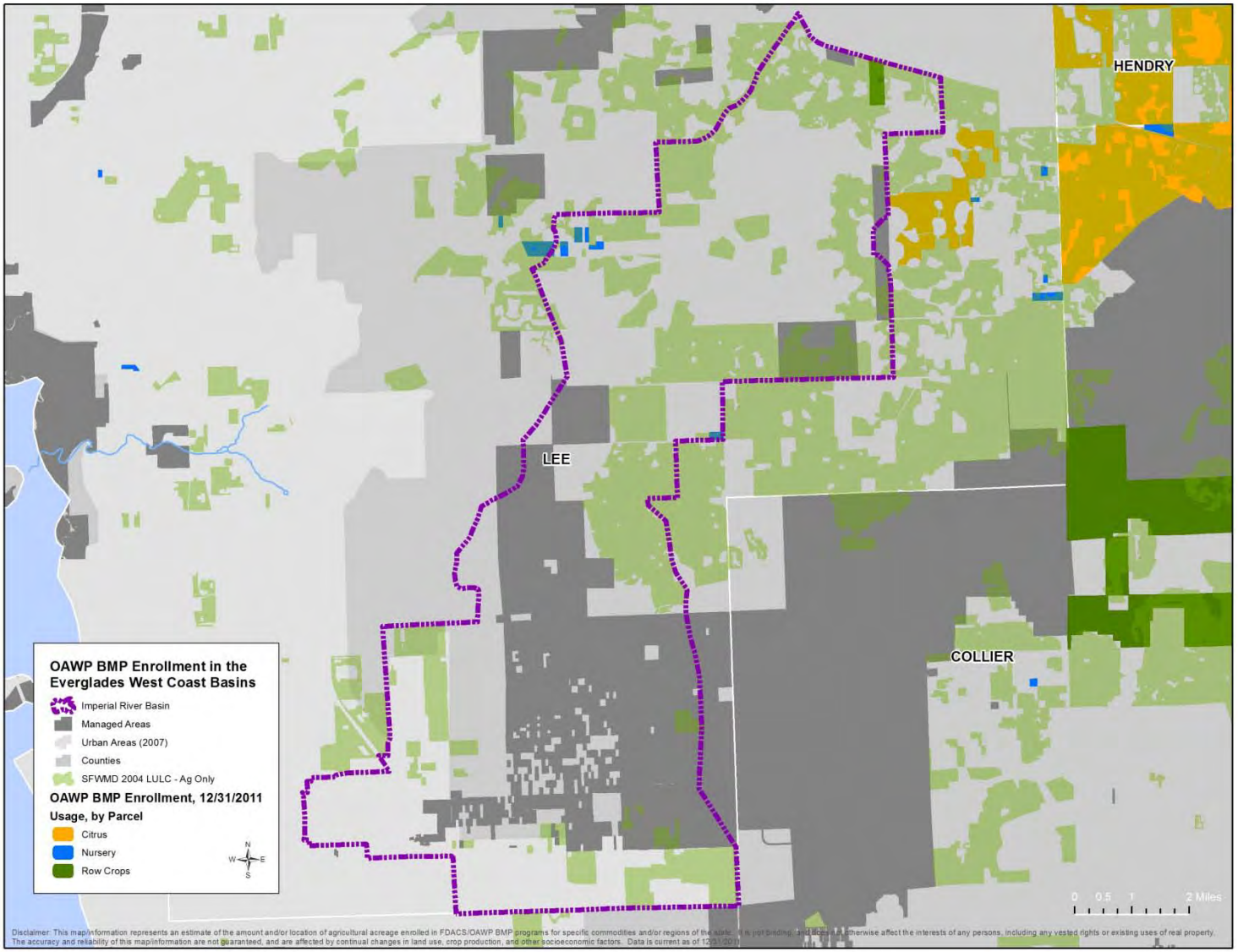



FIGURE 9: BMP ENROLLMENT IN THE IMPERIAL RIVER BASIN AS OF DECEMBER 31, 2011

TABLE 37: AGRICULTURAL TN LOAD REDUCTION ALLOCATION AND ESTIMATED REDUCTIONS IN TN LOAD IN THE FIRST FIVE YEARS – IMPERIAL RIVER BASIN

| ESTIMATED LOADS | TN (LBS/YR) |
|---|---|
| Load Reduction Allocation for Agriculture | 48,570 |
| 1st 5-Year Load Reduction (Phase I) | 16,190 |
| Estimated Load Reductions via BMPs, 50% Target Enrollment | 18,012 |
| Credit for Changes in Land Use (urban conversion only) | **3,927** |
| Remaining Load Reductions Needed for BMAP in Phase I | **-5,749 (credit)** |

### 11.5.4.3 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 SFWMD to identify appropriate options for achieving further agricultural load reductions.

# CHAPTER 12: ASSESSING PROGRESS AND MAKING CHANGES FOR THE IMPERIAL RIVER

Successful BMAP implementation requires commitment and follow-up. In the Commitment to Plan Implementation (see **Chapter 7**), stakeholders have expressed their intention to carry out the plan, monitor its effect, and continue to coordinate within and across jurisdictions to achieve water quality 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 the water quality monitoring component sufficient to make this evaluation.

## 12.1 TRACKING IMPLEMENTATION

FDEP will work with the stakeholders to organize the monitoring data and track project implementation. This information will be presented in an annual report. The stakeholders have agreed to 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 reporting and compare with the BMAP schedule. **Table 21** previously provided a sample annual reporting form on BMAP project implementation (to be completed by the entities).
  - Discuss the data collection process, including any concerns and possible improvements to the process.
  - Review the monitoring plan implementation, as detailed in **Section 12.2**.
- *Sharing New Information*
  - Report on results from water quality monitoring and trend information.
  - Provide updates on new projects and programs in the watershed that will help reduce nutrient loading.
  - Identify and review new scientific developments on addressing nutrient loads and incorporate any new information into annual progress reports.
  - Discuss 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 BMAP.
  - Obtain reports from other basins where tools or other information may be applicable to the Everglades West Coast TMDLs.

Covering all of these topics is not required for the annual meetings, but they provide examples of the types of information that should be considered for the agenda to assist with BMAP implementation and improve coordination among the agencies and stakeholders.

## 12.2 Water Quality Monitoring

The Imperial River Basin monitoring plan is designed to enhance the understanding of basin loads, identify areas with high TN concentrations, and track water quality trends. This information will measure progress toward achieving the TMDL and provide a better understanding of the watershed loading. Sampling stations, parameters, frequency, and other elements of this strategy may be modified as appropriate to match changing environmental conditions and funding resources. However, any modifications made shall not affect the ability of the monitoring network to fulfill the objectives noted below.

During the development of the BMAP, FDEP initiated a ground water monitoring study to establish a ground water monitoring well network in representative areas to provide information on nutrient contributions from major land uses in these basins to evaluate their potential inputs into impaired surface waters. A number of areas have been identified for the monitoring of existing wells and possible new constructed wells. Each of these areas represents one or more of the following nutrient-related sources: (1) residential septic tanks; (2) residential lawn and ornamental fertilizer; (3) golf course fertilizer; (4) reclaimed water used on golf courses; and (5) agriculture. In addition to these proposed new monitoring well locations, existing wells may also be sampled. The work would include installing the network of monitoring wells, sampling the new wells and pre-existing wells one time and analyzing the samples, and producing a summary report and data.

### *12.2.1 Water Quality Monitoring Objectives*

Focused objectives are critical for a monitoring strategy to provide the information needed to evaluate implementation success. The primary and secondary objectives of the monitoring strategy for the tributaries are described below. These objectives will be used to evaluate the success of the BMAP, help interpret the data collected, and provide information for potential future refinements of the BMAP.

***Primary Objective***

- *Enhance the understanding of basin loads, identify areas with high nutrient concentrations, and track water quality trends. This information will measure progress toward achieving the TMDL and provide a better understanding of the watershed loading.*

***Secondary Objective***

- *Identify areas within the watershed with high loadings of TN to better focus management efforts.*

### *12.2.2 Water Quality Indicators and Resource Responses*

To achieve the objectives above, the monitoring strategy focuses on ore indicators to track water quality trends (**Table 38**). The core indicators are directly related to the parameters causing impairment in the river. At a minimum, the core parameters will be tracked to determine progress towards meeting the TMDL.

TABLE 38: WATER QUALITY INDICATORS AND FIELD PARAMETERS FOR THE IMPERIAL RIVER BASIN

| CORE PARAMETERS |
|---|
| Biochemical Oxygen Demand (BOD5) |
| Chlorophyll-a (corrected) |
| Color (Only required in river proper sampling stations )* |
| Dissolved Oxygen (DO) |
| Nitrate/nitrite as N |
| pH – field |
| Specific conductance |
| Temperature |
| Total Kjeldahl nitrogen (TKN) |
| Total Phosphorus |
| Turbidity |

### *12.2.3 MONITORING NETWORK*

The monitoring network for this plan builds on existing efforts in the basin by the city of Bonita Springs, Lee County, and FDEP. **Table 39** lists the stations that are included in the BMAP monitoring network. The water quality monitoring will be conducted on a monthly basis to assess the conditions in the watershed and within the Imperial River to determine changes in water quality from the actions implemented as part of the BMAP. The stations in the monitoring network are also shown in **Figure 10**. The monitoring stations listed are separated into a tiered sampling design as follows:

- ***Tier 1:*** *Stations listed in the BMAP monitoring plan as essential and mandatory for tracking water quality trends in the Imperial River and stations that document watershed reductions. Stations should be sampled monthly for all core parameters. Sampling stations, parameters, frequency, and other elements of this strategy may be modified as appropriate to match changing environmental conditions and funding resources. However, any modifications made shall not affect the ability of the monitoring network to fulfill the objectives noted below.*
- ***Tier 2:*** *Stations that are currently sampled either within the BMAP basin or in a tributary contributing to the overall load. These stations will help in the understanding of the total load within the watershed, and FDEP supports the continued monitoring.*

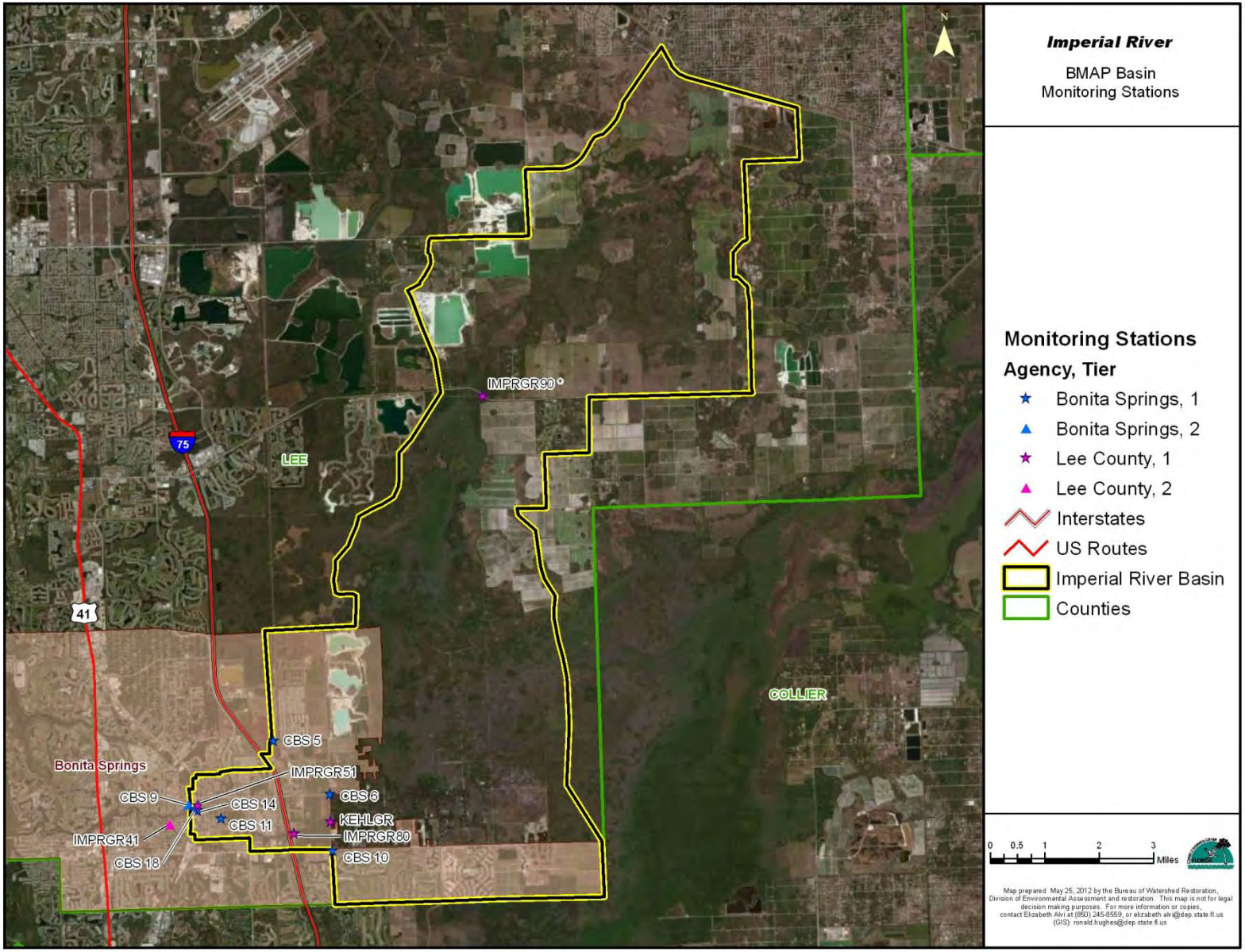



FIGURE 10: MONITORING NETWORK FOR THE IMPERIAL RIVER BASIN

TABLE 39: IMPERIAL RIVER BASIN BMAP MONITORING NETWORK

* Stations that are currently listed as an NPDES outfall station. The station data will not be included in any ambient monitoring analysis.
** Stations will continue to only be sampled bi-monthly.

| AGENCY | TIER | NPDES OUTFALL* | TYPE | STATION ID | LATITUDE | LONGITUDE |
|---|---|---|---|---|---|---|
| Bonita Springs | 1 | N | Watershed | CBS 5 | 26.360597 | -81.755036 |
| Bonita Springs | 1 | N | Watershed | CBS 6 | 26.346186 | -81.738575 |
| Bonita Springs | 1 | N | Watershed | CBS 10 | 26.331186 | -81.738111 |
| Bonita Springs | 1 | N | River | CBS 11 | 26.340214 | -81.771017 |
| Bonita Springs | 1 | Y | Watershed | CBS 14 * | 26.342506 | -81.777969 |
| Bonita Springs | 1 | N | River | CBS 18 | 26.342829 | -81.778696 |
| Lee County | 1 | Y | River | KEHLGR * | 26.338885 | -81.738526 |
| Lee County | 1 | N | Watershed | IMPRGR90 ** | 26.451321 | -81.691111 |
| Lee County | 1 | N | River -Leitner Creek | IMPRGR51 | 26.343744 | -81.777744 |
| Lee County | 1 | N | River | IMPRGR80 | 26.335865 | -81.749360 |
| Bonita Springs | 2 | N | River- Marine | CBS 9 | 26.344014 | -81.780656 |
| Lee County | 2 | N | River -Oak Creek | IMPRGR41 | 26.338919 | -81.786250 |

### *12.2.4 DATA MANAGEMENT AND ASSESSMENT*

The Florida STORET database serves as the primary repository of ambient water quality data for the state of Florida. FDEP pulls water quality data used for impaired water evaluations and TMDL development directly from the STORET database. Ambient water quality data collected as part of the BMAP will be uploaded into STORET for long-term storage and availability. SFWMD, 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 6 months, upon completion of the appropriate QA/QC checks.

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

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

### *12.2.5 QUALITY ASSURANCE/QUALITY CONTROL*

Stakeholders participating in the monitoring plan must collect water quality data in a manner consistent with FDEP's 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 NELAC-certified labs (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.

## 12.3 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 to share information and expertise are tracking plan implementation, monitoring water quality and pollutant loads, and holding periodic meetings.

BMAP execution will be a long-term process. Some projects 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 watershed is not projected to meet the TMDL, determine additional corrective actions. Project implementation as well as program and activity status will be collected annually from the participating entities. The stakeholders will review these reports to assess progress towards meeting the BMAP's goals.

# CHAPTER 13: COMMITMENT TO PLAN IMPLEMENTATION FOR THE IMPERIAL RIVER

Subsection 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 a way to show long-term support for the BMAP and the efforts included. 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.

# APPENDICES

# Appendix A: TMDL Basin Rotation Schedule

TMDLs are developed, allocated, and implemented through a watershed management approach (managing water resources within their natural boundaries) that addresses the state's 52 major hydrologic basins in 5 groups, on a rotating schedule. **Table A-1** shows the hydrologic basins within each of the five 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 | Caloosahatchee | 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 Everglades West Coast Basin is a Group 1 basin. As such, the Cycle 1 list of verified impaired waters was developed in 2002 and the Cycle 2 list was developed in 2009. 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 (a) 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: Stakeholder Involvement in BMAP Development

## EVERGLADES WEST COAST BMAP STAKEHOLDER INVOLVEMENT

The stakeholders involved in the technical meetings provided valuable information during the BMAP process. The technical meetings began in September 2009 to organize and review the technical information that is the basis of the BMAP. The technical stakeholders also identified management actions to improve water quality in the watershed. The technical meetings were held regularly throughout the BMAP development process on the following dates:

- *September 23, 2009;*
- *February 23, 2010;*
- *September 21, 2010;*
- *March 9, 2011; and*
- *December 15, 2011.*

### *PUBLIC PARTICIPATION IN MEETINGS*

All technical meetings were open to the public and noticed in FAW. Technical meetings were open to anyone interested in participating in the technical discussions. In addition, public meetings were held on the Verified Lists, the adoption of the TMDLs, and the BMAP document.

### *PUBLIC MEETING(S)*

Public meetings on the proposed Verified Lists and the Hendry Creek and Imperial River TMDLs were held before each was adopted. In addition, a public workshop on the BMAP was held on [date].

### *PLAN RECOMMENDATION APPROVAL AND ADOPTION*

**The final BMAP is to be adopted by FDEP Secretarial Order.**

# Appendix D: Summary of EPA-Recommended Elements of a Comprehensive Watershed Plan

The following is an excerpt on the nine 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 nine elements that are critical for achieving improvements in water quality. EPA requires that these nine 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 nine 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 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, information and education (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 (I/E) 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 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 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. In stream monitoring does not have to be conducted for individual BMPs unless that type of monitoring is particularly relevant to the project.

# Appendix E: 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.

**Allocation Technical Advisory Committee (ATAC):** The Watershed Restoration Act of 1999 required FDEP to form a Technical Advisory Committee to address issues relating to the allocation of load reductions among point source and nonpoint source contributors. The ATAC was therefore formed in order to develop recommendations for a report to the legislature on the process for allocating TMDLs.

**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 period:** A period of time used as a basis for later comparison.

**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 Pensacola Basin, this document was published in 2004 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.

**Coliforms:** Bacteria that live in the intestines (including the colon) of humans and other animals, used as a measure of the presence of feces in water or soil.

**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.

**Dry Season:** The dry part of the year when rainfall is low; the dry season is defined as November through May.

**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 urgent 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.

**Flocculent:** A liquid that contains loosely aggregated, suspended particles.

**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.

**Organic Matter:** Carbonaceous waste contained in plant or animal matter and originating from domestic or industrial sources.

**Outfall:** The place where a sewer, drain, or stream discharges.

**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.

**Runoff curve:** A calculated number representing the percentage of rainfall that becomes runoff for a given area.

**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:** Water that results from a rainfall event.

**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.

**Submersed:** Growing or remaining under water.

**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.

**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 column:** The water within a waterbody between the surface and sediments.

**Water Quality Index:** Determines the quality of Florida's streams, blackwaters, and springs. Categories include water clarity, dissolved oxygen, oxygen-demanding substances, nutrients, bacteria, and macroinvertebrate diversity.

**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.

**Wet Season:** The rainy part of the year; the wet season is defined as June through October.

# Appendix F: Bibliography of Key References and Websites

### *KEY REFERENCES:*

Florida Department of Environmental Protection. 2001. *Basin status report: Everglades West Coast.* Tallahassee, FL: Bureau of Watershed Management.

———. 2003. *Water quality assessment report: Everglades West Coast*. Tallahassee, FL: Bureau of Watershed Management.

———. 2008. *Dissolved Oxygen TMDLs for Hendry Creek (WBIDs 3258B and 3258B1)*. Tallahassee, FL: Bureau of Watershed Management.

———. 2008. *Dissolved Oxygen TMDLs for Imperial River, WBID 3258E*. Tallahassee, FL: Bureau of Watershed Management.

## *STORMWATER AND WATER QUALITY PROTECTION WEBSITES:*

TABLE F-1: STORMWATER AND WATER QUALITY PROTECTION WEBSITES

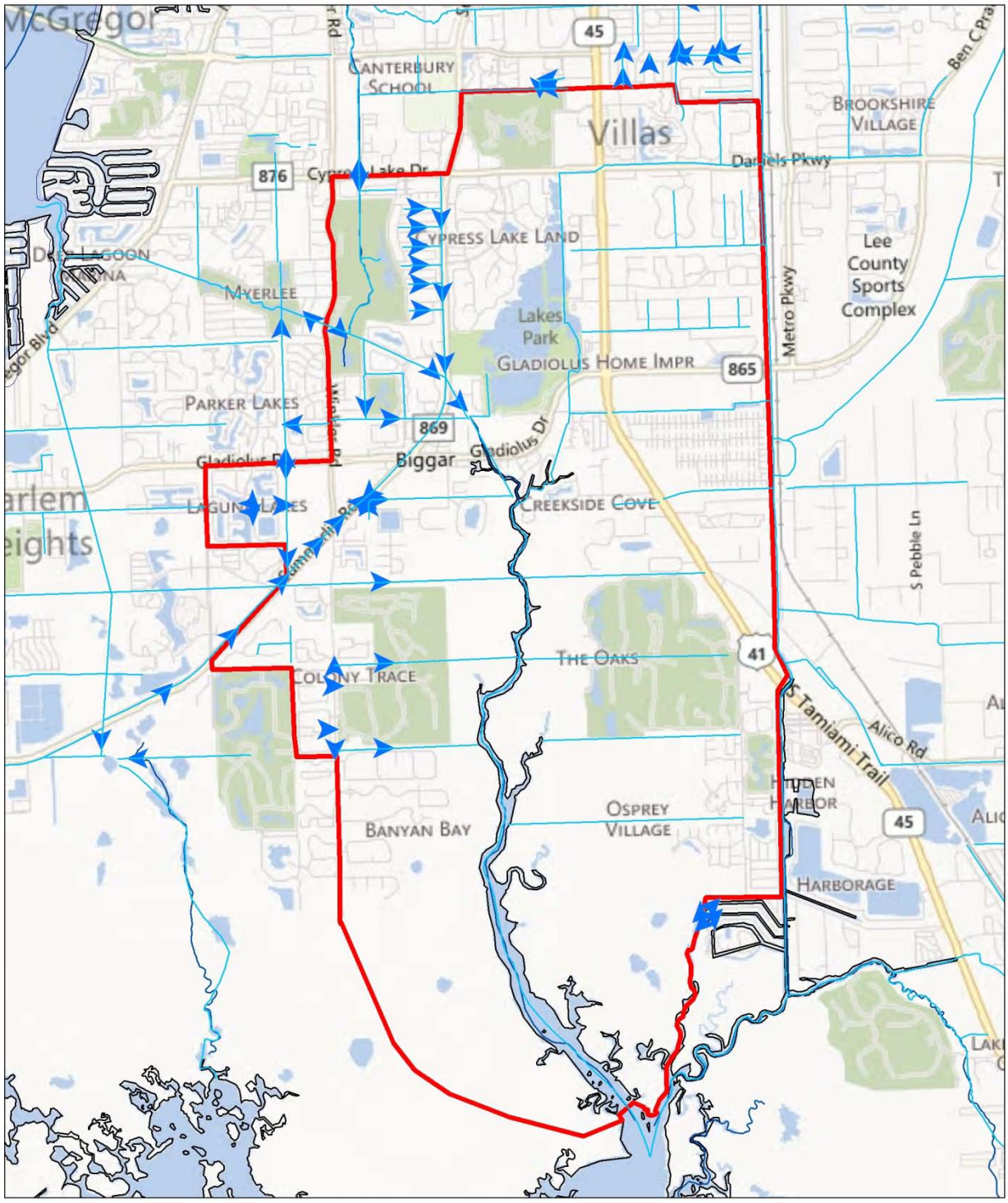
- = Empty cell/no data

| ENTITY/PROGRAM | URL |
|---|---|
| Local and Regional Sites | - |
| **SFWMD Programs** | http://www.sfwmd.gov |
| *Coastal Watersheds* | http://www.sfwmd.gov/portal/page/portal/xweb%20protecting%20and%20restoring/coastal%20watersheds |
| **Lee County Natural Resources** | http://www3.leegov.com/gov/dept/NaturalResources/Pages/NaturalResources.aspx |
| 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 |
| *Surface Water Quality Standards* | http://www.dep.state.fl.us/legal/Rules/shared/62-302/62-302.pdf |
| *Identification of Impaired Surface Waters Rule* | http://www.dep.state.fl.us/legal/Rules/shared/62-303/62-303.pdf |
| *Everglades West Coast Assessment Report* | http://tlhdwf2.dep.state.fl.us/basin411/everwest/assessment/EvergladesWEBX.pdf |
| **FDOH** | - |
| *Standards for OSTDS* | http://www.doh.state.fl.us |
| National Sites | - |
| **Center for Watershed Protection** | http://www.cwp.org/ |
| **EPA Office of Water** | http://www.epa.gov/water |
| *EPA Region 4 TMDLs (southeast United States)* | http://www.epa.gov/region4/tmdl/florida |
| *EPA STORET Program* | http://www.epa.gov/storet/ |

# Appendix G: BMAP Watershed Basin Development

During the Basin Management Action Plan (BMAP) process, it became evident that the actual watershed boundaries for both Hendry Creek and the Imperial River differed from the watershed (WBID) boundaries used for the TMDL assessment. To account for the entire load entering Hendry Creek and the Imperial River, FDEP worked with the stakeholders to refine the basin boundaries to better represent the actual watershed area. The initial BMAP watershed boundary for each area was created using a combination of watershed boundary GIS shapefiles provided by Lee County (Lee County Basin 1990, Lee Watersheds 2000) and the SFWMD (SWFFS Basins; Southwest Florida Feasibility Study) and a shapefile of drainage canals and flow directions within Lee County (Lee County Canals). These boundaries and canals were printed on a large map, and stakeholders provided comments on areas they knew drained into Hendry Creek or the Imperial River. FDEP staff provided ground-truthing of the boundary and areas of interest to verify flow directions. A new boundary was created and presented to stakeholders for review and comments. Changes were made and the BMAP watershed boundary for Hendry Creek and the Imperial River, shown below with verified flow directions, was agreed upon by stakeholders. These refined basin areas were used for the purposes of assigning and allocating pollutant loads to the stakeholders.

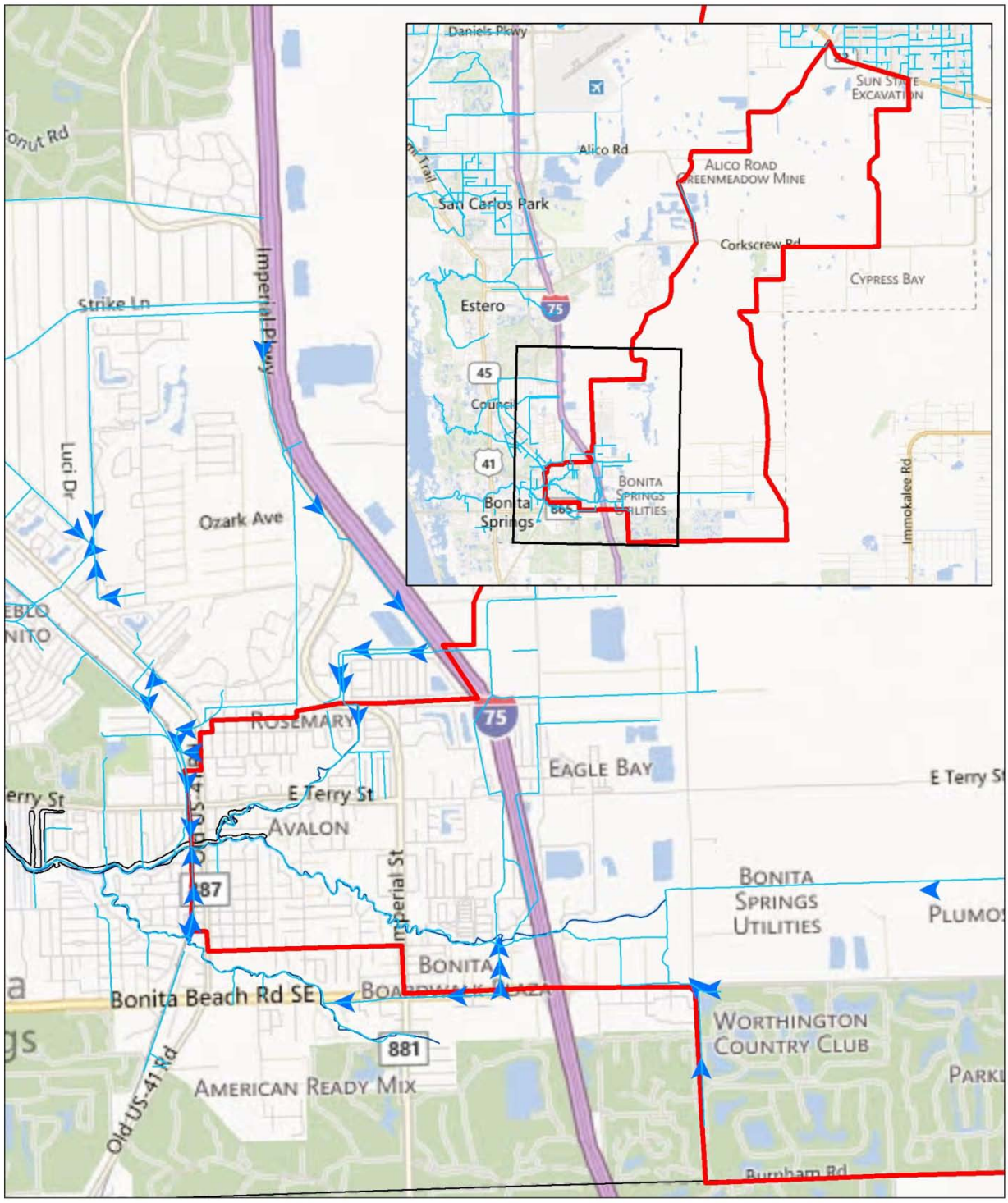
## BMAP Boundary: Hendry Creek




Map created by FDEP's South District.
Disclaimer: This map is intended for display purposes only and is subject to change.
FDEP makes no warranty for the accuracy and completeness of this information.

0 0.3 0.6 1.2 Miles

## BMAP Boundary: Imperial River (FW)




Map created by FDEP's South District.
Disclaimer: This map is intended for display purposes only and is subject to change.
FDEP makes no warranty for the accuracy and completeness of this information.

0 0.2 0.4 0.8 Miles

N

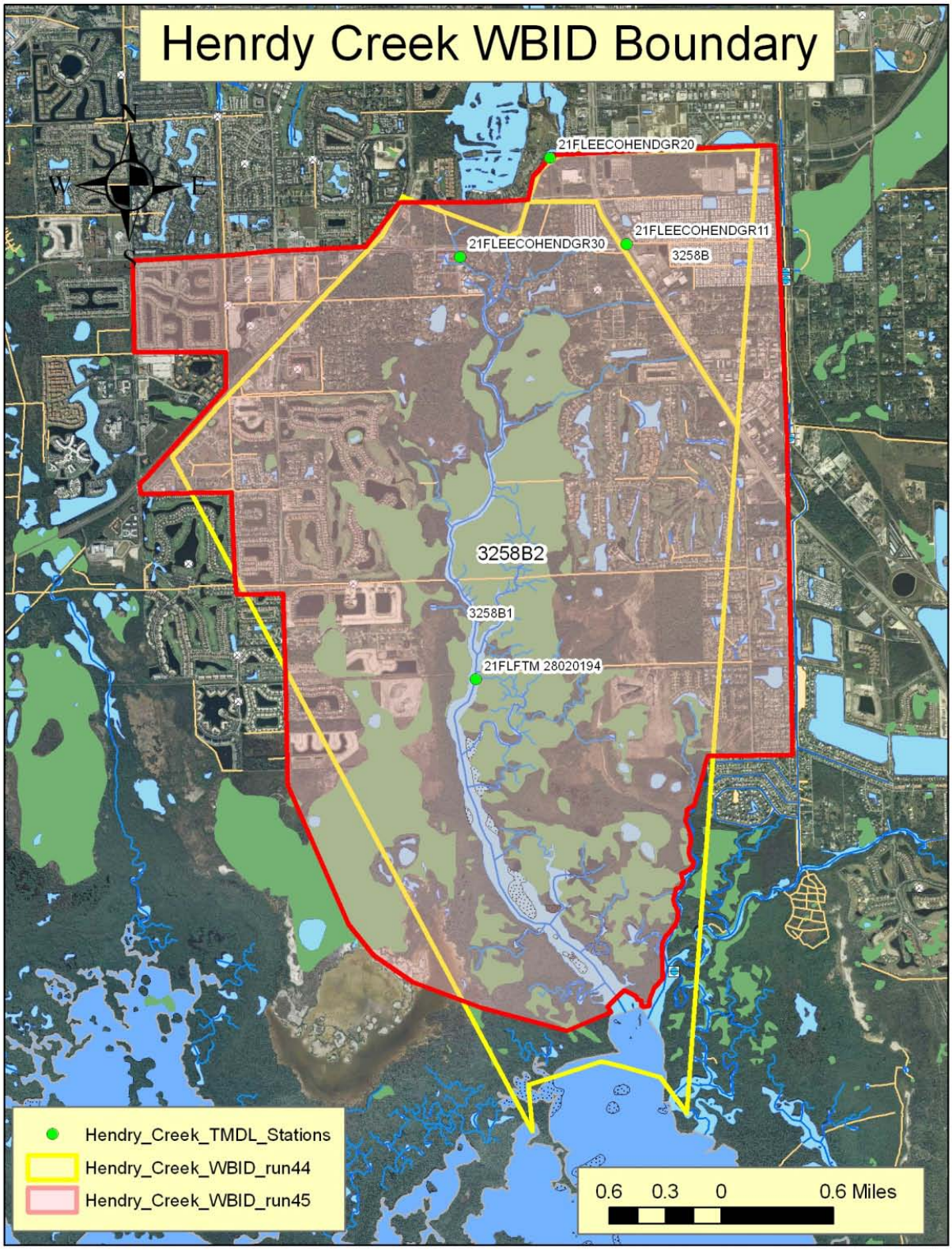
**WBID Changes to Reflect BMAP Boundaries**

To better correlate BMAP success with impairment status, the TMDL watershed (WBID) boundaries, including adjacent WBIDs, were modified to reflect the newly created BMAP watershed boundary.

***Hendry Creek***

The previous and current WBID boundaries are illustrated in the figure below. Hendry Creek (WBID 3258B) and Hendry Creek (Marine) (WBID 3258B1) were retired and a new WBID was created as Hendry Creek (WBID 3258B2). This new WBID is classified as 3M (Class 3 Marine) and, based on current criteria for marine WBIDs, the impairment status remains unchanged.

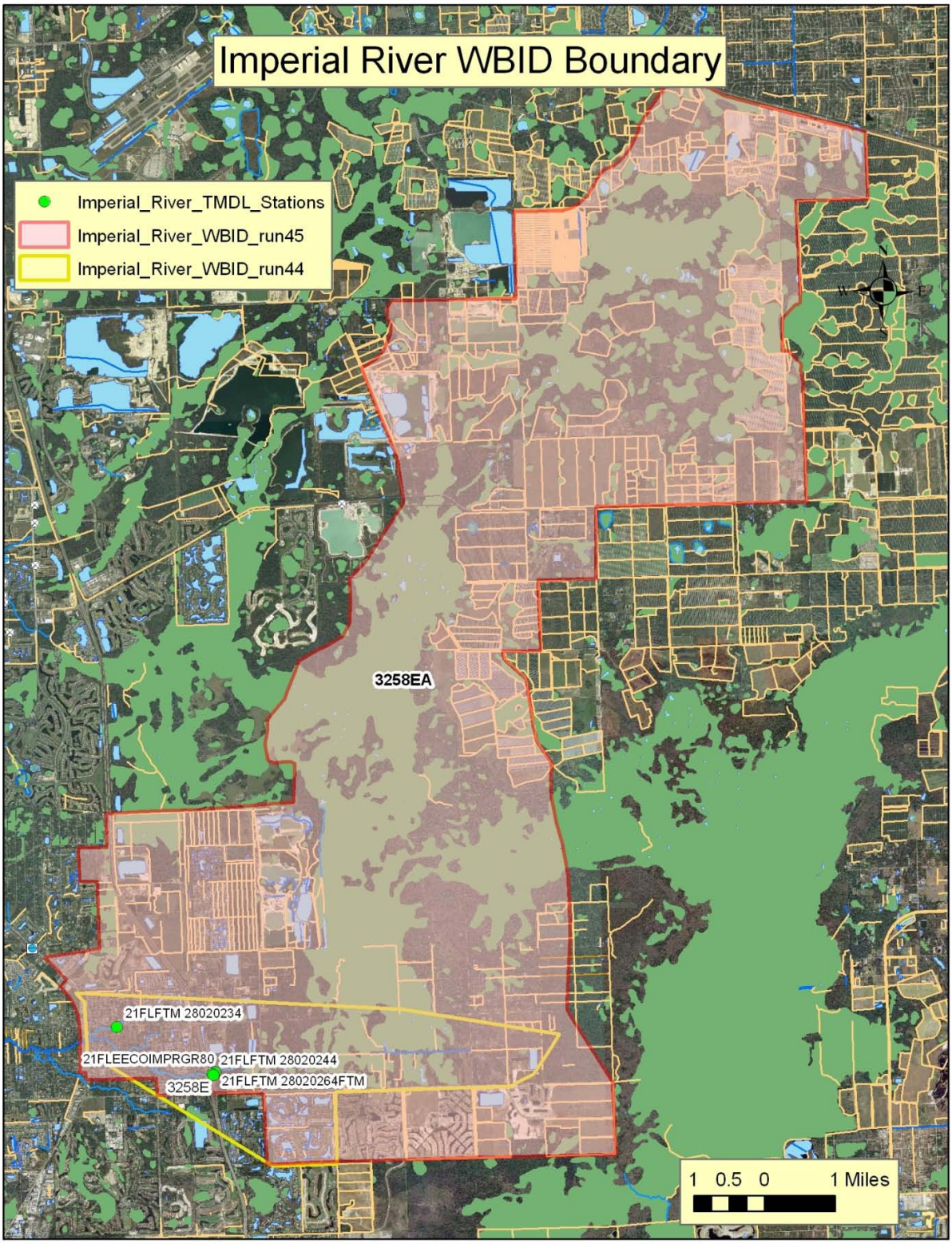
The previous Hendry Creek freshwater segment (WBID 3258B) was also not representative of Hendry Creek (i.e., no part of "Hendry Creek proper" was in that WBID) and was only a drainage of urban development into the Hendry Creek (Marine) WBID. Two stations were reassigned from freshwater to marine categories (21FLEECOHENDGR11 and 21FLEECOHENDGR20). Station 21FLEECOHENDGR11 is no longer sampled and Station 21FLEECOHENDGR20 had conductivity values that were more representative of marine characteristics, which may have erroneously caused an impairment for conductivity if left in the previous freshwater WBID category.


Henrdy Creek WBID Boundary
N
W
E
S
21FLEECOHENDGR20
21FLEECOHENDGR30
21FLEECOHENDGR11
3258B
3258B2
3258B1
21FLFTM 28020194
Hendry_Creek_TMDL_Stations
Hendry_Creek_WBID_run44
Hendry_Creek_WBID_run45
0.6 0.3 0 0.6 Miles

***Imperial River***

The previous and current WBID boundaries are illustrated in the figure below. Imperial River (WBID 3258E) was combined with a large section of Estero Bay Drainage (WBID 3258C) and areas of adjacent WBIDs to create a WBID that reflected the same watershed as that used in the freshwater Imperial River BMAP. This newly created WBID is Imperial River (WBID 3258EA).

This WBID change added a lot of new drainage area to the new Imperial River WBID; however, the change only added one new station (21FLEECOIMPRGR90) located on Corkscrew Road in the middle of the new drainage area. The addition of this new station did not change the impairment status.


Imperial River WBID Boundary
Imperial_River_TMDL_Stations
Imperial_River_WBID_run45
Imperial_River_WBID_run44
3258EA
21FLFTM 28020234
21FLEECOIMPRGR80
21FLFTM 28020244
3258E
21FLFTM 28020264FTM
1 0.5 0 1 Miles