Banana River Lagoon (BRL)
Basin Management Action Plan (BMAP)
Policy Briefing
Wednesday, February 1, 2012
2:00 PM – 4:15 PM
Cape Canaveral Public Library
201 Polk Avenue, Cape Canaveral, FL 32920

AGENDA

2:00 PM WELCOME AND OPENING REMARKS (*Vivian Garfein*)
- Welcome and meeting purpose
- Stakeholder introductions (*All*)
- Value and importance of the Indian River Lagoon

2:15 PM INDIAN RIVER LAGOON TOTAL MAXIMUM DAILY LOADS (TMDLS) (*Tom Frick and Xueqing Gao*)
- Regulatory framework for TMDLs and Florida's approach for integration of TMDLs and numeric nutrient criteria
- TMDL basics
- Indian River Lagoon TMDLs
- Questions and answers (*All*)

2:45 PM BANANA RIVER LAGOON BMAP (*Tom Frick*)
- BMAP approach
- Types of sources and responsible stakeholders
- Seagrass deep edge target
- Questions and answers (*All*)
- Comments (*All*)

3:00 PM PUBLIC COMMENTS

3:15 PM BMAP PROGRESS TO DATE (*Mary Paulic*)
- Evaluation of seagrass target compliance
- Allocation approach
- Identification of *de minimus* stakeholders
- Stakeholder allocations
- Types of projects eligible for BMAP credit
- Costs and benefits of the BMAP for the stakeholders (*Tom Frick*)
- Questions and answers (*All*)
- Comments (*All*)

3:50 PM NEXT STEPS (*Mary Paulic*)
- Credits for submitted projects and additional project collection
- Monitoring plan development
- Production of BMAP document
- BMAP adoption process and role of the stakeholders

Distribution

4:00 PM PUBLIC COMMENTS AND WRAP UP (*Vivian Garfein*)

4:15 PM ADJOURN

Please note the FTP site for documents pertaining to the technical meetings: http://publicfiles.dep.state.fl.us/DEAR/BMAP/IndianRiverLagoon/. For more information, contact Mary Paulic, 850-245-8560 or Mary.Paulic@dep.state.fl.us.

Distribution

Indian River Lagoon (IRL)
Basin Management Action Plans (BMAPs) Fact Sheet

Improving Water Quality and Seagrass Depths in the Lagoon

Overview of Total Maximum Daily Loads

Under Section 303(d) of the federal Clean Water Act, every two years each state must identify its "impaired" waters, including estuaries, lakes, rivers, and streams, that do not meet their designated uses and are not expected to meet applicable water quality standards within the subsequent two years. The Florida Department of Environmental Protection (FDEP) is responsible for developing this "303(d) list" of impaired waters. 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 pollutant that a waterbody can absorb and still meet state water quality standards. Water quality standards vary depending on the type of waterbody, which include fishable and swimmable, recreational purposes, water supply needs, agriculture, and shellfish harvesting. A TMDL consists of: (1) a restoration target based upon state water quality standards, and (2) a required reduction of the pollutants to meet the target. 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 Indian River Lagoon (IRL) Basin is impaired for the nutrients total nitrogen (TN) and total phosphorus (TP). FDEP adopted the nutrient TMDL for the main stem of the lagoon in March 2009. Once a TMDL is adopted, the stakeholders in the watershed are required to implement projects to address their portion of the responsibility for the impairment. The stakeholders must commit the necessary funding to achieve the TMDL; meeting water quality standards is not optional.

The water quality target for the IRL main stem TMDL focuses on the water quality conditions necessary for seagrass re-growth at depth limits that seagrass historically grew in the basin. The amount of seagrass coverage in the IRL Basin has greatly decreased over the years due to changes in water quality conditions. As polluted runoff reaches the lagoon, it prevents the seagrasses from growing in deeper water. To determine the amount of nutrient reductions needed to improve lagoon water quality, the TMDL used a restoration target of 10% less than the historical seagrass depth limit coverage, as allowed by Florida's Water Quality Criteria, Rule 62-302, F.A.C. This restoration target should result in nutrient reductions that allow seagrass coverage to recover almost to the depths previously seen in the area.

The required TN and TP reductions calculated for each waterbody segment in the basin resulted in a percent reduction from current loadings. To keep track of impaired waterbody segments FDEP assigns a waterbody identification number or "WBID" to each one. A WBID is a portion of a waterbody that has different water quality characteristics than the surrounding waters. FDEP uses the WBID approach to focus on each section of a waterbody to assess the health of the waters, and if they are not meeting the necessary water quality standards, the potential causes of the impairment.

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Types of Responsible Entities

There are several types of stakeholders in the basin that are responsible sources and can receive detailed allocations. These entities include:

- Wastewater treatment facilities (WWTFs);
- Municipal separate storm sewer systems (MS4s);
- Urban areas outside of an MS4;
- Water control and improvement districts;
- Agriculture;
- Transportation;
- Other nonpoint sources; and
- Federal facilities.

The BMAP actions are enforceable for point source entities (WWTFs and MS4s) through their National Pollutant Discharge Elimination System (NPDES) permits. The actions for nonpoint sources are enforceable through the Secretarial-adopted BMAP. Agricultural producers are required to implement appropriate best management practices (BMPs) for their crops or livestock activities or implement FDEP designed water quality monitoring to show they are not having an impact on the water quality of the lagoon.

Relationship Between Nutrients and Seagrass

A necessity for seagrass growth is sunlight. However, high concentrations of nutrients currently enter the lagoon causing algae growth to increase because the nutrients act as fertilizer on the algae. The algae form mats or blooms on the surface of the water, which prevent sunlight from reaching the seagrass on the lagoon bottom. In addition, algae can grow on the blades of the seagrass, smothering it and affecting its normal functions. Polluted runoff contributes to darker and less transparent water, which further prevents sunlight from reaching the deeper seagrass beds. The goal of this TMDL is to reduce the amount of nutrients entering the lagoon, which, in turn, will reduce algal growth and allow more sunlight to reach the seagrass.

BMAP Approach

To implement the IRL TMDLs for the main stem, FDEP is developing a Basin Management Action Plan (BMAP). A BMAP outlines the characteristics of the basin, impairments, sources of the pollutants, and a list of projects that will reduce the pollutants to meet the TMDL. Major components of a BMAP include:

- TMDLs being implemented;
- Reductions assigned to responsible sources;
- Projects to meet the TMDL and the funding sources;
- Monitoring plan to determine water quality improvements and progress towards the TMDL;
- Responsible parties commitment to the implementation timeline for their efforts the BMAP; and
- Adoption by the FDEP Secretary.

FDEP is working with the stakeholders in the basin to develop the BMAP. The IRL BMAP will be

phased, meaning only a portion of the total reductions will need to be met in the first 5 years of implementation; however, the BMAP will include a discussion of the remaining reductions and a timeline to achieve the TMDL. This phasing allows new information to be considered in future requirements, including adjustments to allocations.

Because the IRL Basin is large with many stakeholders, the basin is divided into 3 subbasins:

- North IRL;
- Central IRL; and
- Banana River Lagoon (BRL).

A separate BMAP is planned for each of these subbasins. As a first step in the development of these BMAPs, FDEP has been holding technical meetings in the subbasins. The purpose of the technical meetings is fact-finding and compilation and review of data to provide supporting information for the BMAP. Additionally, policy briefings will be held for each subbasin, as needed. The agendas at the policy briefings are designed for management-level representatives to provide feedback to FDEP on the BMAP contents as the BMAP is developed. Both the technical meetings and policy briefings are open to the public. All meetings are publicly noticed and meeting summaries are prepared and distributed.

Project Zones

Although the overall IRL Basin was divided into 3 subbasins to capture the lagoon's variability, there are still major hydrological differences within those subbasins due to differing water residence times, which is the amount of time it takes for water to flush out of the system. The longer the residence time, the longer the pollutants stay in the lagoon system and impact seagrasses. To provide a good representation of loads throughout the watershed and to address the varied hydrological responses to management actions, the Central IRL and North IRL are further subdivided into "project zones." The project zones will assist in achieving restoration targets because they will ensure that the distribution of restoration activities match the hydrology of the basin. Additionally, the project zones will provide flexibility for stakeholders to partner on projects within project zones to achieve the most cost effective load reductions.

In the Central IRL, there are 3 project zones:

- Central IRL A - from the Melbourne Causeway to Grant Farm Island (Figure 1);
- Central IRL SEB - from Grant Farm Island to Wabasso Causeway, CR 510 (Figure 2); and
- Central IRL B - from the Wabasso Causeway to the C-25 canal in St. Lucie County (Figure 3).

In the North IRL, there are 2 project zones:

- North IRL A – from Turnbull Creek to the NASA Causeway, SR 405 (Figure 4); and
- North IRL B - from the NASA Causeway to the Melbourne Causeway, US 192 (Figure 5).

The Banana River Lagoon (Figure 6) does not exhibit the variability in residence time as do the Central and North IRL. Therefore, the entire Banana River Lagoon is one project zone.

Evaluation of Seagrass Depth Limits

The intent of the TMDLs is to recover the deeper water seagrass habitats with the biological response of the seagrass being the most important factor in evaluating the success of achieving the TMDL targets. To assess progress towards the seagrass depth limit targets for the IRL Basin, FDEP used a 2-step process to compare the TMDL seagrass data to more recent data on seagrass depths. This evaluation was conducted for each project zone to determine the extent of compliance with the seagrass depth limit targets. A seagrass depth limit target evaluation for the BMAP was conducted in March 2011 and compared the data used to establish the TMDLs with the latest available seagrass mapping from 2003, 2005, 2006, and 2007.

From this evaluation, FDEP found that BRL and both North IRL project zones were not yet compliant with the seagrass depth limit targets, whereas all 3 Central IRL project zones were found to be compliant. Based on these findings, the stakeholders in the BRL and North IRL subbasins were assigned detailed allocations to continue reducing TN and TP loads to lagoon in an effort to further improve water quality and seagrass depth limits. The stakeholders in the Central IRL subbasin were not assigned specific allocations for the first iteration of the BMAP because these project zones are currently achieving the seagrass depth limit targets. However, the Central IRL stakeholders were asked to submit projects to demonstrate the water quality improvements necessary to maintain or improve the seagrass depth limits.

Allocation Approach to Responsible Entities

Detailed allocations for the nutrient reductions were assigned to the stakeholders in the BRL, North A, and North B project zones. The steps to calculate each entity's allocation for the BMAP are a Geographic Information System (GIS) based process, which uses the input data to the TMDL model to account for the loads from each jurisdiction. The Pollutant Load Screening Model (PLSM) GIS data for each subbasin was used as the base map. GIS data include the 2000 land uses, soil, data, runoff coefficients, event mean concentration (EMCs), and the 30-year average rainfall for each identified area.

The base map was clipped into the project zones to create separate maps. From the project zone maps, the following areas were removed sequentially and then saved as its own dataset to determine loading from those areas:

- Florida Department of Transportation (FDOT) roads, right-of-ways, and stormwater ponds;
- Areas occupied by water control and special districts (where applicable);
- Areas with agricultural land uses outside water control district boundaries;
- All areas occupied by cities, towns, and federal facilities; and
- Remaining areas clipped to each county's boundary.

The project zone maps and associated model data were used to calculate each project zone's starting point load and each entity's starting point load. A target load per acre was calculated using the target load for the project zone from the TMDL. The allowable load for each entity was calculated by multiplying its total load-generating acres by the target load per acre. The required reduction for each entity is the entity's starting point load minus its allowable load.

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As part of the allocation calculation process, *de minimus* loading values for TN and TP were determined. The entities with TN and TP starting point loads below the *de minimus* values were not assigned an allocation in this iteration of the BMAP; however, these entities do submit pertinent project information.

Project Credit

To achieve the required reductions for the first phase of each of the BRL and North IRL BMAPs, each responsible entity is providing a list of projects and programs that reduce nutrient loading to the IRL. The Central IRL stakeholders were also asked to submit projects for the first BMAP iteration to continue seagrass success. Credit will be assigned for projects completed after 2000, since 2000 is the base year used in the TMDL model. These projects will only receive credit for the portion of treatment above and beyond and permit requirements. Entities can also provide information on projects planned for five years from BMAP adoption to meet their load reduction. In addition, provisional credit will be assigned for education and outreach efforts. These credits are considered provisional because studies are underway to gather Florida-specific data that can be used to refine the reduction estimates. Any changes to the assigned credits for these activities will be made in future iterations of the BMAP.

Project credit can also be assigned for larger scale regional projects. Stakeholders within a project zone may wish to partner on a regional project if they do not have enough project opportunities within their jurisdiction or if the regional project provides more cost effective nutrient reductions. Credits for participation will be based on the relative contribution of funding from each participating entity.

Basin Website

FDEP will post agendas, summaries, handouts, and presentations to their website at: http://publicfiles.dep.state.fl.us/DEAR/BMAP/IndianRiverLagoon/.

Contact

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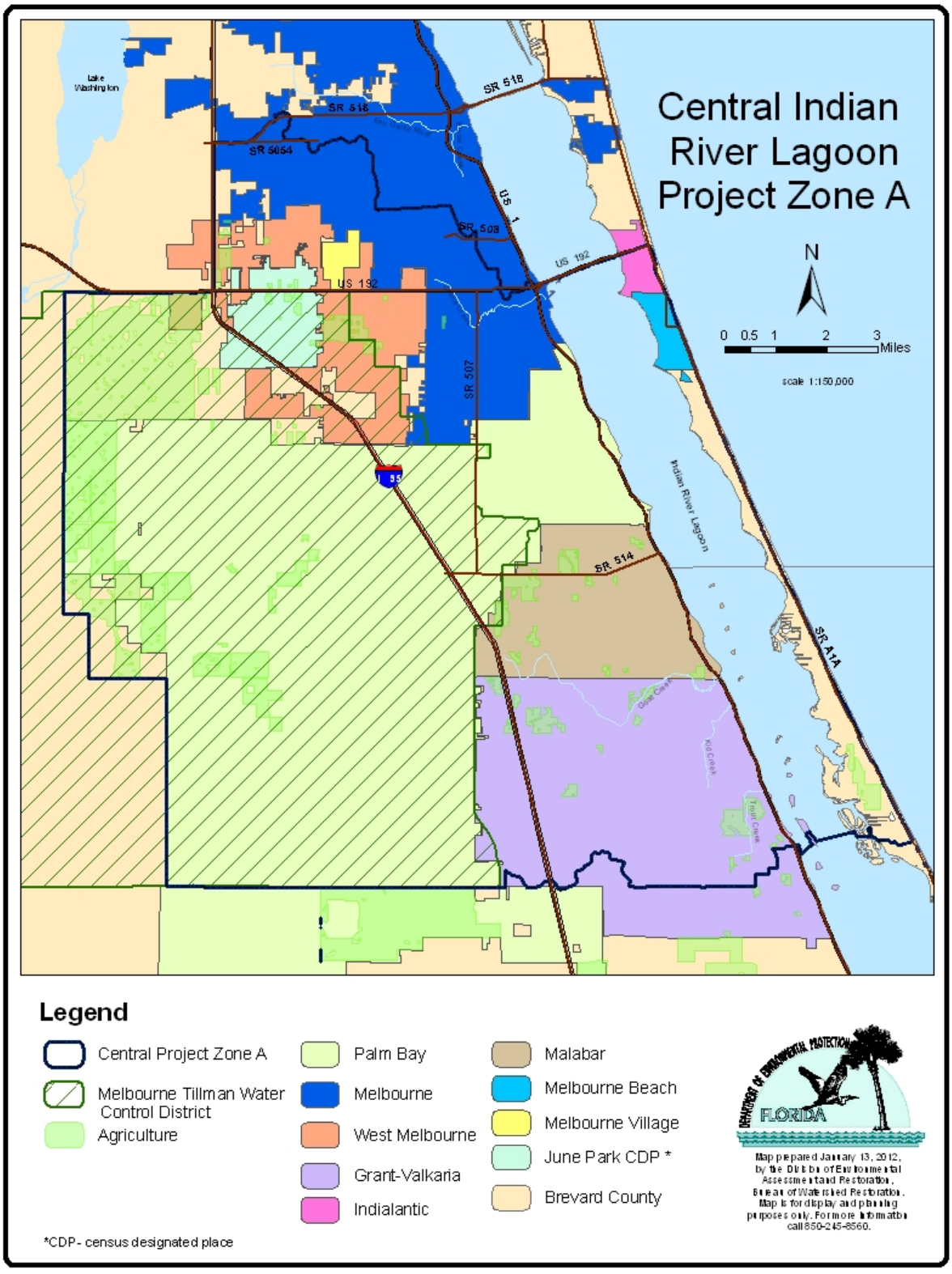


FIGURE 1: IRL CENTRAL A PROJECT ZONE AREA

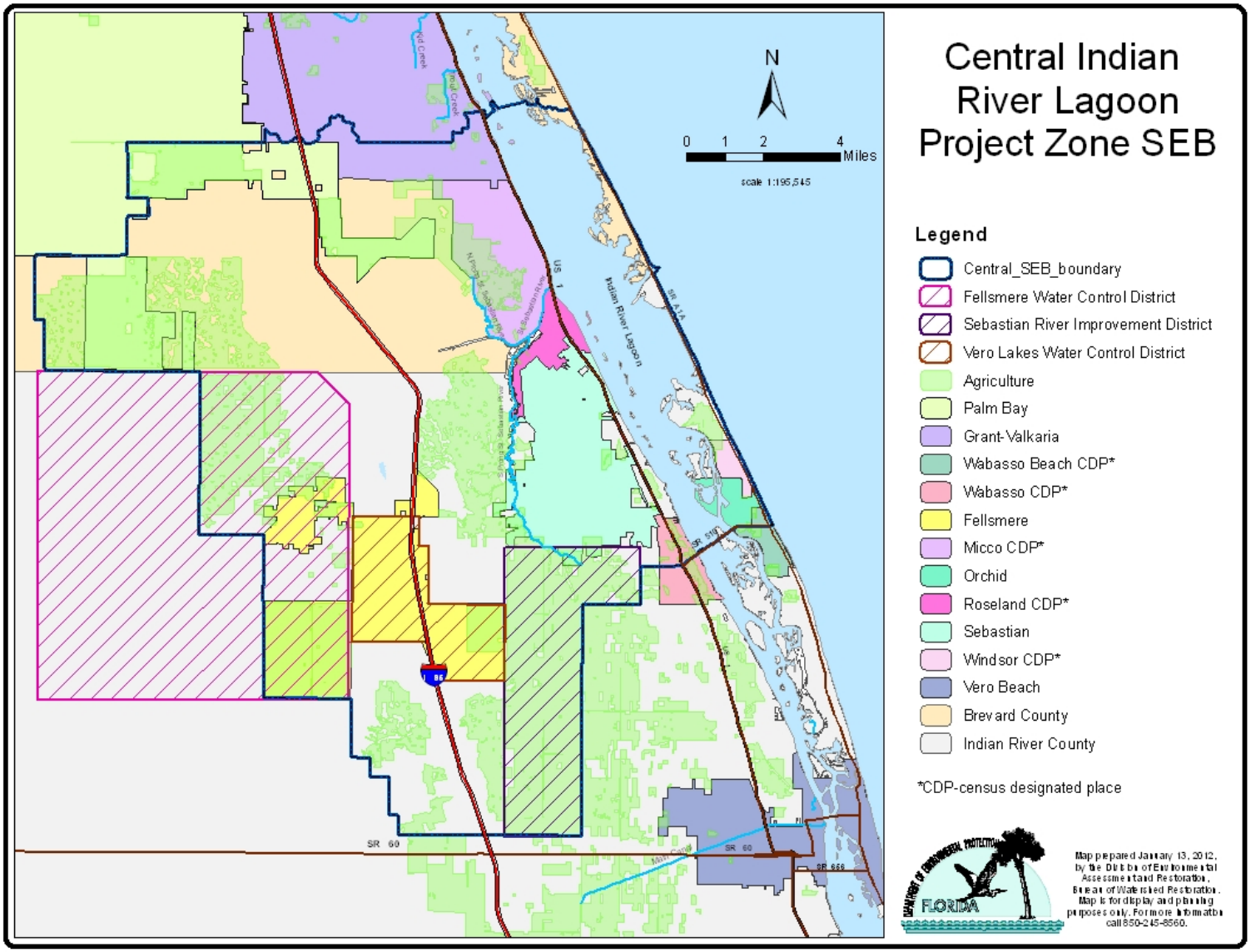


FIGURE 2: IRL CENTRAL SEB PROJECT ZONE AREA

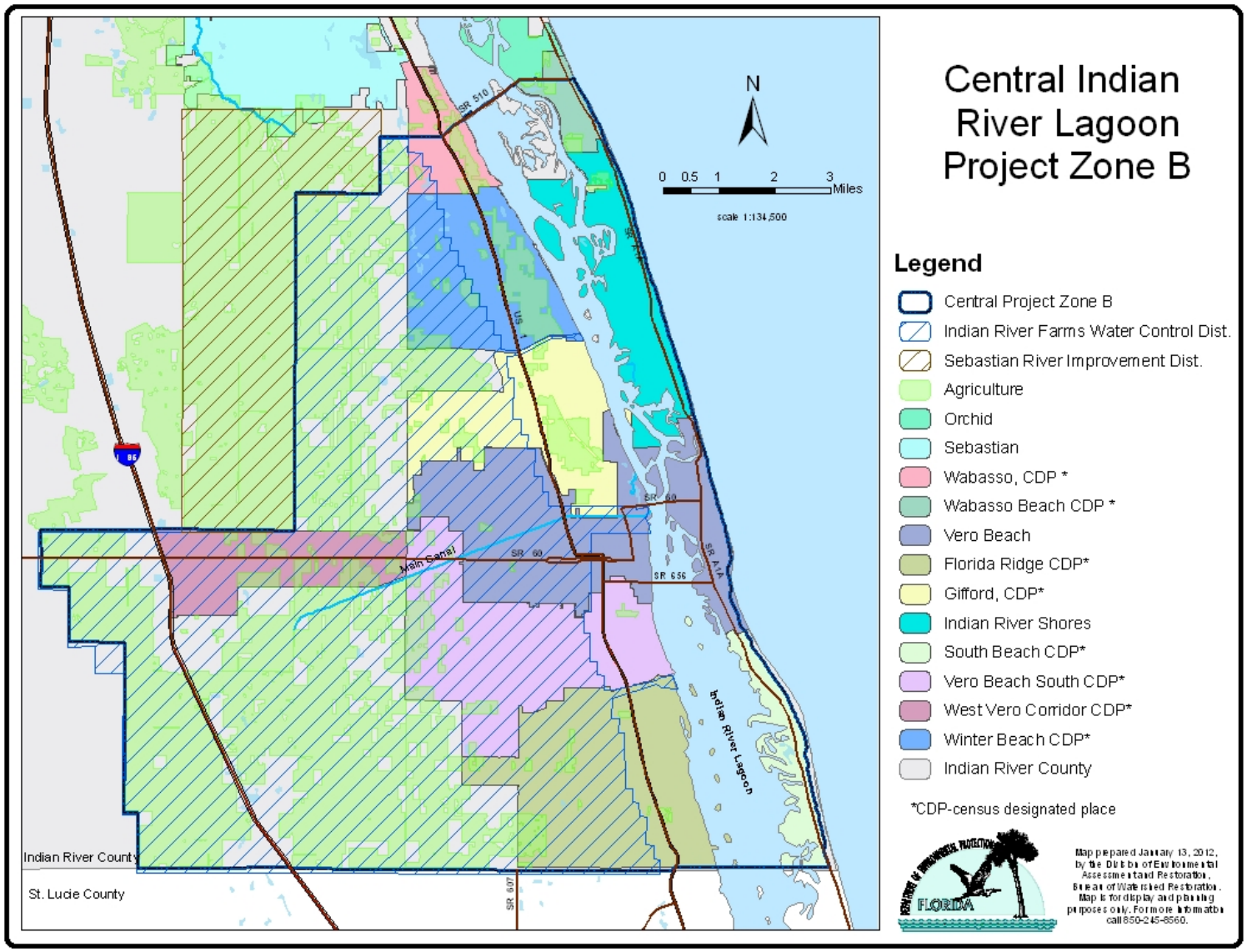


FIGURE 3: IRL CENTRAL B PROJECT ZONE AREA

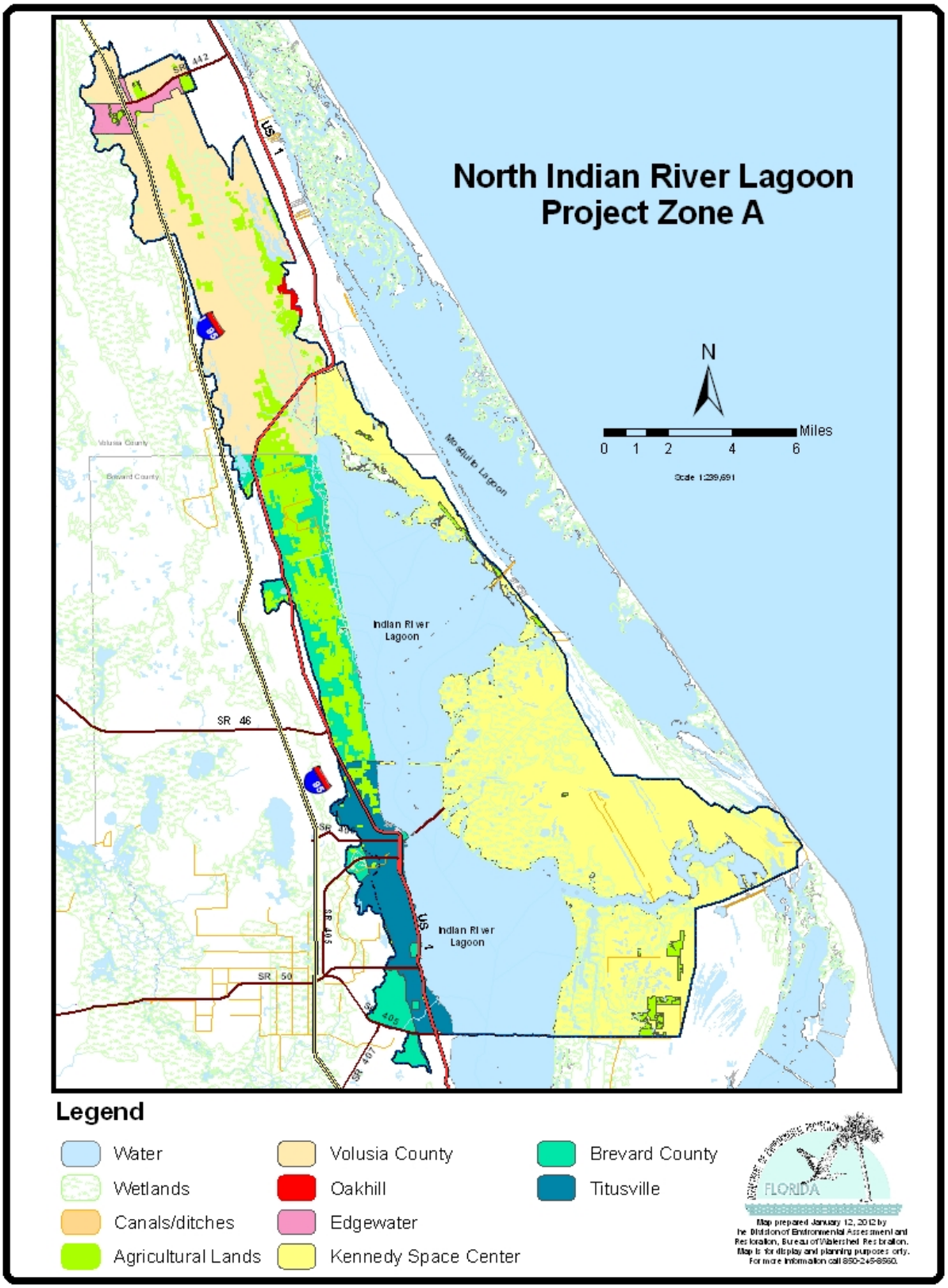


FIGURE 4: IRL NORTH A PROJECT ZONE AREA

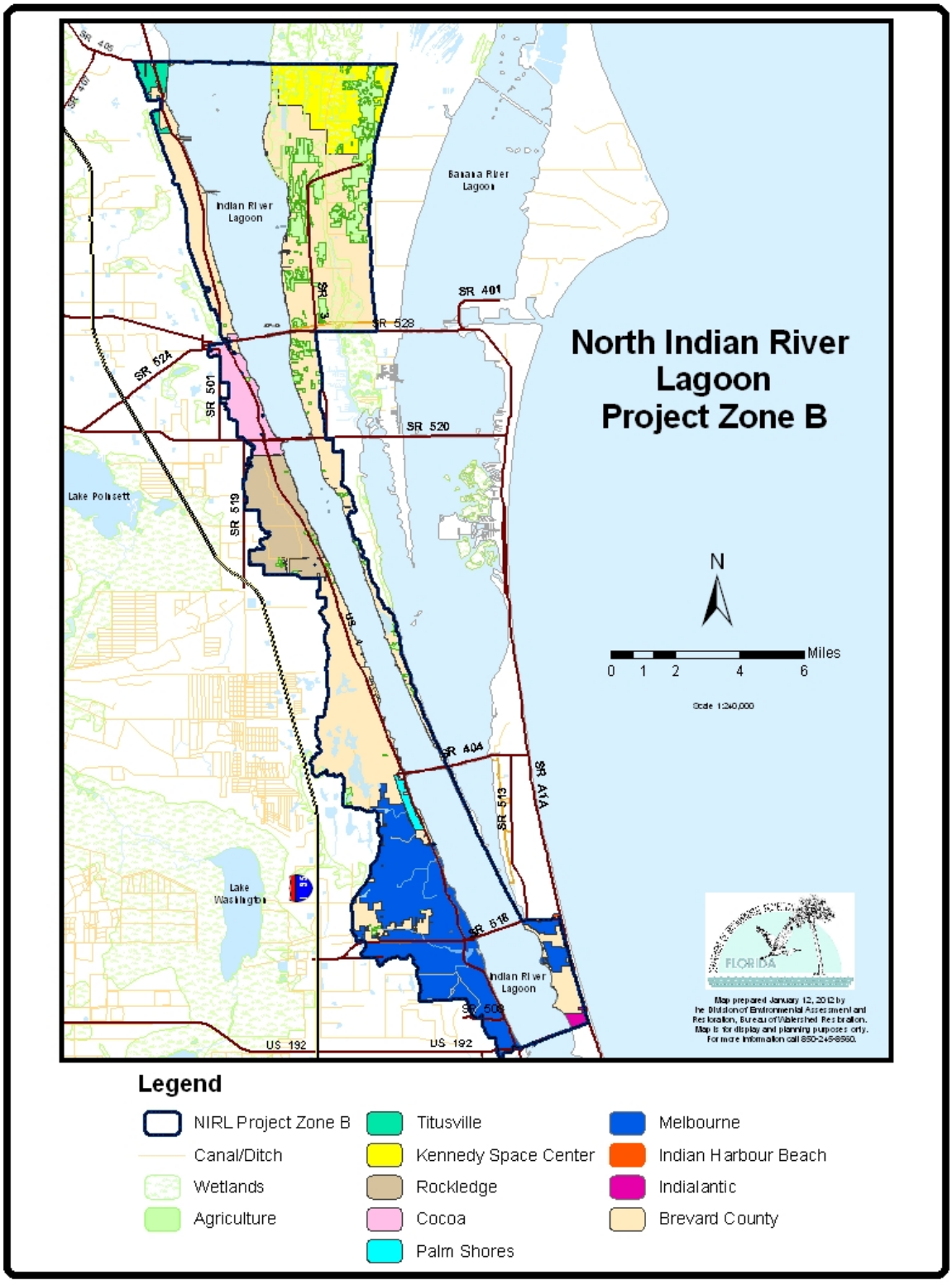


FIGURE 5: IRL NORTH B PROJECT ZONE AREA

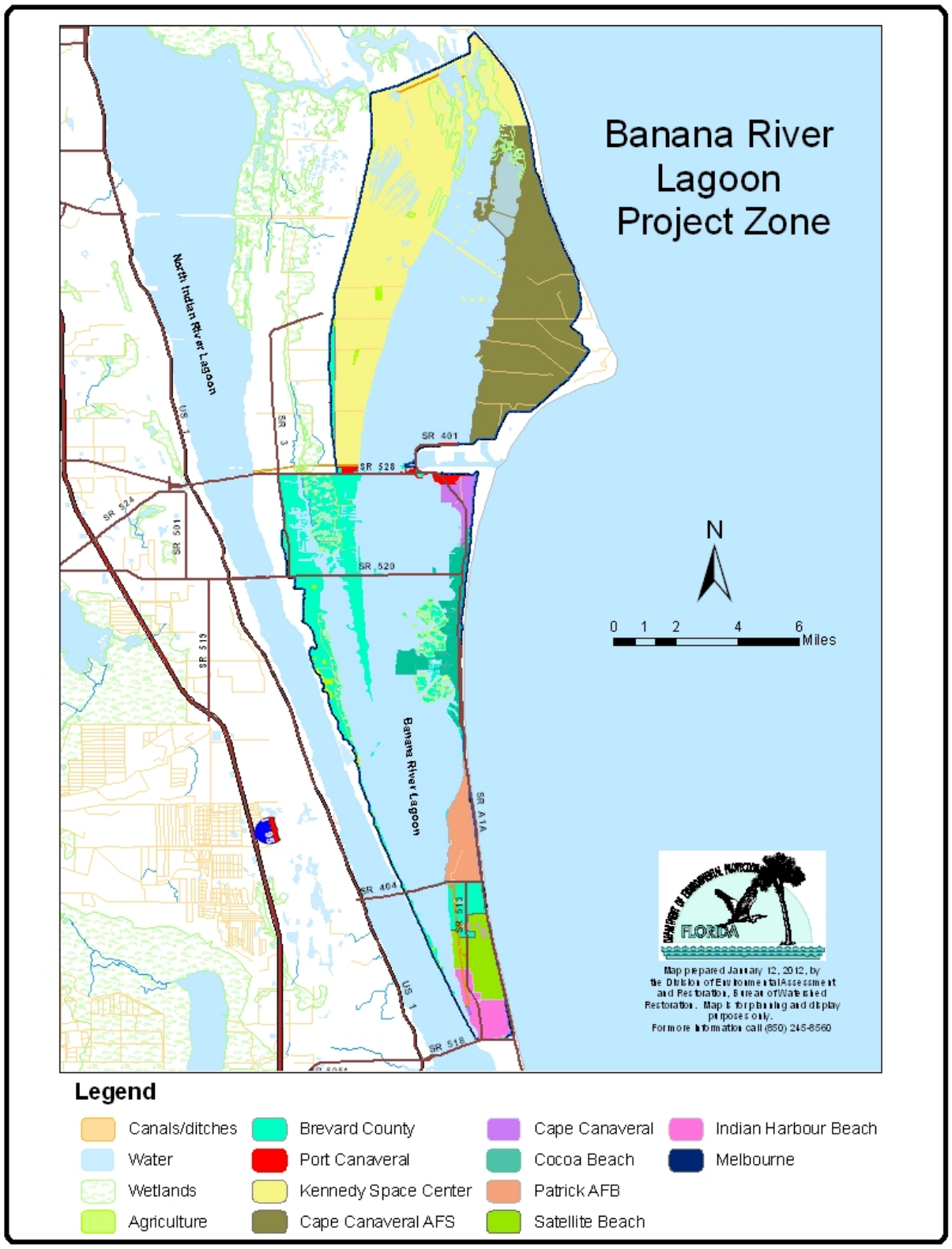


FIGURE 6: BANANA RIVER LAGOON BMAP AREA

Process for Measuring Seagrass Deep Edge Compliance
Banana River Lagoon Basin Management Action Plan
February 1, 2012

BIOLOGICAL RESPONSE GOAL: SEAGRASS DEPTH RECOVERY

The basic premise of the Indian River Lagoon (IRL) total maximum daily loads (TMDLs) is that reduced loadings of total nitrogen (TN) and total phosphorus (TP) will result in the recovery of deeper-water seagrass habitat. The TMDLs set specific targets for allowable loadings of TN and TP and do require reductions in loadings to meet those targets, but the full measure of their successful implementation is the biological response of seagrasses to those reductions. A statistical relationship was established for TN and TP loadings and seagrass depth targets that was used to determine loading limits.

The biological response of the seagrasses is the most important factor for the evaluation of success of the TMDLs. Seagrass deeper-water habitat recovery success is measured on whether the seagrasses can grow at sufficient water depths that meet TMDL depth limit targets. The full reductions in TN and TP specified by the TMDL may not be needed to achieve success of seagrass recovery if seagrass response is sufficient to meet depth limit targets.

SCALE FOR MEASURING SUCCESS: PROJECT ZONES

Success in achieving the TMDL depth limit targets will be assessed on a project zone scale. The IRL Basin, as defined for the basin management action plans (BMAPs), is divided into three sub-lagoons: Banana River Lagoon (BRL), North IRL, and Central IRL. These sub-lagoons are important units but they are large areas that do not account for hydrological distinctions within these sub-lagoons. While the Florida Department of Environmental Protection (FDEP) desires to have all three sub-lagoons achieve seagrass recovery, it is possible to have success in smaller assessment areas, and for those areas within the sub-lagoons that have not fully recovered to continue to make nutrient reductions. For the purposes of the BMAPs, the sub-lagoons were divided into project zones: one zone in BRL, two zones in North IRL, and three zones in Central IRL. Project zones are hydrologically connected areas and incoming loads are expected to affect the entire area. The project zone, therefore, is a reasonable scale by which to judge target success.

TWO-STEP MEASUREMENT OF SUCCESS

FDEP defines success in meeting the TMDL seagrass depth limit targets using a two-step assessment approach. The two steps are used to address the following concerns:

1. Determination of seagrass recovery should take into account inter-annual variability and allow for some years to have less seagrass depth than others.
2. An evaluation of seagrass recovery should not allow one very good year to over-influence the evaluation of otherwise limited seagrass depths.

Step 1: Cumulative Frequency Distribution Analysis

To address the first concern, the Step 1 analysis is applied using a Geographic Information Systems (GIS) based process. This involves taking the four most recent mapped seagrass datasets and creating a combined map or coverage of the seagrass distribution. Using this combined coverage, a 15-meter wide buffer zone, that includes water depth data, is applied to the perimeter of the coverage to create the deep edge of the seagrass beds. This buffered coverage shows the deepest edge that seagrass grew at any time during the data period, and is used to create a cumulative frequency distribution curve of the

depths at which seagrasses exist within the project zone. This curve is then compared to the TMDL depth limit target curve, which is a combined coverage of seagrass data from 1943, 1986, 1989, 1992, 1994, 1996 and 1999. Using all these years' data provides a coverage of all possible locations and water depths where seagrasses grew historically. The TMDLs use a restoration target that is 10% less than the historical seagrass depth limit coverage, as allowed by Florida's Water Quality Criteria, Rule 62-302, Florida Administrative Code. Successful seagrass compliance in Step 1 is reached when 50% or more of the assessment years' frequency distribution curve (including its 50th percentile value) for the project zone lies on or to the right of the TMDL depth limit target curve. If a project zone is compliant with Step 1, then the compliance evaluation continues.

Step 2: Median Depth Limit Comparison for Each Data Year

Step 2 calculates the median depth of seagrass growth for each year of the four most recent datasets, and then each year's median is compared to the TMDL median depth limit target. Three of the four medians of the assessment years' seagrass coverages must meet or exceed the median TMDL depth limit target in order for a project zone to be Step 2 compliant.

If a project zone is compliant based on the Step 1 and Step 2 analyses, then the project zone is considered to be meeting the TMDL seagrass depth limit target. If a project zone fails to meet either Step 1 or Step 2, then it is not considered to be meeting the TMDL seagrass depth limit target for that set of assessment years.

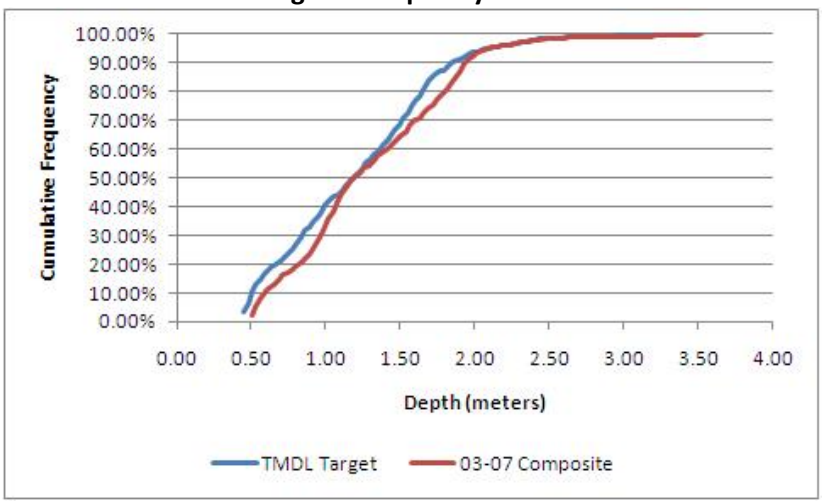
2011 Seagrass Compliance Evaluation

Following the steps described above, FDEP evaluated the most recent available data (mapping years 2003, 2005, 2006, and 2007) to determine if any of the project zones are achieving the seagrass depth limit targets.

BRL Evaluation

Based on the Step 1 analysis, the BRL project zone is compliant as shown in the frequency distribution curves below. The blue line shows the TMDL target depth limit cumulative frequency distribution curve. The red line shows the combined assessment years curve for the most recent data years.

Banana River Lagoon Frequency Distribution Curves



For the Step 2 analysis, the BRL project zone was found to be non-compliant. The TMDL median deep edge seagrass depth and the medians for each year, by project zone, are presented below.

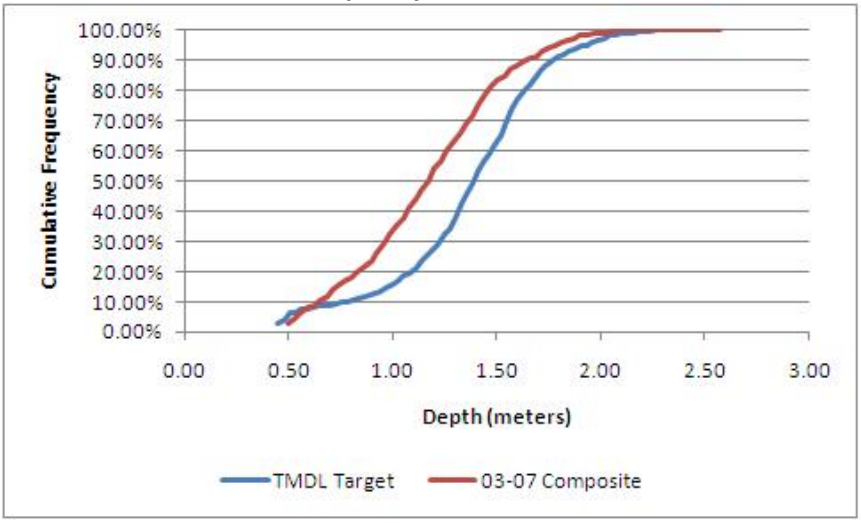
Year	BRL
TMDL Median	1.19
2003	1.11
2005	1.11
2006	1.14
2007	1.17
Step 2 Compliant?	No

Therefore, stakeholders in the BRL project zone will be required to achieve TN and TP reductions in this first five-year BMAP period because these areas are not meeting the TMDL depth limit targets. In year four of the BMAP, TMDL depth limit targets will be reassessed using 2009, 2011, and 2013 mapping data for these project zones. If these project zones are compliant using the 2007-2013 mapping years, FDEP will not ask stakeholders to make additional TN and TP reductions in the next iteration of the BMAP. Then, data from the 2015 and 2017 seagrass mapping years will be evaluated to determine if the project zones continue to meet the TMDL target. If the project zones do not pass the Step 1 and Step 2 assessments for compliance, then FDEP will ask stakeholders to make further nutrient reductions.

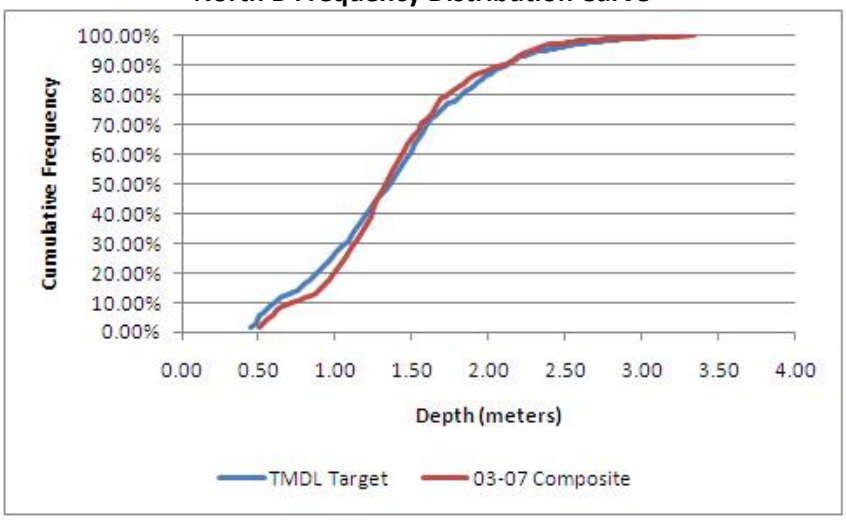
North IRL and Central IRL Evaluations

The results of the Step 1 analysis, shown in the figures below, indicate that the North IRL project zones are not compliant and that all three project zones in Central IRL are Step 1 compliant.

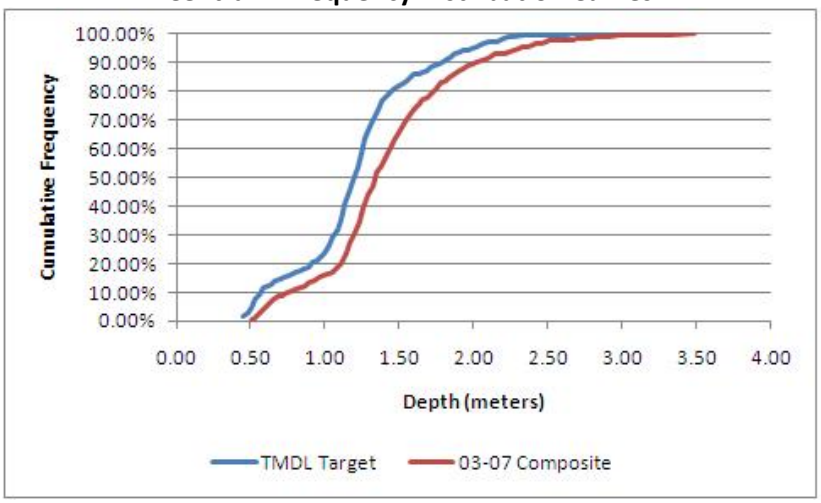
North A Frequency Distribution Curves



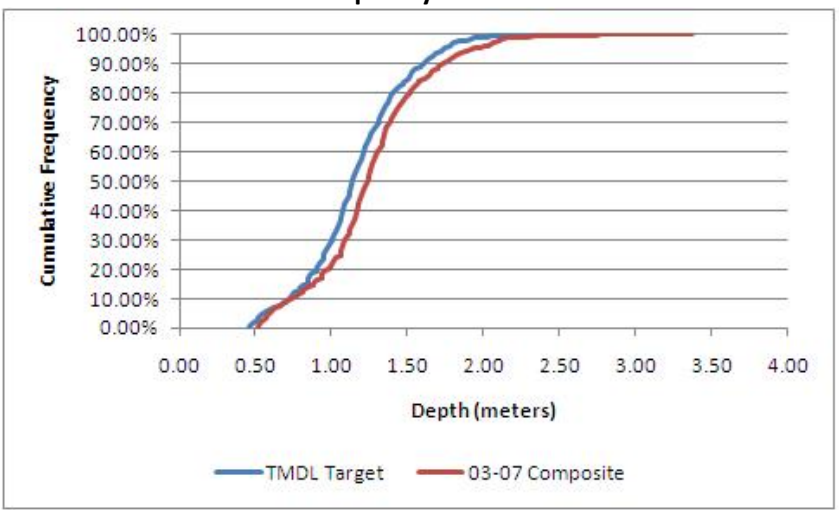
North B Frequency Distribution Curve



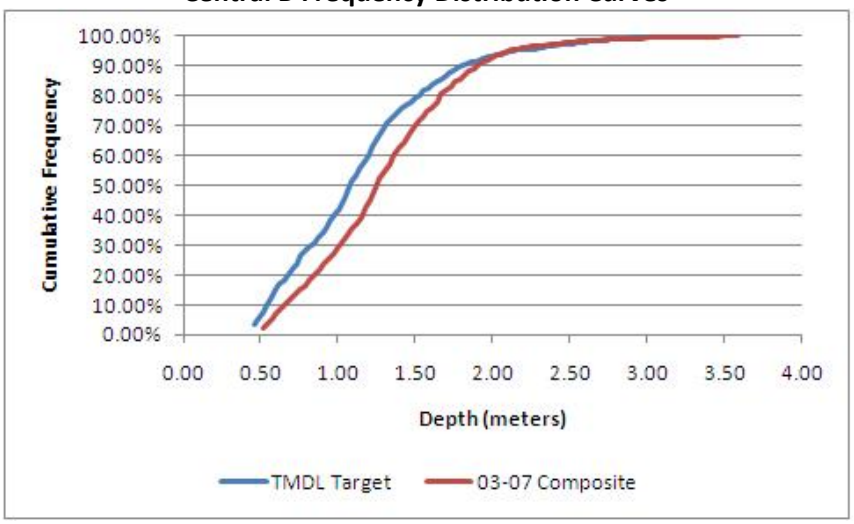
Central A Frequency Distribution Curves



Central SEB Frequency Distribution Curves



Central B Frequency Distribution Curves



For the Step 2 analysis, both the North IRL project zones are not compliant but all three Central IRL project zones are compliant as shown in the table below.

Year	North A	North B	Central A	Central SEB	Central B
TMDL Median	1.41	1.37	1.22	1.15	1.09
2003	0.96	1.26	1.23	1.12	1.12
2005	1.08	1.26	1.20	1.15	1.12
2006	1.08	1.32	1.23	1.18	1.12
2007	1.08	1.29	1.32	1.21	1.24
Step 2 Compliant?	No	No	Yes	Yes	Yes

Therefore, stakeholders in the North IRL project zones will have to make reductions in a BMAP, and the same evaluation process as outlined above for the BRL will be applied to the North IRL.

Central A, Central SEB, and Central B are determined to be fully compliant because these project zones met both Step 1 and Step 2 for the most recent years of data. The stakeholders in the Central IRL project zones are meeting TMDL depth limit targets and will not be assigned additional reductions in the first iteration of the BMAP. However, FDEP asked the stakeholders to provide completed and planned projects to characterize TN and TP reductions that have occurred and will be achieved during the first BMAP cycle. Documenting known load reductions will further the understanding of how compliance was achieved and will be maintained.

FDEP will use the 2009 and 2011 seagrass mapping data, when available, to reassess whether these project zones continue to be compliant. If these project zones continue to meet the TMDL depth limit targets, there will be six mapping years or nine calendar years (2003 – 2011) indicating a trend of success. If during this assessment the project zones are no longer meeting targets, FDEP would then ask for stakeholders to make nutrient reductions.

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Banana River Lagoon Basin Management Action Plan
February 2012

Allocation Calculations for Total Nitrogen and Total Phosphorus

BACKGROUND

In establishing the detailed allocations for the Indian River Lagoon (IRL) Basin Management Action Plans (BMAPs) and the reductions required by the total maximum daily loads (TMDLs) for total nitrogen (TN) and total phosphorus (TP), the Florida Department of Environmental Protection (FDEP) considered the best approach to allocate to the appropriate stakeholders in a manner that is reasonable and equitable. This paper outlines the approach that FDEP applied to calculate allocations and presents the allocations for the Banana River Lagoon (BRL) BMAP.

CALCULATING BASELINE LOADS

Baseline loadings were generated from a land use based Pollutant Load Screening Model (PLSM), which is a Geographic Information System (GIS) based model. This model uses soil, rainfall, runoff data, and TN/TP land use relationships to generate TN and TP loadings for each basin land use. The baseline loadings were generated using year 2000 land use data.

To determine the BMAP allocations, the first step was to remove the areas associated with the land use code 5400, which is used to identify the lagoon surface area, from the PSLM data file for the Banana River Lagoon. Then the individual entity data files were created by clipping out each entity's jurisdiction, as follows:

- Florida Department of Transportation (FDOT) roads and right-of-ways.
- Areas with agricultural land uses.
- Municipalities and federal facilities, each to its own jurisdictional boundary.
- The remaining area was assigned to Brevard County.

Loads Associated with Water

The purpose of the IRL TMDLs is to reduce anthropogenic loads from the surrounding watershed in urban and agricultural areas; it is not the intent of the TMDLs to require load reductions from within surface waters. Therefore, the loading from land use code 5000 were removed from each entity's baseline load and set aside because this land use category is surface waters and is not considered an anthropogenic land use in the TMDL process. FDEP predicts that internal loading in the surface waters will decrease with the flushing of cleaner watershed runoff once the pollutant loading from the watershed is controlled. Since the focus of these reductions is on the external, watershed loading, the loading from the 5000 land uses was set aside and reductions from the stakeholders will not be required for these loads.

Net Loads

Tables 1 and 2 show the TN and TP loads, respectively, for the initial baseline loads, 5000 land use loads, and the net load (baseline loads minus 5000 land use loads) for each entity.

Table 1. Net TN Loads for Each Entity in BRL

Entity	Area (acres)	TN Baseline (lbs/yr)	TN 5000 Land Use Load (lbs/yr)	TN Net Load (lbs/yr)	TN Net Load (lbs/acre/yr)
Agriculture	231	1,361	-	1,361	5.89
Brevard County	10,365	74,447	6,097	68,350	6.59
Cape Canaveral	857	8,976	1	8,975	10.47
Cape Canaveral Air Force Station (AFS)	13,801	53,029	85	52,944	3.84
Cocoa Beach	1,842	18,616	97	18,519	10.05
FDOT 5	559	5,477	20	5,457	9.76
Indian Harbour Beach	1,244	11,800	225	11,575	9.31
Kennedy Space Center	18,545	70,837	727	70,110	3.78
Melbourne	4	30	-	30	7.98
Patrick Air Force Base (AFB)	1,835	24,897	334	24,563	13.38
Port Canaveral	333	1,430	158	1,272	3.82
Satellite Beach	1,737	17,572	327	17,245	9.93
U.S. Army Corps of Engineers (USACE)	30	165	-	165	5.49
Total	**51,383**	**288,637**	**8,071**	**280,566**	**5.46**

Table 2. Net TP Loads for Each Entity in BRL

Entity	Area (acres)	TP Baseline (lbs/yr)	TP 5000 Land Use Load (lbs/yr)	TP Net Load (lbs/yr)	TP Net Load (lbs/acre/yr)
Agriculture	231	340.0	-	340.0	1.472
Brevard County	10,365	14,776.8	574.0	14,202.8	1.370
Cape Canaveral	857	2,031.4	0.2	2,031.2	2.369
Cape Canaveral AFS	13,801	11,089.9	16.5	11,073.4	0.802
Cocoa Beach	1,842	3,845.7	22.2	3,823.5	2.075
FDOT 5	559	1,707.7	3.3	1,704.4	3.050
Indian Harbour Beach	1,244	2,143.3	22.1	2,121.2	1.706
Kennedy Space Center	18,545	8,969.2	104.1	8,865.1	0.478
Melbourne	4	5.5	-	5.5	1.463
Patrick AFB	1,835	6,508.6	41.4	6,467.2	3.524
Port Canaveral	333	209.1	13.3	195.8	0.588
Satellite Beach	1,737	3,342.6	29.1	3,313.5	1.908
USACE	30	33.5	-	33.5	1.115
Total	**51,383**	**55,003.3**	**826.2**	**54,177.1**	**1.054**

DE MINIMUS CALCULATIONS

The net loads from Tables 1 and 2 were then sorted for TN and TP loads, from highest to lowest, to determine whether any entity had loads low enough that reductions from these areas would have essentially no significant impact on the required reductions in the first phase of the BMAP. Tables 3 and 4 present the sorted data and the shaded cells signify the *de minimus* load contributions.

Table 3. Entity Baseline TN Loads Sorted from Highest to Lowest

Entity	TN Net Load (lbs/yr)	% of Total Net Load
Kennedy Space Center	70,110	25.0%
Brevard County	68,350	24.4%
Cape Canaveral AFS	52,944	18.9%
Patrick AFB	24,563	8.8%
Cocoa Beach	18,519	6.6%
Satellite Beach	17,245	6.1%
Indian Harbour Beach	11,575	4.1%
Cape Canaveral	8,975	3.2%
FDOT 5	5,457	1.9%
Agriculture	1,361	0.5%
Port Canaveral	1,272	0.5%
USACE	165	0.1%
Melbourne	30	0.0%

Table 4. Entity Baseline TP Loads Sorted from Highest to Lowest

Entity	TP Net Load (lbs/yr)	% of Total Net Load
Brevard County	14,202.8	26.2%
Cape Canaveral AFS	11,073.4	20.4%
Kennedy Space Center	8,865.1	16.4%
Patrick AFB	6,467.2	11.9%
Cocoa Beach	3,823.5	7.1%
Satellite Beach	3,313.5	6.1%
Indian Harbour Beach	2,121.2	3.9%
Cape Canaveral	2,031.2	3.7%
FDOT 5	1,704.4	3.1%
Agriculture	340.0	0.6%
Port Canaveral	195.8	0.4%
USACE	33.5	0.1%
Melbourne	5.5	0.0%

Four entities each contributed less than 1% of the total load: agriculture, Port Canaveral, USACE, and City of Melbourne. Combined they contribute approximately 1% of the total load and they are considered to be *de minimus*. For agriculture, much of the land use identified as agricultural use is not active or has been converted to other land uses. Melbourne is assigned an allocation for the North IRL BMAP. These entities will not be assigned an allocation for either TN or TP for the first phase of the BMAP. This *de minimus* designation does not preclude these entities from submitting projects for credit or implementing reductions in the near term future.

CALCULATING THE TARGET LOADS PER ACRE AND ALLOCATIONS

The target loads per acre were calculated by dividing the TMDL target load by the total non-lagoon area in the BRL system, as shown in Table 5.

Table 5. Calculated Target Loads per Acre for TN and TP

Category	TN	TP
Non-lagoon acres (from Table 1)	51,383	51,383
TMDL Target Load (lbs)	104,642	17,697
Target Load (lbs/acre)	**2.04**	**0.344**

The target load per acre is used to calculate the allowable or acceptable loadings of TN and TP for each entity, which is the loading allocation assigned to each entity. The amount of loading that each entity must reduce is the difference between the allocated loading and the baseline loading.

When using these target loads to determine loading for each entity, it appeared that the TN reduction for Kennedy Space Center was large given the high proportion of undeveloped lands within this facility. To determine why this might be occurring, FDEP calculated the required reductions for TN per built-up acre for each entity, and found that the required reduction was significantly higher for Kennedy Space Center than the other entities. As a comparison, FDEP also calculated the average TN loads for the undeveloped areas for the overall BRL Basin, as well as for Kennedy Space Center. The average loading from the undeveloped land for Kennedy Space Center of 2.83 lbs/acre of TN is higher than the basin average of 2.08 lbs/acre of TN.

Due to the large percentage of undeveloped area in this basin (approximately 66%), FDEP decided to use the average loading from the undeveloped acres as the interim target for TN in the first phase of the BMAP. Therefore, a target load of 2.08 lbs/acre of TN was used. However, the average loading from undeveloped acres on Kennedy Space Center is greater than the basin-wide average. Since Kennedy Space Center has such a large portion of their area as undeveloped land (approximately 91%), FDEP determined that the average undeveloped area load per acre of 2.83 lbs/acre will be used as the target for Kennedy Space Center. The TMDL nonpoint target for TP of 0.344 lbs/acre was applied for all stakeholders.

BMAP CONSIDERATIONS

The required load reductions will be phased over a 15-year period. In recognition of observed improvements in seagrass growth, the allocation approach will require that 15% of the reductions be achieved in the first 5-year BMAP period. In the second phase of the BMAP, the TMDL will be updated with more current land use, seagrass depth limit target evaluations, and water quality data. These revisions may result in a change to required reductions in future BMAP iterations. Stakeholders have also expressed concern over uncertainties in the TMDL, such as the relationship between TN and TP reductions and the seagrass target, salinity and algae influences on the system, and basin-specific data for model calibration. This phased approach helps to ensure that FDEP does not ask the stakeholders to reduce more than is necessary by using adaptive management principles to evaluate progress towards the TMDL seagrass depth limit targets. It must be noted that the TMDL requirements have not changed, and additional reductions may be required in subsequent iterations of the BMAP to meet the TMDL depth-limit targets.

BMAP Phase 1 Allocations

Using the target loads discussed above, the allocations for Phase 1 of the BRL BMAP are shown in Tables 6 and 7.

Table 6. BRL BMAP Phase 1 Required TN Reductions for the BRL BMAP

Entity	Area (acres)	TN Target (lbs/acre/yr)	TN Target (lbs/yr)	Net Load (lbs/yr)	Required Reduction (lbs/yr)	15% BMAP 1 Required Reduction (lbs/yr)
Brevard County	10,365	2.08	21,567	68,350	46,783	7,017.5
Cape Canaveral	857	2.08	1,784	8,975	7,191	1,078.7
Cape Canaveral AFS	13,801	2.08	28,717	52,944	24,227	3,634.1
Cocoa Beach	1,842	2.08	3,834	18,519	14,685	2,202.8
FDOT 5	559	2.08	1,163	5,457	4,294	644.1
Indian Harbour Beach	1,244	2.08	2,588	11,575	8,987	1,348.1
Kennedy Space Center	18,545	2.83	52,542	70,110	17,568	2,635.2
Patrick AFB	1,835	2.08	3,819	24,563	20,744	3,111.6
Satellite Beach	1,737	2.08	3,614	17,245	13,631	2,044.7
de minimus	598	-	2,828	2,828	-	0.0
Total	**51,383**	**-**	**119,627**	**280,566**	**158,111**	**23,716.5**

Table 7. BRL BMAP Phase 1 Required TP Reductions for the BRL BMAP

Entity	Area (acres)	TP Target (lbs/acre/yr)	TP Target (lbs/yr)	Net Load (lbs/yr)	Required Reduction (lbs/yr)	15% BMAP 1 Required Reduction (lbs/yr)
Brevard County	10,365	0.344	3,570	14,203	10,633	1,595.0
Cape Canaveral	857	0.344	295	2,031	1,736	260.4
Cape Canaveral AFS	13,801	0.344	4,753	11,073	6,320	948.0
Cocoa Beach	1,842	0.344	635	3,824	3,189	478.4
FDOT 5	559	0.344	192	1,704	1,512	226.8
Indian Harbour Beach	1,244	0.344	428	2,121	1,693	254.0
Kennedy Space Center	18,545	0.344	6,387	8,865	2,478	371.7
Patrick AFB	1,835	0.344	632	6,467	5,835	875.3
Satellite Beach	1,737	0.344	598	3,314	2,715	407.3
de minimus	598	-	575	575	0	0.0
Total	**51,383**	**-**	**18,066**	**54,177**	**36,111**	**5,416.7**

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Indian River Lagoon (IRL) Basin Management Action Plans (BMAPs)
Types of Projects Eligible for Credit
February 1, 2012

Reductions in the loadings of total nitrogen (TN) and total phosphorus are needed to improve seagrass depth limit coverage in the IRL Basin. To accomplish this goal, stakeholders were asked to submit projects and programs that reduce nutrient loading to the lagoon. Completed projects since January 1, 2000 were eligible for BMAP credit because the land uses in the total maximum daily load (TMDL) model are based on circa 2000 data; therefore, benefits of management actions since January 1, 2000 were not reflected in the TMDL model. Projects were only given credit for the portion of the load reduction that was over and above any permit requirements for that project. This criterion was needed since permit conditions are established to maintain the current condition (prevent further impacts from the development) and do not contribute to the improvement of water quality in the lagoon.

Several project categories were eligible to receive credit in the BMAP. The first category is standard stormwater treatment best management practices (BMPs) used in Florida, which include:

- Retention BMPs (on-line and off-line systems, basins, and exfiltration trenches);
- Wet detention ponds;
- Dry detention;
- Baffle boxes;
- Nutrient (2nd generation) baffle boxes;
- Catch basin inserts/inlet filters;
- Swales;
- Alum injection;
- Stormwater reuse;
- Stormceptor units;
- Continuous deflective separation (CDS) units;
- Street sweeping; and
- Treatment trains using a combination of BMPs.

Some BMPs were assigned provisional nutrient reduction estimates for the purposes of the first iteration of the BMAPs. Studies to estimate the efficiencies of these BMPs are being conducted across the state, which will provide better information on the expected reductions from these BMPs for use in the next iteration of the BMAP. Provisional credit is assigned for:

- Floating islands/managed aquatic plant systems (MAPS); and
- Public education and outreach efforts.

Based on feedback from the stakeholders, the Florida Department of Environmental Protection (FDEP) is currently researching the nutrient reduction potential of several other types of BMPs. If these projects are found to reduce nutrients, credit can be assigned for these efforts in the BMAPs. These other BMP types include:

- Muck/sediment removal;
- Vegetation and algal harvesting; and
- Tilting weir gates in canals or other changes in water management that improve water quality.