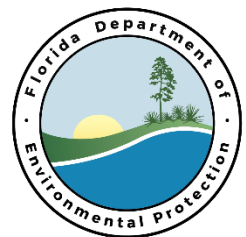


Final
2017 Progress Report
for the North Indian River Lagoon
Basin Management Action Plan

**Division of Environmental Assessment and Restoration
Florida Department of Environmental Protection**

August 2017

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Tallahassee, FL 32399
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Acknowledgments

This 2017 Progress Report for the North Indian River Lagoon (IRL) Basin Management Action Plan (BMAP) was prepared as part of a statewide watershed management approach to restore and protect Florida's water quality. It was prepared by the Florida Department of Environmental Protection (DEP) with participation from the North IRL stakeholders.

Table 1. List of North IRL BMAP participants

Type of Governmental or Private Entity	Participant
Counties	Brevard County Volusia County
Municipalities	City of Cocoa City of Edgewater City of Indian Harbour Beach City of Oak Hill City of Rockledge City of Titusville Town of Indialantic Town of Palm Shores Town of Melbourne Village City of Melbourne
Agencies	Florida Department of Agriculture and Consumer Services Florida Department of Environmental Protection Florida Department of Transportation District 5 Kennedy Space Center St. Johns River Water Management District
Other Interested Parties	Agriculture

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List of Acronyms and Abbreviations

µg/L	Micrograms Per Liter
BAM	Biosorption Activated Media
BMAP	Basin Management Action Plan
BMP	Best Management Practice
BRL	Banana River Lagoon
CDS	Continuous Deflective Separation
DEP	Florida Department of Environmental Protection
F.A.C.	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDOT	Florida Department of Transportation
FYN	Florida Yards and Neighborhood (Program)
GIS	Geographic Information System
IA	Implementation Assurance
IDDE	Illicit Discharge Detection and Elimination (Program)
IRL	Indian River Lagoon
KSC	Kennedy Space Center
lbs/yr	Pounds Per Year
m	Meter
MAPS	Managed Aquatic Plant System
MDL	Minimum Detection Level
mg/L	Milligrams Per Liter
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
OAWP	Office of Agricultural Water Policy
O&M	Operations and Maintenance
PLSM	Pollutant Load Screening Model
POR	Period of Record
PSA	Public Service Announcement
SJRWMD	St. Johns River Water Management District
SR	State Road
STORET	STorage and RETrieval (Database)
TBD	To Be Determined
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
U.S.	United States
WBID	Waterbody Identification

Section 1: Introduction

1.1 Purpose of the Report

This is the fourth annual Progress Report for the North Indian River Lagoon (IRL) Basin Management Action Plan (BMAP). **Section 2** describes the activities and projects implemented by stakeholders during the reporting period (March 1, 2016, through February 28, 2017). **Section 3** summarizes stakeholder compliance with the BMAP. **Section 4** summarizes the water quality monitoring, and includes the results of a water quality evaluation conducted in the North IRL. The appendices provide supporting materials. **Appendix A** contains a comprehensive list of stakeholder projects and activities that are planned, completed, underway, or cancelled. **Appendix B** discusses the results of the water quality trend analysis performed on data from select tributary monitoring stations.

1.2 Total Maximum Daily Loads (TMDLs) for the North IRL Subbasin

The Florida Department of Environmental Protection (DEP) verified the IRL Basin as impaired because of excessive amounts of total nitrogen (TN) and total phosphorus (TP), as evidenced by a decrease in seagrass distribution and by low dissolved oxygen (DO). In March 2009, DEP adopted the IRL Basin TMDLs with a focus on the water quality conditions necessary for seagrass regrowth at the depth limits where seagrass historically grew in the basin, based on a multiyear composite of seagrass coverage. The median depth limits of seagrass coverage in the IRL Basin have decreased over the years because of changes in water quality resulting from anthropogenic (human) influences. **Table 2** and **Table 3** list the TN and TP TMDLs and pollutant load allocations, respectively, adopted by rule for the segments with waterbody identification (WBID) numbers in the North IRL Subbasin.

Table 2. TN TMDLs in the North IRL Subbasin

lbs/yr = Pounds per year; NASA= National Aeronautics and Space Administration; N/A = Not applicable

WBID Number	WBID Name	Project Zone	Parameter	TMDL (lbs/yr)	Wastewater Facilities Allocation (lbs/yr)	Stormwater Allocation (lbs/yr)	Atmospheric Deposition Allocation (lbs/yr)
2963F	Indian River above Max Brewer	North A	TN	177,220	N/A	88,322	88,898
2963E	Indian River above NASA Causeway	North A	TN	173,232	N/A	95,932	77,300
2963D	Indian River above 520 Causeway	North B	TN	147,524	8,111	73,882	65,531
2963B and 2963C	Indian River above Melbourne Causeway	North B	TN	189,068	9,200	114,458	65,410
Total			TN	687,044	17,311	372,594	297,139

Table 3. TP TMDLs in the North IRL Subbasin

lbs/yr = Pounds per year; NASA= National Aeronautics and Space Administration; N/A = Not applicable

WBID Number	WBID Name	Project Zone	Parameter	TMDL (lbs/yr)	Wastewater Facilities Allocation (lbs/yr)	Stormwater Allocation (lbs/yr)	Atmospheric Deposition Allocation (lbs/yr)
2963F	Indian River above Max Brewer	North A	TP	9,320	N/A	7,307	2,013
2963E	Indian River above NASA Causeway	North A	TP	14,793	N/A	13,042	1,751
2963D	Indian River above 520 Causeway	North B	TP	11,845	1,609	8,752	1,484
2963B and 2963C	Indian River above Melbourne Causeway	North B	TP	20,592	225	18,886	1,481
Total			TP	56,550	1,834	47,987	6,729

1.3 North IRL Subbasin

Because of the large size and hydrologic diversity of the IRL Basin, DEP divided the watershed into three subbasins: (1) North IRL, (2) Central IRL, and (3) Banana River Lagoon (BRL). Separate BMAPs were developed for each subbasin; this report focuses solely on the North IRL subbasin.

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

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

Figure 1 and **Figure 2** show the locations of these project zones and the associated stakeholders.

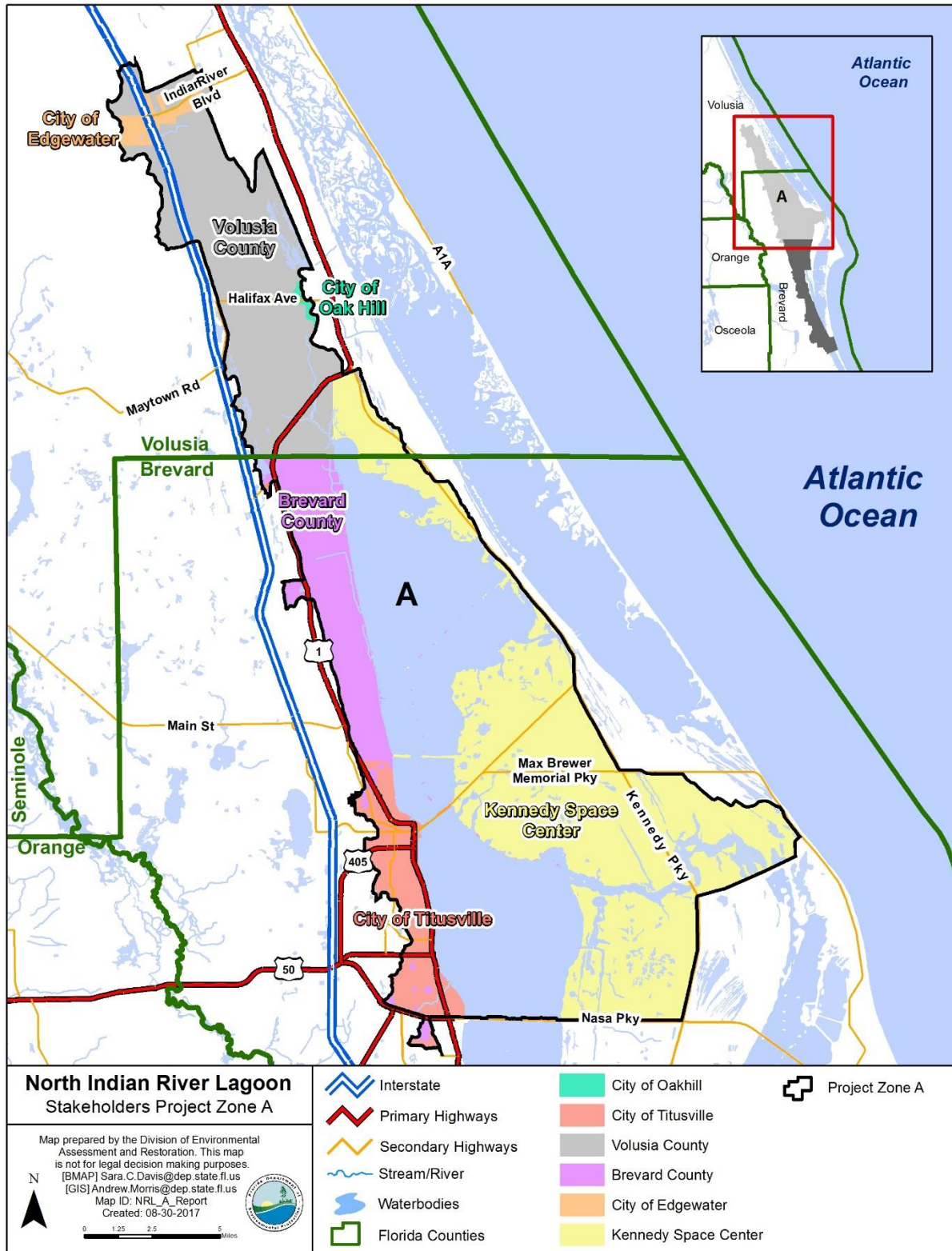


Figure 1. North IRL Project Zone A stakeholders

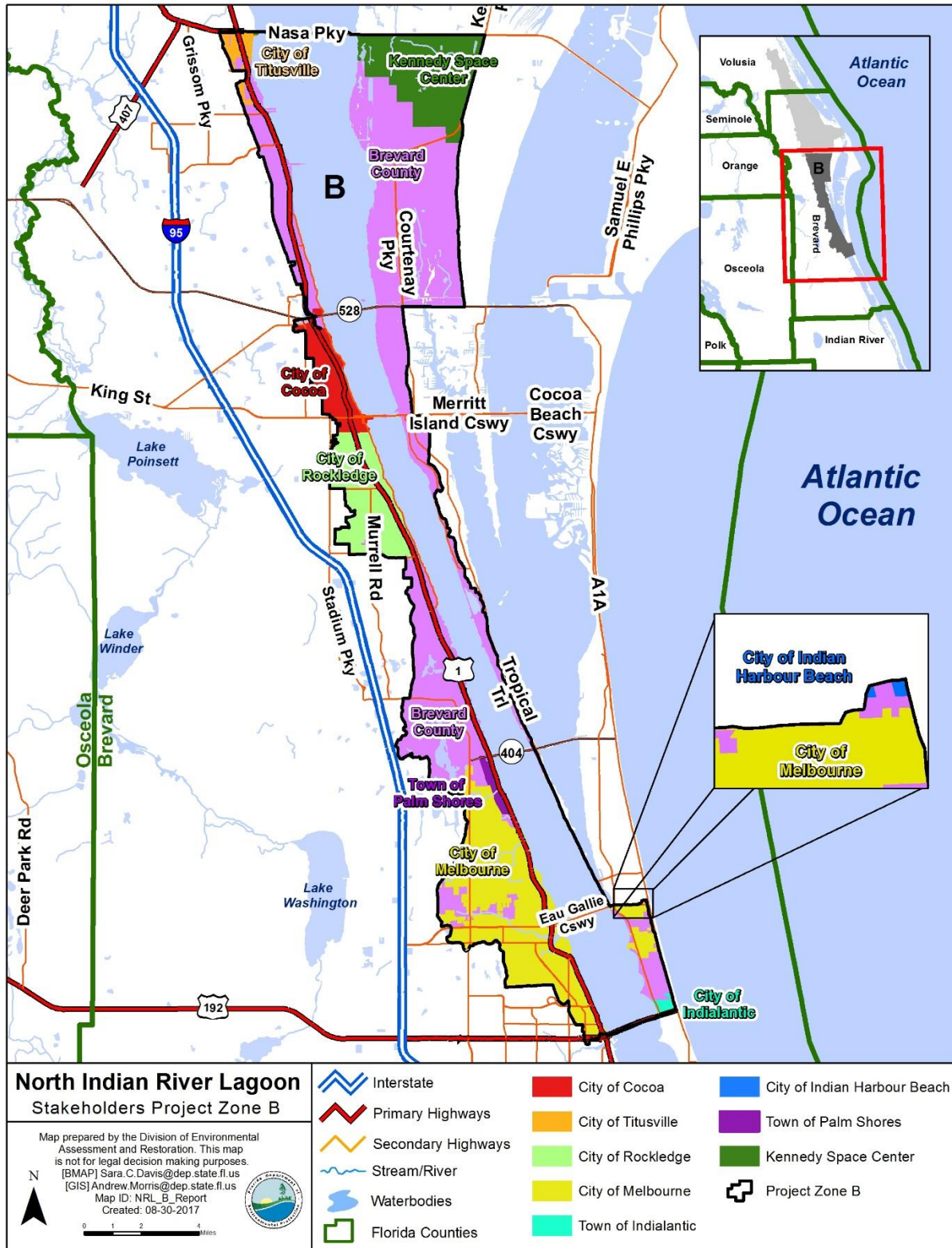


Figure 2. North IRL Project Zone B stakeholders

Section 2: Activities During the Reporting Period

Section 2.1 and **Section 2.2** describe the accomplishments in the North IRL during the reporting period (March 1, 2016, through February 28, 2017). New projects added to the individual project tables are described below, as are individual projects completed during the reporting period. Ongoing efforts such as street sweeping, ordinances, and public education efforts are not specifically described below but must continue each year for the project credit to remain effective. **Appendix A** contains the individual project tables.

2.1 Activities by Entity

2.1.1 Brevard County

In 2016, Brevard County passed a half-cent sales tax to support IRL restoration efforts and implement projects to reduce nutrient loading from stormwater runoff and groundwater discharges to the IRL. The county secured legislative appropriation funding to increase muck dredging projects in five priority areas: Mims boat ramp on Jones Road, Sykes Creek, Cocoa Beach, Grand Canal, and Turkey Creek.

The county completed the Port St. John C (BC-61) and Huntington Road (BC-60) managed aquatic plant system (MAPS) projects during the reporting period. These were partially funded by a DEP grant (G0430). BC-61 is credited with reductions of 62 lbs/yr of TN and 11 lbs/yr of TP. BC-60 is credited with reductions of 520 lbs/yr of TN and 47 lbs/yr of TP.

Brevard County also initiated the development of a Shoreline Management Plan, which will be used to identify opportunities and implement environmental enhancement and erosion protection along the IRL shoreline in Brevard County. The goals of the plan are as follows:

- Stabilize shorelines.
- Prevent erosion.
- Maintain, enhance and restore estuary habitat along the IRL shoreline.
- Protect water quality.

Brevard County, in partnership with the University of Central Florida, began conducting surveys of the IRL shoreline in Brevard County to create geographic information system (GIS) data layers that spatially represent shoreline conditions and features. Grant funding from the Florida Coastal Management Program Coastal Partnership Initiative was used to complete the process.

2.1.2 City of Cocoa

The city completed the Peachtree Street Reconstruction Project (CC-12), Cocoa Riverfront Park Project (CC-13), and Bracco Pond Outfall Control Structure Project (CC-14) during the reporting period. It also added a new dry retention stormwater facility project (CC-20) at Forrest Avenue. Reductions for these projects are still being verified, and will be included in future reports.

2.1.3 City of Rockledge

The city completed the Huntington Lakes II (ROCK-24) retention facility and monitoring. Reductions for this project are still being determined. The city also linked the stormwater video public service announcement (PSA) "Knowing Your Waterways" to the city's webpage and Facebook page.

2.1.4 City of Titusville

The city completed the Draa Field Stormwater Park (TV-03) in December 2016. The treatment system consists of a 4-acre enhanced wet detention pond with littoral plantings, a permeable reactive barrier made of limerock, and a constructed wetland underdrain system. The project will reduce TN by 771 lbs/yr and TP by 312 lbs/yr. Water quality monitoring is ongoing and will be used to verify and update the reductions if necessary.

The city installed MAPS in the senior center wet detention pond (TV-11) in December 2015. Plants were harvested in May and October 2016. Biomass sampling analyses were conducted and reductions are being verified.

Titusville also planted littoral zone vegetation around three existing wet detention ponds (TV-12 and TV-13). Plants are currently being monitored for growth and survival. The results of biomass sampling analyses will be used to verify reduction credits.

2.1.5 Agriculture

In 2015, the Florida Department of Agricultural and Consumer Services (FDACS) Office of Agricultural Water Policy (OAWP) adopted a revised vegetable and agronomic crop manual that includes specific nutrient and irrigation management best management practices (BMPs) for plastic mulch, bare ground, sugar cane, hay/silage, and greenhouse production systems. In early 2016, FDACS adopted a dairy manual targeting dairies that do not have DEP-issued National Pollutant Discharge Elimination System (NPDES) permits. In June 2016, a poultry manual was also adopted. To date, FDACS has developed BMP manuals for cow/calf, citrus, vegetable and agronomic crops, nurseries, equine, sod, dairy, poultry, and specialty fruit and nut operations. Currently, the OAWP is working on a small farms manual as well as revisions to the sod and cow/calf manuals.

As of December 31, 2016, there were 18 agricultural BMP notices of intent (NOIs) issued by FDACS OAWP covering 608 acres in the North IRL (**Figure 3** and **Figure 4**). Agricultural BMPs may or may not be implemented on all these acres because NOIs may include nonproduction acres, such as buildings, parking lots, and fallow acres. Furthermore, this

enrollment acreage includes NOIs on lands not classified as agriculture in the BMAP. However, land use in the BMAP area (St. Johns River Water Management District [SJRWMD] 2000) may not accurately reflect agricultural land uses in the basin today. To calculate the actual agricultural acreage in the North IRL covered by the FDACS BMPs, FDACS used the Pollutant Load Screening Model (PLSM). Per this land use, 447 agricultural acres of the North IRL are enrolled in the FDACS BMP Program. **Table 5** and **Table 8** list the BMPs and the acreage covered by NOIs.

During the reporting period, staff enrolled a total of 16.55 acres in the North IRL area. In Project Zone A, 14.55 acres were enrolled in the Citrus BMP Manual, and in Project Zone B, 2 acres were enrolled.

FDACS OAWP Implementation Assurance (IA) Program

The OAWP formally established its IA Program in 2005 in the Suwannee River Basin as part of the multi-agency/local stakeholder Suwannee River Partnership. In 2007, the OAWP initiated the IA Program in the Lake Okeechobee Watershed and launched a standardized follow-up program for the remaining areas of the state in 2013, beginning with the Ridge Citrus and Indian River Citrus BMPs. In early 2014, the OAWP began to streamline the IA Program to ensure consistency statewide and across commodities and BMP manuals. This effort resulted in a single IA site-visit form, which is currently used by OAWP staff.

The IA Program is based on interactions with producers during site visits, which are conducted by OAWP field staff and technicians as workload allows. For the visits, field staff and technicians use a standard form (not BMP specific) developed in 2014. This form focuses on nutrient management, irrigation management, and water resource protection BMPs common to all of the BMPs that have been adopted by rule. The paper forms are submitted to OAWP staff and compiled into a spreadsheet, and the data are reported annually. From 2007 to 2015, the OAWP conducted 1,936 site visits. However, it is difficult to compare data collected prior to the implementation of the single IA site-visit form developed in 2014 because of regional differences (e.g., different forms and information asked) in administering the IA Program.

Additional emphasis was given to verifying the implementation of BMPs by enrolled producers with the enactment of Chapter 2016-1, Laws of Florida, which directed the OAWP to formalize the Implementation Verification Program into rules. In December 2016, the OAWP published a notice of rule development. As of February 2017, draft rule language has been distributed and presented at a public workshop. This language provides the structure for a statewide uniform implementation verification system, including assessments of the status of implementation, compliance assistance to aid producers in achieving full implementation, and referral of producers who are not implementing BMPs to DEP.

Table 4. Agricultural acreage in North IRL Project Zone A as of December 31, 2016

¹ FDACS staff-adjusted acreage for the purposes of enrollment is based on a review of more recent aerial imagery in the basin and local staff observations.

SJRWMD = St. Johns River Water Management District

N/A = Not applicable

2000 SJRWMD Land Use	2000 Acres	FDACS-Adjusted Acres ¹
Pasture	1,190.5	1,164.5
Row/Field/Mixed Crops	618.1	574.2
Fallow Cropland	40.7	40.7
Horse Farm	119.7	111.0
Citrus	5,115.2	3,515.4
Abandoned Citrus	936.7	N/A
Tree Crops	1.7	1.7
Tree Nurseries	26.5	26.5
Ornamentals	12.1	12.1
Poultry Feeding Operations	8.0	8.0
Total	8,069	5,454

Table 5. BMP enrollment for North IRL Project Zone A as of December 31, 2016

Related FDACS BMP Programs	Acreage Enrolled	Related NOIs	PLSM Agricultural Land Use Acres with NOIs
Citrus	266	9	236
Total	266	9	236

Table 6. BMP enrollment summary for North IRL Project Zone A

Category	Acres
Total Acreage Remaining in Basin for Enrollment	5,188
Five-Year Enrollment Goal (50 %)	2,727
Acreage Enrolled as of December 31, 2016	266
Remaining Acres To Enroll in Phase I	2,461

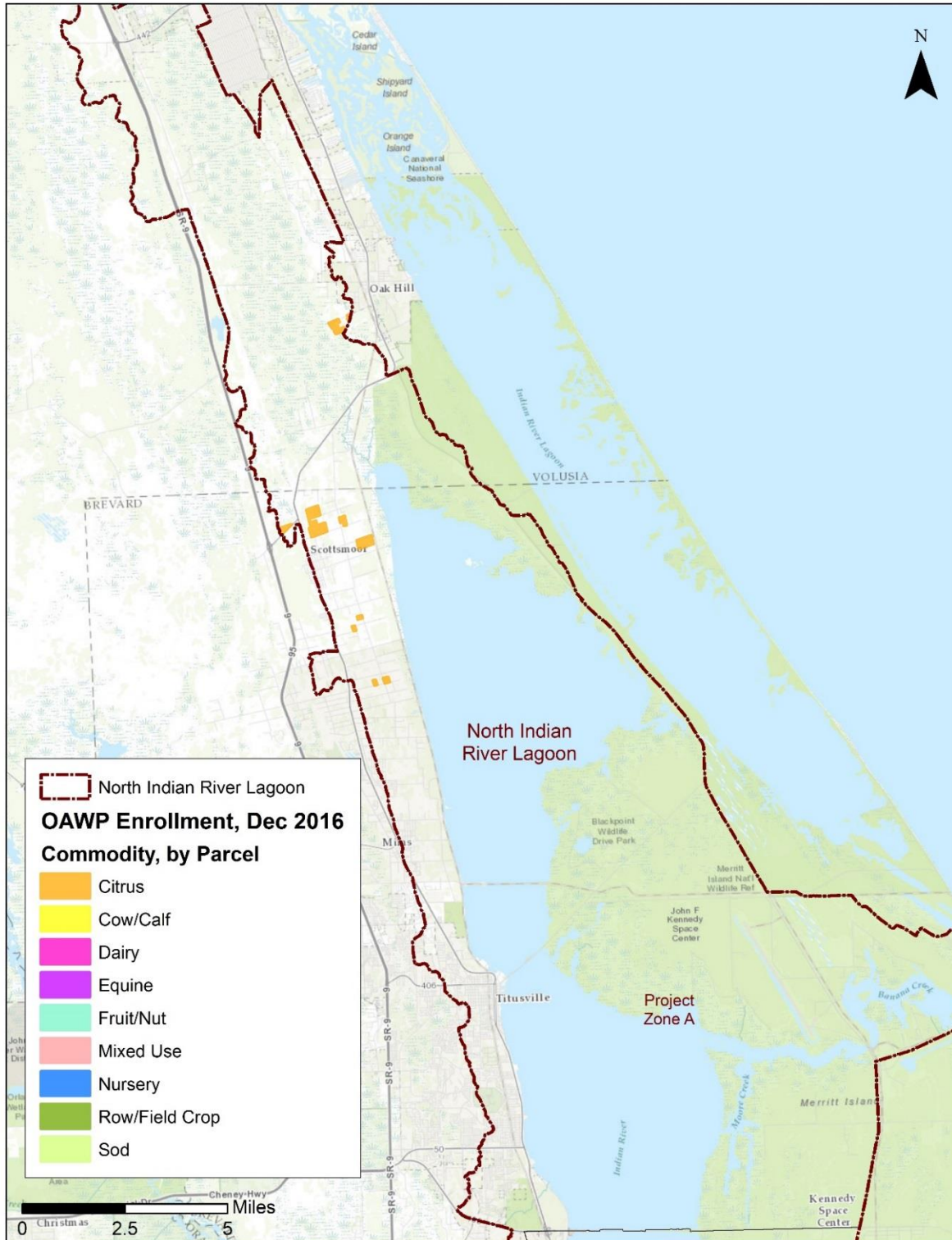


Figure 3. FDACS BMP Program enrollment progress in North IRL Project Zone A as of December 31, 2016

Table 7. Agricultural acreage in North IRL Project Zone B as of December 31, 2016

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.

N/A = Not applicable

2000 SJRWMD Land Use	2000 Acres	FDACS-Adjusted Acres ¹
Pasture	164.2	84.8
Row/Field/Mixed Crops	42.9	35.3
Tree Crops	2.8	2.8
Citrus	3,364.5	2,339.2
Abandoned Citrus	65.7	N/A
Ornamentals	43.9	43.9
Specialty Farms	8.0	8.0
Total	3,692	2,514

Table 8. BMP enrollment for North IRL Project Zone B as of December 31, 2016

Related FDACS BMP Programs	Acreage Enrolled	Related NOIs	PLSM Agricultural Land Use Acres with NOIs
Citrus	304.36	4	205.27
Cow/Calf Operations	8.97	1	5.71
Nurseries	28.39	4	.36
Total	342	9	211

Table 9. BMP enrollment summary for North IRL Project Zone B

Category	Acres
Total Acreage Remaining in Basin for Enrollment	2,172
Five-Year Enrollment Goal (50%)	1,257
Acreage Enrolled as of December 31, 2016	342
Remaining Acres To Enroll in Phase I	915



Figure 4. FDACS BMP Program enrollment progress in North IRL Project Zone B as of December 31, 2016

2.2 Summary of Accomplishments

Table 10 lists the projects completed during the reporting period in the North IRL. In the North IRL Project Zone A, these projects resulted in a reduction of 1,291 lbs/yr of TN and 359 lbs/yr of TP. These reductions are in addition to those projects given credit at BMAP adoption and in previous annual reports. Therefore, the total reductions to date are 30,647 lbs/yr of TN and 10,370 lbs/yr of TP, or 30 % of the TN and 53 % of the TP reductions needed to meet the TMDLs allocated to the North A project zone.

Table 10 also lists the reductions for projects completed during the reporting period in the North IRL Project Zone B. These projects resulted in a reduction of 509 lbs/yr of TN and 99 lbs/yr of TP. The total reductions to date are 70,809 lbs/yr of TN and 22,403 lbs/yr of TP, or 57 % of the TN and 68 % of the TP reductions needed to meet the TMDLs allocated to the North B project zone.

Figure 5, Figure 6, Figure 7, and Figure 8 list the load reductions for TN and TP, respectively, compared with the starting load and allocations for North IRL Project Zones A and B.

Table 10. Summary of projects completed during the reporting period in the North IRL Subbasin

TBD = To be determined; N/A = Not applicable; lbs/yr = Pounds per year

Entity	Project Zone	Project Number	Project Name	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)
City of Titusville	A	TV-03	Draa Field Stormwater Park	771	312
City of Titusville	A	TV-12	Senior Center Ponds Littoral Zone Plantings	TBD	TBD
City of Titusville	A	TV-13	Royal Oak Littoral Zone Plantings	TBD	TBD
Brevard County	A	BC-60	Huntington Road	520	47
City of Cocoa	B	CC-12	Peachtree Street Reconstruction	TBD	TBD
City of Cocoa	B	CC-13	Cocoa Riverfront Park	TBD	TBD
City of Cocoa	B	CC-14	Control Gate	TBD	TBD
City of Melbourne	B	MEL-12	South Croton Baffle Box	133	32
City of Melbourne	B	MEL-14	Paradise Baffle Box	125.57	17.09
City of Melbourne	B	MEL-18	Croton Road (Lime) Baffle Box	149	35
City of Melbourne	B	MEL-19	Young Street Existing Baffle Box Upgrade	39.3	4.65
City of Rockledge	B	ROCK-24	Huntington Lakes II	TBD	TBD
Brevard County	B	BC-61	Port St. John C	62	10.5
Total Reductions				1,780	458

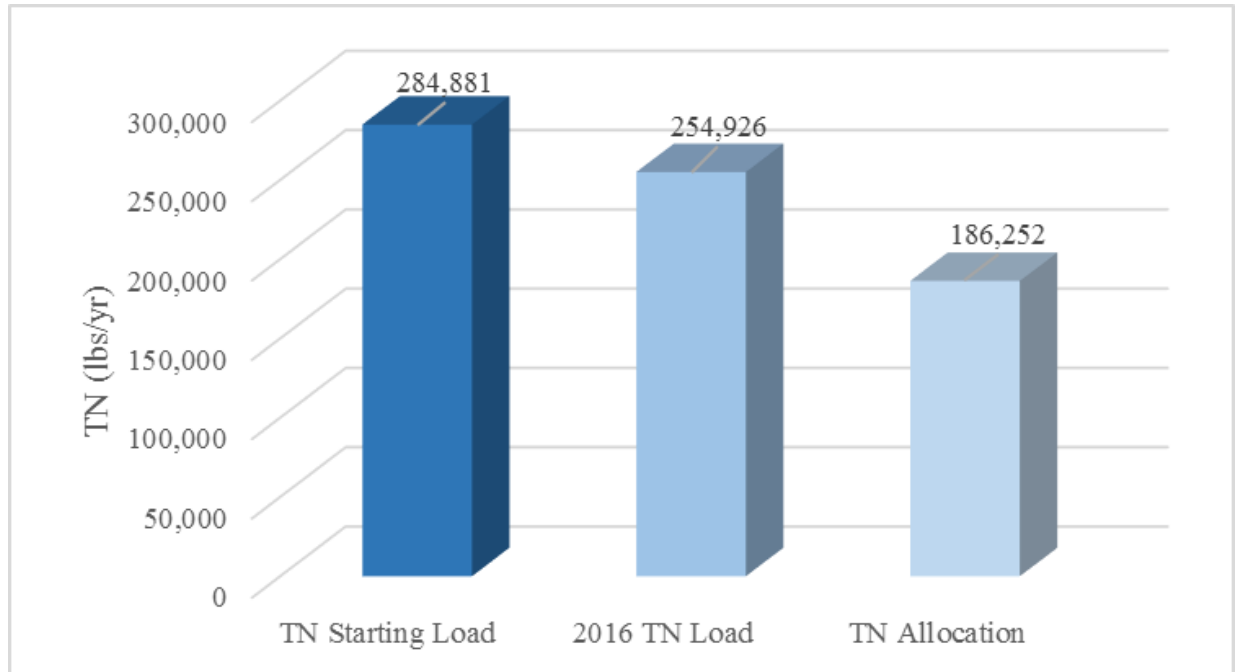


Figure 5. Progress towards the North IRL TN TMDL for Project Zone A through February 28, 2017

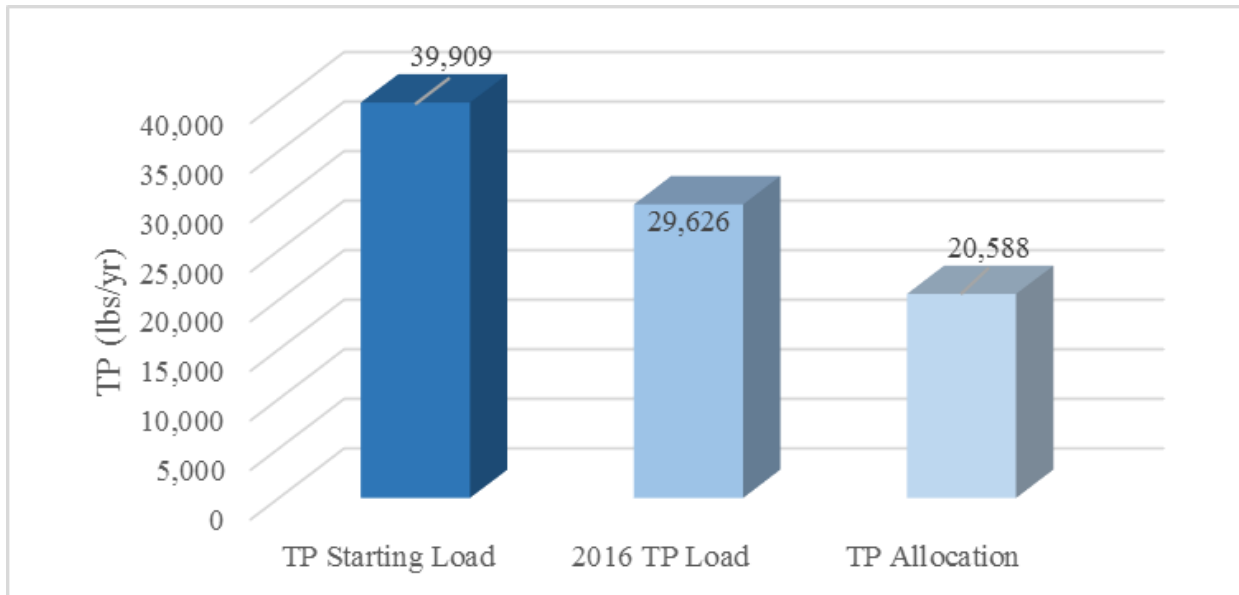


Figure 6. Progress towards the North IRL TP TMDL for Project Zone A through February 28, 2017

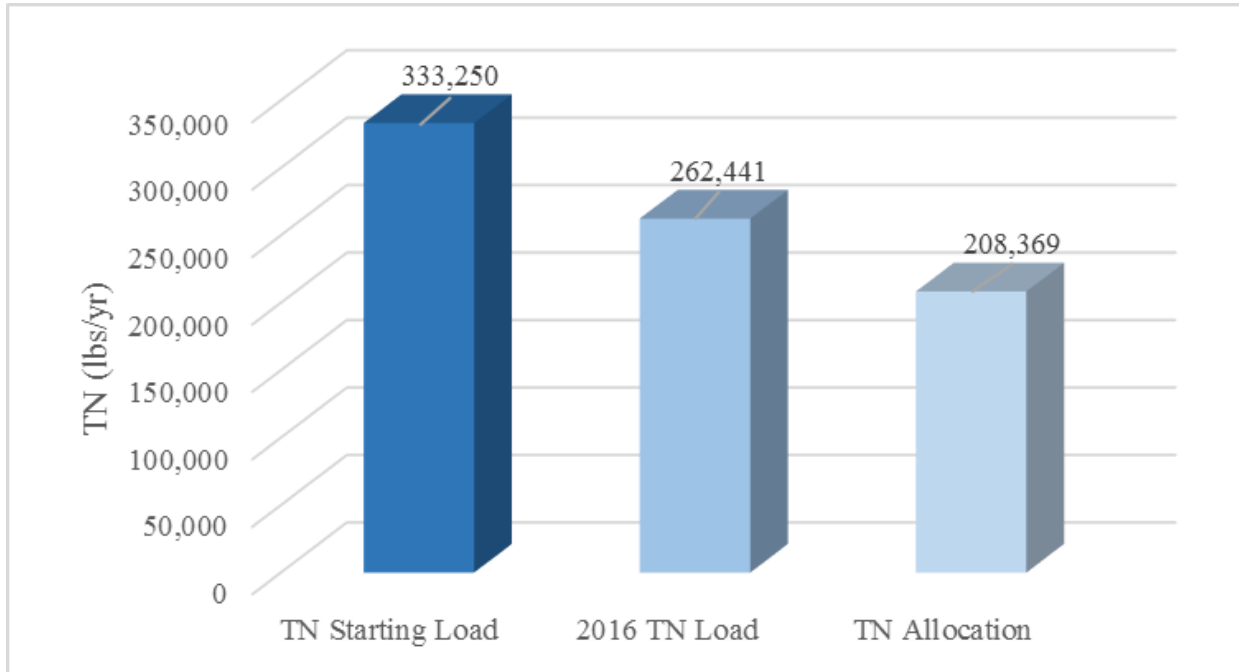


Figure 7. Progress towards the North IRL TN TMDL for Project Zone B through February 28, 2017

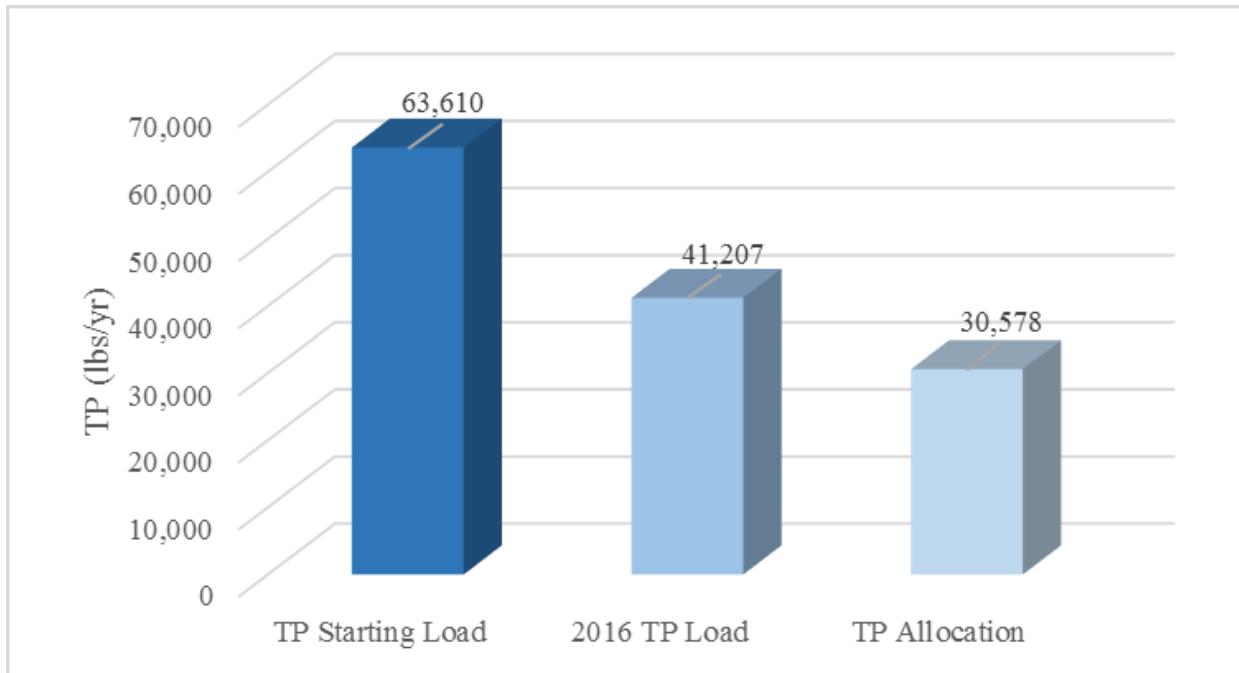


Figure 8. Progress towards the North IRL TP TMDL for Project Zone B through February 28, 2017

Section 3: Compliance

DEP annually reviews each entity's progress towards completing projects in the BMAP and achieving the assigned allocations. **Table 11** lists the number of projects that each entity has committed to in the BMAP and annual reports, along with the status of those projects. **Table 12** summarizes the reductions achieved and required reductions for each entity in the BMAP.

Table 11. Projects to achieve the TMDL

Entity	Projects	Completed	Underway	Cancelled
Agriculture	2	2	0	0
Brevard County	78	50	27	1
City of Cocoa	20	14	6	0
City of Edgewater	1	1	0	0
City of Melbourne	23	12	9	2
City of Rockledge	34	28	6	0
City of Titusville	32	13	19	0
Florida Department of Transportation (FDOT) District 5	22	22	0	0
Kennedy Space Center (KSC)	19	19	0	0
Town of Indialantic	3	3	0	0
Town of Palm Shores	1	1	0	0
Volusia County	3	3	0	0
Total	238	168	67	3

Table 12. Summary of reductions by entity

N/A = Not applicable; no reductions required.

Project Zone	Entity	Total TN Required Reduction (lbs/yr)	Total TP Required Reduction (lbs/yr)	Current TN Reduction (lbs/yr)	Current TP Reduction (lbs/yr)	% of Required TN Reductions Achieved	% of Required TP Reductions Achieved
A	Agriculture	37,313	6,860	5,047	1,420	14	21
A	Brevard County	14,533	1,880	6,812	1,945	47	103
A	City of Edgewater	160	No required reductions	84	11	53	N/A
A	City of Titusville	44,033	9,653	8,383	3,661	19	37
A	FDOT District 5	2647	947	819	130	31	14
A	KSC	No required reduction	No required reduction	8,941	3,135	N/A	N/A
A	Volusia County	No required reductions	No required reductions	588	67	N/A	N/A
B	Agriculture	7,313	2,967	4,739	1,029	65	35
B	Brevard County	35,327	6,633	27,598	7,518	78	113
B	City of Cocoa	16,067	3,713	8,063	3,868	50	104
B	City of Melbourne	44,920	13,120	7,476	2,333	16	17
B	City of Rockledge	13,967	3,960	6,818	2,548	49	64
B	City of Titusville	313	No required reductions	160	73	51	N/A
B	FDOT District 5	4,327	2,127	2,647	633	61	30
B	KSC	No required reductions	No required reductions	1,273	1,185	N/A	N/A
B	Town of Indialantic	947	200	350	61	37	31
B	Town of Palm Shores	No required reductions	No required reductions	21	4	N/A	N/A

Section 4: Water Quality

4.1 Water Quality Monitoring

The North IRL BMAP monitoring plan was designed to enhance the understanding of basin loads, identify areas with high nutrient concentrations, and track water quality trends. The information gathered through the monitoring plan will measure progress toward achieving the TMDL and provide a better understanding of watershed loading. The BMAP monitoring plan consists of ambient water quality sampling and biological monitoring.

4.2 SJRWMD Water Quality Analysis

Data from 6 stations were used to assess water quality between January 2016 and April 2017 (**Figure 5**). These stations provide information on conditions in the BRL (IRLB04), North IRL Project Zone A (IRLI06), North IRL Project Zone B (IRLI13), and Central IRL Project Zone A (IRLI23). Concentrations of 4 forms of nitrogen, 3 forms of phosphorus, and chlorophyll *a* varied in space and through time (**Figure 6**, **Figure 7**, and **Figure 8**). Concentrations of chlorophyll *a* were high at all stations from IRLI23 north in early 2016, with particularly elevated concentrations evident in the BRL (IRLB04; 126 micrograms per liter [$\mu\text{g/L}$]). *Aureoumbra lagunensis*, or brown tide, was dominant in many of these samples, and the "crash" of the bloom in March 2016 led to a massive fish kill in the BRL. Other peaks in chlorophyll *a* tended to follow or coincide with increases in nitrogen or phosphorus. In early 2017, chlorophyll *a* concentrations fell below 10 $\mu\text{g/L}$ at all stations except IRLI06 and IRLI23, where concentrations fell between 10 and 15 $\mu\text{g/L}$.

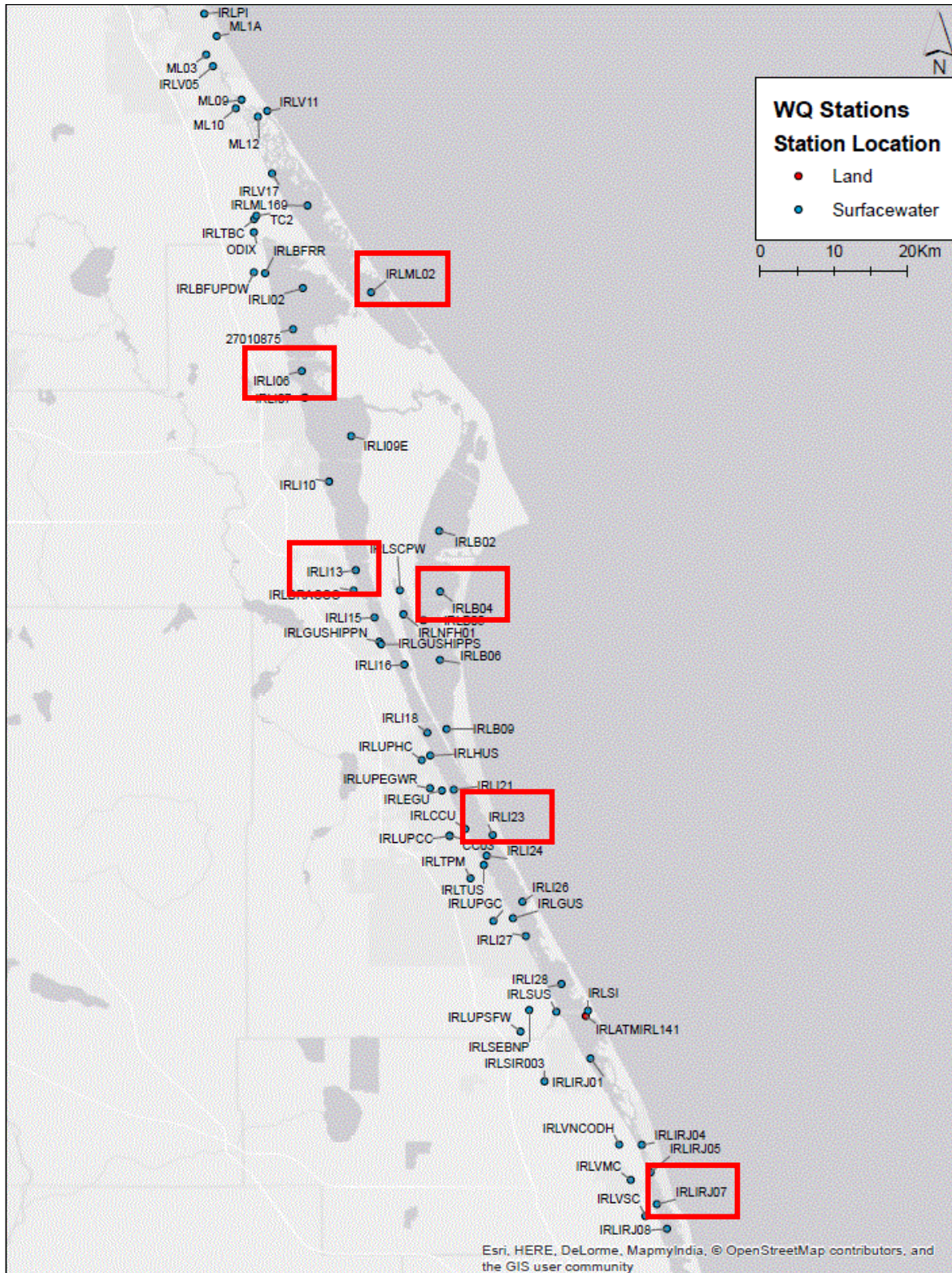


Figure 9. Water quality sampling stations with highlighted representative stations

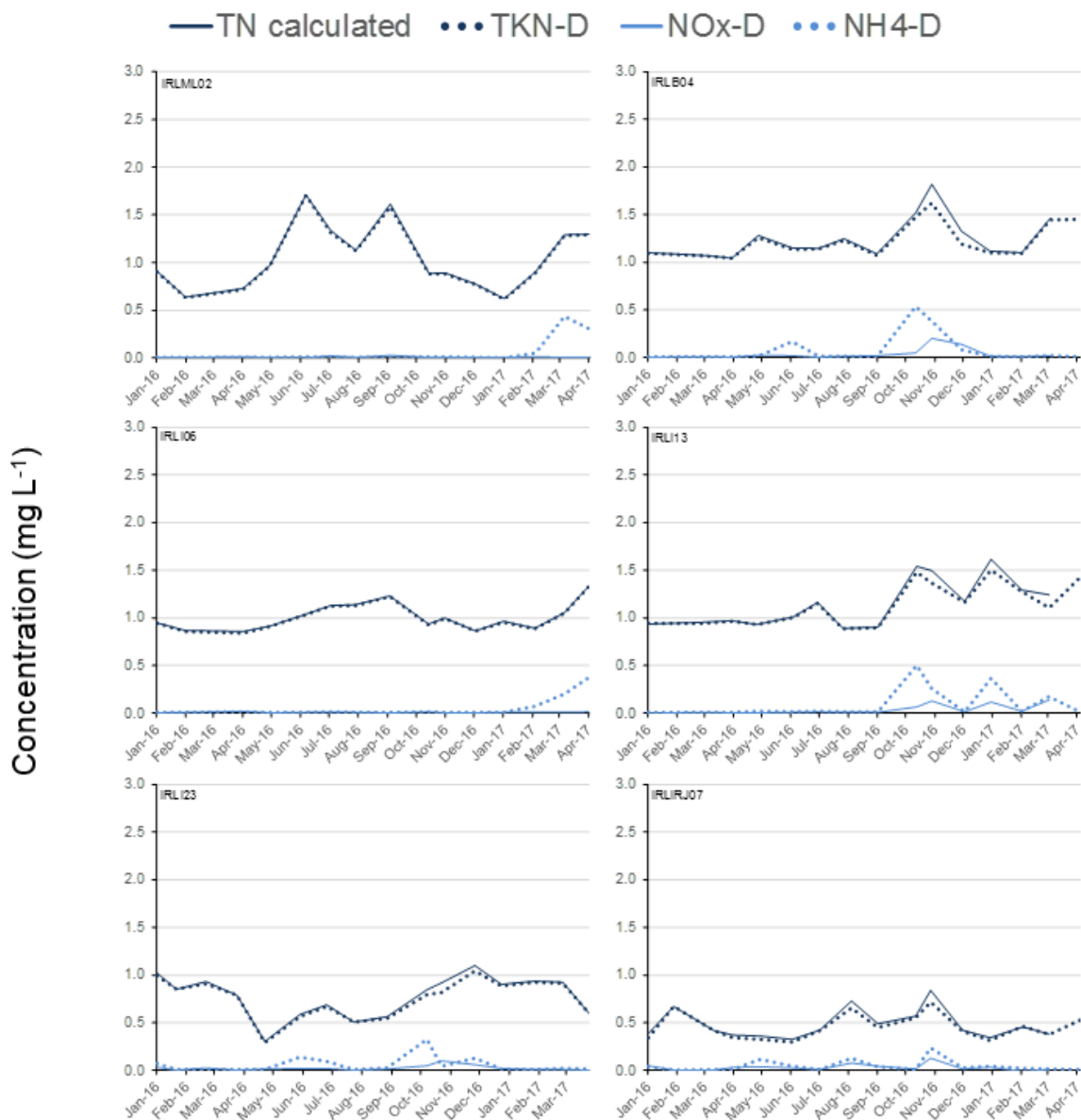


Figure 10. Concentrations of various forms of nitrogen. TN calculated = Total nitrogen calculated from other forms, TKN-D = Total dissolved Kjeldahl nitrogen, NOx-D = Dissolved nitrate and nitrite, NH4-D = Dissolved ammonium



Figure 11. Concentrations of various forms of phosphorus. TP-T = Total phosphorus, TP-D = Total dissolved phosphorus, PO4-D = Dissolved orthophosphate

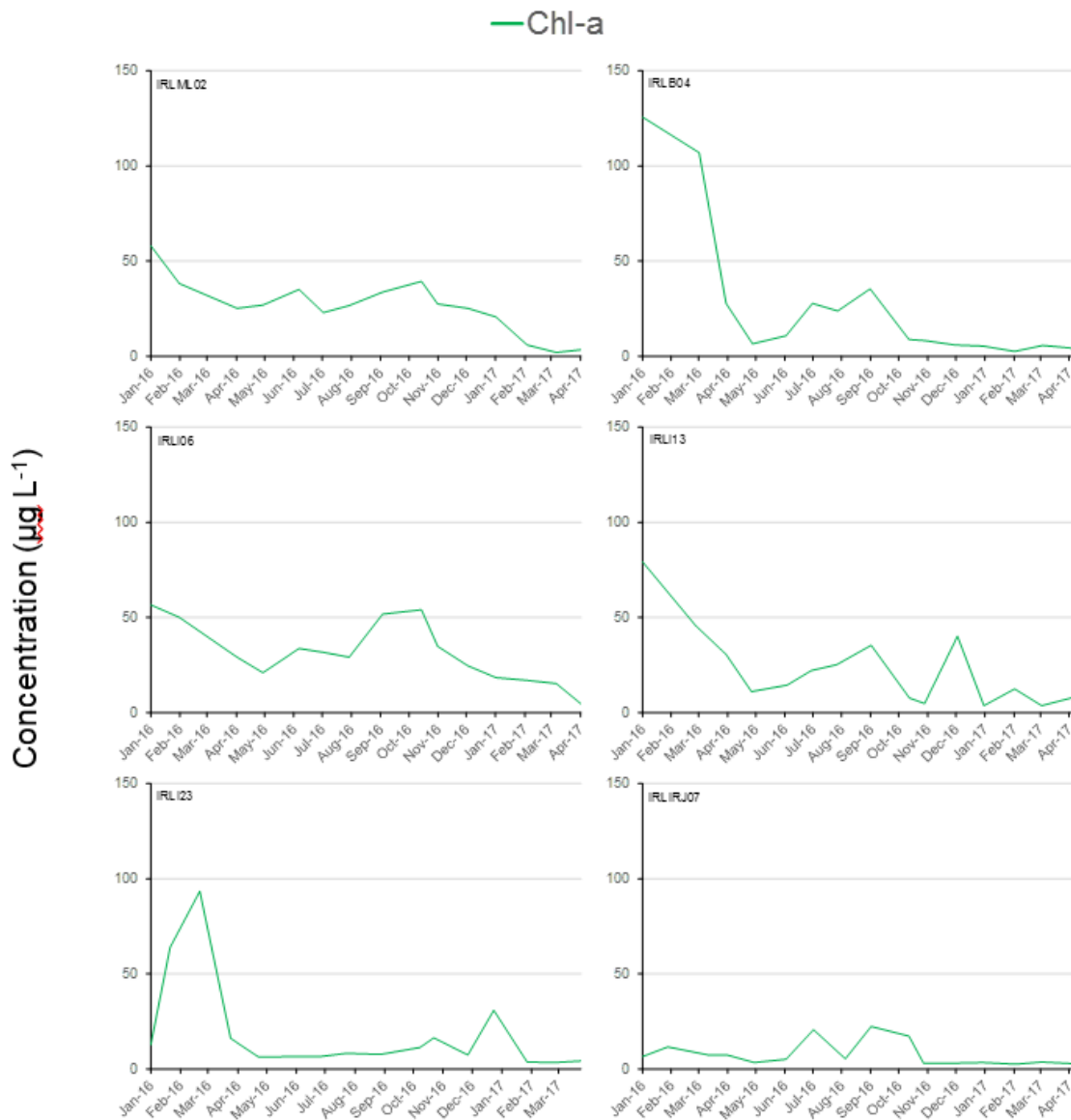


Figure 12. Chlorophyll concentrations. Chl-a = chlorophyll *a*

4.2.1 Water Quality Trend Analysis

The most current STORage and RETrieval (STORET) data for Stations IRLTBC, TC2, and ODIX were processed using the methods described in **Appendix B**. Only data that met quality control objectives were used in the analysis. Nonparametric statistical techniques were used to identify monotonic trend analyses in a statistically rigorous way with the Seasonal Mann-Kendall trend test. Nonparametric tests such as the Mann-Kendall are robust against outliers and large data gaps, and data are not required to conform to a particular distribution for nonparametric analyses.

Table 13 summarizes the results from the Seasonal Mann-Kendall trend tests, and **Appendix B** provides additional details and graphs.

Table 13. Summary of results for water quality analyses

POR = Period of record; N/A = Not applicable.

WBID	Station	Zone	Parameter	POR Start	POR End	N (# of Samples)	Tau	P-Value	Slope	Trend Test Interpretation
2942B	IRLTBC	NIRL-A	TN	2000	2016	123	0.223	0.002	<0.0001	Significant increasing trend
2942B	IRLTBC	NIRL-A	TP	2000	2016	164	0.308	<0.001	<0.0002	Significant increasing trend
2942A	VC-ODIX	NIRL-A	TN	2000	2016	23	N/A	N/A	N/A	Insufficient data for trend analysis
2942B	VC-TC2	NIRL-A	TN	2000	2016	11	N/A	N/A	N/A	Insufficient data for trend analysis

Appendices

Appendix A. BMAP Projects

The BMAP project tables below show the implementation status of the BMAP projects as of February 28, 2017. The tables list (in lbs/yr) the nutrient reduction attributable to each individual project. These projects were submitted to provide reasonable assurance to DEP that each entity has a plan on how to meet its allocation. However, the list of projects is meant to be flexible enough to allow for changes that may occur over time, provided that the reduction is still met within the specified period.

Table A-1. Brevard County projects in the North IRL

N/A = Not applicable; O&M = Operations and maintenance; TBD = To be determined

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	BC-01	Old Dixie Highway 601	BMP Cleanout	Completed		TBD	TBD	\$1,000		A
2013	BC-02	Chain of Lakes Pond	Wet Detention Pond	Completed	1,072.5	2,699	1,109	\$2,051,405		A
2013	BC-03	Education Efforts	Education Efforts	Completed	N/A	1,660	214			A
2013	BC-04	Scottsmeer I	BMP Treatment Train	Planned	530.9	TBD	TBD	\$601,664	\$1,000	A
2013	BC-05	Chain of Lakes Southern Expansion Phase 1	Wet Detention Pond	Completed	575.2	1,325	441	\$3,200,000	\$1,000	A
2013	BC-06	Chain of Lakes Reuse	Stormwater Reuse	Completed		498	63			A
2015	BC-07	Scottsmeer C	BMP Treatment Train	Planned	463	TBD	TBD			A
2013	BC-08	Twin Lakes North	Baffle Box – 1st generation	Completed	7.7	10	1			B
2013	BC-09	Twin Lakes South	Baffle Box – 1st generation	Completed	8.5	10	1	\$20,082		B
2013	BC-10	Lucas Place 640 Baffle Box	Baffle Box – 1st generation	Completed	5.2	8	1	\$36,835	\$1,000	B
2013	BC-11	Rockledge Drive 2055	Baffle Box – 1st generation	Completed	2.4	2	0	\$61,094	\$1,000	B
2013	BC-12	Rockledge and Riverwoods Baffle Box	Baffle Box – 1st generation	Completed	3.8	3	0	\$47,686	\$1,000	B
2013	BC-13	Anchor Lane	Baffle Box – 1st generation	Completed	29.4	47	5	\$49,560	\$1,000	B
2013	BC-14	Kelmore Baffle Box	Baffle Box – 1st generation	Completed	9.7	10	2	\$21,817	\$1,000	B
2013	BC-15	Puesta Del Sol 735 Baffle Box	Baffle Box – 1st generation	Completed	2.2	2	0	\$24,953	\$1,000	B
2013	BC-16	Tequesta Harbor Baffle Box	Baffle Box – 1st generation	Completed	13.1	21	2	\$27,582	\$1,000	B
2013	BC-17	Broadway Boulevard Pond	Wet Detention Pond	Completed	85.7	272	56	\$553,169		B
2013	BC-18	Fairglen Elementary School Pond	Wet Detention Pond	Completed	80.2	350	111	\$730,869		B
2013	BC-19	Lake George	Wet Detention Pond	Completed	719	1,261	415	\$347,255	\$1,000	B

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	BC-20	Merritt Island Courthouse Pond	Wet Detention Pond	Completed	7	8	3	\$95,584		B
2013	BC-21	Parkway Drive Phase 2 Pond	Wet Detention Pond	Completed	1,796.9	4,041	1,599	\$1,817,720		B
2013	BC-22	Street Sweeping	Street Sweeping	Completed	N/A	636	408			B
2013	BC-23	Education Efforts	Education Efforts	Completed	N/A	6,339	1,035			B
2013	BC-24	Pine Island Phase I and II	Wet Detention Pond	Completed	6,232.9	10,948	3,218	\$4,131,255	\$34,705	B
0	BC-25	Merritt Island Airport	Wet Detention Pond	Cancelled	0	0	0	\$0		B
2013	BC-26	Pines Industrial	Wet Detention Pond	Planned	71	802	101	\$822,000		B
2013	BC-27	Johnson Junior High	MAPS	Planned	133.4	187	27	\$484,200		B
2013	BC-28	Florida Boulevard	MAPS	Completed	88.4	197	21	\$40,772	\$18,295	B
2013	BC-29	Fairglen Elementary	MAPS	Planned	80.2	123	12	\$34,996	\$15,703	B
2013	BC-30	Port St. John B	MAPS	Completed	57.9	237	42	\$16,308	\$7,315	B
2013	BC-31	Wickham Park North	MAPS	Underway	1,796.9	2,804	598	\$75,428	\$33,846	B
2013	BC-32	West Avenue 6600	Baffle Box – Type 1 retrofit	Underway	50.7	120	12	\$15,000		B
2013	BC-33	Lucas Place	Baffle Box – Type 1 retrofit	Completed	2.7	8	1	\$12,507		B
2013	BC-34	Indian River Isles	Baffle Box – Type 1 retrofit	Completed	7.3	63	8	\$30,844		B
2013	BC-35	Granada Street 1030 East	Baffle Box – Type 1	Completed	38.6	99	16	\$15,000		B
2013	BC-36	Haverhill Avenue	Baffle Box – Type 1 retrofit	Completed	47.5	80	8	\$35,857		B
2013	BC-37	Manth Avenue	Baffle Box – Type 1 retrofit	Completed	69.1	226	29	\$12,507		B
2013	BC-38	Rockledge and Riverwoods Boulevard Rockledge	Baffle Box – Type 1 retrofit	Completed	3.8	3	0	\$15,000		B
2013	BC-39	Alamanda Indian Harbour Beach	Baffle Box – Type 1 retrofit	Completed	2.8	3	0	\$12,507		B
2013	BC-40	River Shore 1848 Indialantic	Baffle Box – Type 1 retrofit	Completed	2.7	3	0	\$31,751		B

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	BC-41	River Shore 1925 Indialantic	Baffle Box – Type 1 retrofit	Completed	7.4	7	1	\$12,507		B
2013	BC-42	Cedar Lane Indialantic	Baffle Box – Type 1 retrofit	Completed	3.8	6	1	\$12,507		B
2013	BC-43	Riverview 9856 Indialantic	Baffle Box – Type 1 retrofit	Completed	5.7	9	1	\$15,000		B
2013	BC-44	Riverview 9864 Indialantic	Baffle Box – Type 1 retrofit	Completed	98.5	202	33	\$15,000		B
2013	BC-45	Oak Ridge Indialantic	Baffle Box – Type 1 retrofit	Completed	126.5	257	39	\$15,000		B
2013	BC-46	Kingsmill-Aurora Phase 2	Wet Detention Pond	Planned	1,220.4	4,059	1,590	\$1,600,000	\$1,000	B
2013	BC-47	Sediment Trap, Grated Inlet Basket, Inlet Weir Cleaning	BMP Cleanout	Completed		TBD	TBD	\$392,105		B
2013	BC-48	Merritt Ridge 3A	MAPS	Completed	32.1	138	27	\$100,362		B
2013	BC-49	Lake George	MAPS	Underway	719	505	51	\$51,200		B
2013	BC-50	Wickham Park	Stormwater Reuse	Completed		75	5			B
2013	BC-51	Ellington Park	Stormwater Reuse	Completed		409	87			B
2013	BC-52	Rockledge Barton Park Reuse	Stormwater Reuse	Completed		262	24			B
2013	BC-53	Florida Boulevard Pond	Wet Detention Pond	Completed	88.4	545	185	\$350,384		B
2014	BC-54	McGiver South	Baffle Box – Type 1 retrofit	Completed	2.8	6	1	\$12,507		B
2014	BC-55	651 Franklyn	Baffle Box – Type 1 retrofit	Completed	13.7	15	2	\$12,507		B
2014	BC-56	Fountainhead	Aquatic Vegetation Harvesting	Completed	125.5	401	65	\$39,274		B
2015	BC-57	Fiske	Baffle Box – Type 1 retrofit	Completed	126.2	317	56	\$12,507		B
2015	BC-58	Street Sweeping	Street Sweeping	Completed	N/A	110	71			A
2015	BC-59	Baffle Box/Sediment Trap Cleaning	BMP Cleanout	Underway		TBD	TBD	\$20,082		A
2016	BC-60	Huntington Road	MAPS	Completed	354.6	520	47	\$45,788	\$9,998	A

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2016	BC-61	Port St. John C	MAPS	Completed	20	62	11	\$14,062	\$3,071	B
2016	BC-62	Shoreview Circle	Baffle Box – Type 1 retrofit	Underway	TBD	TBD	TBD			B
2016	BC-63	Granada West	Baffle Box – Type 1 retrofit	Underway	TBD	TBD	TBD			B
2016	BC-64	Shoreview Lane	Baffle Box – Type 1 retrofit	Underway	TBD	TBD	TBD			B
2016	BC-65	Sunset Park North	Baffle Box – Type 1 retrofit	Underway	TBD	TBD	TBD			B
2016	BC-66	Oak Street	Baffle Box – Type 1 retrofit	Underway	TBD	TBD	TBD			B
2017	BC-67	Fountainhead Advanced Denitrification		Planned	234.7	TBD	TBD	\$284,320		B
2017	BC-68	Multiple Ditch Outfall Denitrification D1		Planned		TBD	TBD	\$3,496,838		A & B
2017	BC-69	Multiple Ditch Outfall Denitrification D4		Planned		TBD	TBD	\$2,140,000		B
2017	BC-70	Otter Creek Basin D4		Planned		TBD	TBD	\$130,000		B
2017	BC-71	Suntree In-Channel Denitrification D4		Planned		TBD	TBD	\$71,000		B
2017	BC-72	Multiple Ditch Outfall Denitrification D5		Planned		TBD	TBD	\$927,858		Unknown
2017	BC-73	Eau Gallie Area Muck Dredging	Muck Removal/ Restoration Dredging	Planned		TBD	TBD	\$26,250,000		B
2017	BC-74	Flounder Creek Pond Denitrification Retrofit		Planned	320	TBD	TBD	\$180,000		A
2017	BC-75	Huntington Creek Pond Denitrification Retrofit		Planned	355	TBD	TBD	\$180,000		A
2017	BC-76	Kingsmill Aurora Phase II	Pond	Planned	1,213	TBD	TBD	\$990,000		B
2017	BC-77	Merritt Ridge 2B D2	Swale	Planned	2	TBD	TBD	\$45,000		B
2017	BC-78	Merritt Ridge 2E D2	Pond	Planned		TBD	TBD	\$720,000		B

Total TN Project Reduction = 34,410 lbs/yr Total TP Project Reduction = 9463 lbs/yr

Total TN Reduction Required = 49,890 lbs/yr Total TP Reduction Required = 8, 513 lbs/yr

Table A-2. City of Cocoa projects in the North IRL

N/A = Not applicable; O&M = Operations and maintenance; TBD = To be determined

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	CC-01	Bracco Pond B	Wet Detention Pond	Completed	591.8	2,328	1,050	\$250,000		B
2013	CC-02	Bracco Expansion Area	Wet Detention Pond	Completed	775.2	156	42	\$570,762		B
2013	CC-03	Cocoa Village Park	Dry Detention Pond	Completed	13.5	37	7	\$330,000		B
2013	CC-04	Morris Pond	Wet Detention Pond	Completed	16.2	128	47	\$247,480		B
2013	CC-05	North Brevard Avenue Stormwater Treatment Facility	Continuous Deflective Separation (CDS) Unit	Completed	11.3	0	5			B
2013	CC-06	North Fiske Stormwater Retention Facility	100 % Onsite Retention	Completed	33.9	42	2	\$330,000		B
2013	CC-07	Suntree Baffle Box #1	Baffle Box – 2nd generation	Completed	5.9	7	1	\$80,000		B
2013	CC-08	Street Sweeping	Street Sweeping	Completed	N/A	4,027	2,582	\$80,000		B
2013	CC-09	Bracco Supplemental Water Supply	Reclaimed Water	Completed		1,102	108	1,200,000		B
2013	CC-10	Diamond Square Stormwater Improvements	Wet Detention Pond	Completed	95.4	108	0	\$210,000		B
2014	CC-11	Education Efforts	Education Efforts	Completed	N/A	128	26			B
2016	CC-12	Peachtree Street Reconstruction	Other Structural BMP	Completed		TBD	TBD	\$1,700,000		B
2016	CC-13	Cocoa Riverfront Park	Other Structural BMP	Completed		TBD	TBD	\$162,000		B
2016	CC-14	Control Gate	Control Structure	Completed	TBD	TBD	TBD			B
2016	CC-15	Florida Avenue Improvements	BMP Treatment Train	Underway	6.9	TBD	TBD	\$2,400,000		B
2016	CC-16	AT&T Detention Pond Retrofit	BMP Treatment Train	Underway	12.3	TBD	TBD	\$207,641		B
2016	CC-17	Church Street Baffle Box	Baffle Box	Planned		TBD	TBD	\$173,620	\$3,000	B

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2016	CC-18	John Garren Street Realignment and Parking	BMP Treatment Train	Planned		TBD	TBD	\$500,000	\$2,000	B
2016	CC-19	Brevard Ave. Bioretention and Tree Preservation	BMP Treatment Train	Planned		TBD	TBD	\$500,000	\$2,000	B
2017	CC-20	U.S. Highway 1 and Forrest Ave. Stormwater Treatment Facility	Dry Detention Pond	Planned	10	TBD	TBD			A

Total TN Project Reduction = 8,063 lbs/yr Total TP Project Reduction = 3,868 lbs/yr

Total TN Reduction Required =16,067 lbs/yr Total TP Reduction Required = 3,713 lbs/yr

Table A-3. City of Edgewater projects in the North IRL

N/A = Not applicable

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	EW-1	Education Efforts	Education Efforts	Completed	N/A	84	11		\$15,000	A

Total TN Project Reduction = 84 lbs/yr Total TP Project Reduction = 11 lbs/yr

Total TN Reduction Required = 160 lbs/yr Total TP Reduction Required = N/A

Table A-4. City of Melbourne projects in the North IRL

N/A = Not applicable; O&M = Operations and maintenance; TBD = To be determined

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	MEL-01	Fee and Apollo Drainage Improvements	Wet Detention Pond	Completed	43.6	28	79	\$525,161		B
2013	MEL-02	Dove Street Pond	Wet Detention Pond	Completed	14.9	69	31	\$156,164		B
2013	MEL-03	Charles Drive Pipe Replacement	Wet Detention Pond	Completed	143.3	183	162	\$462,644		B
2013	MEL-04	Wickham Park Pond	Wet Detention Pond	Completed	1,796.9	627	248	\$250,000		B
2013	MEL-05	Babcock Street Realignment	Retention BMP	Completed	42.3	163	42	\$1,757,186		B
2013	MEL-06	Garfield Street Ponds – Lot 12 (North)	Dry Detention Pond	Cancelled	0	0	0			B
2013	MEL-07	Garfield Street Ponds – Lot 24 (South)	Dry Detention Pond	Cancelled	0	0	0			B
2013	MEL-08	Education Efforts	Education Efforts	Completed	N/A	2,583	587			B
2013	MEL-09	Street Sweeping	Street Sweeping	Completed	N/A	793	508			B
2013	MEL-10	Autumn Woods	Wet Detention Pond	Underway	56.9	TBD	TBD	\$879,220		B
2013	MEL-11	Participation in Florida Yards and Neighborhoods (FYN) Program	Education Efforts	Completed	N/A	2,583	587			B
2015	MEL-12	South Croton Baffle Box	BMP Treatment Train	Completed	14.8	133	32	\$487,296		B
2015	MEL-13	Bell Street Baffle Box	Baffle Box – 2nd generation with media filter	Underway	127.2	1,877	467	\$300,000		B
2015	MEL-14	Paradise Baffle Box	Baffle Box – 2nd generation with media filter	Completed	125.6	126	17	\$19,000		B
2015	MEL-15	Garfield North Baffle Box	Baffle Box – 2nd generation with media filter	Underway	67	993	244	\$350,000		B
2015	MEL-16	Garfield South Baffle Box	Baffle Box –	Underway	11.8	176	43	\$150,000		B

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
			2nd generation with media filter							
2016	MEL-17	Sherwood Stormwater Quality Project	Wet Detention Pond	Planned	246.2	TBD	TBD	\$2,168,800		B
2016	MEL-18	Croton Road (Lime) Baffle Box	Baffle Box – 2nd generation with media filter	Completed	13.4	149	35			B
2016	MEL-19	Young Street Existing Baffle Box Upgrade	Baffle Box – 2nd generation with media filter	Completed	7	39	5	\$20,000		B
2017	MEL-20	Thrush Drive Baffle Box	Baffle Box – 2nd generation with media filter	Planned		TBD	TBD	\$450,000		B
2017	MEL-21	Cliff Creek Box	Baffle Box – 2nd generation with media filter	Planned		TBD	TBD	\$450,000		B
2017	MEL-22	Riverside Drive Septic to Sewer Conversion	Wastewater Service Area Expansion	Planned		TBD	TBD	\$215,000		B
2017	MEL-23	Leewood Forest Wetland and Baffle Box	Wetland Treatment	Planned		TBD	TBD	\$2,590,000		B

Total TN Project Reduction = 7,476 lbs/yr Total TP Project Reduction = 2,333 lbs/yr

Total TN Reduction Required = 44,920 lbs/yr Total TP Reduction Required = 13,120 lbs/yr

Table A-5. City of Rockledge projects in the North IRL

O&M = Operations and maintenance; TBD = To be determined

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	ROCK-01	Orange Avenue Baffle Box	Baffle Box – 2nd generation	Completed	10.4	16	2	\$8,600	\$2,555	B
2013	ROCK-02	Barton Avenue Baffle Box	Baffle Box – 2nd generation	Completed	27.1	35	5	\$9,350	\$2,555	B
2013	ROCK-03	Hardee Circle Baffle Box	Baffle Box – 2nd generation	Completed	14.6	16	2	\$43,420	\$2,555	B
2013	ROCK-04	Rockledge Avenue Baffle Box	Baffle Box – 2nd generation	Completed	41	73	14		\$3,682	B
2013	ROCK-05	Bougainvillea Drive Baffle Box	Baffle Box – 2nd generation	Completed	35.7	104	18	\$29,495	\$2,566	B
2013	ROCK-06	Park Avenue Baffle Box	Baffle Box – 2nd generation	Completed	13.2	9	1	\$52,529	\$2,555	B
2013	ROCK-07	Little John Lane Baffle Box	Baffle Box – 2nd generation	Completed	11.9	16	2	\$60,000	\$2,555	B
2013	ROCK-08	Fernwood Drive Baffle Box	Baffle Box – 2nd generation	Completed	12.9	14	2	\$55,750		B
2013	ROCK-09	Valencia Drive Baffle Box	Baffle Box – 2nd generation	Completed	22.9	38	6	\$58,960	\$2,555	B
2013	ROCK-10	Knollwood Baffle Box	Baffle Box – 2nd generation	Completed	24.3	26	3	\$68,248	\$3,682	B
2013	ROCK-11	Sutton Street Baffle Box	Baffle Box – 2nd generation	Completed	8	9	1			B
2013	ROCK-12	River Groves Baffle Box	Baffle Box – 2nd generation	Completed	7.4	5	0			B
2013	ROCK-13	Summer Place Baffle Box	Baffle Box – 2nd generation	Completed	9.8	7	1			B
2013	ROCK-14	Sweet Street Swale	Swales	Completed	8	38	5			B
2013	ROCK-15	Community Park of Rockledge Regional Facility Phase 1	Wet Detention Pond	Completed	25.6	5	1	\$50,000	\$23,974	B
2013	ROCK-16	Pineland Park Unit Three	Wet Detention Pond	Completed	54.3	1	0	\$100,000	\$6,234	B
2013	ROCK-17	Barton Park Regional Detention System	Wet Detention Pond	Completed	757	2,823	1,249	\$2,600,000	\$40,000	B

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	ROCK-18	Florida Avenue Stormwater Facility	Wet Detention Pond	Completed	25.2	76	50	\$435,000	\$40,950	B
2013	ROCK-19	Police Department Pond	Wet Detention Pond	Completed	39.1	16	5	\$350,000	\$7,035	B
2013	ROCK-20	Huntington Lakes I	Wet Detention Pond	Completed	36.9	1	0	\$950,000		B
2013	ROCK-21	Street Sweeping	Street Sweeping	Completed		498	319		\$54,000	B
2013	ROCK-22	Treatment Missing from Model	Monitoring/ Data Collection	Completed	383.2	1,248	477			B
2013	ROCK-23	Education Efforts	Education Efforts	Completed		1,541	347	\$2,385	\$0	B
2015	ROCK-24	Huntington Lakes II	Wet Detention Pond	Completed	133.5	TBD	TBD	\$900,000	\$15,000	B
2016	ROCK-25	Aquatic Harvesting	Aquatic Vegetation Harvesting	Completed		TBD	TBD			B
2016	ROCK-26	Breeze Swept Septic Phase-out	Wastewater Service Area Expansion	Underway		TBD	TBD	\$3,700,000	\$20,000	B
2016	ROCK-27	River Ridge Nondischarge	100 % Onsite Retention	Completed	35.3	190	39			B
2016	ROCK-28	Southwest Gus Hipp Conveyance	BMP Treatment Train	Completed		TBD	TBD	\$17,000		B
2016	ROCK-29	Gus Hipp Pond	Wet Detention Pond	Planned		TBD	TBD	\$335,000		B
2016	ROCK-30	Public Works Pond 1	Dry Detention Pond	Planned	5.7	4	1	\$5,000		B
2016	ROCK-31	Public Works Pond 2	Dry Detention Pond	Planned	7	13	3	\$10,000		B
2016	ROCK-32	School Triangle Pond	Dry Detention Pond	Planned	1.2	2	0	\$20,300		B
2016	ROCK-33	Barton Park Irrigation	Stormwater Reuse	Planned		TBD	TBD			B
2016	ROCK-34	Winchester Cove Nondischarge	100 % Onsite Retention	Completed	1.9	13	2			B

Total TN Project Reduction = 6,818 lbs/yr Total TP Project Reduction = 2,548 lbs/yr

Total TN Reduction Required = 13,967 lbs/yr Total TP Reduction Required = 3,960 lbs/yr

Table A-6. City of Titusville projects in the North IRL

N/A = Not applicable; O&M = Operations and maintenance; TBD = To be determined

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	TV-01	Area 1 Stormwater Improvements	Wet Detention Pond	Completed	432.2	1,019	412	\$2,151,510	\$4,797	A
2013	TV-02	Chain of Lakes Regional Stormwater Pond	Regional Stormwater Treatment	Completed	339.8	360	160		\$15,620	A
2013	TV-03	Draa Field Stormwater Park	Wet Detention Pond	Completed	105.1	771	312	\$1,661,443	\$15,000	A
2013	TV-04	St. Johns Basin Stormwater Improvements	Wet Detention Pond	Completed	882.1	317	1,156	\$1,854,254	\$8,000	A
2013	TV-05	St. Johns Basin Stormwater Improvements	Baffle Box – 2nd generation	Completed	882.1	1,510	216	\$167,343		A
2013	TV-06	Spaceview Park	Alum Treatment	Completed	110.6	1,153	378	\$2,300,000	\$15,000	A
2013	TV-07	Education Efforts	Education Efforts	Completed	N/A	1,522	292	\$2,500	\$5,000	A
2013	TV-08	Street Sweeping	Street Sweeping	Completed	N/A	1,012	649	\$188,120	\$63,106	A
2013	TV-09	Education Efforts	Education Efforts	Completed	N/A	56	6	\$2,500	\$5,000	B
2013	TV-10	Street Sweeping	Street Sweeping	Completed	N/A	104	67	\$188,120	\$63,106	B
2016	TV-11	Senior Center Pond Floating Islands	Floating Islands/ MAPS	Completed	624	719	87	\$52,536	\$43,720	A
2016	TV-12	Senior Center Ponds Littoral Zone Plantings	BMP Treatment Train	Completed	413.6	189	90	\$50,000		A
2016	TV-13	Royal Oak Littoral Zone Plantings	BMP Treatment Train	Completed	123.1	79	19	\$50,000		A
2016	TV-14	Main Street Baffle Box with Biosorption Activated Media (BAM)	Baffle Box – 2nd generation with media filter	Planned	296	TBD	TBD	\$300,000	\$4,000	A
2016	TV-15	Sycamore Street Baffle Box with BAM	Baffle Box – 2nd generation	Planned	300.1	TBD	TBD	\$300,000	\$4,000	A

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
			with media filter							
2016	TV-16	Knox Mc Rae Baffle Box	Baffle Box – 2nd generation with media filter	Planned	37.9	TBD	TBD	\$250,000	\$4,000	A
2016	TV-17	Coleman Basin TMDL Improvements	BMP Treatment Train	Planned	107	TBD	TBD			A
2016	TV-18	South Street Basin TMDL Improvements	BMP Treatment Train	Planned	235	TBD	TBD	\$380,000		A
2016	TV-19	St. Theresa Basin TMDL Improvements	BMP Treatment Train	Planned	314	TBD	TBD	\$250,000		A
2016	TV-20	La Paloma Basin TMDL Improvements	BMP Treatment Train	Planned	488	TBD	TBD	\$250,000		A
2016	TV-21	THS Basin TMDL Improvements	BMP Treatment Train	Planned	239.7	TBD	TBD			A
2016	TV-22	Brevard Street Basin TMDL Improvements	BMP Treatment Train	Planned	17.7	TBD	TBD			A
2016	TV-23	St. Johns 2nd Baffle Box TMDL Improvements	BMP Treatment Train	Planned	882.1	TBD	TBD			A
2016	TV-24	Marina Basin TMDL Improvements	BMP Treatment Train	Planned	271.2	TBD	TBD			A
2016	TV-25	Grace Basin TMDL Improvements	BMP Treatment Train	Planned	17.7	TBD	TBD			A
2016	TV-26	Miracle City Basin TMDL Improvements	BMP Treatment Train	Underway	2.5	TBD	TBD		\$500	A
2016	TV-27	South Marina Basin TMDL Improvements	BMP Treatment Train	Planned	322.9	TBD	TBD			A
2016	TV-28	SR 50 Basin TMDL Improvements	BMP Treatment Train	Planned	131.1	TBD	TBD			A
2016	TV-29	Commons Basin TMDL Improvements	BMP Treatment Train	Planned	4.4	TBD	TBD			A
2016	TV-30	Broad Street Basin TMDL Improvements	BMP Treatment Train	Planned	13.4	TBD	TBD			A

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2016	TV-31	Riverview Street Basin TMDL Improvements	BMP Treatment Train	Planned	7.3	TBD	TBD			A
2016	TV-32	THS 2 Basin TMDL Improvements	BMP Treatment Train	Planned	26.5	TBD	TBD			A

Total TN Project Reduction = 8,543 lbs/yr Total TP Project Reduction = 3,734 lbs/yr

Total TN Reduction Required = 44,346 lbs/yr Total TP Reduction Required = 9,653 lbs/yr

Table A-7. FDOT District 5 projects in the North IRL

N/A = Not Applicable; O&M = Operations and maintenance

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	FDOT-01	Education Efforts	Education Efforts	Completed	N/A	39	11			A
2013	FDOT-02	Street Sweeping	Street Sweeping	Completed	N/A	185	119			A
2013	FDOT-03	Fertilizer Cessation	Fertilizer Cessation	Completed		595	0			A
2013	FDOT-04	70100-3517-01 French Drains	100 % Onsite Retention	Completed	21.3	57	34			B
2013	FDOT-05	70100-3544-01 French Drains	100 % Onsite Retention	Completed	7	26	14			B
2013	FDOT-06	70020-3501-01 Pond 1	Wet Detention Pond	Completed	17.1	38	22			B
2013	FDOT-07	70020-3501-02A Pond 2A	Wet Detention Pond	Completed	12.6	35	19			B
2013	FDOT-08	70020-3501-02B Pond 2B	Wet Detention Pond	Completed	4.8	10	5			B
2013	FDOT-09	70020-3501-03 Pond 3	Wet Detention Pond	Completed	8.4	18	10			B
2013	FDOT-10	70020-3501-04 Pond 4	Dry Detention Pond	Completed	7.9	17	9			B
2013	FDOT-11	70020-3549-01 Pond 1	Wet Detention Pond	Completed	9.9	28	14			B
2013	FDOT-12	70020-3549-02 Pond 2	Wet Detention Pond	Completed	18.9	34	18			B
2013	FDOT-13	70020-3549-03 Pond 3	Wet Detention Pond	Completed	11.2	32	17			B
2013	FDOT-14	70020-3549-04 Pond 4	Wet Detention Pond	Completed	3.4	14	7			B
2013	FDOT-15	70020-3549-05 Pond 5	Wet Detention Pond	Completed	3.4	11	6			B
2013	FDOT-16	70140-3514-01 Pond A	Dry Detention Pond	Completed	1.5	4	2			B
2013	FDOT-17	70140-3514-02 Pond B	Wet Detention Pond	Completed	5.9	18	8			B
2013	FDOT-18	70120-3518-01 Pond 7	Wet Detention Pond	Completed	9.9	45	21			B

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	FDOT-19	70008-3505-01 Pond 1	Wet Detention Pond	Completed	2.3	6	3			B
2013	FDOT-20	Education Efforts	Education Efforts	Completed	N/A	86	28			B
2013	FDOT-21	Street Sweeping	Street Sweeping	Completed	N/A	616	395			B
2013	FDOT-22	Fertilizer Cessation	Fertilizer Cessation	Completed		1,552	0			B

Total TN Project Reduction = 3,466 lbs/yr Total TP Project Reduction = 762 lbs/yr

Total TN Reduction Required = 6974 lbs/yr Total TP Reduction Required = 3,074s/yr

Table A-8. KSC projects in the North IRL

O&M = Operations and maintenance

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	KSC-01	Landscape Fertilizer Reduction	Fertilizer Reduction	Completed		312	44			A
2013	KSC-02	Citrus Grove Termination Roberts Road	Fertilizer Reduction	Completed		140	557			A
2013	KSC-03	Citrus Grove Termination Schwartz Road	Fertilizer Reduction	Completed		256	308			A
2013	KSC-04	Storage Building L5-0734	Land Use Change	Completed	0.02	0	0			A
2013	KSC-05	Support Building L5-0683	Land Use Change	Completed	0.2	3	1			A
2013	KSC-06	Shuttle Landing Facility – missing from model	Wet Detention Pond	Completed	617.8	2,566	1,005			A
2013	KSC-07	Launch Pad 39A	Other Nonstructural BMP	Completed	456.5	1,255	326			A
2013	KSC-08	Launch Pad 39B	Other Nonstructural BMP	Completed	549	3,043	589			A

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	KSC-09	Schwartz Road Drainage System - missing from model	Impoundment	Completed	1,614.1	1,290	271			A
2013	KSC-10	Warehouse/Processing Area – missing from model	Wet Detention Pond	Completed	15.2	75	33			A
2013	KSC-11	Landscape Fertilizer Reduction	Fertilizer Reduction	Completed		312	44			B
2013	KSC-12	Citrus Grove Termination Jerome Road West	Fertilizer Reduction	Completed		184	851			B
2013	KSC-13	KARS II Racquetball Court M6-0328A	Land Use Change	Completed	0.1	1	0			B
2013	KSC-14	Visitor Center Storage Building M6-0503	Land Use Change	Completed	0.1	1	0			B
2013	KSC-15	Causeway Wetland Mitigation	Wet Detention Pond	Completed	12.6	8	4			B
2013	KSC-16	Visitors Complex/ NASA Badging Center	Wet Detention Pond	Completed	131.7	452	169			B
2013	KSC-17	NASA Parkway West	Swales	Completed	135.8	239	101			B
2014	KSC-18	Demolition of Facility J6-2377	Land Use Change	Completed	0.1	1	0			A
2015	KSC-19	Demolition of Facility M5-1546	Land Use Change	Completed	5.00	76	16			B

Total TN Project Reduction = 10,214 lbs/yr Total TP Project Reduction = 4,319 lbs/yr

Table A-9. Town of Indialantic projects in the North IRL

N/A = Not Applicable; O&M = Operations and maintenance

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	TI-01	Swales North of U.S. Highway 192 Causeway	Swales	Completed	29.2	297	52			B
2013	TI-02	100 % Onsite Retention	Retention BMP	Completed	3.5	35	6			B
2013	TI-03	Education Efforts	Education Efforts	Completed	N/A	18	3			B

Total TN Project Reduction = 350 lbs/yr Total TP Project Reduction = 61 lbs/yr

Total TN Reduction Required = 947 lbs/yr Total TP Reduction Required = 200 lbs/yr

Table A-10. Town of Palm Shores projects in the North IRL

N/A = Not Applicable; O&M = Operations and maintenance

Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	PS-01	Education Efforts	Education Efforts	Completed	N/A	21	4			B

Total TN Project Reduction = 21 lbs/yr Total TP Project Reduction = 4 lbs/yr

Table A-11. Volusia County projects in the North IRL

N/A = Not Applicable; O&M = Operations and maintenance; TBD = To be determined

N/A = Not applicable Year Project Added	Project Number	Project Name	Project Type	Project Status	Acres Treated	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	Cost	Cost Annual O&M	Project Zone
2013	VC-01	Education Efforts	Education Efforts	Completed	N/A	588	67			A
2017	VC-02	Roadside Ditch Cleaning	BMP Cleanout	Completed		TBD	TBD			A
2017	VC-03	Open Channel Cleaning	BMP Cleanout	Completed		TBD	TBD			A

Total TN Project Reduction = 588 lbs/yr Total TP Project Reduction = 67 lbs/yr

Appendix B. Water Quality Trend Analysis Methodology and Results

Water quality trend analyses were performed on data from select tributary stations in the North IRL Basin. The most current data for Stations IRLTBC, ODIIX, and TC2 were obtained from STORET. STORET data were processed using the methods described below, and only data that met quality control objectives were used in the analysis.

Nonparametric statistical techniques were used to identify monotonic trend analyses in a statistically rigorous way with the Seasonal Mann-Kendall trend test. Data are not required to conform to a particular distribution for nonparametric analyses. Nonparametric tests are also robust against outliers and large data gaps.

Methods

STORET data were processed according to the following methods (in order of operation):

Total Nitrogen (TN) Calculation

"Total Nitrogen" data was calculated for dates where both "Nitrite + Nitrate" and "Total Kjeldahl Nitrogen" data existed, but "Total Nitrogen" data did not. "Total Nitrogen" was calculated as the summation of "Total Kjeldahl Nitrogen" and "Nitrite + Nitrate."

Sample Depth

If "surface water," "midwater," and "bottom" samples were collected at a station for the same parameter on the same day, then only the "surface water" sample was retained for analysis.

Only surface samples, which included samples collected at depths less than 1 meter (m), were used in the analyses.

Data Qualifiers

Data with result qualifiers of "A," "F," "G," "H," "J," "K," "L," "N," "O," "T," "V," "Y," or "?" were not used in the analysis, per Table 1, Data Qualifier Codes, in Rule 62-160.700, Florida Administrative Code (F.A.C.), Quality Assurance, and per guidance from Kevin O'Donnell in the DEP Water Assessment Standards Program.

Data with a result qualifier of "I" were only used if a corresponding minimum detection level (MDL) was listed.

Data with a result qualifier of "U" were reviewed as follows:

- If not already present, a result qualifier of "U" was assigned to any data with a result value of "*Non-Detect."
- Data with a result value of "*Not Reported" were deleted unless they also had a value qualifier of "U."

- Data with a result qualifier of "U" were processed in accordance with Rule 62-303.320 (12), F.A.C., Aquatic Life-Based Water Quality Criteria Assessment. Results reported by a laboratory with the "U" data qualifier code were assessed as half the reported result or half the criterion (whichever was lower).

Sample Frequency

Samples collected on the same day at the same site were averaged by station.

To be treated as temporally independent, samples must be collected at least four days apart.

A median value was calculated for samples collected within a four-day period at the same station.

Field replicate and field blank samples were not used in the analysis.

Results

IRLTBC Station

Data for the IRL Turnbull Creek (IRLTBC) station were processed for the period from 2000 to 2016. Sufficient data were available for monthly distribution using the Seasonal Mann-Kendall regression analysis. TP concentration exhibited a significant increasing trend between 2000 and 2016 ($p < 0.05$). The median TP concentration for this period was 0.146 milligrams per liter (mg/L).

The TN concentration was calculated as the sum of total Kjeldahl nitrogen (TKN) concentration and nitrate/nitrite concentration. The TN concentration trend for IRLTBC increased significantly ($p < 0.05$) from 2000 to 2016. The median TN concentration for this period was 1.709 mg/L. Numerous data were not included in the statistical analyses because the detection limit was not provided for nitrite/nitrate.

ODIX Station

No additional data have been uploaded to STORET for this station since 2016. Although data have been collected periodically since 2011, Seasonal Mann-Kendall analysis is not possible because only 2 data points are available for the fourth quarter between 2011 and 2016. Median TN and TP concentrations were 2.04 and 0.17 mg/L, respectively.

TC2 Station

No additional data have been uploaded to STORET for this station since 2016. Data provided by Volusia County for the TC2 station (Canal at Watson Stanley Road) covered a period of less than 2 years (May 2014–January 2016) and are insufficient for the Seasonal Mann-Kendall analysis. The median TP concentration was 0.23 mg/L, and the median TN concentration was 1.50 mg/L.

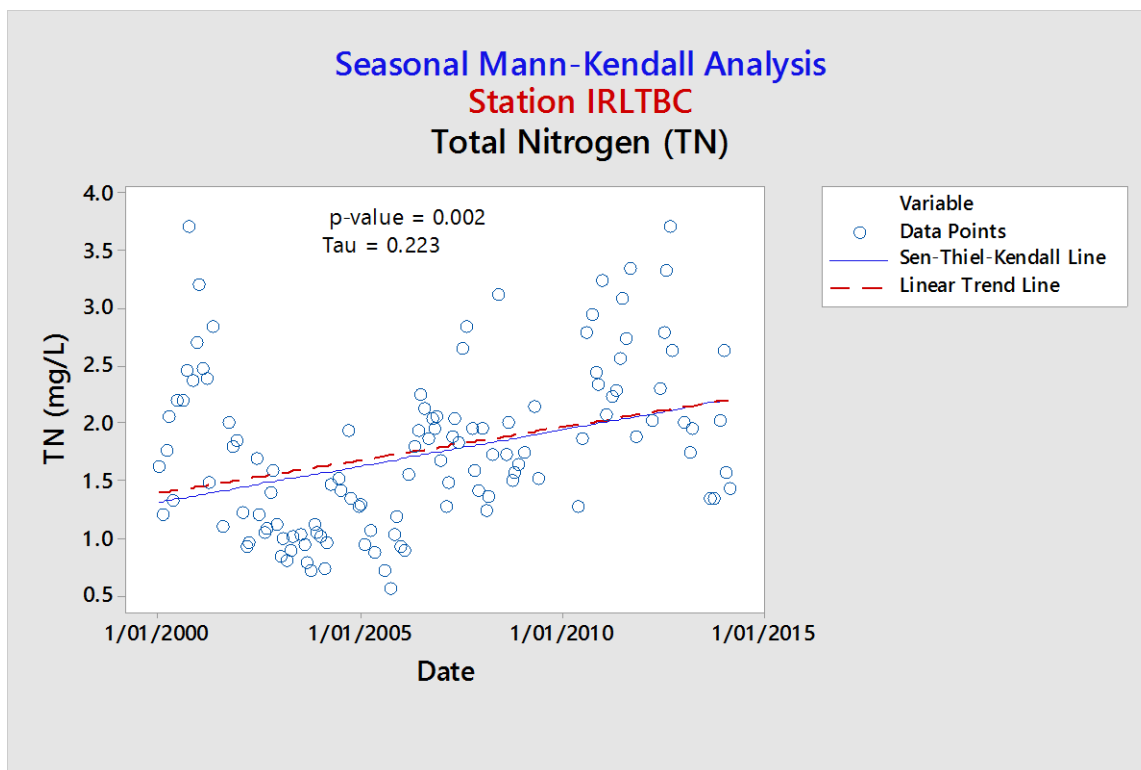


Figure B-1. Station IRLTBC TN trend analysis results

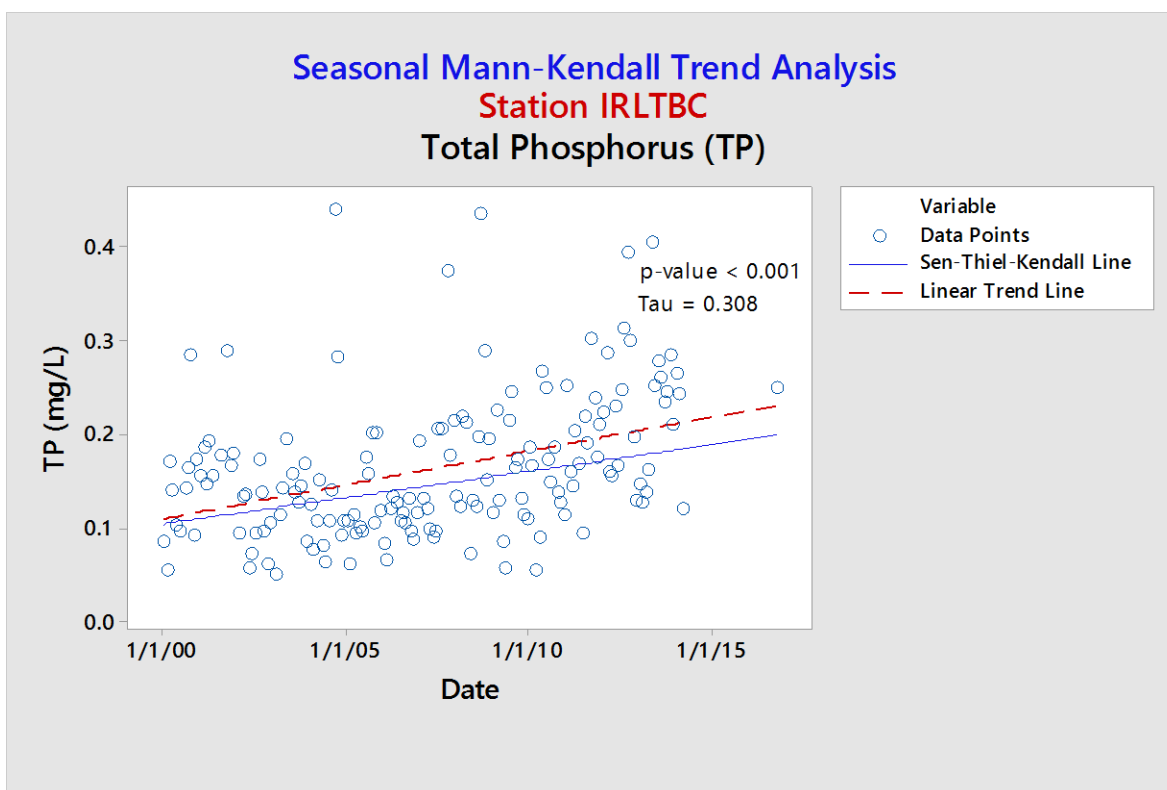


Figure B-2. Station IRLTBC TP trend analysis results