Chapter 4: Nutrient Source Control Programs

Edited by William Baker, Jonathan Madden and Pamela Wade

SUMMARY

Source control program requirements were established by legislation for the Northern and Southern Everglades areas depicted in **Figure 4-1**. The Northern Everglades and Estuaries Protection Program (NEEPP) [Section 373.4595, Florida Statutes (F.S.)] established source control requirements for the Lake Okeechobee, Caloosahatchee River and Estuary, and St. Lucie River and Estuary watersheds (the Northern Everglades), with varying levels of responsibility accorded to each of the coordinating agencies — the South Florida Water Management District (District or SFWMD), Florida Department of Agriculture and Consumer Services (FDACS), and Florida Department of Environmental Protection (FDEP). The Everglades Forever Act (EFA) (Section 373.4592, F.S.) established source control requirements for the Everglades Construction Project (ECP) basins and the non-Everglades Construction Project (non-ECP) basins in the Southern Everglades with primary responsibility assigned to the District. The agencies implement their respective programs through specific rules promulgated by each agency based on statutory authorizations.

This chapter and related appendices (Appendices 4-1 through 4-4) of the *2013 South Florida Environmental Report* (SFER) – *Volume I* provide the Water Year 2012 (WY2012) (May 1, 2011–April 30, 2012) update on the nonpoint source control programs mandated by the NEEPP and the EFA. The nonpoint source control programs provide a consistent and holistic approach while recognizing the unique source control issues of each watershed. These programs address the reduction of pollutants through on-site measures that prevent or reduce pollution at its source, such as agricultural and urban best management practices (BMPs) and regulations. Nonpoint source control programs along with regional construction projects and point source programs are needed to achieve mandated water quality standards, including total maximum daily loads (TMDLs). Construction projects and point source programs are described in the protection plans discussed below and permit-specific reports are provided in the 2013 SFER – Volume III. A successful source control program must be cost effective and include comprehensive BMP plans, deadlines for implementation, verification of implementation, water quality monitoring, performance evaluation, and research and demonstration projects. Comprehensive BMP plans include on-site nutrient management practices as well as minimize off-site nutrient transport through water management and sediment controls.

Source control is an integral component of Northern and Southern Everglades restoration and protection programs. For the Northern Everglades, source control program planning is incorporated into the Lake Okeechobee Protection Plan, which was updated in 2011 (SFWMD et al., 2011), and the 2012 updates to the Caloosahatchee and St. Lucie River watershed protection plans presented in the 2012 SFER (Balci and Bertolotti, 2012a; Bertolotti and Balci, 2012b). For the Southern Everglades, source control program planning is incorporated into the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area (Long-Term Plan) (Burns and McDonnell, 2003).

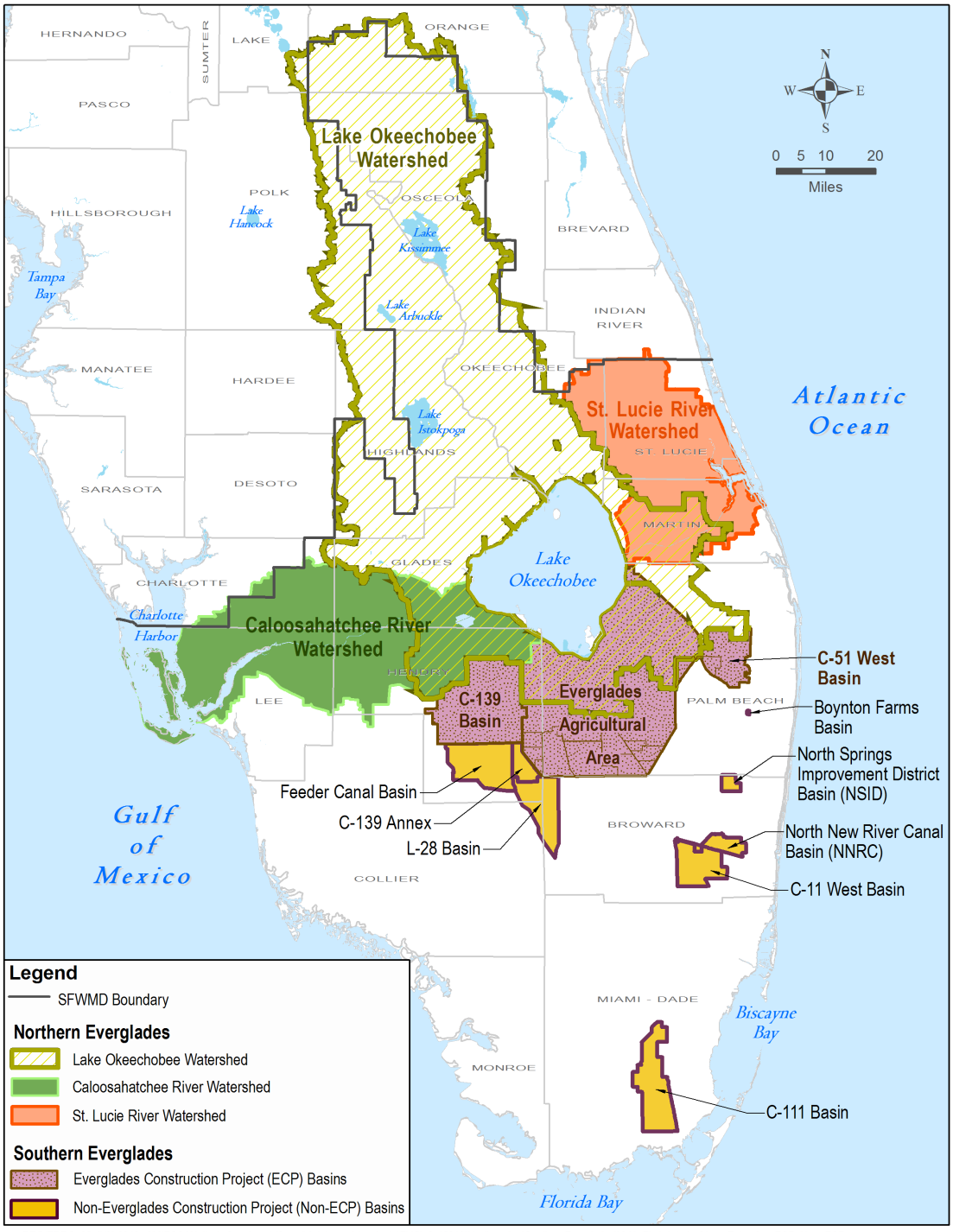

Figure 4-1. The Northern Everglades and Southern Everglades source control program implementation areas. [Note: Watershed areas are based on most recent hydrologic boundaries and may differ from areas shown in previous reports.]

WATER YEAR 2012 NUTRIENT SOURCE CONTROL HIGHLIGHTS

An overview of nutrient source control program status and related activities during WY2012 is presented below. A summary of the WY2012 discharge total phosphorus (TP) load by sub-watershed is provided in **Table 4-1**.

Lake Okeechobee Watershed

- Preliminary performance measures for TP for the Lake Okeechobee Watershed were developed. Performance measures are procedures established from available historic data that the District will follow to determine whether a hydrologic unit has discharged at or below an annual basin-specific nutrient level adjusted for hydrologic variability as applicable. The determination requires an annual calculation of nutrient levels leaving the individual hydrologic units.
- The Lake Okeechobee Watershed Assessment Monitoring Network was reviewed to reduce sampling visits during the dry season when sites are generally not flowing.
- Continued development and implementation of the data sharing process with the FDACS for tracking landowner participation and implementation of FDACS agricultural BMPs under their Notice of Intent process.

Caloosahatchee and St. Lucie River Watersheds

- Preliminary performance measures for TP and total nitrogen (TN) for the St. Lucie River Watershed were developed, followed by sensitivity analyses on the use of alternate base periods and rainfall stations, along with preparation of documents for public workshops. Development of performance measures for TP and TN for the Caloosahatchee Watershed is under way and focused on developing data inventories for the tidal and coastal sub-watersheds.
- Water quality monitoring networks to evaluate performance measures under a regulatory program were defined. In-depth reviews of historic data were conducted to ensure data are adequate to support a regulatory program. Hydrologic evaluations to improve the delineation of tributary areas are under way.

Everglades Agricultural Area Basin

- The Everglades Agricultural Area (EAA) achieved a 71 percent [154 metric tons (mt)] TP load reduction for WY2012 compared with the predicted load from the pre-BMP baseline period adjusted for rainfall. The total cumulative reduction in TP loads due to BMP implementation since WY1996 is 2,565 mt, which represents a long-term reduction of 55 percent overall.
- Post-permit compliance activities were continued by the District. BMP inspections were emphasized using a prioritized list based on an analysis of farm-level monitoring results for WY2011, farm location, water quality history, size, and date of previous inspection.
- Research on improving BMP effectiveness through the control of floating aquatic vegetation continued through a cooperative effort between the District and the EAA Everglades Protection District.

C-139 Basin

- WY2012 was the first year of full implementation of comprehensive BMP plans as outlined in the amended Chapter 40E-63, Florida Administrative Code (F.A.C.).
- Discharges from the C-139 Basin carried 15 mt of TP load, which is below the predicted load from the pre-BMP baseline period adjusted for rainfall.
- Monitoring and data analyses efforts to identify upstream TP sources and potential water quality improvement projects that can be developed to control those sources were assessed for optimization by the District.
- The District ensured that technical information continued to be developed through research and demonstration projects to improve BMP efficiencies within the basin.

Non-ECP Basins

- The total TP load of 13 mt discharged to the Everglades Protection Area (EPA) from the non-ECP basins during WY2012 represents continued decreased TP loads largely due to basin diversions and water quality improvement efforts.
- The L-28 Weir Demonstration Project, the C-111 Spreader Canal Western Project, and other projects, as well as county cost-shared outreach and education, in the non-ECP basins supported continued water quality improvements in discharges to the EPA.

Table 4-1. Summary of Water Year 2012 (WY2012) (May 1, 2011–April 30, 2012) discharge total phosphorus (TP) load[1] by sub-watershed.

Sub-watershed	Watershed[2]	Area[3] (acres[4])	TP Load (metric tons)	TP Unit Area Load (pounds per acre[5])
Upper Kissimmee	LOW	1,028,421	62	0.13
Lower Kissimmee	LOW	429,188	110	0.56
S-133	LOW	25,626	0.3	0.03
S-135	LOW	17,756	0	0.00
S-154	LOW	31,815	6	0.42
S-154C	LOW	2,134	1	0.67
S-191	LOW	119,402	31	0.58
Lake Istokpoga	LOW	394,203	17	0.10
Indian Prairie	LOW	276,577	33	0.26
Fisheating Creek	LOW	298,713	24	0.17
Nicodemus Slough	LOW	19,329	0.4	0.04
L-8	LOW	106,440	10	0.20
South Lake Okeechobee[6]	LOW/ECP	321,169	2	NA[7]
S-4	LOW/CRW	42,145	11	0.57
East Caloosahatchee	CRW/LOW	204,094	34	0.37
West Caloosahatchee	CRW	350,114	97	0.61
Tidal Caloosahatchee	CRW	264,705	NA[8]	NA[8]
Coastal Caloosahatchee	CRW	229,322	NA[8]	NA[8]
C-25/C-25E	SLRW	114,464	62	1.19
North Fork	SLRW	114,909	NA[8]	NA[8]
C-24	SLRW	87,770	55	1.38
C-23	SLRW	114,094	28	0.54
North and South Mid-estuary	SLRW	6,019	NA[8]	NA[8]
Basins 4 and 5	SLRW	10,193	NA[8]	NA[8]
Basin 6	SLRW	4,863	NA[8]	NA[8]
South Fork	SLRW	48,089	NA[8]	NA[8]
South Coastal	SLRW	7,914	NA[8]	NA[8]
C-44	SLRW/LOW	132,572	10	0.17
Everglades Agricultural Area[9]	ECP	470,324	63	0.29
C-139[9]	ECP	168,450	15	0.20
C-11 West[10]	Non-ECP	45,728	3	0.17
North New River Canal	Non-ECP	17,904	no flow[11]	no flow[11]
North Springs Improvement District	Non-ECP	7,022	no flow[11]	no flow[11]
Feeder Canal	Non-ECP	68,883	3	0.08
L-28	Non-ECP	71,790	5	0.16
C-111	Non-ECP	72,902	2	0.05
Boynton Farms	Non-ECP	217	NA[8]	NA[8]

[1] This differs from loads presented in Chapter 8 of this volume because Chapter 8 focuses solely on TP loads entering Lake Okeechobee.

[2] LOW = Lake Okeechobee Watershed, CRW = Caloosahatchee River Watershed, SLRW = St. Lucie River Watershed, ECP = Everglades Construction Project basins, Non-ECP = Non-Everglades Construction Project basins

[3] Sub-watershed acreage is based on most recent hydrologic boundaries and may differ in total acreage from previous reports.

[4] 1 acre = 0.4047 hectares.

[5] 1 pound per acre = 1.12 kilogram per hectare.

[6] The South Lake Okeechobee Sub-watershed load includes TP load into Lake Okeechobee only.

[7] NA – not available. The unit area load for the South Lake Okeechobee Sub-watershed is not presented in this table because the sub-watershed can also discharge south to the stormwater treatment areas (STAs)/Everglades Protection Area (EPA), and therefore, the TP load presented does not represent the total TP load from the area.

[8] NA – not available. No instrumentation is in place for flow and/or water quality monitoring.

[9] The Everglades Construction Project (ECP) basins discharges receive further treatment downstream through the STAs prior to discharge to the EPA.

[10] The C-11 West Basin flows west to Water Conservation Area 3A through pumps S-9 and S-9A to the EPA, and also flows east through S-13A. The reported unit area load represents only the portion of TP load directed to the EPA.

[11] No discharges to the EPA during WY2012.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION POLLUTANT SOURCE CONTROL PROGRAMS

The FDEP is responsible for source control programs as outlined in the NEEPP and watershed protection plans. Description of FDEP source control activities can be found in the three-year update to the river watershed protection plans in Chapter 4 of the 2012 SFER – Volume I and Appendices 10-1 and 10-2, as well as the Lake Okeechobee Protection Plan 2011 Update (SFWMD et al., 2011).

OVERVIEW OF SOUTHERN EVERGLADES SOURCE CONTROL PROGRAMS

William Baker

The Southern Everglades source control program is one of several strategies to achieve water quality standards in the Everglades Protection Area (EPA). The program includes implementation of phosphorus reduction BMPs and regulatory, voluntary, and educational programs as well as integration of state, local, and regional water quality projects. The Everglades Forever Act (EFA), Section 373.4592, F.S., outlines the District's responsibilities and schedules to implement basin-specific solutions to control phosphorus at the source.

The EFA mandates specific performance levels for controlling phosphorus in discharges from the Everglades Agricultural Area (EAA) and C-139 basins that discharge to the Everglades Construction Project (ECP) basins. For other basins that discharge to the EPA [the non-Everglades Construction Project (non-ECP) basins], the EFA requires the FDEP to issue long-term compliance permits to the District to regulate phosphorus levels in discharges. BMP implementation guidelines are outlined in a District regulatory rule (Chapter 40E-63, F.A.C., available at www.sfwmd.gov/rules) for the EAA and C-139 ECP basins, and through FDEP Permit Number 06, 502590709 for non-ECP basins. The District is required to implement, monitor, optimize, and annually report on each basin's progress on an Everglades phosphorus source control strategy in accordance with the EFA.

The District has identified all basins with discharges to the EPA in which phosphorus source control programs are to be implemented (**Figure 4-1**). Background and details of these source control programs, including requirements for (1) implementing BMP plans, discharge monitoring plans, and water quality improvement plans (WQIPs), (2) research and demonstration projects, (3) data evaluation, (4) compliance methodologies and determinations, and (5) educational and outreach activities, have been extensively reported in previous SFERs.

The District must comply with specific EFA source control requirements stipulated in permits issued by the FDEP [i.e., ECP stormwater treatment area (STA) and non-ECP permits]. These permits incorporate a comprehensive approach for controlling phosphorus, including implementation of source controls through the utilization of regulatory, cooperative, and educational programs. The District is required by these permits to annually report on the results of these programs. This chapter and related Volume I and Volume III appendices serve as the reporting mechanisms to fulfill this requirement.

Continued implementation of mandatory BMP programs in the EAA and C-139 basins and WQIPs in non-ECP basins, and achievement of the required levels of performance in TP loading from these basins are necessary for the District to achieve the phosphorus criterion in the EPA and fulfill its obligations under the EFA and the federal Everglades Settlement Agreement (Settlement Agreement dated July 26, 1991, Case No. 88-1886-CIV-MORENO, United States

District Court for the Southern District of Florida, as modified by the Omnibus Order entered in the case on April 27, 2001). During WY2012, the District continued to implement the source control activities on a basin-specific basis. Detailed updates on these activities are provided in the *Status of Source Control in the ECP Basins* and *Status of Source Control in the Non-ECP Basins* sections of this chapter. Supplemental information for the ECP and non-ECP basins is provided in Appendices 4-2 and 4-3 of this volume, respectively.

The long-term Everglades water quality goal is for all discharges to the EPA to achieve and maintain water quality standards in the EPA, including compliance with the TP criterion established in Rule 62-302.540, F.A.C. This goal will be accomplished through a combination of TP control strategies, for example, STAs (see Chapter 5 of this volume) and alternative treatment technologies (see Chapter 8 of this volume) integrated with other regional water management projects in a comprehensive approach. Controlling phosphorus at the source is a critical component of water quality improvement strategies in the Everglades restoration program.

STATUS OF SOURCE CONTROL IN THE ECP BASINS

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BACKGROUND

For the EAA and C-139 basins, the EFA mandates a nonpoint regulatory source control program to implement BMPs to control phosphorus at the source and a monitoring program to assess program effectiveness [Section 373.4592(4)(f), F.S.]. The EFA further mandates that Chapter 40E-63, F.A.C., is to outline the specific methodology and permissible TP loading levels for both basins based on historical data or baseline periods defined in the EFA. Achieving TP load requirements from these tributary basins is critical to the success of the ECP because the STAs were designed based on historical data and an expected range of inflow TP loads. The source control program's mandated implementation of BMPs in the EAA and C-139 basins are the primary regulator of TP loads in discharges from the basins prior to inflow to an STA. Along with the design characteristics of the STAs, performance of an STA in reducing TP concentrations to meet EPA water quality standards relies on the level of phosphorous discharged to the STA for treatment.

The EFA mandates an agricultural privilege tax for both the EAA and C-139 basins to be used towards the funding of the ECP. For the EAA, the legislature provided a tax incentive credit against the EAA agricultural privilege tax for any phosphorous load reductions achieved in excess of 25 percent to encourage BMP performance and maximize load reductions. The minimum tax rate for the EAA with incentive credits is $24.89 per acre for notices mailed out through November 2013. For notices mailed out from November 2014 to November 2016 the tax rate will not include incentive credits and will be $25 per acre. For notices mailed out November 2017 and thereafter, the tax rate will reduce to $10 per acre. For the C-139 Basin, the tax rate is set at $4.30 per acre, which will reduce to $1.80 per acre for tax notices mailed out November 2014 and thereafter. Further details can be found in Appendix 4-2.

The EAA Basin is required to achieve a 25 percent reduction of the TP loads discharged when compared to the pre-BMP baseline period as defined in the EFA. The specific compliance methodology to assess if the 25 percent reduction goal is being met is also defined in Chapter 40E-63, F.A.C., and outlined in the *Water Year 2012 Phosphorus Results* section.

If the EAA Basin is determined to be out of compliance, then, in accordance with the rule, the data collected by the individual permittees under an approved discharge monitoring plan for each farm are used as a secondary compliance method. This secondary method assesses individual farm TP load contributions and individual farm compliance. However, the rule does not have a provision for use of TP load data from individual farms for determining compliance when the basin-level TP load reduction requirement is met. The District collects monitoring data from the EAA Basin at discharge locations to evaluate the overall effectiveness of the BMPs in achieving and maintaining compliance with the TP load reduction requirement.

For the C-139 Basin to be in compliance, it must also meet phosphorus levels relative to the EFA-defined baseline period using specific methods defined within Chapter 40E-63, F.A.C. Unlike the EAA, which has a load reduction requirement of 25 percent, the C-139 Basin mandate is to maintain the historical load levels observed during the baseline period.

The EFA states that if the C-139 Basin is out of compliance, actions required from individual landowners are conditioned on the proportional share of the TP load discharged from the basin. A secondary compliance determination (specified in Chapter 40E-63, F.A.C.) for individual landowners in the C-139 Basin is an optional farm-level compliance and monitoring program. However, since permittees in the C-139 Basin are not required to collect water quality and quantity data to characterize farm-level discharges, a water quality and quantity monitoring network for upstream areas throughout the basin is used by the District to differentiate the relative contribution of the hydrologic sub-basins within the C-139 Basin that will support water quality improvement activities if necessary. The specific procedures for determining EAA and C-139 Basin compliance, basin-level data collection efforts, and farm-level discharge monitoring results are outlined in Appendix 4-2.

Investigation to improve the selection, design criteria, and implementation of BMPs is ongoing and occurs through different mechanisms based on the factors specific to each basin. This section provides a WY2012 update on compliance with TP loading limits and source control strategies for the EAA and C-139 basins. The compliance update includes WY2012 phosphorus results, monitoring program updates, short-term and long-term variations, and investigative issues. The source control strategies update includes program accomplishments, ongoing activities, and planned initiatives.

EVERGLADES AGRICULTURAL AREA BASIN UPDATE

During WY2012, the TP loads discharged from the EAA Basin decreased by 71 percent compared to the predicted load from the pre-BMP baseline period adjusted for hydrologic variability associated with rainfall. This represents the seventeenth consecutive year the EAA Basin was in compliance. Because the EAA Basin has been in compliance each year since the program's inception, the secondary compliance method at the permit-level has not been necessary. Although permit-level compliance determination was not necessary, the data provided indicates a low overall permit-level discharge rate similar to WY2011 as compared to years prior to WY2011. Representative monitoring locations for determining WY2012 compliance with the TP load reduction requirement are shown in **Figure 4-7**.

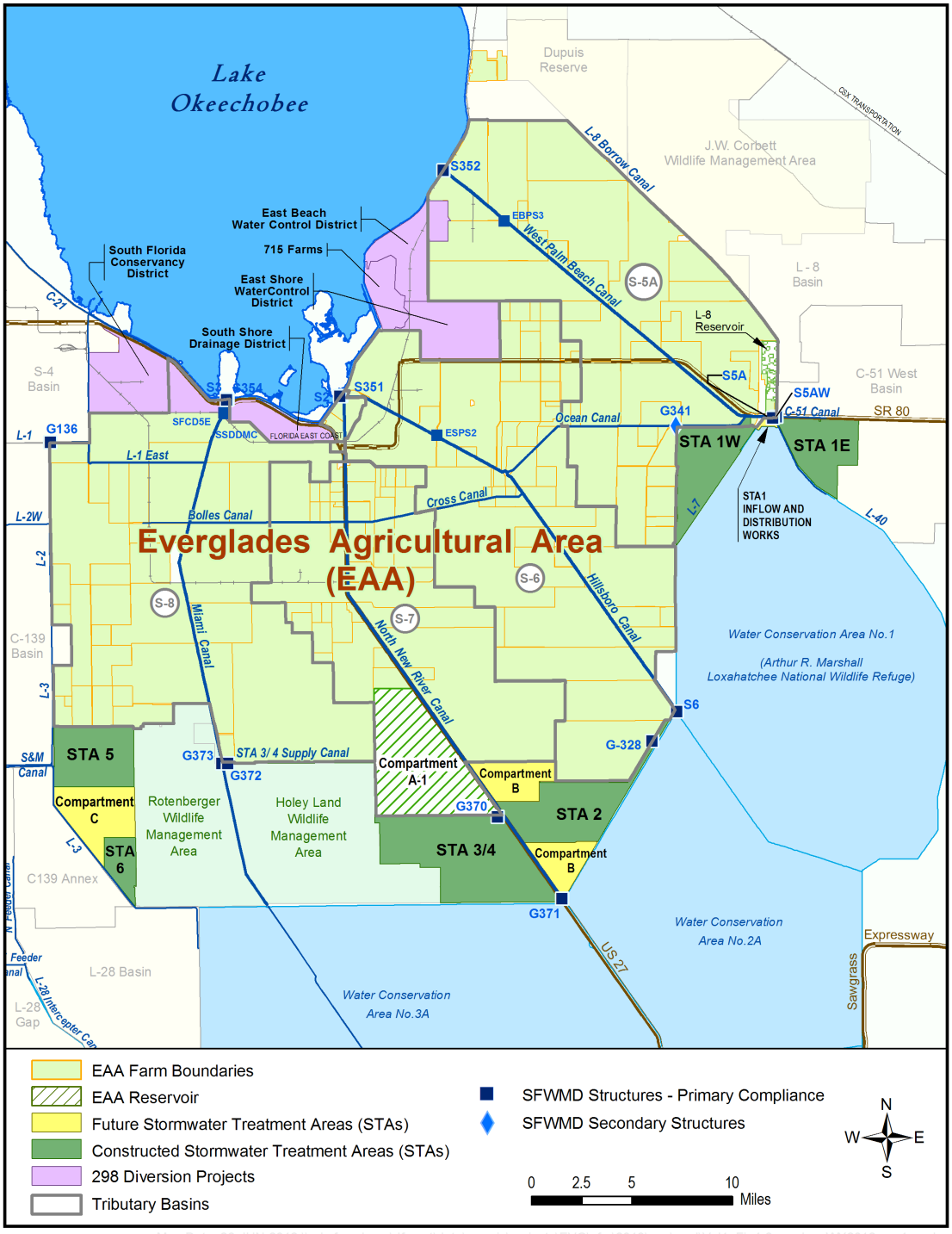

Figure 4-7. Water Year 2012 (WY2012) (May 1, 2011–April 30, 2012) Everglades Agricultural Area (EAA) Basin boundaries and primary compliance water control structures.
[Note: STA – Stormwater Treatment Area, 1E – 1 East, and 1W – 1 West

Water Year 2012 Phosphorus Results

This section provides an update on the observed WY2012 TP loads in comparison to the basin's EFA-mandated load limits as defined by Chapter 40E-63, F.A.C. Additional detailed information on the EAA Basin-level monitoring program and summaries of sub-basin flows, related TP loads, and TP flow-weighted mean (FWM) concentrations are presented in Appendix 4-2 of this volume.

Table 4-5 provides a summary of the EAA WY2012 results for the observed and performance measure TP loads in metric tons (mt). The observed load is based on flow and water quality data measured during the water year. The target load is the pre-BMP baseline period load modeled by multiple linear regression at a 25 percent reduction to reflect the EFA reduction requirement. The application of the regression model to the current water year rainfall characteristics accounts for the hydrologic variability between WY2012 and the baseline period. Target loads are evaluated based on exceedance for three consecutive years to verify noncompliance at a theoretical confidence level of 87.5 percent. The limit load is calculated based on the 90th percentile confidence level of the target load. The limit load provides for a higher theoretical confidence level to verify noncompliance based on an exceedance in a single year. The two-tiered target and limit evaluations balance the EFA requirement and possible statistical error in the regression model. The predicted load is the modeled pre-BMP baseline period load prior to reductions considering current water year rainfall characteristics. Details of target and limit load calculations and performance evaluation can be found in Appendix 4-1 of this volume and Chapter 40E-63, F.A.C. **Table 4-5** also summarizes TP concentrations in parts per billion (ppb) [1 ppb = 1 microgram per liter (µg/L)].

Table 4-5. Results of WY2012 Everglades Agriclutural Area (EAA) Basin TP compliance calculations.

	TP Load
Predicted TP load (adjusted for WY2012 rainfall amounts and monthly distribution relative to baseline period)[1]	217 metric tons (mt)
Target TP load (Predicted TP load reduced by 25 percent)	163 mt
Limit TP load (upper 90 percent confidence limit for target load)	223 mt
Observed WY2012 TP load from the EAA with BMPs implemented	63 mt
WY2012 TP load reduction (relative difference between observed and predicted TP loads)	71%
Five-year average TP load reduction	61%

	TP Concentration
Observed annual average EAA TP concentration prior to BMP implementation (WY1980–WY1988)[1]	173 parts per billion (ppb)
Observed WY2012 TP concentration from the EAA with BMPs implemented	93 ppb
Five-year (WY2008–WY2012) flow-weighted mean (FWM) TP concentration	111 ppb

[1]The baseline period of record is October 1978–September 1988 in accordance with Everglades Forever Act (EFA) requirements. Under Chapter 40E-63, F.A.C. compliance is based on whole water year periods (May 1–April 30) that fall within the October 1978–September 1988 range, that is, WY1980–WY1988 (May 1, 1979–April 30, 1988).

Table 4-6 summarizes data for all calculated water years. This table presents observed and predicted TP data and annual rainfall and flow measurements. The TP values presented are attributable only to the EAA Basin (farms, cities, and industries) and do not represent the cumulative TP being discharged through the EAA boundary structures from all sources.

Table 4-6. WY1980–WY2012 EAA Basin TP measurements and calculations.

Water Year	Observed TP Load[1] (mt)	Predicted TP Load[2] (mt)	Percent TP Load Reduction[3]	Annual Rainfall (inches)	Annual Flow (10^3 ac-ft)[4]	Annual FWM Concentration (ppb)	Baseline and BMP Status Timeline[5]
1980	167	154	-9%	53.5	1,162	117	Baseline Period
1981	85	98	13%	35.1	550	126	
1982	234	255	8%	46.7	781	243	
1983	473	462	-2%	64.4	1,965	195	
1984	188	212	11%	49.8	980	155	
1985	229	180	-27%	39.7	824	225	
1986	197	240	18%	51.2	1,059	151	
1987	291	261	-12%	52.0	1,286	183	
1988	140	128	-9%	43.4	701	161	
1989	183	274	33%	39.7	750	197	Pre-BMP Period
1990	121	120	-1%	40.1	552	177	
1991	180	219	17%	50.4	707	207	
1992	106	179	41%	47.6	908	94	
1993	318	572	44%	61.7	1,639	157	
1994	132	160	17%	50.5	952	112	
1995	268	388	31%	67.0	1,878	116	
1996[6]	162	503	68%	56.9	1,336	98	
1997	122	240	49%	52.0	996	100	
1998	161	244	34%	56.1	1,276	102	
1999	128	249	49%	43.4	833	123	
2000	193	425	55%	57.5	1,311	119	
2001	52	195	73%	37.3	667	64	
2002	101	227	55%	49.1	1,071	77	
2003	81	125	35%	45.6	992	66	
2004	82	229	64%	46.8	961	69	
2005	182	444	59%	51.0	1,190	124	
2006	153	270	44%	50.1	1,035	119	
2007	150	182	18%	37.2	727	166	
2008	94	167	44%	47.0	619	123	
2009	129	407	68%	43.7	877	119	
2010	169	288	41%	61.9	1,079	127	
2011	45	219	79%	42.0	517	71	Everglades Rule BMPs
2012	63	217	71%	44.4	546	93	

[1]TP values are attributable only to the EAA Basin (farms, cities, and industries) and do not represent the cumulative TP being discharged through the EAA boundary structures from all sources such as Lake Okeechobee and the 298 Districts.

[2]Predicted TP load represents the baseline period load adjusted for rainfall variability.

[3] Percent TP load reduction values for WY1980–WY1988 represent the compliance model calibration period.

[4]10^3 ac-ft = thousands of acre-feet.

[5]Dashed vertical line indicates the period for which BMPs were not fully implemented from WY1992 to WY1995.

[6]1996 was the first year of compliance measurement for the EAA Basin.

The EAA Basin percent TP load reduction trend is presented in **Figure 4-8**. The solid line shows the five-year trend of percent load reduction. The diamond (¨) symbol represents the annual measurements. An upward trend in the solid line in **Figure 4-8** denotes a reduction in loads; that is, an overall long-term improvement in the water quality of EAA Basin runoff discharges.

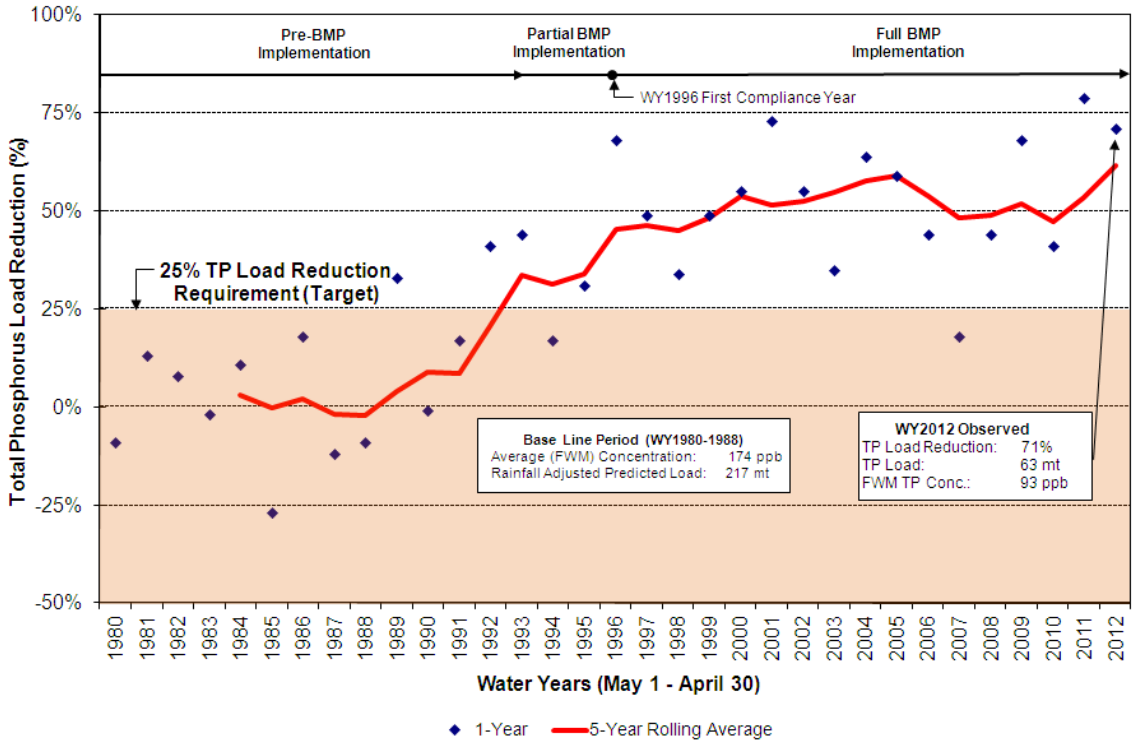

Figure 4-8. EAA Basin percent total phosphorus (TP) load reduction trend with period of record comparisons.
[Note: BMP – best management practice; mt – metric tons; ppb – parts per billion.]

Supplemental evaluation of the EAA data at the basin, sub-basin, and permit level is presented in Appendix 4-2 of this volume. The supplemental evaluation includes compliance calculation details, monitoring data and a water quality summary, discussion of short-term and long-term variations in basin loads, cumulative load reductions, permit-level data, and agricultural privilege tax incentive credit information.

EAA Basin Source Control Strategy

The source control strategy for the EAA Basin primarily relies on an EFA-mandated regulatory program for BMP implementation for which compliance determinations began in WY1996. Chapter 40E-63, F.A.C., requires a permit for a BMP plan for each crop or land use within each sub-basin or farm. In addition, through an adaptive management process, the regulatory program ensures that mandatory BMP implementation and performance measures continue to be applicable in response to regional changes.

The BMP plans are comprehensive; they address both nutrient input to the system and transport from the system and generally consist of nutrient management, water management, and sediment controls. Changes to the BMP plans require the District's approval. Permittees are also required to collect water quality and quantity data at farm discharges (permit level) through

approved discharge monitoring plans. Refer to the 2009 SFER – Volume I, Appendix 4-1 for more information on comprehensive BMP plans and BMP plan examples, and each subsequent annual SFER Volume I, Appendix 4-2 for permit-level water quality and quantity data for the EAA. Water quality data collected at the permit level are used as general indicators of individual BMP plan performance and used as a secondary means of compliance if the EAA is not in compliance at the basin level, but cannot be related directly to individual BMPs or considered in isolation of other potential factors affecting performance.

The original guidance document for BMP design and plan implementation in the EAA is the Procedural Guide for the Development of Farm-Level Best Management Practice Plans for Phosphorus Control in the EAA, Version 1.1, developed by the UF/IFAS (Bottcher et al., 1997). Additional research has been conducted to improve BMP effectiveness and design by the UF/IFAS pursuant to the EFA and Chapter 40E-63, F.A.C., requirements and via the EAA – Everglades Protection District (EAA–EPD) Master Research Permit. Investigation to improve the selection, design criteria, and implementation of BMPs is ongoing. Updates to documentation for individual BMPs are available at http://edis.ifas.ufl.edu. Searching this site for "EAA BMP" provides documents including design criteria for construction (as applicable), operation of BMPs, and farm management applicable to the EAA. The District refers to these updated technical sources when conducting BMP field verifications and advising permittees on revising BMP plans. The update on source control activities below describes the current investigations to enhance the body of knowledge on BMPs in the EAA. The District's current emphasis is on working cooperatively with the EAA–EPD to continue the floating aquatic vegetation research approved through a 2010 scope of work modification.

In addition to the EAA–EPD research, BMP research is conducted by individual consultants for the EAA–EPD outside the oversight of the permit by individual landowners, other agencies, or the UF/IFAS. Results from these research projects can result in recommendations to adjust BMP implementation, but consideration is given to site-specific conditions on a farm-by-farm basis.

As indicated in the UF/IFAS procedural guide, the industry definition for a BMP is an "on-farm operational procedure designed to reduce phosphorus losses in drainage waters to an environmentally acceptable level" (Bottcher et al., 1997). Based on Chapter 40E-63, F.A.C., permittees are required to revise their BMP plan to enhance performance if the basin as a whole is not in compliance and the secondary performance measure at the individual farm level is not met. However, since the EAA Basin has been in compliance with required phosphorus loading levels, implementation of more effective BMP practices has not been mandatory.

In addition, the strategy in the EAA Basin includes supplemental source control projects for maintaining or improving the current level of performance. The District conducts upstream data collection at tributaries and supplementary analyses of nonagricultural and agricultural sources with the potential to affect basinwide performance to determine the most effective source control strategies. Cooperation of landowners and other interested parties is necessary for the successful implementation of source controls beyond those required by the regulatory program.

EAA Basin Source Control Activities

During WY2012, the District implemented the ongoing EFA-mandated regulatory BMP program and made progress on the supplemental projects listed below.

Water Year 2012 Activities

- **BMP Regulatory Program.** At the end of WY2012, 474,622 acres were under Everglades WOD permits in the EAA. Tracking of the acreage where BMPs are fully

implemented is essential to assess BMP program effectiveness. This is because BMP performance is measured based on the comparison of phosphorus loading levels from different water year periods with the assumption that major factors affecting runoff (rainfall and acreage) are the same for each period. Post-permit compliance activities continued in these farm basins through on-site BMP verifications. BMP verifications were prioritized based on farm location, water quality history, size, and date of previous verification. The permit renewal process started in March 2012 and is expected to be completed in WY2013.

- **298 and 715 Farms Diversion Projects.** Prior to calendar year 2001, the diversion areas discharged exclusively to Lake Okeechobee and therefore were not part of the EAA baseline period. Since 1992, landowners within these areas were collectively permitted under Chapter 40E-61, F.A.C., via the Lake Okeechobee Surface Water Improvement and Management Plan Master Permit. From 2001 to 2005, diversion projects were completed to direct most of the flows from these areas to the south for treatment in STAs and discharge to the EPA. These basins are within an area of overlap between the Northern and Southern Everglades source control programs and therefore must achieve the discharge requirements of both the Lake Okeechobee TMDLs and the ECP. Defining a separate method for evaluating the impact of BMPs on TP loads in these relatively recent tributaries (diversion areas) to the EPA is required by the EFA. Two phosphorus reduction performance goals continue in effect for discharges from these areas: reduce overall TP loads by 25 percent, and reduce TP loads to Lake Okeechobee by 80 percent. Technical and regulatory details are being developed to implement a compliance methodology for the diversion areas to assess compliance and provide consistency with the EAA source control program.
- **BMP Research.** In addition to the regulatory program, the EFA and Chapter 40E-63, F.A.C., require EAA landowners, through the EAA–EPD, to sponsor a program of BMP research, testing, and implementation that monitors the efficacy of established BMPs in improving water quality in the EPA. The master permit for BMP research, testing, and implementation is the mechanism through which the District regulates research on BMP effectiveness and outreach. Meaningful findings that can be incorporated into agricultural practices are essential to meet and maintain the performance goals of the ECP and to optimize the regulatory program. The master permit is issued to the EAA–EPD, and research is conducted by the UF/IFAS in Belle Glade. The activities under the EAA–EPD master permit for WY2012 were as follows:
  - BMP training workshops were conducted in September 2011 and April 2012 for growers in the EAA with a total of 183 participants. Feedback received via evaluations collected after training workshops was positive and was used to modify and improve training topics, content, and speaker selections. The BMP workshop presentations can be found at the following website: http://erec.ifas.ufl.edu/research/index_soil_and_water.shtml.
  - Under the approved 2010 scope of work modification, the following activities have been conducted: (1) bathymetric surveys of farm main canals (November 2011), (2) dry season sediment analyses of farm main canals (November 2011), (3) analyses of ambient main canal and drainage water quality monitoring (biweekly) grab samples for TP, total dissolved phosphorus, particulate phosphorus, dissolved organic phosphorus, total suspended solids, total dissolved calcium, and pH, (4) bimonthly qualitative and quantitative assessment of floating aquatic vegetation biomass from each farm main canal, (5) flow composite sampling of farm drainage water collected and analyzed for every drainage event, and (6) monitoring of farm canal drainage flow rates, canal

elevations, rainfall, and estimation of farm drainage water velocities during drainage events. In addition, the UF/IFAS occasionally uses in-situ Hydrolabs to monitor canal water temperature and pH. Selected grab samples are analyzed for dissolved organic carbon. All data are subjected to quality control and assurance standards.

Water Year 2013 Anticipated Activities

- **BMP Regulatory Program.** The District's post-permit compliance activities are slated to continue. BMP verifications are expected to be prioritized based on the analysis of farm-level results for WY2012. The prioritized list is based on farm location, water quality history, size, and date of previous verification.
- **298 and 715 Farms Diversion Projects.** The District plans to align efforts for developing regulatory source control performance measures with similar work associated with the NEEPP for the overlapping Lake Okeechobee Watershed. The District plans to present draft performance measures and gather stakeholders' input to (1) implement a compliance methodology for the diversion areas, (2) evaluate effectiveness of BMPs in the diversion areas discharging to the EPA to meet requirements of the EFA, and (3) ensure consistency with Lake Okeechobee water quality goals associated with the NEEPP.
- **BMP Research.** The EAA–EPD will continue research and documentation on phosphorus loading from EAA farms based on improved floating aquatic vegetation and canal management practices. Also, the EAA–EPD will continue to conduct BMP training workshops. The following activities are being proposed for calendar year 2013: (1) wet season sediment analyses for all eight study farms, (2) biweekly sampling of ambient canal and drainage waters, (3) survey and composition analysis every two months of floating aquatic vegetation biomass, (4) two BMP training workshops, and (5) an annual report and presentation at the EAA-EPD Landowners Annual Meeting. Based on feedback from BMP training attendees, presentations will be posted online and distributed electronically with no hard copies printed.
- **West Palm Beach Canal Data Collection.** A canal water quality, flow, and sediment data collection effort is planned within the EAA canals for WY2013 with an initial focus on the Eastern Flow Path. The objective is to further the understanding of phosphorus sources, transport mechanisms, and sinks affecting TP loading from the EAA at the sub-basin level. This knowledge is expected to help in refining source control initiatives.

C-139 BASIN UPDATE

During WY2011, amendments to rules within Chapter 40E-63, F.A.C., were adopted to provide for a more comprehensive and effective source control program. The amended rule includes requirements for implementation of all defined categories of BMPs (nutrient management, water management, and sediment controls) for all properties, as applicable. As a result, the "Initial Performance Measure Determination" period was reset to account for additional water quality improvement activities and will be WY2013. However, basin performance will be computed and reported annually for each water year, that is, annual phosphorus loads will be compared to the predicted annual average phosphorus load derived for the baseline period.

Chapter 40E-63, F.A.C., allows for the option of a permit-level discharge monitoring plan to be considered as a secondary performance methodology should the C-139 Basin be determined to not meet overall load performance. None of the permits issued to date include an optional

discharge monitoring plan; therefore, only C-139 Basin-level data are reported in this chapter. The C-139 Basin and the representative monitoring locations during WY2012 for determining TP load performance are shown in **Figure 4-9**.

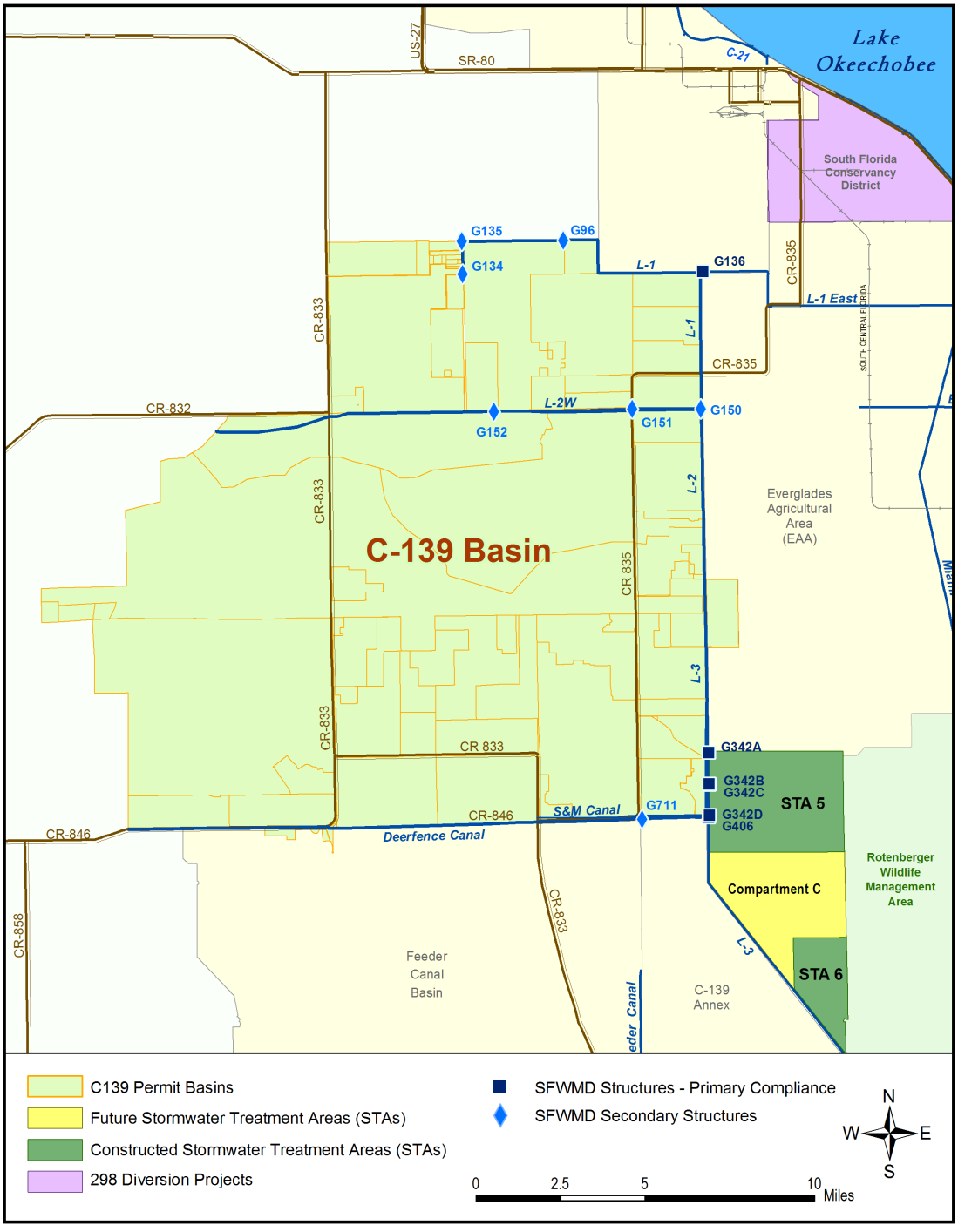

Figure 4-9. WY2012 C-139 Basin boundary and primary compliance water control structures.

Water Year 2012 Phosphorus Results

This section provides an update on the observed WY2012 TP loads in comparison to the basin's EFA-mandated load limits as defined by Chapter 40E-63, F.A.C. The TP load discharged from the C-139 Basin was below the predicted load from the pre-BMP baseline period adjusted for rainfall.

Table 4-7 provides a summary of the C-139 Basin WY2012 results for the observed and performance measure TP loads in metric tons. The observed load is based on flow and water quality data measured during the water year. The target load is the multiple linear regression modeled pre-BMP baseline period load considering the current water year rainfall characteristics. The application of the regression model to the current water year rainfall characteristics accounts for the hydrologic variability within WY2012 as compared to the baseline. The target load model was developed to meet the EFA requirement of maintaining pre-BMP baseline period loading rates. Loads are evaluated as described in the EAA section above. Details of target and limit load calculations and performance evaluation can be found in Appendix 4-1 of this volume and Chapter 40E-63, F.A.C. **Table 4-7** also summarizes TP concentrations in parts per billion.

Table 4-7. Results of WY2012 C-139 Basin TP performance calculations.

	TP Load
Target (predicted) TP load (adjusted for WY2012 rainfall amounts and monthly distribution relative to the baseline period[1])	32 mt
Limit TP load (upper 90th percentile confidence level for target load)	74 mt
Observed WY2012 TP load from the C-139 Basin with partial implementation of Comprehensive BMP Plans	15 mt
	TP Concentration
Observed annual average C-139 Basin TP concentration prior to BMP implementation (WY1980–WY1988)[1]	235 ppb
Observed WY2012 TP concentration from the C-139 Basin with partial implementation of Comprehensive BMP Plans	159 ppb
Five-year (WY2008- WY2012) FWM TP concentration	187 ppb

[1]The baseline period of record is October 1978–September 1988 in accordance with EFA requirements. Under Chapter 40E-63, F.A.C. compliance is based on whole water year periods (May 1–April 30) that fall within the October 1978–September 1988 range, that is, WY1980–WY1988 (May 1, 1979–April 30, 1988).

Supplemental evaluation of the C-139 Basin data is presented in Appendix 4-2 of this volume. The supplemental evaluation includes performance calculation details, monitoring data, and a water quality summary, as well as a discussion of short-term and long-term variations in basin loads. Individual structure flows, related TP loads, and FWM concentrations are also presented as an aid to focus BMP source control efforts.

Table 4-8 summarizes data for all calculated water years. This table presents observed and predicted TP data and annual rainfall and flow measurements. The TP values presented in **Table 4-8** are attributable only to the C-139 Basin.

Table 4-8. WY1980–WY2012 C-139 Basin TP measurements and calculations.

Water Year	Annual Flow (10^3 ac-ft)[1]	Annual FWM Concentration (ppb)	Observed TP Load[2] (mt)	Predicted TP Load[3] (mt)	Annual Rainfall (inches)	Baseline and BMP Status Timeline
1980	172	173	37	42	56.4	Baseline Period
1981	51	69	4	4	31.1	
1982	44	120	6	9	38.6	
1983	345	363	154	115	72.0	
1984	156	215	41	20	47.2	
1985	63	195	15	20	46.9	
1986	110	129	18	19	46.7	
1987	149	208	38	55	60.2	
1988	94	252	29	22	48.0	
1989	73	163	15	11	40.7	Pre-BMP Period
1990	46	102	6	10	39.6	
1991	45	93	5	21	47.5	
1992	100	104	13	28	51.0	
1993	137	162	27	39	55.5	
1994	137	134	23	30	52.0	
1995	272	194	65	54	59.8	
1996	236	164	48	55	60.1	
1997	165	226	46	40	55.7	
1998	170	170	36	43	56.6	
1999	136	212	36	30	51.4	
2000	202	210	52	36	54.4	
2001	57	245	17	6	35.6	
2002	200	267	66	36	53.5	
2003	224	276	76	39	54.6	Increasing BMP Implementation Refer to Table 4-9
2004	204	274	69	25	49.1	
2005	168	197	41	27	50.0	
2006	333	260	107	35	54.8	
2007	77	305	29	7	36.2	
2008	39	113	5	12	41.6	
2009	165	256	52	14	43.0	
2010	202	171	43	54	59.8	
2011	106	154	20	13	41.0	
2012	78	159	15	32	44.5	

[1] 10^3 ac-ft = thousands of acre-feet.
[2] TP values attributable only to the C-139 Basin.
[3] Predicted TP load represents the baseline period load adjusted for rainfall variability. For WY1980–WY2010 Rule 40E63, F.A.C. January 2002, and for WY2011–WY2012 Amended Rule 40E-63, F.A.C., November 2010.

C-139 Basin Source Control Strategy

The C-139 Basin source control strategy primarily relied on the EFA-mandated regulatory program with increasing levels of BMP implementation based on compliance status with basin phosphorus load levels (targets and limits). However, the C-139 Basin was unable to meet the historical phosphorus load levels for the first four consecutive years of WY2003 to WY2006. In response and as required by paragraph 40E-63.460(3)(d), F.A.C. (2002), a rulemaking process to amend Part IV of Chapter 40E-63, F.A.C., was initiated in 2007 and completed in 2010. BMP implementation levels and compliance actions since program inception (including the rulemaking process) are summarized in **Table 4-9**.

Table 4-9. WY2003–WY2012 C-139 Basin BMP implementation summary.

Compliance Water Year	BMP Level[1]	Met Performance	Compliance Action
WY2003	Initial Implementation of Level I – 15 points	No	Go to Level II Full Implementation in November 2003
WY2004	Implement Level II – 15 points with site verification visits	No	Go to Level III Full Implementation in November 2004
WY2005	Implement Level III – 25 points with site verification visits	No	Go to Level IV Full Implementation in November 2005
WY2006	Implement Level IV – 35 points with site verification visits	No	Initiate Rule Development
WY2007	Continue Level IV	No	Continue Rule Development Process
WY2008	Continue Level IV	Yes	Continue Rule Development Process
WY2009	Continue Level IV	No	Continue Rule Development Process
WY2010	Continue Level IV	Yes	Continue Rule Development Process
WY2011	Comprehensive BMP Plan	Yes[2]	Partial Implementation of Comprehensive BMP Plans
WY2012	Comprehensive BMP Plan	Yes[2]	Full Implementation of Comprehensive BMP Plans

[1] Increasing BMP levels/points correspond to increased source control implementation.
[2] WY2011 and WY2012 performance is shown for reference only. Initial Performance Measure Determination Period under amended methodology set forth in amended Chapter 40E-63, F.A.C., is WY2013.

The implementation of the mandatory BMP program revealed basin-specific constraints that needed to be considered for the program to be effective. In general, three key underlying challenges needed to be considered:

- The C-139 Basin canals have limited capacity to detain or store runoff, thus preventing landowners from recycling excess runoff. Travel time to the basin outlets can be short. Storm events at the end of the wet season can cause flooding and are concurrent with planting and fertilization of winter crops.
- Sandy soils have limited binding capacity for phosphorus. Any unutilized synthetic fertilizers containing phosphorus are lost to the groundwater or transported offsite in runoff.
- As water use demands have intensified, the historically rain-fed system has been supplemented with groundwater, a potential new source of TP.

The District has conducted technical investigations including water quality analyses, hydrology evaluations, and demonstration projects to develop solutions to these challenges. Also, the District has cost-shared implementation of higher cost technologies, implemented a water quality monitoring network, conducted integrated regulatory approaches with consumptive water use and stormwater management system permitting groups within the agency, enhanced stakeholder interaction and outreach, and contracted modeling [i.e., Watershed Assessment Model (WAM)] to evaluate the feasibility and TP reductions of BMPs and source control infrastructure projects.

The results from the activities conducted above and lessons learned from the regulatory program were incorporated into the rule (adopted on November 9, 2010), for a more comprehensive and effective program. The amended rule includes requirements for implementation of all defined categories of BMPs (nutrient management, water management, and sediment controls) for all properties, as applicable. A comprehensive BMP plan will serve to control the different types of phosphorus species (particulate or dissolved), sources, and transport mechanisms through which phosphorus leaves property.

Since permittees in the C-139 Basin are not required to collect water quality and quantity data to characterize farm-level discharges, the water quality and quantity monitoring network for upstream areas will be used by the District to differentiate the relative contribution of the hydrologic sub-basins within the C-139 Basin, the timing of releases, and phosphorus species. This information is crucial for developing effective source control strategies into the future. This sub-regional monitoring and data analysis will support water quality improvement activities in case the latest rule amendments are insufficient to achieve consistent compliance with the EFA requirements.

Figure 4-10 shows trends in TP concentration data since WY1980. The TP values presented in this figure are attributable only to the C-139 Basin.

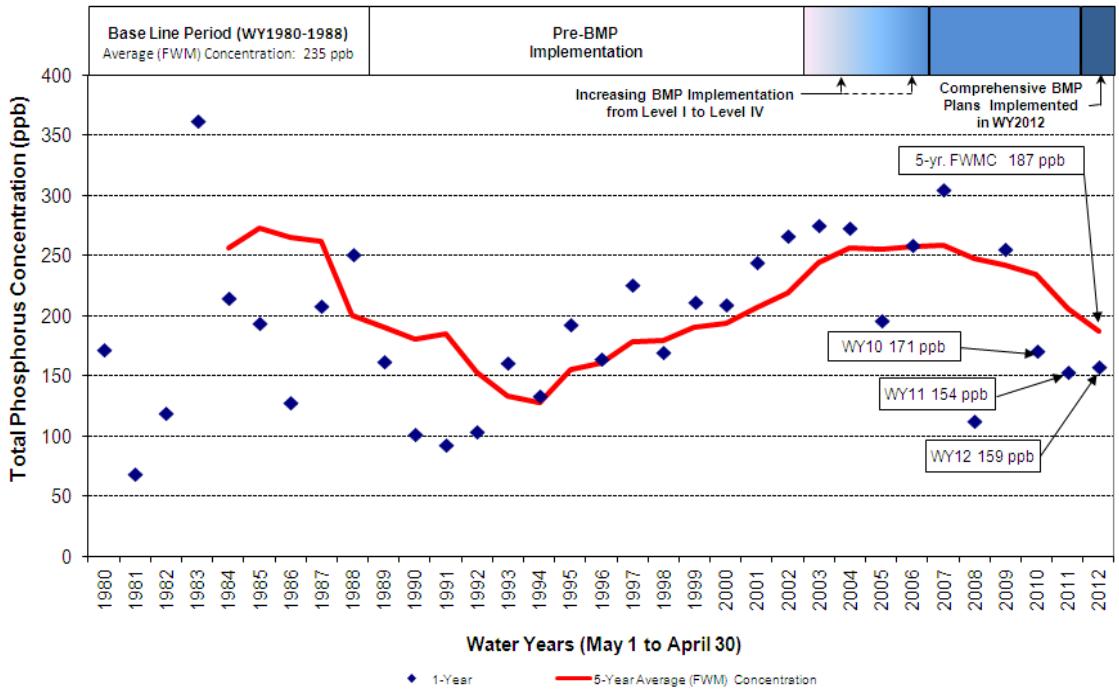

Figure 4-10. C-139 Basin TP flow-weighted mean (FWM) concentration results. [Note: 5-yr. FWMC – five-year flow-weighted mean concentration.]

C-139 Basin Source Control Activities

Water Year 2012 Activities

During WY2012, the District continued to strengthen the mandatory regulatory program for the following C-139 Basin source control initiatives as detailed in the 2010 SFER – Volume I, Chapter 4:

- **BMP Regulatory Compliance Program.** At the end of WY2012, there were 162,777 acres under District permits in the C-139 Basin where comprehensive BMP plans are implemented. Post-permit compliance activities continued in these permit basins through on-site BMP verifications.
- **C-139 Basin Vegetable Production Demonstration Project.** A draft report for the data collected during the last three years of the demonstration project is complete. The project evaluated the crop production response to phosphorus fertilizer applications and also the effects of soil pH moderation on crop productivity and on-site water quality. In addition, a comparison of sequential analysis and soil test analyses with multiple extractants was made to determine the proper soil test extractant to use in soils with high calcium concentration and pH. The contract ends in WY2013.
- **C-139 Basin Monitoring Network.** Eight automatic sampling stations collecting TP concentration and flow data were installed in the C-139 Basin to isolate runoff from the sub-regions identified in the November 2010 revisions to Chapter 40E-63, F.A.C. The data collected during WY2012 are being reviewed to refine data collection and analysis methods.
- **C-139 Basin Upstream Synoptic Monitoring Project.** The collection of water samples at the 10 sites representing locations upstream of basin regulatory compliance points concluded in WY2011. These sampling locations provided snapshots of phosphorus concentrations throughout the watershed in the wet season (April–October). Since WY2006, weekly samples were collected when water was flowing and samples analyzed for TP, total dissolved phosphorus (represents total soluble phosphorus), and orthophosphorus (represents soluble reactive phosphorus). All data collected were analyzed under the C-139 Basin Phosphorus Source Control Data and Modeling Evaluation project (next bullet).
- **C-139 Basin Phosphorus Source Control Data and Modeling Evaluation.** The objectives of this project were to (1) update previous water quality data analyses to include data collected during WY2010 and WY2011, and (2) incorporate detailed data for one impoundment into the C-139 Basin WAM, and validate the modeled results against observed data. The final report was submitted in December 2011 and the following recommendations were made for supporting adaptive management of the BMP program: (1) continue focus on nutrient management and enhanced retention/tailwater recovery practices as data indicated that soluble phosphorus represented the majority of phosphorus discharges from the basin and phosphorus concentration was directly correlated with flow; (2) on-farm water management BMPs, regional projects, and operational protocol for District structures should focus on retention and reduction of flows as existing data show a strong relationship between flow rate and phosphorus concentration; and (3) continue funding of BMP research and demonstration projects to better understand the performance of individual BMPs. In regards to the C-139 Basin WAM validation, results showed that the model provides a starting point when evaluating management practices at the farm level. However, by incorporating detailed field data (e.g., land use, soils, and topography) and farm-specific information, the model can be further calibrated to produce more accurate results.

- **C-139 Basin Dye Tracer Evaluation of Aboveground Impoundments.** An evaluation of the water quality treatment effectiveness for phosphorus of a typical aboveground impoundment found that short circuits and dead zones may exist within it. Short circuits result in areas of the impoundment not being utilized and reductions in treatment efficiency. A tracer test will be conducted to evaluate how features (soil, topography, configuration, etc.) affect transport and removal in the aboveground impoundment, thus justifying modifications to improve performance. In addition, an assessment of the hydrologic characteristics of the aboveground impoundment that was modified to better use existing storage and ensure sufficient detention time will be performed to evaluate the feasibility of conducting a tracer test at a future date.
- **C-139 Basin Regional Feasibility Study.** A District regional feasibility study, encompassing the C-139, Feeder Canal, and L-28 basins began in September 2008. The feasibility study is intended to address two significant water resources issues in this region: (1) water quality of discharges to downstream waters, and (2) balancing annual climate patterns with flood, natural resources (wetlands) protection, and water availability. The following activities were completed during WY2012: (1) monitoring of the eight nested pair groundwater wells, (2) calibration and verification of a "Routing Tool Spreadsheet" model [utilizing Regional Scale Model (RSM) outputs] for suitability to the task of assessing alternatives, and (3) the utility of the tool was evaluated by simulating two scenarios (a theoretical low-level reservoir and a theoretical "dispersed water management" projects). The project is now complete.
- **BMP Demonstration Grant.** The three funded projects were finished in WY2012. Findings and recommendations for each project are as follows:
  - **Surface Water Optimization.** This study suggests that constructing internal berms within an existing reservoir and flowing water through these constructed cells can further reduce farm phosphorus loads in comparison to typical reservoirs. Also, it recommends additional water quality and flow monitoring to quantify BMP effectiveness in the long term.
  - **Chemical Precipitation Treatment.** Data collection was limited by dry conditions during the study. It was recommended to extend the water quality monitoring period for one more year to determine BMP effectiveness, its feasibility, and any factors potentially affecting BMP performance.
  - **Evaluation of Aboveground Impoundment for Reducing Phosphorus in Discharges.** Results from this study indicate that the treatment efficiency for the impoundment was 20 percent or 14 kilograms per hectare. The lower-than-expected treatment efficiency was likely due to dead zones, long-term phosphorus loading that has used most of the soil phosphorus retention capacity, lower residence time, and short circuiting. Modifications (structural and managerial) to improve this efficiency were identified. However, they need to be field tested to evaluate their feasibility and associated costs.

In response to some of the recommendations described above, the District extended the cooperative agreement with Hendry Soil and Water Conservation District to allow for additional collection of water quality data under the Surface Water Optimization and Chemical Precipitation Treatment projects to determine or confirm BMP performance.

Water Year 2013 Anticipated Activities

- **BMP Regulatory Program.** The following activities are planned in WY2013: (1) conduct site inspections to verify implementation of comprehensive BMP plans, and (2) disseminate the results of the BMP demonstration projects funded to date.
- **C-139 Basin Dye Tracer Evaluation of Aboveground Impoundments.** This project is scheduled to finish in WY2013. A report summarizing the project's results and finding will be provided.
- **C-139 Basin Vegetable Production Demonstration Project (Long-Term Plan Project C-139 Basin – Source Controls, FY2009–FY2012).** The final three-year project report summarizing the results from WY2009–WY2012 will be provided. The project is scheduled to be complete in WY2013.
- **BMP Demonstration Projects.** The two currently funded projects will end in WY2013 and final reports summarizing the results and findings will be provided. Based upon availability of resources, the District will fund and/or cost-share demonstration projects that focus on innovation and/or optimization of BMP efficiencies based on basin-specific challenges. It is the intent to maximize the use of funds available for the greatest basinwide benefits.
- **C-139 Basin Regional Feasibility Study Follow-Up.** The following activities are anticipated in WY2013: (1) monitoring of eight nested pair groundwater wells will continue, and (2) potential application of the Routing Tool Spreadsheet modeling to select alternatives in concert with the Central Everglades restoration planning process.

OTHER ECP BASIN UPDATES

This section discusses source control efforts in areas other than the EAA and C-139 that discharge to the STAs. These include the L-8 and C-51 West basins in east-central Palm Beach County. While a portion of stormwater runoff from each of these basins is discharged either to tide through the S-155A structure to the C-51 East Basin and Lake Worth Lagoon or to Lake Okeechobee, drainage from each of these basins is also discharged, either directly or via an adjacent basin, to Stormwater Treatment Area 1 West (STA-1W) and Stormwater Treatment Area 1 East (STA-1E). The Village of Wellington's Acme Improvement District is one of the sub-basins of the C-51 West Basin. Further background information on these basins can be found in previous SFERs.

C-51 West and L-8 Basins Source Control Strategies and Activities

The District monitors water quality in the C-51 West and L-8 basins to ensure phosphorus loads generated within these basins do not affect the performance of STA-1W and STA-1E. The water quality monitoring programs include monitoring of TP concentration and flows at discharge locations to the C-51 West canal, as required by the Village of Wellington Acme Improvement District's ERP, and upstream monitoring associated with Village of Wellington administered phosphorus source control programs. Appendix 4-3 includes a summary of TP concentration data for the Village of Wellington Acme Improvement District.

The Village of Wellington, in addition to its upstream water quality monitoring program, has been administering numerous phosphorus source control activities within the Acme Basin since WY1998. These activities, which include enforcement of Village of Wellington-enacted phosphorus source control ordinances associated with equestrian activities within the basin, remain ongoing.