Appendix 4-2: Water Year 2010 Supplemental Evaluations for Regulatory Source Control Programs in Everglades Construction Project Basins

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INTRODUCTION

This appendix summarizes required monitoring and supplemental data evaluations for the regulatory source control programs in the Everglades Construction Project basins — namely, the Everglades Agricultural Area (EAA) and C-139 basins — during Water Year 2010 (WY2010) (May 1, 2009–April 30, 2010). The information covered in this appendix provides the underlying data employed in the overall compliance determination of both the EAA and C-139. Permit-level data used for secondary compliance determination in the EAA, in the event of basin-level non-compliance, are presented as well as the current Agricultural Privilege Tax Incentive Credits earned to date. Supplemental evaluations of the rainfall, flow, and phosphorus load distribution among the EAA sub-basins are also included.

This appendix provides the following:

- EAA Basin Compliance Calculation Details
- EAA Basin-Level Water Quality Summaries
- EAA Basin Water Quality Summaries by Sub-Basin
- EAA Basin Short-term and Long-Term Variations in Rainfall and Runoff
- EAA Permit-Level Water Quality Monitoring Data
- EAA Agricultural Privilege Tax Incentive Credits
- C-139 Basin Compliance Calculation Details
- C-139 Basin-Level Water Quality Summaries
- C-139 Basin Short-term and Long-Term Variations in Rainfall and Runoff
- C-139 Basin Water Quality Summaries by Sub-Basin

EAA BASIN SUPPLEMENTAL EVALUATION

EAA BASIN COMPLIANCE CALCULATION DETAILS

Compliance with EAA Basin mandates is based on mathematical equations and methodology outlined in Chapter 40E-63, Florida Administrative Code (F.A.C.; Rule 40E-63). The equations are reproduced in **Figure 1**. **Figure 2** presents the monthly rainfall totals for the EAA Basin during WY2010 and related coefficients used to calculate the target load per the rule's equations. The target load is based upon a 25 percent reduction in loading as well as accounting for a reduction in the EAA Basin area by a factor equal to the current acreage divided by the baseline acreage. The predicted load is the pre-Best Management Practices (BMPs) baseline period load adjusted for the hydrologic variability associated with rainfall. Calculation of the limit is not required for WY2010, as the basin load was less than the target load.

RULE 40E-63 BASIN COMPLIANCE MODEL (excerpt from Chapter 40E-63, F.A.C.)

To reflect the required 25% reduction, period of record (POR) TP loads are multiplied by 0.75 before performing the following regression:

$$\ln(L) = -7.998 + 2.868\ X + 3.020\ C - 0.3355\ S$$

[Explained Variance = 90.8%, Standard Error of Estimate = .183]

Predictors (X, C, S) are calculated from the first three moments (m_1, m_2, m_3) of the 12 monthly rainfall totals (r_i, I = 1, 12, inches) for the current year:

$m_1 =$ Sum $[r_i]$ / 12

$m_2 =$ Sum $[r_i - m_1]^2$ / 12

$m_3 =$ Sum $[r_i - m_1]^3$ / 12

$X = \ln(12\ m_1)$

$C = [(12/11)\ m_2]^{0.5} / m_1$

$S = (12/11)\ m_3 / m_2^{\ 1.5}$

where,

L = 12-month load attributed to EAA Runoff, reduced by 25% (metric tons)

X = natural logarithm of 12-month total rainfall (inches)

C = coefficient of variation calculated from 12 monthly rainfall totals

S = skewness coefficient calculated from 12 monthly rainfall totals

The first predictor (X) indicates that load increases approximately with the cube of total annual rainfall. The second and third predictors (C & S) indicate that the load resulting from a given annual rainfall is higher when the distribution of monthly rainfall has higher variance or lower skewness. For a given annual rainfall, the lowest load occurs when rainfall is evenly distributed across months and the highest load occurs when all of the rain falls in one month. Real cases fall in between.

Compliance will be tracked by comparing the measured EAA Load with:

Target = $\exp[-7.998 + 2.868\ X + 3.020\ C - 0.3355\ S]$

Limit = Target $\exp(1.476\ SE\ F)$

SE = $0.1833\ [1 + 1/9 + 5.125\ (X\text{-}X_m)^2 + 17.613\ (C\text{-}C_m)^2 + 0.5309\ (S\text{-}S_m)^2 + 8.439\ (X\text{-}X_m)\ (C\text{-}C_m) - 1.284\ (X\text{-}X_m)\ (S\text{-}S_m) - 3.058\ (C\text{-}C_m)\ (S\text{-}S_m)]^{0.5}$

where,

m = subscript denoting average value of predictor in base period ($X_m = 3.866$, $C_m = 0.7205$, $S_m = 0.7339$)

Target = predicted load for future rainfall conditions (metric tons/yr)

Limit = upper 90% confidence limit for target (metric tons/yr)

SE = standard error of predicted ln(L) for May-April interval

F = factor to reflect variations in model standard error as a function of month (last in 12-month interval), calculated from base period:

Month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
F:	1.975	1.609	1.346	1.000	1.440	1.238	1.321	2.045	2.669	2.474	2.420	2.216

Figure 1. Rule 40E-63, Florida Administrative Code (F.A.C.), Appendix A3 excerpt: hydrologic adjustment and basin compliance mathematical equations to calculate annual total phosphorus (TP) reductions.

WY2010 EAA basin compliance TP load calculation

See 40E-63 Appendix A for "Target" equation

Month	Rainfall	(in)		
May	9.06	in	m_1 =	5.16
June	10.72	in	m_2 =	8.31
July	6.43	in	m_3 =	7.48
August	6.74	in	X =	4.125
September	6.85	in	C =	0.584
October	2.41	in	S =	0.340
November	1.16	in	SE =	0.2270
December	3.13	in		
January	1.53	in	Target[1] TP Load =	215.9 mtons
February	2.86	in	Limit[2] TP Load =	301.9 mtons
March	5.94	in	Observed TP Load =	168.8 mtons
April	5.07	in	Predicted =	287.9 mtons
Total Rainfall	61.88	in	% Reduction =	41%

Notes:

[1] Target load is adjusted for reduction in EAA land area (470324 ac./ 523721 ac.)
Target load calculation accounts for 25% reduction of baseline period loads

[2] Limit load in upper 90% confidence limit for Target

[3] Predicted load = Target load / (1 - 0.25)

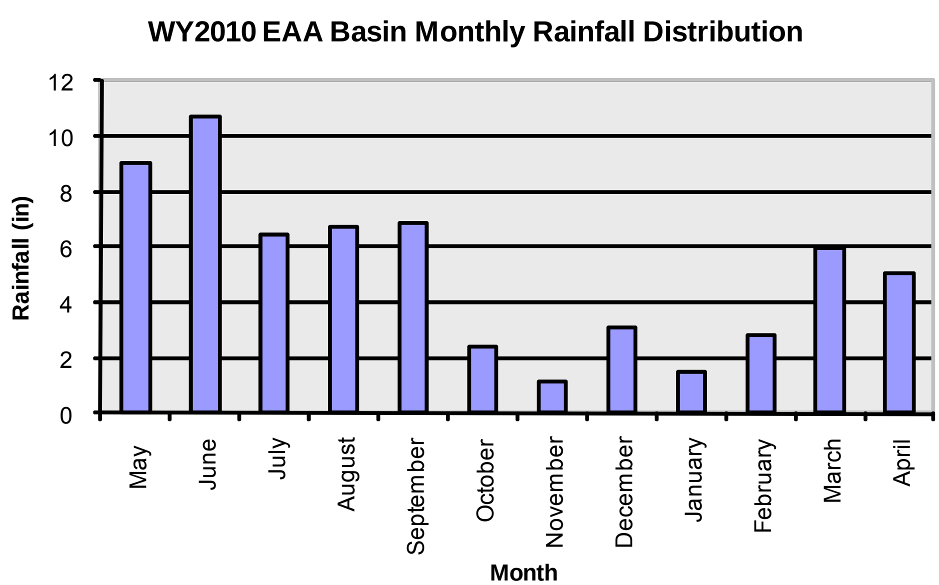


Figure 2. Water Year 2010 (WY2010) (May 1, 2009–April 30, 2010) Everglades Agricultural Area (EAA) Basin monthly rainfall totals, compliance calculation coefficients, and target load calculation.

EAA BASIN-LEVEL MONITORING DATA

Chapter 40E-63, F.A.C. (Rule 40E-63), requires the South Florida Water Management District (SFWMD or District) to report on the status of the required water quality monitoring for determining compliance with total phosphorus (TP) load mandates for the EAA. Appendices A3 and B2 of Rule 40E-63 outline data collection requirements. Data collection efforts for WY2010 were consistent with Rule 40E-63 and supporting appendices.

The EAA Basin-level compliance determination is based on water year monitoring at various inflow and outflow points defining the boundary of the four major EAA sub-basins (S-5A, S-2/S-6, S-2/S-7, and S-3/S-8) and the conveyance canals serving those sub-basins. **Table 1** summarizes the structures defining the WY2010 boundary for each EAA Sub-basin. **Table 2** provides TP sampling statistics for all the locations monitored by the District for the EAA Basin during WY2010.

During WY2010, 15 structures comprised the modeling boundary of the EAA Basin, and 17 water quality monitoring sampling points represented the water quality of flow through those structures. Some structures contain more than one sampling point as these structures are designed to move water in either direction with water quality samples being collected on the upstream side.

EAA BASIN-LEVEL WATER QUALITY SUMMARY

Since the implementation of BMPs required by the Everglades Regulatory Program, TP loads from the surface water runoff attributable to the lands within the EAA Basin have been evaluated on an annual basis taking into account changes brought about from lands converted to Stormwater Treatment Areas (STAs), inflow sources from external basins, and the addition of new water control structures. To interpret TP measurements taken at inflow and outflow water control structures defining the boundary of the EAA Basin, it is important to recognize that water leaving the EAA Basin through these structures is a combination of EAA farm and urban-generated runoff and water passing through the EAA Basin canals from external basins. This pass-through water includes discharges from Lake Okeechobee and 298 District diversion areas. The diversion areas depicted in Figure 4-17 of this volume include the South Florida Conservancy District (SFCD), South Shore Drainage District (SSDD), East Beach Water Control District (EBWCD), East Shore Water Control District (ESWCD), and Closter Farms. The runoff from lands within the diversion areas enter the EAA through four pump stations: EBWCD (pump station EBPS3), the combined area of ESWCD and Closter Farms (pump station ESPS2), SSDD (pump station SSDDMC), and SFCD (pump station SFCD5E).

Supporting water quality data for WY2010 are presented in **Tables 1-5**. **Table 3** summarizes the annual flow, TP load, and flow-weighted mean (FWM) TP concentrations for every structure used during WY2010 to determine overall compliance with EAA load reduction requirements. The structure summaries present the annual flow and TP load at each structure that inflows and outflows from each EAA Sub-basin. Annual individual summaries are not intended to be aggregated to mass-balance the flows and loads for a reported EAA TP runoff load. The runoff determination procedures outlined in Rule 40E-63, F.A.C., for deriving the annual water year TP load values within the EAA Basin are accomplished through daily inflows to the EAA, excluding irrigation flow, subtracted from the outflow results for the entire EAA Basin.

A list of the boundary structures used in the EAA Basin-level compliance determination is presented in **Table 1** according to EAA Sub-basin. Historically, the premise has been that east-west transfers of water between sub-basins via the Cross, Ocean, and Bolles canals have been negligible with regard to the EAA Basin Compliance Model and its calculations. Several Everglades restoration projects in the EAA are under evaluation, like the Everglades Agricultural

Area Conveyance and Regional Treatment Project. The District has initiated evaluation of how model assumptions will need to be revised based on such projects and the potential transfer of water between sub-basins.

Table 1. EAA Sub-basin inflow and outflow monitoring points during Water Year 2010 (WY2010) (May 1, 2009–April 30, 2010).

EAA Sub-Basin (Canal)	Structure/Site	Inflow	Outflow
S5A (WPB Canal)	S-5A (S-5A Complex)		●
	S-5AW (S-5A Complex)	●	●
	S-352	●	●
	EBPS3	●	
S2/S6 (HILLS Canal)	S-6		●
	G-328		●
	S-2 (S-2 Complex)		●
	S-351 (S-2 Complex)	●	
	ESPS2	●	
S2/S7 (NNR Canal)	G-370		●
	G-371		●
	S-2 & S-351 (see above)	●	●
S3/S8 (MIA Canal)	G-372		●
	G-373		●
	S-3 (S-3 Complex)		●
	S-354 (S-3 Complex)	●	
	SSDDMC	●	
	SFCD5E	●	
	G-136	●	

Note: The term “Complex” is used to denote a complex of more than one structure under one structure name (e.g., the S-2 Complex contains the S-2 structure and the S-351 structure).

Table 2. Summary statistics for WY2010 TP monitoring data for the EAA Basin.

Sub-Basin (canal)	Structure	Sampling Point	Sample Type	Number of Samples	Number Used in Load Calculation	Minimum Observed (ppm)	Maximum Observed (ppm)	Number Flagged	Flow[1] Curve Rating
S5A (WPB canal)	S-352	S-352	Grab	74	13	0.081	0.454	0	Good
			Composite[2]	18	12	0.123	0.430	0	
	S-5A Complex	S-5A	Grab	51	13	0.057	0.325	0	Good
			Composite[2]	41	39	0.050	0.302	1	
	EBPS	EBEACH	Grab	51	22	0.052	0.752	0	Good[3]
			Composite[2]	36	35	0.099	2.545	0	
S2/S6 (HILLS canal)	S-2 Complex	S2	Grab	17	1	0.055	0.361	0	Good
			Composite[2]	4	4	0.067	0.242	0	
		S351	Grab	57	11	0.034	0.115	0	Good
			Composite[2]	15	9	0.028	0.107	0	
	S-6	S-6	Grab	52	19	0.015	0.270	0	Good
			Composite[2]	43	41	0.021	0.210	2	
	G-328	G328	Grab	52	26	0.012	0.103	0	Fair
			Composite[2]	35	35	0.020	0.170	0	
	ESPS	ESHORE2	Grab	52	19	0.041	0.559	0	Good[3]
			Composite[2]	36	35	0.060	0.462	0	
S2/S7 (NNR canal	S-2 Complex	S2	Grab	17	1	0.055	0.361	0	Good
			Composite[2]	4	4	0.067	0.242	0	
		S351	Grab	57	11	0.034	0.115	0	Good
			Composite[2]	15	9	0.028	0.107	0	
	G-370	G-370	Grab	52	26	0.015	0.139	0	Excellent
			Composite[2]	40	39	0.025	0.158	0	
	G-371	G-371	Grab	52	1	0.011	0.229	0	Good
			Composite[2]	4	4	0.026	0.044	0	

Table 2. Continued.

Sub-Basin (canal)	Structure	Sampling Point	Sample Type	Number Sampled	Number Used	Min. (ppm)	Max. (ppm)	Number Flagged	Flow[1] Curve Rating
S3/S8 (MIA canal)	S-3 Complex	S3	Grab	15	3	0.052	0.338	0	Good
			Composite[2]	5	5	0.066	0.175	0	
		S354	Grab	58	10	0.034	0.115	1	Excellent
			Composite[2]	15	9	0.028	0.107	0	
	G-136	G136	Grab	53	32	0.025	0.386	1	Poor[4]
			Composite[2]	29	26	0.041	0.326	0	
	SSDDMC	SSDDMC	Grab	52	17	0.041	0.559	0	Fair
			Composite[2]	32	32	0.060	0.462	0	
	SFCD5E	SFCD5E	Grab	52	22	0.035	0.249	0	Fair
			Composite[2]	36	35	0.048	0.295	0	
	G-372	G-372	Grab	52	27	0.016	0.188	0	Excellent
			Composite[2]	37	35	0.038	0.941	0	
	G-373	G-373	Grab	52	2	0.015	0.139	0	Good
			Composite[2]	3	3	0.025	0.158	0	

Notes:

[1]Flow Curve Rating: Discharge estimates derived from theoretical equations are within a range of expected values based on streamflow measurements used to calibrate the theoretical equations and are classified as: Excellent (< 5%), Good (< 10%), Fair (< 15%), or Poor (> 15%).

[2]Composite samples could be time-proportional, flow-proportional, or a combination of the two.

[3]Good, based on experience with theoretical ratings based on pump manufacturers' performance curves, but streamflow measurements are not sufficient to calibrate theoretical equations and the flow curve rating cannot adequately be determined.

[4]Poor, based on experience with ratings at culverts with flashboards, but streamflow measurements are not sufficient to calibrate theoretical equations and the flow curve rating cannot adequately be determined.

Table 3. WY2010 flow volumes (thousands acre-feet or kac-ft), TP loads (metric tons or mt), and flow-weighted mean (FWM) TP concentrations (parts per billion or ppb) for EAA Basin structures.

Sub-Basin (canal)		Direction	Structure	Load (mt)	Flow (kac-ft)	Conc. (ppb)
S5A (WPB canal)	Outflow	to Lake Okeechobee	S-352	0.00	0.00	N/A
		to STA-1 Inflow & Distribution Works	S-5A + S-5AW	68.93	293.29	191
		Total		**68.93**	**293.29**	**191**
	Inflow	from Lake Okeechobee	S-352	5.20	24.33	173
		from L-8 Canal	S-5A + S-5AW	0.92	8.67	86
		from East Beach WCD	EBPS3	16.32	16.07	823
		Total		**22.44**	**49.07**	**371**
S2/S6 (HILLS Canal)	Outflow	to Lake Okeechobee	S-2	2.90	10.51	223
		to STA-2 Inflow Distribution Canal	S-6	43.99	314.67	113
		to STA-2 Inflow Distribution Canal	G-328	1.51	29.90	41
		Total		**48.39**	**355.08**	**110**
	Inflow	from Lake Okeechobee*	S-351	6.54	61.21	87
		from East Shore WCD	ESPS2	6.35	35.33	146
		Total		**12.89**	**96.54**	**108**
S2/S7 (NNR canal)	Outflow	to Lake Okeechobee	S-2	see S-351 above*		
		to STA-3/4	G-370	37.30	262.75	115
		to STA-3/4 Bypass Structure	G-371	.13	2.66	40
		Total		**37.43****	**265.41****	**114****
	Inflow	from Lake Okeechobee*	S-351	see S-351 above*		
		from WCA2	G-371	0.08	2.71	23
		Total		**0.08****	**2.71****	**23****
S3/S8 (MIA canal)	Outflow	to Lake Okeechobee	S-3	1.12	6.57	139
		to STA-3/4	G-372	47.24	282.73	135
		to STA-3/4 Bypass Structure	G-373	.45	6.90	52
		Total		**48.81**	**296.21**	**134**
	Inflow	from Lake Okeechobee	S354 (S3)	5.66	59.53	77
		from South Shore DD	SSDDMC	2.15	12.00	145
		from South Florida Conservancy Dist.	SFCD5E	2.98	24.15	100
		from WCA 3	G-373	0.42	4.66	73
		from C-139 Basin	G-136	4.03	23.72	138
		Total		**15.23**	**124.05**	**100**

Notes: *The S-351 inflow and S-2 outflow sites serve the S2/S6 and S2/S7 sub-basins. The total is shown only once to avoid double-counting data.

** Totals for inflows and outflows of the S-2/S-7 sub-basin do not include the inflows and outflows from S-351 and S-2, which are included in the S-2/S-6 sub-basin's totals.

EAA Basin Phosphorus Loads, Flows and Phosphorus Flow-Weighted Mean Concentrations by Sub-Basin

Based on the boundary conditions, **Table 4** presents the summaries of flows and TP loads for each sub-basin identified in **Table 1**. The summaries in **Table 4** generally describe the mass balance of inflows and outflows from the EAA sub-basins. The observed runoff TP load and runoff volume from each sub-basin, summing up to a total observed EAA Basin runoff TP load of 169 metric tons (mt) and runoff volume of 1,079,079 acre-feet (ac-ft), is noted in this table. More detailed WY2010 information on the annual load, flow, and FWM TP concentration at each of the individual inflow and outflow structures for each sub-basin in **Table 1,** along with TP data collection statistics and the current quality level of flow information at each structure, is presented in **Tables 2** and **3**.

Table 5 presents a summary of the inflow and outflow TP concentrations for WY2010, which contrasts the concentrations of incoming flows from Lake Okeechobee with the total outflow concentrations from each sub-basin. The TP concentrations at the Lake Okeechobee inflow points (S-351, S-352, and S-354) to the EAA sub-basins for WY2010 ranged between 77 and 173 parts per billion (ppb). Sub-basin outflow TP concentrations ranged between 108 and 191 ppb. Determining the source of discharges from EAA boundary structures is accomplished by tracking the inflow sources. All external sources of TP load flowing into the EAA are assumed to pass through during the water year with the exception of inflows from Lake Okeechobee, which can also serve to meet irrigation demands and canal level management. For example, during WY2010, the Miami Canal conveyed EAA Basin runoff, Lake Okeechobee pass-through flows, C-139 Basin runoff, and runoff from two diversion area basins (SFCD and SSDD) to the Stormwater Treatment Area 3/4 (STA-3/4) inflow structure (G-372). Therefore, G-372 received multiple sources of water of varying amounts (flow and TP load), which contributed to the total observed flow and TP load.

It is not the intent of this document to quantify or report how flows and TP loads from the various sources are allocated or apportioned to the various sub-basin outflow points. However, this information is useful in knowing how much water from sources external to the EAA Basin (Lake Okeechobee and diversion areas), in addition to EAA Basin runoff, is routed for treatment in or to bypass an STA because of capacity constraints in any given water year. This detailed information is reported in other chapters of this volume, specifically Chapters 3A and 5, which provide a comprehensive picture of flow and TP loads (and the source) being discharged to the Everglades Protection Area (EPA) and on STA performance, respectively.

Table 4. EAA Sub-basin flows and TP loads by source for WY2010.

S5A Sub-Basin (WPB Canal)	Load (mt)		Flow (kac-ft)	
Source	Inflow	Outflow	Inflow	Outflow
EAA*	N/A	50.82	N/A	267.96
Lake	5.20	1.79	24.33	9.25
EBWCD	16.32	16.32	16.07	16.07
Total	**21.52**	**68.93**	**40.40**	**293.28**
S2/S6 Sub-Basin (HILLS Canal)	**Load (mt)**		**Flow (kac-ft)**	
Source	Inflow	Outflow	Inflow	Outflow
EAA*	N/A	40.12	N/A	312.59
Lake	2.29	0.03	21.42	0.31
ESWCD & Closter	6.35	6.35	35.33	35.33
Total	**8.64**	**46.50**	**56.75**	**348.23**
S2/S7 Sub-Basin (NNR Canal)	**Load (mt)**		**Flow (kac-ft)**	
Source	Inflow	Outflow	Inflow	Outflow
EAA*	N/A	39.04	N/A	269.95
Lake	4.25	0.27	39.79	2.30
Total	**4.25**	**39.31**	**39.79**	**272.25**
S3/S8 Sub-Basin (MIA Canal)	**Load (mt)**		**Flow (kac-ft)**	
Source	Inflow	Outflow	Inflow	Outflow
EAA*	N/A	38.85	N/A	228.57
Lake	5.66	0.81	59.53	7.77
C-139	4.03	4.03	23.72	23.72
SSDD	2.15	2.15	12.00	12.00
SFCD	2.98	2.98	24.15	24.15
Total	**14.82**	**48.82**	**119.40**	**296.21**

Notes:

The total loads and flows leaving the sub-basins represent pass through volumes as well as volumes originating within the basin. With the exception of lake inflows, it is assumed that 100 percent of all other inflow sources to the EAA sub-basins pass through the main EAA conveyance canals directly to the outlet of each sub-basin. These assumptions are mandated in the model developed under Rule 40E-63, F.A.C., for determining EAA Basin TP load reductions.

EAA* — Represents each sub-basin's portion of the total EAA Basin TP load and volume from runoff.

N/A — Not Applicable

Table 5. EAA Sub-basin inflow and outflow FWM TP concentration for WY2010.

EAA Sub-Basin	Lake Inflow FWM Concentration (ppb)	Total Outflow FWM Concentration (ppb)
S5A (WPB Canal)	173	191
S2/S6 (HILLS Canal)	87	108
S2/S7 (NNR Canal)	87	117
S3/S8 (MIA Canal)	77	134

EAA Basin Short-Term and Long-Term Variations

Rainfall variation in both spatial and temporal distribution influence runoff patterns throughout the basin. For instance, a basin-wide average rainfall amount of 37 inches occurring in two separate water years can produce markedly different runoff volumes and TP loads. The impact of spatial and temporal rainfall variation on runoff is the basis for the rainfall adjustments that are applied to pre-BMP baseline predicted loads. **Figure 3** depicts the annual variation of total rainfall occurring within each of the four major sub-basin groups (averaged rainfall from sites within the sub-basin) compared to the total rainfall for the entire EAA Basin (averaged rainfall from all sites) since WY1996. **Figure 4** depicts the variation of WY2010 sub-basin monthly rainfall compared to the total monthly rainfall for the EAA Basin. A more detailed summary of the WY2010 rainfall and predicted load adjustments based on Rule 40E-63, F.A.C., compliance calculations for the EAA is provided in the *EAA Basin Compliance Calculation Details* section of this appendix. Chapter 2 of this volume includes details of the hydrologic events that occurred throughout the District region during WY2010.

Since WY1996, runoff volumes between the sub-basins have typically shown an evenly distributed and narrower range of variation when based on the percent contribution of each (typically 20 to 30 percent each) to the total EAA Basin runoff volume (**Figure 5)**. However, with runoff TP loads among the sub-basins, a wider range of variation is seen (**Figure 6**). The range of variation has become more evenly distributed in the past several years.

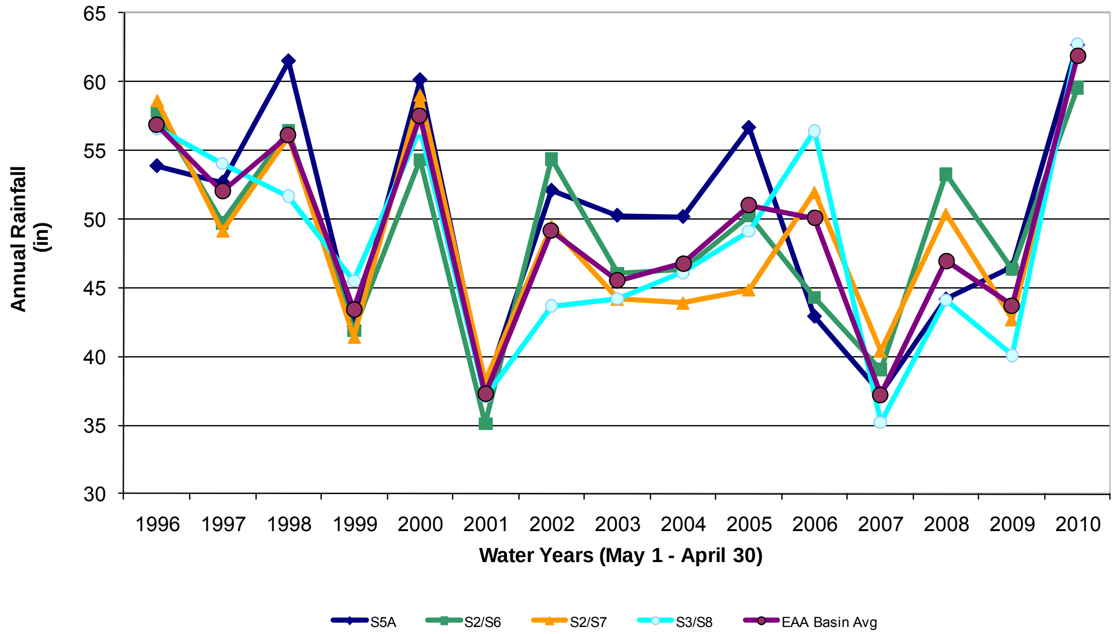


Figure 3. WY1996–WY2010 EAA Sub-basin annual rainfall distribution trend.

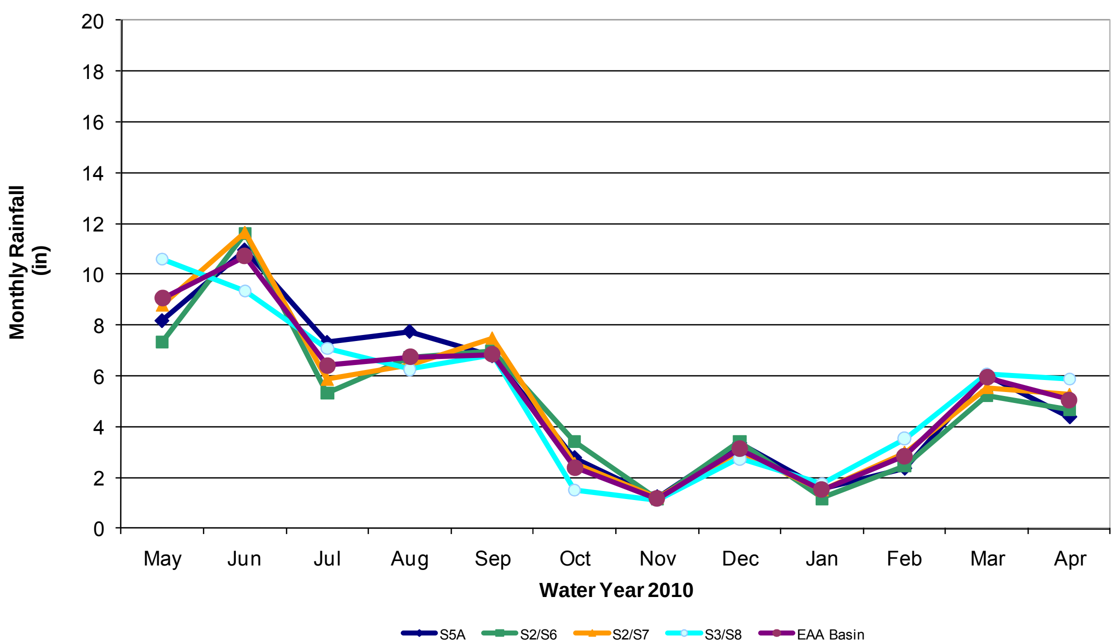


Figure 4. WY2010 EAA Sub-basin monthly rainfall distribution trend.

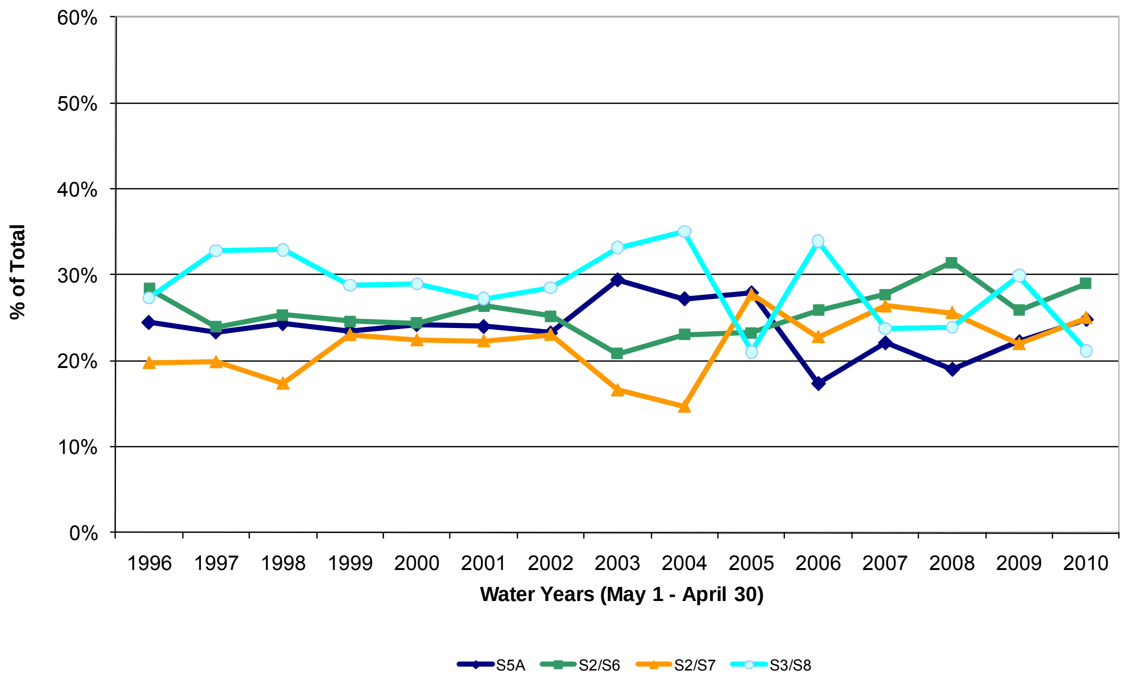


Figure 5. WY1996–WY2010 EAA Sub-basin annual runoff volume percent relative contribution trend of basin total.

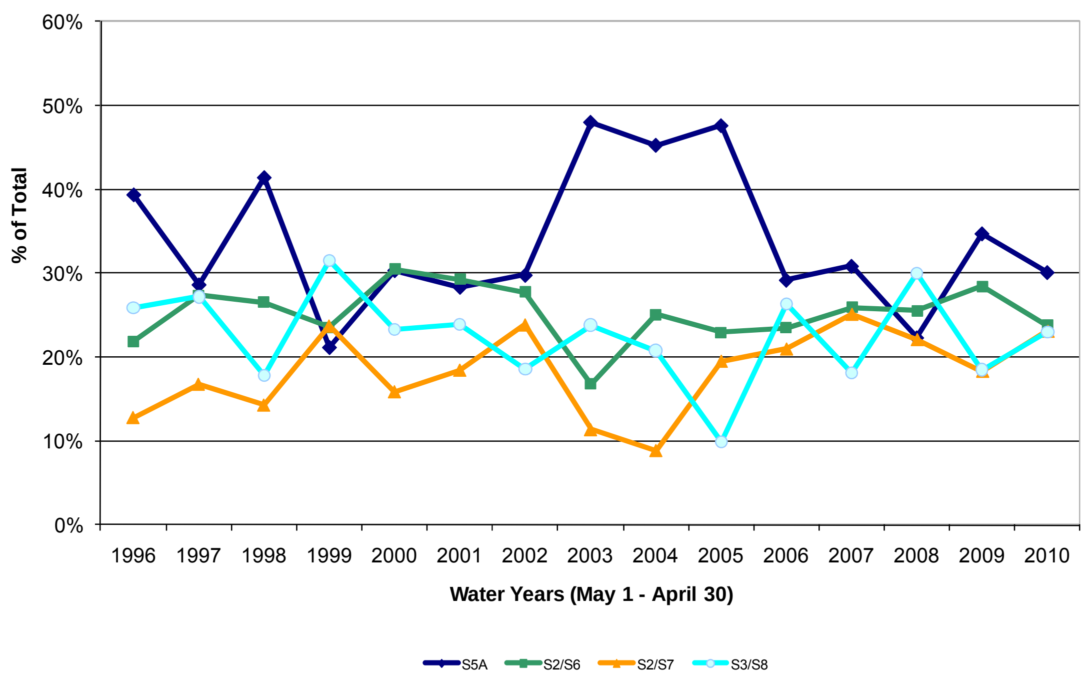


Figure 6. WY1996–WY2010 EAA Sub-basin annual TP load percent relative contribution trend of basin total.

EAA PERMIT-LEVEL MONITORING DATA

The TP concentrations and load data for individual farms within the EAA Basin for WY2010 are presented in this section in both tabular form and as a spatial distribution. Individual farms within the EAA are required to submit these permit-level data for any discharge structure as a condition of a BMP permit issued in accordance with Chapter 40E-63, Part 1 (Rule 40E-63), F.A.C. **Table 6** identifies separate hydraulic drainage areas (e.g., individual farms) within the EAA Basin. Drainage areas are identified according to the unit area or basin identification (ID) number. The table summarizes the area FWM TP concentration, observed TP unit area load (UAL), and the rainfall adjusted UAL for WY2010.

Table 6 includes five basins (East Beach Water Control District, East Shore Water Control District, Closter Farms, South Shore Drainage District, and South Florida Conservancy District) that historically discharged to Lake Okeechobee and where diversion of the majority of discharges to the Everglades was recently initiated in accordance with Everglades Forever Act (EFA; Section 373.4592, Florida Statutes) requirements.

Permit-level data allows relative comparisons (1) between farms, (2) between water years for a single farm, and (3) between water years and a baseline for a single farm. The District uses such relative comparisons when considering individual farm BMP performance with permittees. Factors that affect permit-level concentrations and loads were discussed in the *2006 South Florida Environmental Report (SFER) – Volume I*, Chapter 3 (refer to the *EAA Basin Permit-Level Monitoring Results* section).

Permit-level data are used for compliance determination only if the EAA Basin as a whole does not meet its compliance requirement. The permit-level results are not used to calculate TP reduction at the EAA Basin level.

Table 6 lists the TP data using the following column designations:

- ***Basin ID*** is a unique identifier for each hydraulic drainage area within a permit. It may represent one or more farms.
- ***Early Baseline*** indicates whether a farm qualifies for early baseline status by having implemented BMPs since January 1, 1994, initiated a discharge monitoring plan since January 1, 1993, and submitted specific information at the initial application period in 1992. A “Y” indicates an early baseline farm; “N” indicates that a farm does not qualify for early baseline status. If the EAA Basin as a whole falls out of compliance, then the methodology applied to assess compliance at the farm level is different for early baseline and non-early baseline farms. These methodologies are described in Rule 40E-63, F.A.C.
- ***Baseline Year*** is the water year for which a farm established its baseline period load. For early baseline farms, the baseline period load is based on data collected from May 1, 1993, through April 30, 1994.
- ***Rainfall Adjusted Unit Area Load*** (pounds per acre, or lbs/ac):
    - Baseline is the TP load per unit area measured for the baseline year for a farm (includes 10-year base period rainfall adjustment). A baseline has not been calculated for two of the five Lake Okeechobee diversion basins. Three of the five Lake Okeechobee diversion basins have baselines remaining from the portions of those basins that have historically discharged into the EAA and were originally tracked in the permit-level data. A methodology to evaluate compliance at the permit level for the Lake Okeechobee diversion basins similar to that for the historic EAA areas does not exist. Preliminary

data analysis in support of a compliance methodology continued during WY2010.

  - WY2010 (Adjusted UAL) is the TP load per unit area for the current water year for a farm (includes 10-year base period rainfall adjustment).

- ***WY2010 Percent (%) TP Reduction*** is the WY2010 TP load reduction for the farm compared to the baseline year.
- ***WY2010 TP Concentration*** (parts per billion or ppb) is the FWM TP concentration for the farm for WY2010.
- ***WY2010 TP Unit Area Load*** (pounds per acre or lbs/ac) is the observed TP load per unit area for the current water year for a farm.

Figures 7, 8, and **9** depict the spatial distribution of TP concentrations, rainfall adjusted UALs, and observed UALs found in the EAA, respectively. These figures are graphical representations of the **Table 6** data from individual permit holders. Each basin I.D. is mapped as a whole, and no information is available to account for localized variations within a basin.

Table 6. WY2010 permit-level data for the EAA Basin.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac) Baseline	WY2010	WY2010 % TP Reduction	WY2010 Unit Area Load (lbs/ac)	WY2010 TP Conc. (ppb)	Comments
26-001-01	767.8	Y	1994	2.12	0.26	88%	0.46	64.5	
26-002-01	897.8	N	2001	Unable to Calculate	0.00	Unable to Calculate	0.00	0.0	Pasture Area with no recorded flows
26-003-01	599.2	N	1999	0.27	Unable to Calculate	Unable to Calculate	Unable to Calculate	Unable to Calculate	<75% annual load sampled (0% Sampled)
26-004-01	4501.6	N	1999	1.22	0.18	85%	0.31	64.5	
26-006-01	1198.4	N	1998	1.19	0.31	74%	0.55	143.4	
26-007-01	653.3	N	1999	2.07	0.64	69%	1.12	129.9	
26-008-01	120.0	Y	1994	2.12	0.26	88%	0.46	64.5	
26-009-01	159.8	N	1999	0.74	Unable to Calculate	Unable to Calculate	Unable to Calculate	Unable to Calculate	<75% annual load sampled (0% Sampled)
26-010-01	1231.0	N	1995	1.81	0.33	82%	0.58	96.2	
26-010-02	9961.3	N	1995	5.83	0.57	90%	1.00	156.7	
50-002-01	5656.4	Y	1994	3.21	0.79	75%	1.10	185.2	
50-002-02	9285.4	Y	1994	2.90	0.89	69%	1.24	187.4	
50-003-01	242.0	Y	1994	0.40	0.92	-130%	1.52	132.7	
50-003-02	520.0	Y	1994	0.62	2.62	-325%	4.35	201.2	
50-003-03	117.6	N	1995	0.22	1.27	-468%	1.42	154.6	
50-003-04	320.0	Y	1994	0.91	2.98	-228%	4.95	284.2	
50-004-01	908.9	Y	1994	3.68	0.77	79%	1.07	160.2	
50-005-01	319.8	Y	1994	0.91	3.18	-251%	5.29	264.3	
50-005-02	232.9	Y	1994	0.06	0.26	-318%	0.43	139.0	
50-005-03	320.0	Y	1994	0.26	1.03	-300%	1.70	163.7	
50-005-04	309.6	Y	1994	1.49	0.32	79%	0.53	77.7	
50-005-05	747.0	Y	1994	1.95	0.48	75%	0.85	231.8	
50-005-06	502.0	Y	1994	1.56	3.90	-151%	6.48	447.5	
50-006-01	397.2	Y	1994	4.53	2.06	55%	2.86	307.8	
50-006-02	359.3	Y	1994	5.50	2.37	57%	2.66	249.2	
50-006-03	640.3	Y	1994	3.55	1.68	53%	1.89	180.3	
50-007-01	6472.6	Y	1994	1.56	0.47	70%	0.53	43.5	
50-007-02	5716.7	Y	1994	15.11	2.99	80%	4.15	186.1	
50-008-01	7261.2	Y	1994	0.34	0.25	28%	0.43	85.1	
50-009-04	317.0	N	1999	5.19	3.58	31%	4.01	182.2	
50-009-05	1479.4	Y	1994	1.54	2.16	-40%	3.58	144.7	
50-010-01	784.2	N	1995	2.42	1.56	35%	1.75	193.5	
50-010-02	5327.1	N	1994	1.80	1.31	27%	1.71	146.8	
50-010-03	5826.3	Y	1994	1.31	0.43	67%	0.73	71.0	
50-010-04	7159.0	Y	1994	4.76	1.50	69%	1.68	150.6	

Table 6. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac) Baseline	Rain Adjusted Unit Area Load (lbs/ac) WY2010	WY2010 % TP Reduction	WY2010 Unit Area Load (lbs/ac)	WY2010 TP Conc. (ppb)	Comments
50-010-06	10487.3	N	2001	1.31	0.36	73%	0.63	99.9	South Florida Conservancy District[1]
50-011-01	1747.7	Y	1994	2.76	0.39	86%	0.43	74.2	
50-011-03	14337.8	Y	1994	5.79	2.13	63%	2.39	391.5	
50-011-04	4066.0	Y	1994	5.21	1.64	68%	1.84	127.9	
50-011-06	638.0	N	1999	0.02	0.45	-2879%	0.79	265.9	
50-012-01	1021.5	Y	1994	4.06	3.45	15%	3.87	310.3	
50-013-01	1362.6	N	1997	2.98	0.76	74%	1.06	136.3	
50-014-01	1520.4	Y	1994	1.37	Unable to Calculate	Unable to Calculate	Unable to Calculate	Unable to Calculate	<75% annual load sampled (0% Sampled)
50-015-01	3276.4	Y	1994	2.62	1.22	53%	1.70	190.6	
50-015-02	2554.5	Y	1994	5.28	0.78	85%	1.09	237.7	
50-016-01	1497.3	Y	1994	15.11	1.06	93%	1.47	159.7	
50-017-01	895.0	Y	1994	3.22	1.50	53%	2.50	76.9	
50-018-01	5901.5	Y	1994	2.82	1.71	39%	2.38	195.9	
50-018-02	6594.0	Y	1994	3.54	0.79	78%	1.10	86.3	
50-018-03	9062.3	Y	1994	1.98	1.25	37%	1.73	160.2	
50-018-04	1913.1	Y	1994	3.88	0.60	85%	1.05	90.0	
50-018-05	1827.1	N	1995	3.64	0.53	85%	0.93	94.3	
50-018-06	1255.1	Y	1994	1.46	0.56	62%	0.98	76.2	
50-018-07	1117.4	Y	1994	2.12	0.26	88%	0.46	64.5	
50-018-08	3208.6	Y	1994	2.28	0.30	87%	0.53	78.2	
50-018-09	1736.6	Y	1994	4.22	1.06	75%	1.86	132.2	
50-018-10	8254.4	Y	1994	3.05	1.53	50%	1.71	123.3	
50-018-11	1871.1	Y	1994	19.73	1.99	90%	2.24	106.9	
50-018-12	1655.2	Y	1994	1.78	2.73	-53%	3.80	166.1	
50-018-13	594.3	Y	1994	0.40	3.13	-683%	4.35	239.6	
50-018-14	569.9	N	1994	2.21	1.57	29%	2.61	137.1	
50-018-15	757.3	Y	1994	1.12	1.51	-35%	2.51	143.6	
50-018-16	240.0	Y	1994	4.11	2.49	39%	4.14	77.9	
50-018-17	488.1	Y	1994	3.10	1.18	62%	1.95	221.1	
50-018-18	357.7	Y	1994	0.64	0.00	100%	0.00	0.0	
50-018-19	314.3	Y	1994	35.32	3.96	89%	6.58	133.0	
50-018-20	380.6	Y	1994	3.59	0.91	75%	1.51	84.1	
50-018-22	4481.2	Y	1994	8.18	0.75	91%	1.32	88.1	
50-018-23	2946.0	Y	1994	2.22	0.56	75%	0.99	73.8	
50-018-24	3800.3	Y	1994	1.96	0.65	67%	1.14	74.5	
50-018-25	3808.4	Y	1994	4.99	0.49	90%	0.81	91.6	
50-019-01	568.4	Y	1994	1.54	0.24	85%	0.39	48.4	
50-019-02	1210.0	Y	1994	1.38	1.64	-19%	2.73	193.7	
50-019-03	1051.4	Y	1994	0.58	0.38	35%	0.62	83.6	
50-020-01	320.0	Y	1994	3.32	3.43	-3%	3.85	248.7	

Table 6. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac) Baseline	WY2010	WY2010 % TP Reduction	WY2010 Unit Area Load (lbs/ac)	WY2010 TP Conc. (ppb)	Comments
50-021-01	2558.0	Y	1994	8.92	1.18	87%	1.33	272.7	
50-022-01	320.0	Y	1994	0.80	0.32	60%	0.53	128.2	
50-023-01	278.0	Y	1994	11.83	1.24	89%	1.40	294.0	
50-024-01	574.0	N	1995	6.43	0.35	95%	0.58	132.0	
50-025-01	823.7	Y	1994	3.68	0.69	81%	0.96	221.2	
50-027-01	2771.8	Y	1994	2.40	0.94	61%	1.05	134.4	
50-027-02	798.5	Y	1994	1.22	1.24	-1%	1.39	94.4	
50-027-03	1353.1	Y	1994	2.32	0.51	78%	0.58	156.1	
50-027-04	2520.0	Y	1994	2.10	1.35	36%	1.52	178.5	
50-028-01	220.0	Y	1994	14.54	1.56	89%	1.75	102.9	
50-029-01	530.6	Y	1994	4.30	1.46	66%	2.42	156.8	
50-030-01	446.1	Y	1994	14.14	3.40	76%	3.82	238.8	
50-031-01	1608.9	Y	1994	2.56	1.27	50%	1.43	69.9	
50-031-02	1387.0	Y	1994	5.48	0.76	86%	0.85	237.1	
50-031-03	602.4	Y	1994	8.57	5.90	31%	6.62	286.0	
50-032-01	305.7	Y	1994	0.84	1.86	-122%	3.09	187.6	
50-033-02	6196.8	N	1994	12.52	5.13	59%	7.13	822.7	East Beach Drainage District[1]
50-034-01	7897.1	Y	1994	1.68	0.11	94%	0.12	72.2	
50-034-02	600.5	Y	1994	3.37	0.20	94%	0.22	109.0	
50-034-03	4611.8	Y	1994	4.08	0.60	85%	0.99	80.3	
50-034-04	4138.0	Y	1994	1.54	0.37	76%	0.62	94.3	
50-035-01	478.5	Y	1994	5.74	1.89	67%	2.12	186.1	
50-035-02	1634.3	N	1997	2.98	0.76	74%	1.06	136.3	
50-035-03	120.0	N	1999	8.71	6.33	27%	8.80	156.1	
50-037-01	1184.4	Y	1994	6.70	0.00	100%	0.00	0.0	Rock mining operation with no reported flows. Consistent with ERP Permit, which provides onsite retention.
50-038-01	1285.0	Y	1994	3.71	1.22	67%	1.70	164.5	
50-039-01	62.5	N	1995	4.01	Unable to Calculate	Unable to Calculate	Unable to Calculate	Unable to Calculate	<75% annual load sampled (0% Sampled)
50-039-02	143.1	N	1995	4.25	2.66	38%	2.98	157.8	
50-040-01	216.2	N	1995	1.40	1.28	8%	1.78	126.3	
50-040-02	498.6	N	1995	3.61	1.26	65%	1.75	142.9	
50-041-01	108.8	N	1998	2.69	1.09	59%	1.23	182.7	
50-041-02	300.4	N	1998	2.44	0.23	91%	0.38	108.2	
50-042-01	320.0	N	1995	0.14	0.22	-56%	0.37	186.8	
50-044-01	2168.8	N	1996	5.02	2.96	41%	4.11	325.1	
50-045-01	281.8	N	1995	4.35	0.83	81%	0.93	144.8	

Table 6. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac) Baseline	Rain Adjusted Unit Area Load (lbs/ac) WY2010	WY2010 % TP Reduction	WY2010 Unit Area Load (lbs/ac)	WY2010 TP Conc. (ppb)	Comments
50-045-02	160.6	N	1995	1.41	2.21	-56%	2.48	133.4	
50-046-01	35.0	N	1994	2.21	1.57	29%	2.61	137.1	
50-047-01	630.3	N	1996	1.46	1.12	24%	1.25	116.7	
50-047-02	640.0	N	1995	0.84	2.02	-140%	2.27	190.0	
50-047-03	1832.0	N	1997	0.44	1.15	-164%	1.29	112.7	
50-047-04	198.5	N	1996	0.68	0.87	-29%	0.97	141.0	
50-047-05	314.0	N	1997	0.55	1.45	-164%	1.63	142.7	
50-047-07	3494.2	N	1996	0.67	0.86	-28%	1.20	127.6	
50-047-08	1557.7	N	1996	0.96	2.53	-162%	2.83	208.6	
50-048-01	1185.1	N	1995	1.25	1.48	-19%	1.66	123.3	
50-048-02	640.0	N	1995	0.36	0.29	19%	0.49	107.5	
50-051-01	811.4	N	1995	0.97	0.53	45%	0.59	107.8	
50-053-01	148.9	N	1995	5.16	1.27	75%	1.43	333.1	
50-054-01	9379.9	N	1996	1.16	1.91	-65%	2.66	289.5	
50-054-02	960.0	N	1996	0.50	2.23	-349%	3.10	238.2	
50-054-03	1227.2	N	1996	0.35	0.38	-9%	0.53	143.0	
50-054-04	3684.3	N	1996	0.82	0.69	17%	0.95	80.1	
50-055-01	392.9	N	1997	0.86	0.07	91%	0.08	63.5	
50-055-02	810.4	N	1999	0.45	0.48	-6%	0.54	57.2	
50-055-03	2871.2	N	1996	0.74	0.64	14%	0.72	85.8	
50-056-01	849.8	N	1996	0.98	2.42	-146%	3.42	248.5	
50-058-01	157.0	N	1995	0.02	Unable to Calculate	Unable to Calculate	Unable to Calculate	Unable to Calculate	<75% annual load sampled (0% Sampled)
50-059-01	11522.9	N	1996	2.35	1.46	38%	2.03	259.9	
50-059-02	1767.6	N	1997	1.07	0.86	20%	1.20	123.0	
50-059-03	709.5	N	1996	1.65	2.16	-31%	3.00	370.6	
50-059-04	306.1	N	1996	1.14	1.20	-5%	1.67	153.0	
50-060-01	8137.2	N	1995	0.18	0.43	-141%	0.48	79.6	
50-060-02	7613.8	N	1995	0.75	0.41	45%	0.46	69.7	
50-061-01	639.5	N	1995	1.44	0.25	82%	0.28	183.6	
50-061-03	3434.3	N	1995	0.76	0.64	17%	1.05	88.1	
50-061-05	313.7	N	1995	1.89	2.12	-12%	3.52	125.4	
50-061-06	237.0	N	1995	1.68	3.43	-105%	5.69	249.1	
50-061-07	318.2	N	1995	1.24	0.61	51%	1.01	64.2	
50-061-08	375.2	N	1999	1.76	0.95	46%	1.33	158.1	
50-061-10	25062.2	N	1996	0.60	0.24	60%	0.42	63.2	
50-061-12	730.0	N	1995	2.55	1.29	49%	2.15	127.7	
50-061-13	1059.6	N	1995	1.16	0.88	25%	1.46	163.3	
50-061-15	6760.2	N	1995	1.91	0.90	53%	0.90	118.4	
50-061-17	1598.1	N	1995	12.22	2.93	76%	4.08	272.6	
50-061-18	1555.1	N	1995	9.82	0.82	92%	0.92	31.4	

Table 6. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac) Baseline	Rain Adjusted Unit Area Load (lbs/ac) WY2010	WY2010 % TP Reduction	WY2010 Unit Area Load (lbs/ac)	WY2010 TP Conc. (ppb)	Comments
50-061-20	156.1	N	1994	1.80	1.31	27%	1.71	146.8	
50-061-22	3739.3	N	1996	0.49	0.86	-75%	1.50	119.5	
50-062-01	4625.8	N	1996	0.20	0.95	-384%	1.58	225.8	
50-062-02	10754.2	N	1996	0.46	0.38	18%	0.63	88.4	
50-062-03	1188.3	N	1996	0.54	0.62	-15%	1.03	80.5	
50-062-04	901.2	N	1996	0.26	0.82	-216%	1.35	150.1	
50-062-05	5249.6	N	1996	0.41	0.47	-14%	0.78	83.3	
50-062-09	7658.9	N	1997	0.22	0.19	15%	0.31	63.6	
50-062-10	8772.4	N	1997	0.72	0.34	53%	0.38	40.9	
50-062-11	1276.6	N	1996	0.44	0.73	-66%	1.21	102.4	
50-063-01	9792.2	N	1996	0.45	0.55	-23%	0.92	130.9	
50-064-01	898.7	N	1997	2.98	0.76	74%	1.06	136.3	
50-064-03	145.0	N	1997	2.98	0.76	74%	1.06	136.3	
50-064-04	1150.4	N	1997	2.98	0.76	74%	1.06	136.3	
50-065-02	938.1	N	1995	3.64	0.61	83%	0.68	162.1	
50-065-03	3751.7	N	1997	2.98	0.76	74%	1.06	136.3	
50-065-05	929.8	N	1997	2.98	0.76	74%	1.06	136.3	
50-065-06	453.9	N	1997	2.98	0.76	74%	1.06	136.3	
50-065-07	513.0	N	1995	3.92	0.76	81%	0.86	128.4	
50-065-08	628.0	N	1997	2.98	0.76	74%	1.06	136.3	
50-065-10	792.3	N	1995	1.55	0.71	54%	0.80	67.3	
50-067-01	1143.9	N	1996	0.40	0.88	-123%	1.55	128.4	
50-067-02	10257.1	N	1996	0.94	0.49	48%	0.85	75.9	
50-067-03	681.6	N	1996	1.02	0.89	14%	1.55	66.6	
50-067-04	3819.5	N	1996	0.55	0.51	8%	0.89	73.4	
50-067-05	7322.6	N	1996	0.42	0.31	26%	0.54	56.2	
50-067-06	1277.2	N	1999	0.49	0.29	42%	0.50	44.9	
50-067-07	1975.5	N	1999	0.54	1.82	-240%	3.19	190.0	
50-067-09	1277.7	N	1999	0.54	0.42	21%	0.74	66.8	
50-067-10	2551.8	N	1999	1.21	0.43	65%	0.75	64.8	
50-067-11	6179.0	N	1999	0.85	0.32	62%	0.56	55.6	
50-067-13	685.3	N	1997	2.29	Unable to Calculate	Unable to Calculate	Unable to Calculate	Unable to Calculate	<75% annual load sampled (0% Sampled)
50-068-01	2615.8	N	1996	1.13	2.01	-77%	2.79	250.5	
50-069-01	317.5	N	1996	1.06	0.57	46%	0.94	133.5	
50-070-01	245.0	N	1995	3.82	1.97	48%	2.21	141.1	
50-070-02	244.0	N	1995	3.09	1.39	55%	1.56	144.6	

Table 6. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac) Baseline	WY2010	WY2010 % TP Reduction	WY2010 Unit Area Load (lbs/ac)	WY2010 TP Conc. (ppb)	Comments
50-073-01	67.8	N	2001	Baseline Year	0.00	Unable to Calculate	0.00	0.0	Not Used for agriculture; has onsite retention area and does not discharge
50-077-01	3168.0				0.95		1.58	110.6	715 Farms (Closter Farms)[2]
50-078-01	71.6	N	1999	8.71	2.60	70%	4.31	145.4	
50-080-01	8108.5				1.04		1.72	145.6	East Shore Drainage District[2]
50-081-01	210.0	N	2004	0.66	0.51	22%	0.85	64.2	
50-081-02	4845.5	N	1994	1.31	0.67	48%	1.18	140.6	South Shore Drainage District[2]
50-082-01	484.5	N	1995	9.82	1.34	86%	2.22	55.8	

Notes:

[1] A small portion of the South Florida Conservancy District and the East Beach Water Control District were capable of discharging to the Everglades. However, a majority of this area historically discharged only to Lake Okeechobee and is now discharging to the Everglades. A BMP permit issued under Rule 40E-63 and permit-level monitoring are required.

[2] Closter Farms (a.k.a. 715 Farms), East Shore Water Control District, and the South Shore Drainage District historically discharged only to Lake Okeechobee and are now discharging to the Everglades. A BMP permit issued under Rule 40E-63 and permit-level monitoring are required.

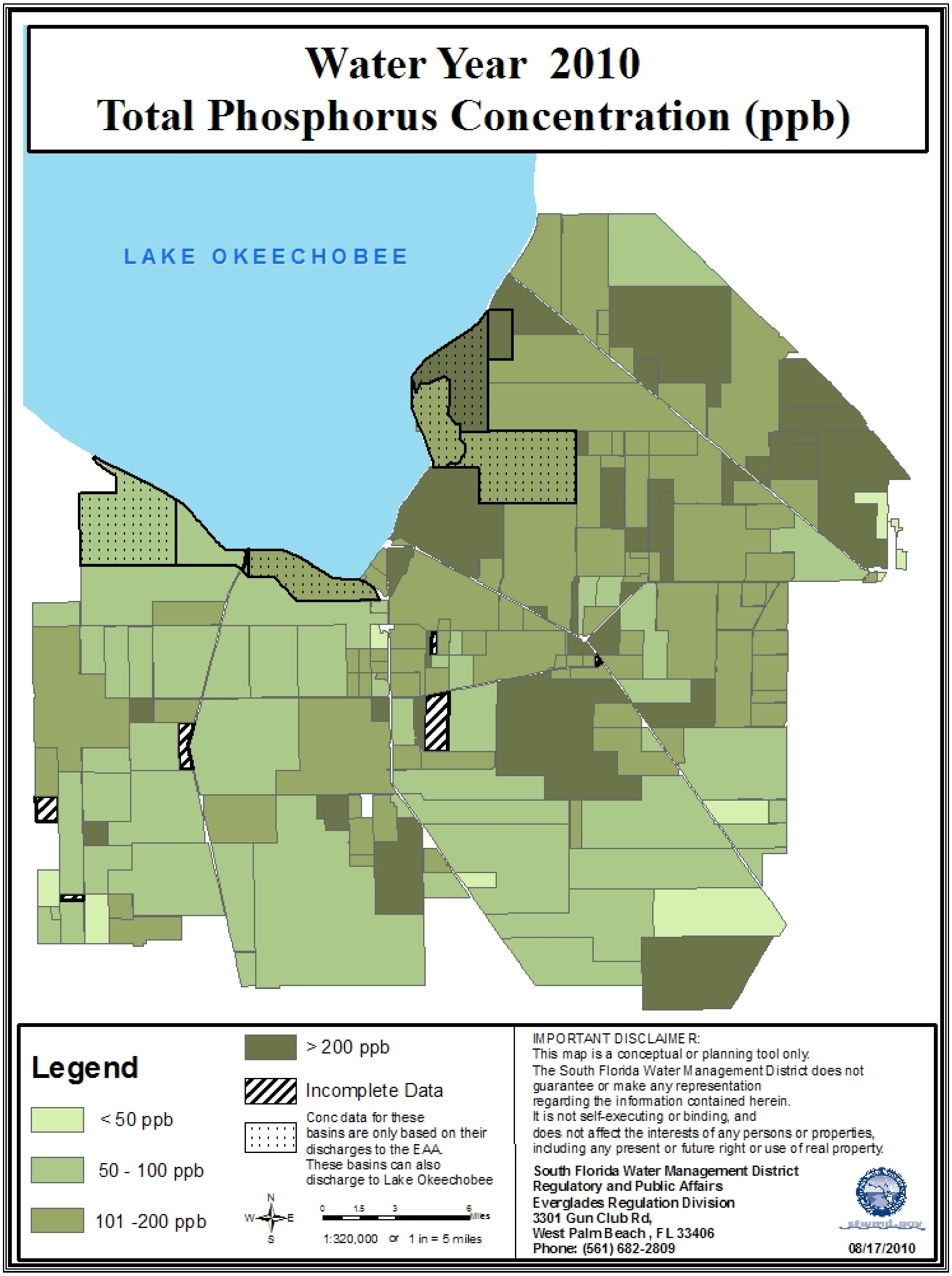


Figure 7. FWM TP concentrations (ppb) in the EAA Basin for WY2010.

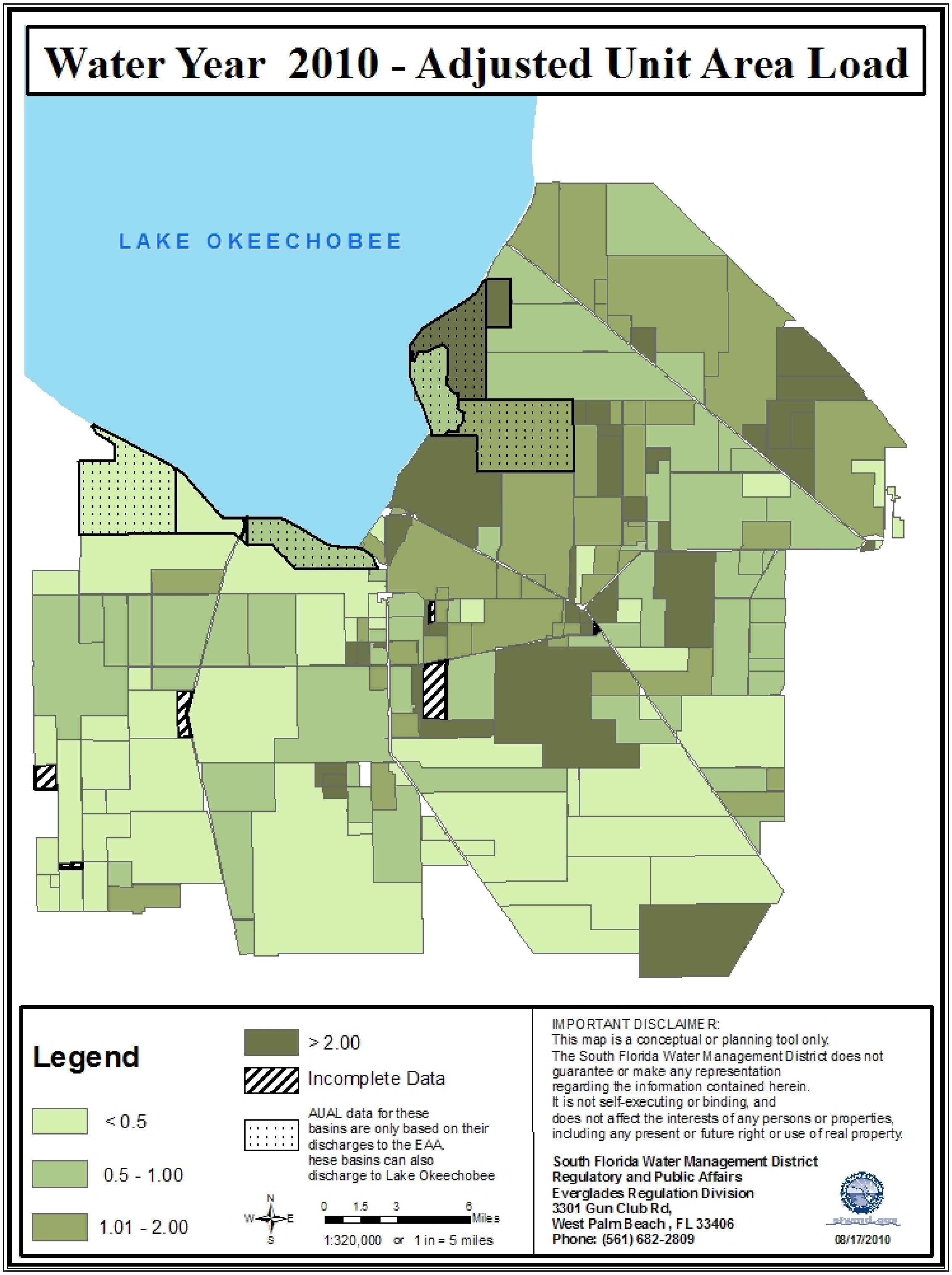


Figure 8. WY2010 rainfall-adjusted unit area TP load (pounds per acre or lbs/ac) in the EAA Basin.

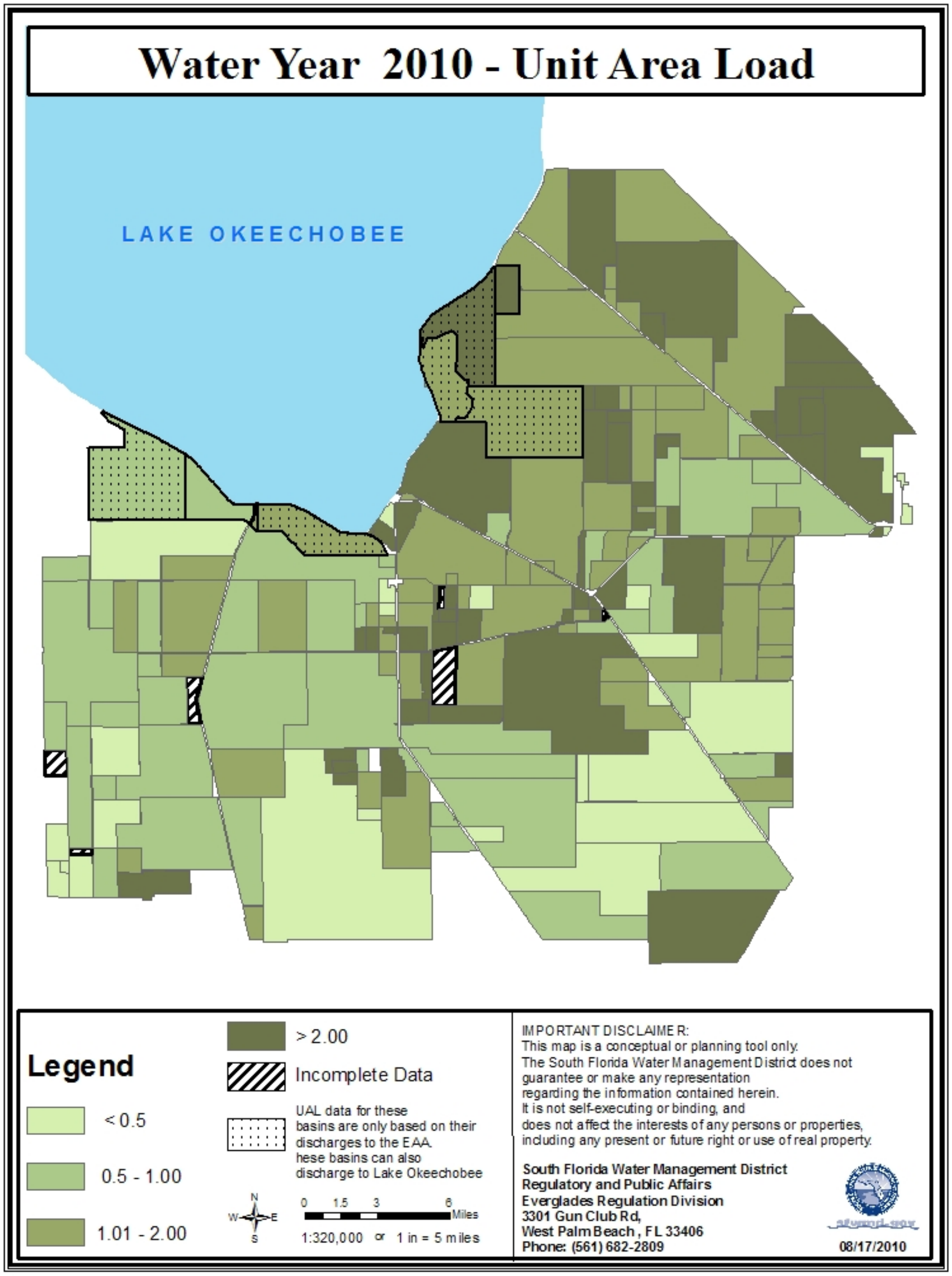


Figure 9. WY2010 observed unit area TP load (lbs/ac) in the EAA Basin.

AGRICULTURAL PRIVILEGE TAX INCENTIVE CREDITS

The EFA imposed an Agricultural Privilege Tax for all real property located within the EAA that is classified as agricultural. Incentive credits against the Agricultural Privilege Tax are set forth to encourage the performance of BMPs to maximize the reduction of TP loads at the points of discharge from the EAA. **Table 7** lists the Everglades Agricultural Privilege area-wide incentive credit schedule and tax credits earned to date for the EAA.

Table 7. Everglades Agricultural Privilege Tax area-wide incentive credits for the EAA Basin.

Everglades Agricultural Privilege Tax
Area-Wide Incentive Credit Schedule

Calendar Year	Water Year	Min. Phos. Reduction Required (%)	Actual Phos. Reduction Achieved (%)	Credits Earned	Total Credits (Cumulative)	Credits Used	Credit Balance	Fiscal Year
1994	1993	25	44	19	19.00	0.00	19.00	FY95
1995	1994	25	17	0	19.00	0.00	19.00	FY96
1996	1995	25	31	6	25.00	0.00	25.00	FY97
1997	1996	25	68	43	68.00	0.00	68.00	FY98
1998	1997	25	49	24	92.00	3.91	88.09	FY99
1999	1998	25	34	9	97.09	3.91	93.18	FY00
2000	1999	25	49	24	117.18	3.91	113.27	FY01
2001	2000	25	55	30	143.27	3.91	139.36	FY02
2002	2001	25	73	48	187.36	10.02	177.34	FY03
2003	2002	25	55	30	207.34	10.02	197.32	FY04
2004	2003	25	35	10	207.32	10.02	197.30	FY05
2005	2004	25	64	39	236.30	10.02	226.28	FY06
2006	2005	25	59	34	260.28	15.55	244.73	FY07
2007	2006	25	44	19	263.73	15.55	248.18	FY08
2008	2007	25	18	-7	241.18	15.55	225.63	FY09
2009	2008	25	44	19	244.63	15.55	229.08	FY10
2010	2009	25	68	43	272.08	15.55	256.53	FY11
2011	2010	25	**41**	**16**	272.53	15.55	256.98	FY12
2012	2011	25			256.98	15.55	241.43	FY13
2013	2012	25			241.43	15.55	225.88	FY14

Note: Water Year 2010 (Calendar Year 2011 / FY2012) subject to Governing Board approval.

Additional Information of Interest

Per Acre Charge	Years	Area-Wide Incentive Credit	Min. Phos. Reduction Required
$24.89	1994 - 1997	0.33	25%
$27.00	1998 - 2001	0.54	25%
$31.00	2002 - 2005	0.61	25%
$35.00	2006 - 2013	0.65	25%
$25.00	2014 - 2016	N/A	N/A
$10.00	2017	N/A	N/A

Note:

1. Vegetable classified acreage is never charged more than $24.89 pre acre.
2. Vegetable classified acreage is not eligible for incentive credits.
3. The minimum per acre charge will never drop below $24.89 through Nov 2013. If incentive credits would cause the per acre charge to drop below $24.89, any earned, unused credits will we carried forward and applied to the following year.
4. Any unused or excess incentive credits remaining after certification of the Everglades agricultural privilege tax roll for the tax notices mailed in November 2013 shall be canceled.
5. The annual Everglades agricultural privilege tax for the tax notices mailed in November 2014 through November 2016 shall be $25 per acre and for tax notices mailed in November 2017 and thereafter shall be $10 per acre.

Florida Statute 373.4592, EFA

Calculating Credits:

1994 - 1997	N/A
1998 - 2001	$27.00 - $24.89 = $2.11 / .54 = 3.91
2002 - 2005	$31.00 - $24.89 = $6.11 / .61 = 10.02
2006 - 2013	$35.00 - $24.89 = $10.11 / .65 = 15.55

C-139 BASIN SUPPLEMENTAL EVALUATION

C-139 BASIN COMPLIANCE CALCULATION DETAILS

Compliance with C-139 Basin mandates is based on mathematical equations and methodology dictated by Rule 40E-63, F.A.C. The equations relevant to WY2010 compliance are reproduced in **Figure 10**. **Figure 11** presents the monthly rainfall totals for the C-139 Basin during WY2010 and related coefficients used to calculate the target load per the rule's equations. The predicted load (target) is the pre-BMP baseline period load adjusted for hydrologic variability associated with rainfall. A one-year limit is calculated as the target plus a 90 percent confidence interval based on the regression statistics. Three successive years above the target or any one year above the limit, within the rule's designated rainfall range, results in an out-of-compliance determination.

The observed TP load for WY2010 is lower than the target. Therefore, the basin is in compliance. Submittal of permit-level data is not currently a mandatory requirement, but rather an optional method for individual farms to show farm-level compliance with TP loads when the basin as a whole is out of compliance. The optional farm-level monitoring and farm-level compliance methodology for the C-139 Basin is described in Appendix B3 of Rule 40E-63, F.A.C. Since the C-139 regulatory program began in WY2003, BMP permit holders in the basin have not requested the optional farm-level compliance method and, therefore, no data have been submitted.

RULE 40E-63 C-139 BASIN COMPLIANCE MODEL (from Chapter 40E-63, F.A.C.)

The Target and Limit will be calculated according to the following equations and explanation:

$\ln(L) = -12.898 + 4.126\ln(Rain)$

[Explained Variance = 88.6%, Standard Error of Estimate = 0.387]

where: L = 12-month load attributed to C-139 Basin Runoff (metric tons)

Compliance will be tracked by comparing the measured C-139 Basin Load with:

Target = Load Predicted from current Rainfall using Base Period Model (mtons) Target $= 2.50271 \times 10^{-6} R^{4.12603}$

Limit = Target x Uncertainty Factor (mtons)

σ = Standard Error of predicted ln(L) for May-April interval

$\sigma = 0.38700 [1 + 1/9 + 2.08621 (\ln(R) - 3.87905)^2]^{0.5}$

where:

R = Water Year total rainfall (inches)

σ = Standard error of predicted phosphorus load (on a natural logarithmic scale)

The following standard statistical notes are not included within Rule 40E-63, but are required for calculation of the limit value.

Uncertainty Factor = $e^{t\sigma}$

t = t-statistic for 9-2=7 degrees of freedom

t = 1.414924

Figure 10. Rule 40E-63, F.A.C., Appendix B2 excerpt: hydrologic adjustment and basin compliance mathematical equations to calculate annual TP reductions.

WY2010 C-139 basin compliance TP load calculation

See 40E-63 Appendix B2 for "Target" equation

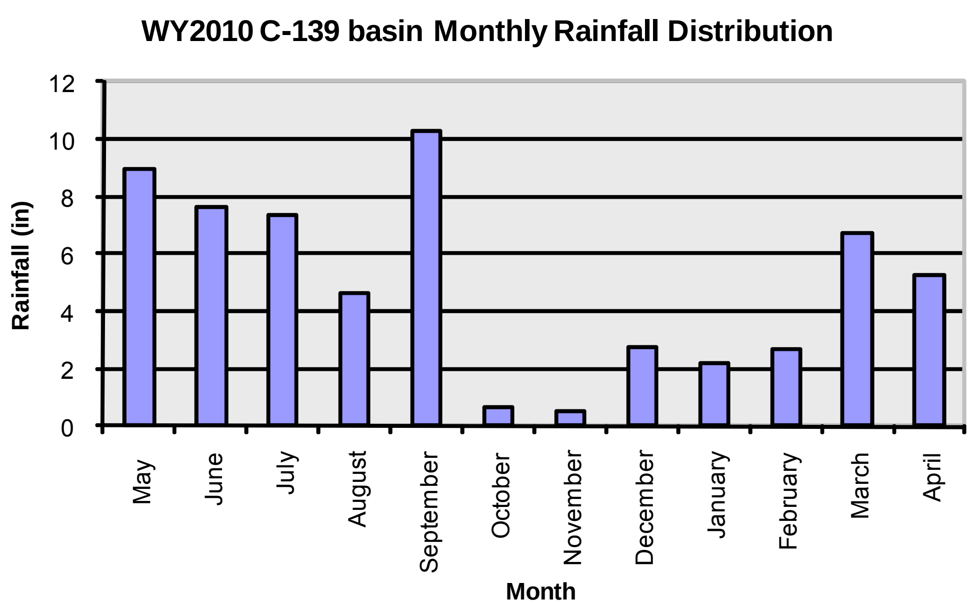
Month	Rainfall (in)
May	8.98 in
June	7.60 in
July	7.35 in
August	4.64 in
September	10.30 in
October	0.68 in
November	0.55 in
December	2.78 in
January	2.21 in
February	2.69 in
March	6.72 in
April	5.30 in
Total Rainfall	59.81 in

SE = 0.4248

Target TP Load = 53.63 mtons

Limit TP Load = 97.82 mtons

Observed TP Load = 41.88 mtons



Note: Monthly data is not factored into calculation.

Figure 11. WY2010 C-139 Basin monthly rainfall, total rainfall, calculated target, limit, and observed TP loads, based upon Rule 40E-63, F.A.C., Appendix B2.

C-139 BASIN-LEVEL MONITORING DATA

Chapter 40E-63, F.A.C. (Rule 40E-63), requires the District to report on the status of the required water quality monitoring for determining compliance with TP load mandates for the C-139 Basin. Appendices A3 and B2 of Rule 40E-63 outline data collection requirements. Data collection efforts for Water Year 2010 (WY2010) (April 1, 2009–May 30, 2010) were consistent with Rule 40E-63 and supporting appendices.

During WY2010, six structures comprised the modeling boundary of the C-139 Basin and six water quality monitoring sampling points represented the water quality of flow through those structures. In the C-139 Basin, all six modeling boundary structures (G-406, G-342A–D, and G-136) are monitored directly. The G-136 structure also serves as the inflow and outflow boundary point, respectively, for the EAA and C-139 basins. **Table 8** of this appendix provides TP sampling statistics for all the locations monitored by the District for the C-139 Basin during WY2010.

Table 8. Summary statistics for WY2010 TP monitoring data for the C-139 Basin.

Structure	Sampling Point	Sample Type	Number Sampled	Number Used	Min. (ppm)	Max. (ppm)	Number Flagged	Flow[1] Curve Rating
G-342A	G342A	Grab	52	10	0.025	0.386	0	Good
		Composite[2]	29	27	0.041	0.326	0	
G-342B	G342B	Grab	44	0	0.035	0.298	0	Good
		Composite[2]	31	22	0.042	0.285	1	
G-342C	G342C	Grab	46	0	0.043	0.211	0	Good
		Composite[2]	28	16	0.046	0.198	1	
G-342D	G342D	Grab	48	0	0.045	0.287	0	Good
		Composite[2]	44	39	0.047	0.352	1	
G-406	G406	Grab	44	0	0.040	0.371	0	Good
		Composite[2]	45	43	0.042	0.294	1	
G-136	G136	Grab	52	0	0.042	0.265	0	Poor [3]
		Composite[2]	35	29	0.042	0.410	0	

[1]Flow Curve Rating: Discharge estimates derived from theoretical equations are within a range of expected values based on stream-flow measurements used to calibrate the theoretical equations and are classified as: Excellent (< 5%), Good (< 10%), Fair (< 15%), or Poor (> 15%).

[2]Composite samples could be time-proportional, flow-proportional, or a combination of the two.

[3]Poor, based on experience with ratings at culverts with flashboards, but stream-flow measurements are not sufficient to calibrate theoretical equations and the flow curve rating cannot adequately be determined.

C-139 BASIN-LEVEL WATER QUALITY SUMMARY

As in the EAA Basin, the District is required to collect monitoring data from the C-139 Basin to determine compliance with the TP load limitations. The TP load ultimately discharging to the Everglades is not the same as the TP loads leaving the outflow structures from the C-139 Basin because discharges are directed into other water bodies. The outfall structures accounting for the loads in the C-139 Basin compliance determination include G-136 discharging to the L-1 canal; G-342A, G-342B, G-342C, and G-342D discharging into Stormwater Treatment Area 5 (STA-5) Flow-ways 1 and 2; and G-406 discharging into the L-3 canal leading to STA-5, Flow-way 3, and Stormwater Treatment Area 6 (STA-6). The overall flow, TP load, and FWM concentration at the six primary basin outflow structures during WY2010 are summarized in **Table 9**.

Table 9. C-139 Basin flows, TP loads, and FWM concentrations by source for WY2010.

C-139 to EAA Source	TP Load (mt)	Flow (kac-ft)	FWM (ppb)	% of Total Load	% of Total Flow
G-136 Total[1]	4.03	23.71	138	9.6%	11.9%
C-139 to STA-5/6 Source	**TP Load (mt)**	**Flow (kac-ft)**	**FWM (ppb)**	**% of Total Load**	**% of Total Flow**
G-342A	3.12	16.29	155	7.5%	8.2%
G-342B	0.85	4.18	164	2.0%	2.1%
G-342C	8.95	38.64	188	21.4%	19.5%
G-342D	6.86	32.34	172	16.4%	16.3%
G-406 [2]	18.06	83.30	176	43.1%	42.0%
STA-5/6 Total	**37.85**	**174.74**	**175**	**90.4%**	**88.1%**
C-139 Basin Source	**TP Load (mt)**	**Flow (kac-ft)**	**FWM (ppb)**	**% of Total Load**	**% of Total Flow**
Basin Total	**41.88**	**198.50**	**171**	**100%**	**100%**

[1] G-136 discharges runoff from C-139 Basin lands that are tributary to the L-1 canal. Conveyance of runoff through G-136 into the Miami Canal for eventual treatment in STA-3/4 is due to flood control necessities in the L-1 canal and capacity limitations in sending the runoff to the south through the L-2 and L-3 canals for treatment in STA-5.

[2] G-406 is no longer a STA-5 diversion structure. Discharge through G-406 flows south typically to STA-5 Flow-way 3 or to STA-6, unless diversion is necessary through G-407 to Water Conservation Area 3 (WCA-3).

The C-139 Basin exported 41.9 mt of TP during WY2010, substantially less than the 52.3 mt of TP during WY2009. During WY2010, 37.9 mt of TP was exported to STA-5 and STA-6 via G-342A, G-342B, G-342C, G-342D, and G-406 (90.4 percent) and 4.0 mt (9.6 percent) to the L-1 canal via G-136.

Although the C-139 Basin received considerably more rainfall in WY2010 (59.81 inches) than in WY2009 (42.96 inches), the increase in the total runoff volume was not proportional (199,000 ac-ft) compared to WY2009 (165,000 ac-ft). The annual FWM TP concentration was 171 ppb for the C-139 Basin in WY2010, which was 33 percent less than the 256 ppb in WY2009. Factors that potentially affected the TP runoff and load for WY2010 include the following: (1) additional response time since the Level IV BMPs were implemented so that the measure of effectiveness is better represented by the monitoring; (2) rainfall was distributed relatively evenly over the water year (more than 40 percent of the rainfall occurred during dry season), resulting in less stormwater runoff being released through the basin compliance structures; and (3) impacts of the demonstration projects are now apparent as they have resulted in long-term structural and operational improvements that have increased on-site water quality treatment and reduced runoff.

C-139 Basin Short-Term and Long-Term Variations

The 2008 SFER – Volume I, Chapter 4, presents a preliminary review of rainfall, runoff volumes, and water quality data conducted to identify causes for the C-139 Basin repetitive out of compliance results, specifically focusing on WY2007. Further analysis including WY2008 and WY2009 data supports the conclusion that the temporal distribution of rainfall substantially affects the ability for the basin to retain runoff. Detailed discussions of potential factors that contribute to the variation of the basin runoff and loads are presented in the 2009 and 2010 SFERs – Volume I, Chapter 4, under the *C-139 Basin Short-Term and Long-Term Variations* section. The following discussion focuses on the derivation of relationships from monthly rainfall, flow, and TP load data over the period of record. These efforts, combined with the concurrent activities described in Chapter 4 of this volume should, in the long-term, help the C-139 Basin meet its TP discharge goals.

Overall, WY2010 was one of highest rainfall years for the WY1980-WY2010 period, at approximately 10 inches above average rainfall, as depicted in **Figure 12**. Because the target TP load for the basin is adjusted by total annual rainfall, higher rainfall amounts result in a higher TP load performance measure target. **Figure 13** shows how the amount of annual rainfall in the C-139 Basin compares with the amount of rainfall that translates into excess runoff. In general, an increase in annual rainfall corresponds to a higher runoff coefficient. However, although the WY2010 annual rainfall amount of 59.81 inches, was significantly higher than the previous year's rainfall amount of 42.96 inches, the annual runoff coefficient was lower. Evaluation of the intra-annual data should contribute to better understanding, future prediction, and control of TP discharges.

As stated in 2009 SFER – Volume I, Appendix 4-2, the rainfall distribution pattern appears to have had a significant impact on the basin loads. Rainfall patterns potentially affect both the amount of rainfall translated to runoff and the TP concentration of the runoff. Rainfall concentrated over a shorter period, such as in WY2007 and WY2009, tended to produce a larger amount of runoff and higher peak monthly flow. When the rainfall was more evenly distributed in a year, such as in WY2008 and WY2010, lower runoff percentages and lower monthly peak flows resulted. However, it is recognized that a number of factors can influence the runoff ratio; the lower rainfall range appears to be most sensitive to the intra-annual rainfall patterns. The annual runoff coefficient is significantly higher for water years with rainfall concentrated in a short period, which typically have higher coefficient of variation.

The scatter plot of monthly flow versus monthly FWM TP concentration in **Figure 14** implies that monthly TP concentrations from C-139 increase strongly with monthly flow. In WY2010, the maximum monthly flow was significantly less than WY2009 and, correspondingly, the annual FWM TP concentration in WY2010 was also much less. The reduction of both percent rainfall as runoff and TP concentration accounted for a 20 percent reduction of observed TP loads in WY2010 compared to WY2009.

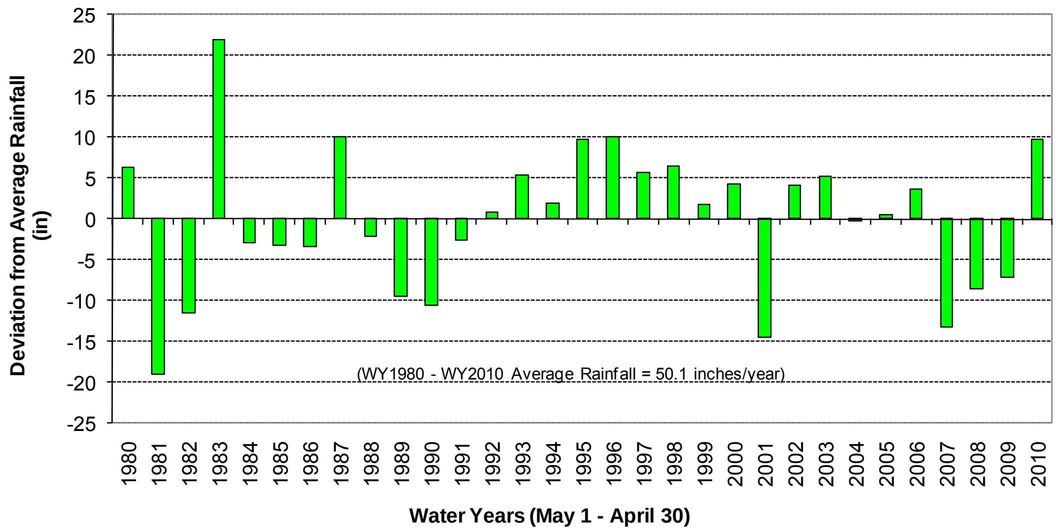


Figure 12. WY1980–WY2010 C-139 Basin annual rainfall deviation from the long-term average.

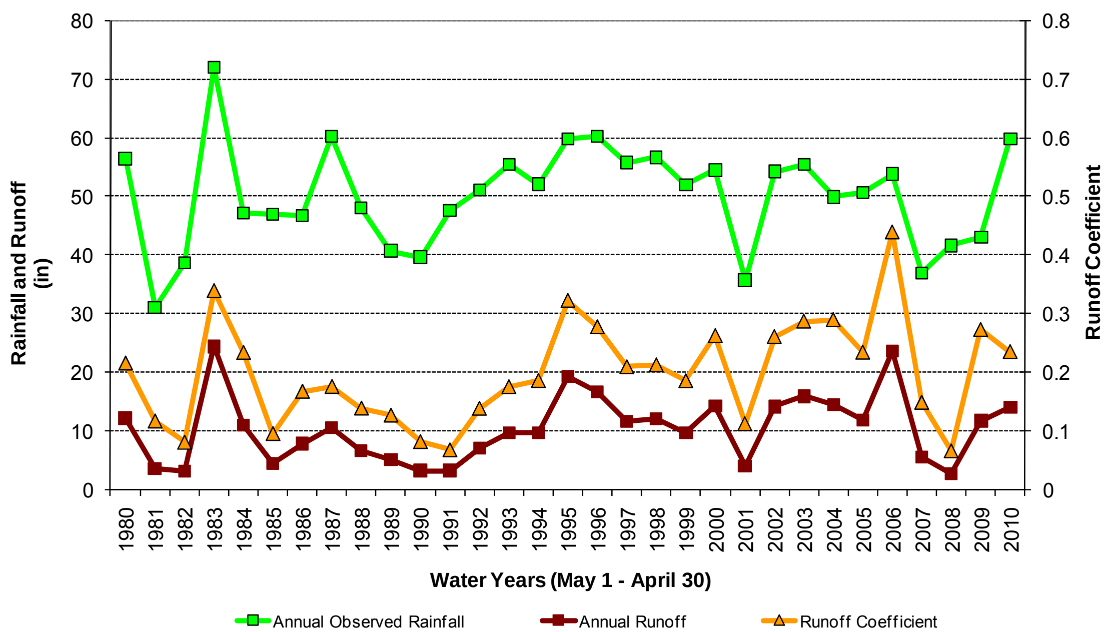


Figure 13. WY1980–WY2010 C-139 Basin annual rainfall and runoff relationship.

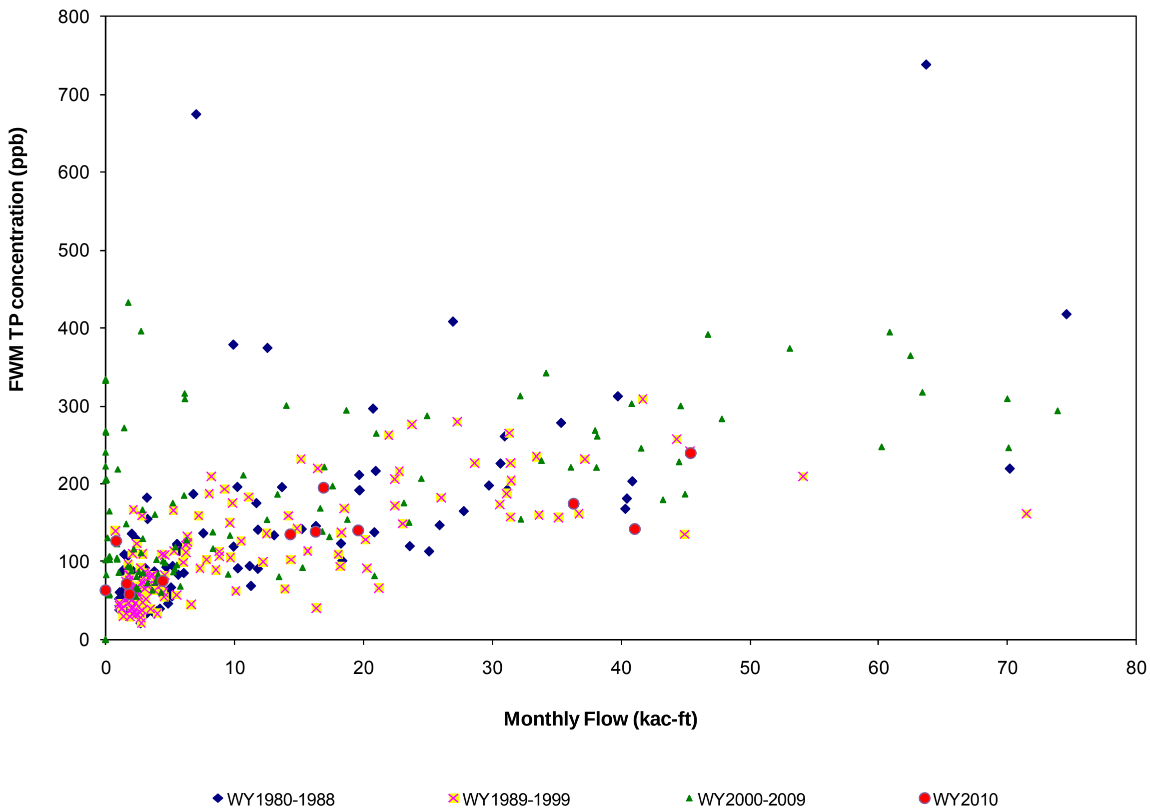


Figure 14. C-139 Basin monthly flow volume in thousands acre-feet (kac-ft) versus monthly FWM TP concentration (ppb) for selected water years.

C-139 SUB-BASIN LEVEL MONITORING DATA

To supplement the basin-level analysis with information from smaller units of area contributing flow and TP load, the District has established an upstream monitoring network of automatic sampling equipment, known as the C139D Monitoring Project. This monitoring project has eight automatic samplers for determining water quality and flow data from C-139 Basin sub-basins (**Figure 15**). Three automatic samplers were installed in WY2006 (G150, SM00.2TW/SMSBV, and DF02.1TW/DFNBV), four were installed in WY2007 (DF11.3TW01/C139S1, L202.0TN/C139S2, L207.0TN/C139S3, and G151), and two were installed in WY2008 (C139S4 and C139S6). C139S4 was installed to replace G151. TP is collected, analyzed, and reported from the automatic samplers. TP, total dissolved phosphorus, and soluble reactive phosphorus are measured from grab samples collected weekly at the same sites. **Table 10** summarizes station names, sampling start date, and number of samples for each collection type during WY2010. The water quality data from these sites are stored in the District's DBHYDRO hydrometeorological database under the project name C139D. Calculation of TP loads and FWM concentrations will require additional processing and, therefore, is anticipated to be reported on an annual basis in future SFERs.

The sites were not fully established in WY2010 for calculation of WY2010 flows, loads, and concentrations at the sub-regional level. To supplement the measured canal stage and velocity, field-measured calibrations must be performed under discharge conditions to estimate flow volumes passing the station. By WY2010, all eight stations had completed flow calibration and started to report data, but additional efforts, including filling in the missing data, base, and negative flow adjustments, are still needed for full utilization of the flow data from these sites for load and FWM TP concentration calculation. Once the details are completed for these sites to become operational, flow and stage data will be recorded daily (or in even finer increments) with FWM TP concentration data collected weekly.

Table 10. C-139 Basin upstream automatic sampling stations under the C139D Monitoring Project.

Flow Station Name	Water Quality Station Name	First Auto Collection	# of WY2010 Samples Grab/Auto	Type of Flow Calculation	First Flow or Velocity Record
G150	G150	10/25/06	52/124	CULV	5/3/1989
C139S1	C139S1	12/20/06	52/49	IVEL	2/28/2007
C139S2	C139S2	10/25/06	52/49	IVEL	8/30/2006
C139S3	C139S3	10/25/06	51/40	IVEL	10/20/2006
C139S4	C139S4	1/2/08	52/47	IVEL	9/27/2007
C139S6	C139S6	6/11/08	49/29	IVEL	3/16/2008
SMSBV	SM00.2TW	4/25/06	50/24	IVEL	12/19/2005
DFNBV	DF02.1TW	4/25/06	44/51	IVEL	1/7/2006

Note: Culvert (CULV) and Index Velocity Meter (IVEL).

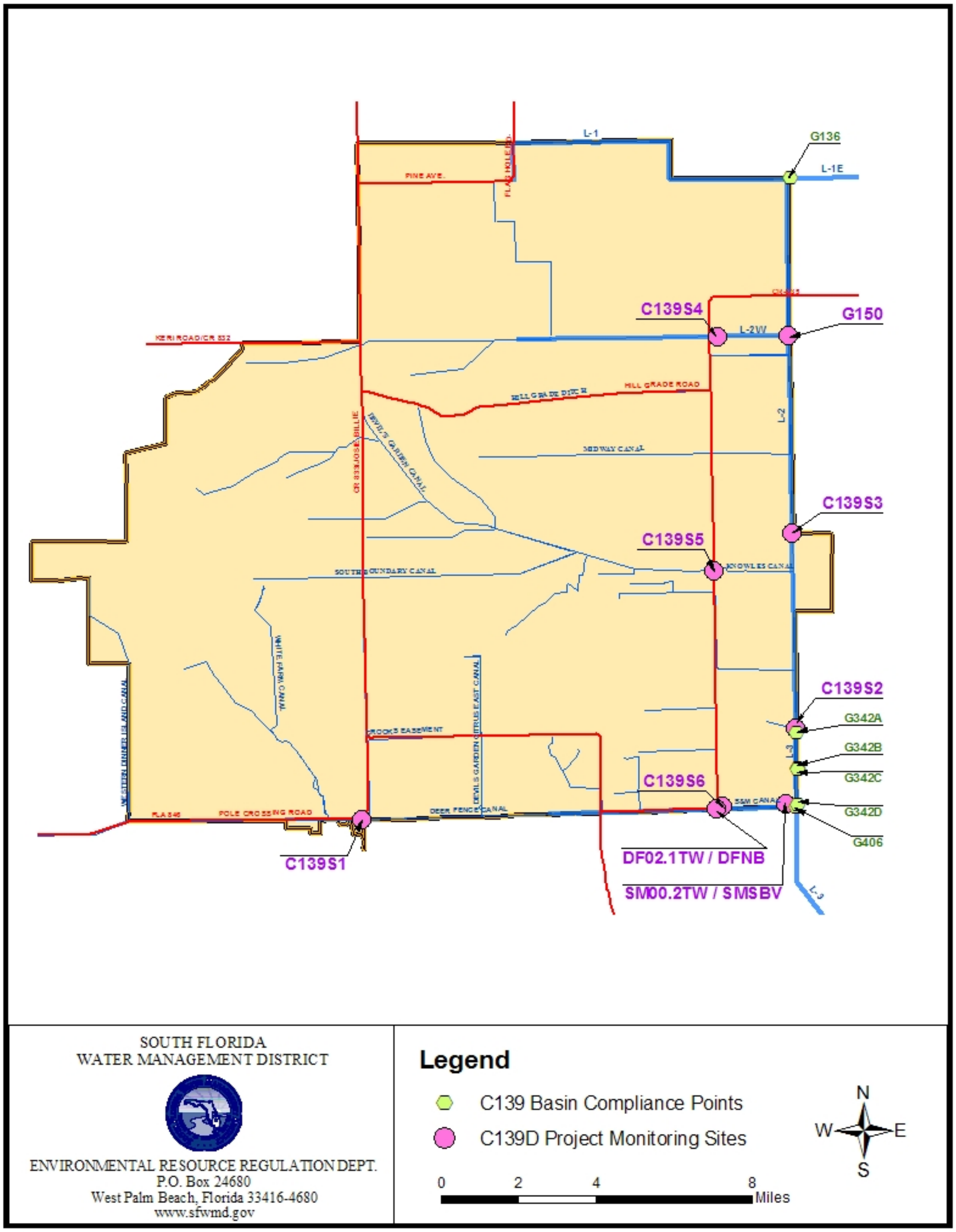


Figure 15. C-139 Basin upstream automatic sampling stations under the C139D Monitoring Project location map.