Appendix 4-2: Water Year 2012 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 2012 (WY2012) (May 1, 2011–April 30, 2012). It provides the underlying data employed in the overall load performance and compliance determination for both the EAA and C-139 basins. Permit-level data used for secondary compliance determination in the EAA, in the event of basin-level noncompliance, 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 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 Basin permit-level water quality monitoring data
- C-139 Basin load performance calculation details
- C-139 Basin 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.). The equations are applied to the monthly rainfall totals for the EAA Basin during WY2012. These totals and related coefficients used to calculate the target load per the rule's equations are provided in **Figure 1**. 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 (pre-BMPs) baseline period load adjusted for the hydrologic variability associated with rainfall. Calculation of the limit is not required for WY2012, as the basin load was less than the target load.

EAA BASIN-LEVEL MONITORING DATA

Chapter 40E-63, F.A.C. requires the South Florida Water Management District (District or SFWMD) 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 Chapter 40E-63 outline data collection requirements. Data collection efforts for WY2012 were consistent with Chapter 40E-63 and supporting appendices.

Basin-level compliance determination is based on water year monitoring at various inflow and outflow points defining the boundary of four major EAA sub-basins (S-5A, S-2/S-6, S-2/S-7, and S-3/S-8) and conveyance canals serving these sub-basins. **Table 1** provides TP sampling statistics for all the District-monitored locations in the EAA Basin during WY2012.

During WY2012, 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 4-7 in Chapter 4 of this volume include the South Florida Conservancy District, South Shore Drainage District, East Beach Water Control District, East Shore Water Control District, and Closter (715) Farms. The runoff from lands within the diversion areas enters the EAA through four pump stations: East Beach Water Control District (pump station EBPS3), the combined area of East Shore Water Control District and Closter Farms (pump station ESPS2), South Shore Drainage District (pump station SSDDMC), and South Florida Conservancy District (pump station SFCD5E).

WY2012 EAA basin compliance TP load calculation

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

Month	Rainfall (in)			
May	2.80 in		m_1 =	3.70
June	4.46 in		m_2 =	8.12
July	8.09 in		m_3 =	7.03
August	6.55 in		X =	3.793
September	6.46 in		C =	0.805
October	8.08 in		S =	0.331
November	0.41 in		SE =	0.2140
December	1.29 in			
January	0.05 in		Target[1] TP Load =	162.8 mtons
February	1.00 in		Limit[2] TP Load =	223.2 mtons
March	1.54 in		Observed TP Load =	63.0 mtons
April	3.66 in		Predicted =	217.0 mtons
Total Rainfall	44.40 in		% Reduction =	71%

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)

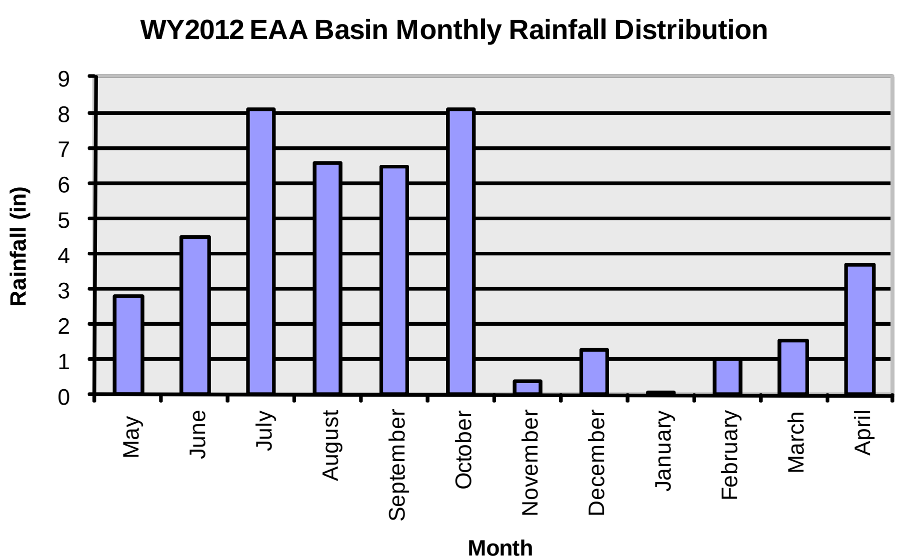

Figure 1. Water Year 2012 (WY2012) (May 1, 2011–April 30, 2012) Everglades Agricultural Area (EAA) Basin monthly rainfall totals, compliance calculation coefficients, and target total phosphorus (TP) load calculation. [Note: ac. = acres, in = inches, mtons = metric tons.]

Table 1. Summary statistics for Water Year 2012 (WY2012) (May 1, 2011–April 30, 2012) total phosphorus (TP) monitoring data for the Everglades Agricultural Area (EAA) Basin. [Note: ppm = parts per million.]

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 Curve Rating[1]
S-5A (West Palm Beach Canal)	S-352	S-352	Grab	76	40	0.057	1.386	0	Excellent
			Composite[2]	5	5	0.081	0.603	0	
	S-5A Complex	S-5A	Grab	53	21	0.051	0.179	0	Excellent
			Composite[2]	37	34	0.052	0.259	0	
	EBPS	EBEACH	Grab	52	7	0.063	0.795	0	Good[3]
			Composite[2]	21	16	0.114	0.873	1	
S-2/S-6 (Hillsboro Canal)	S-2 Complex	S2	Grab	18	1	0.022	0.450	0	Good
			Composite[2]	6	3	0.047	0.171	0	
		S351	Grab	52	23	0.033	0.188	0	Fair
			Composite[2]	21	21	0.034	0.139	0	
	S-6	S-6	Grab	13	3	0.026	0.207	0	Fair
			Composite[2]	37	34	0.013	0.145	0	
	G-328	G328	Grab	52	18	0.012	0.132	1	Fair
			Composite[2]	30	30	0.014	0.114	0	
	ESPS	ESHORE2	Grab	52	8	0.033	0.205	0	Good[3]
			Composite[2]	15	14	0.058	0.201	0	
S-2/S-7 (North New River Canal)	S-2 Complex	S2	Grab	18	1	0.022	0.450	0	Good
			Composite[2]	6	3	0.047	0.171	0	
		S351	Grab	52	23	0.033	0.188	0	Fair
			Composite[2]	21	21	0.034	0.139	0	
	G-370	G-370	Grab	52	14	0.011	0.156	0	Excellent
			Composite[2]	31	31	0.012	1.527	0	
	G-371	G-371	Grab	59	11	0.008	0.132	0	Fair
			Composite[2]	9	9	0.017	0.104	0	

Table 1. Continued.

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 Curve Rating[1]
S-3/S-8 (Miami Canal)	S-3 Complex	S3	Grab	14	1	0.035	0.113	0	Excellent
			Composite[2]	2	1	0.068	0.088	0	
		S354	Grab	52	23	0.026	0.246	1	Good
			Composite[2]	17	17	0.039	0.086	1	
	G-136	G136	Grab	52	22	0.025	0.327	0	Poor[4]
			Composite[2]	25	22	0.031	0.282	0	
	SSDDMC	SSDDMC	Grab	52	10	0.014	0.127	0	Good
			Composite[2]	17	17	0.044	0.163	0	
	SFCD5E	SFCD5E	Grab	52	21	0.033	0.131	0	Excellent
			Composite[2]	25	25	0.040	1.385	0	
	G-372	G-372	Grab	52	18	0.014	0.127	0	Good
			Composite[2]	28	28	0.019	0.102	0	
	G-373	G-373	Grab	58	15	0.013	0.230	0	Good
			Composite[2]	15	15	0.024	0.098	0	

[1]Flow curve ratings – 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 2 summarizes the annual flow, TP load, and flow-weighted mean (FWM) TP concentrations for every structure used during WY2012 to determine overall compliance with EAA Basin 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 Basin TP runoff load. The runoff determination procedures outlined in Chapter 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.

Table 2. WY2012 flow volumes, TP loads, and flow-weighted mean (FWM) TP concentrations for EAA Basin structures. [Note: kac-ft = thousand acre-feet, mt = metric tons, ppb = parts per billion, STA-1 = Stormwater Treatment Area 1, STA-2 = Stormwater Treatment Area 2, STA-3/4 = Stormwater Treatment Area 3/4.]

Sub-Basin (Canal)	Direction		Structure	Load (mt)	Flow (kac-ft)	Concentration (ppb)
S5A (West Palm Beach Canal)	Outflow	to Lake Okeechobee	S-352	0.00	0.00	N/A[1]
		to STA-1 inflow and distribution works	S-5A + S-5AW	22.12	146.52	122
		Total		**22.12**	**146.52**	**122**
	Inflow	from Lake Okeechobee	S-352	26.57	130.24	165
		from L-8 Canal	S-5A + S-5AW	0.00	0.00	136
		from East Beach Water Control District	EBPS3	2.35	4.73	402
		Total		**28.92**	**134.97**	**174**
S-2/S-6 (Hillsboro Canal)	Outflow	to Lake Okeechobee[2]	S-2	0.35	1.09	258
		to STA-2 inflow distribution canal	S-6	18.26	164.39	90
		to STA-2 inflow distribution canal	G-328	1.72	34.17	41
		Total		**20.09**	**198.94**	**82**
	Inflow	from Lake Okeechobee[2]	S-351	19.09	196.75	79
		from East Shore Water Control District	ESPS2	2.08	14.61	116
		Total		**21.17**	**211.35**	**81**
S-2/S-7 (North New River Canal)	Outflow	to Lake Okeechobee[2]	S-2		see S-2 above[2]	
		to STA-3/4	G-370	25.08	113.68	179
		to STA-3/4 bypass structure	G-371	3.04	31.84	77
		Total[2]		**28.34**	**146.23**	**157**
	Inflow	from Lake Okeechobee[2]	S-351		see S-351 above[2]	
		from Water Conservation Area 2	G-371	0.33	22.48	12
		Total[3]		**0.33**	**22.48**	**12**
S-3/S-8 (Miami Canal)	Outflow	to Lake Okeechobee	S-3	0.05	0.44	98
		to STA-3/4	G-372	11.29	156.06	59
		to STA-3/4 bypass structure	G-373	4.46	54.29	67
		Total		**15.85**	**210.61**	**61**
	Inflow	from Lake Okeechobee	S354 (S3)	9.41	120.72	63
		from South Shore Drainage District	SSDDMC	0.85	5.67	122
		from South Florida Conservancy District	SFCD5E	2.39	17.66	110
		from Water Conservation Area 3	G-373	0.82	16.02	41
		from C-139 Basin	G-136	3.20	17.84	146
		Total		**16.67**	**177.92**	**76**

[1]N/A – not available.

[2]The S-351 inflow and S-2 outflow sites serve the S-2/S-6 and S-2/S-7 sub-basins. The total is shown only once to avoid double counting data.

[3]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 totals.

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

Based on the boundary conditions, **Table 3** presents the summaries of flows and TP loads for each sub-basin. The summaries in **Table 3** generally describe the mass balance of inflows and outflows from the EAA sub-basins. The observed runoff TP load and volume from each sub-basin, summing up to a total observed EAA Basin runoff TP load of 63 metric tons (mt) and runoff volume of 546,372 acre-feet (ac-ft), is noted in this table. The EAA permit-level monitoring data (**Table 5** in the *EAA Permit-Level Monitoring Data* section of this appendix) represents the raw discharges from each farm structure into the regional canal system. Although permit-level discharges do not always result in EAA runoff, analysis of the timing, location, and volumes can provide insight into the EAA Basin runoff TP load. 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. More detailed information on the WY2012 load, flow, and FWM TP concentrations at each of the individual inflow and outflow structures**,** along with TP data collection statistics and the current quality level of flow information at each structure, is presented in **Tables 1** and **2**. The locations of the EAA boundary structures represented as inflows and outflows in **Tables 3** and **4** are depicted in Figure 4-7 in Chapter 4 of this volume.

Table 4 presents a summary of the inflow and outflow TP concentrations for WY2012, 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 WY2012 ranged between 63 and 165 parts per billion (ppb). Sub-basin outflow TP concentrations ranged between 61 and 157 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 WY2012, the Miami Canal conveyed EAA Basin runoff, Lake Okeechobee pass-through flows, C-139 Basin runoff, and runoff from two diversion area basins (South Florida Conservancy District and South Shore Drainage District) 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 should be noted that this document does not 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 into a 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 and on STA performance, respectively.

Table 3. EAA sub-basin flows and TP loads by source for WY2012.[1]

Source	Load (mt)		Flow (kac-ft)	
	Inflow	Outflow	Inflow	Outflow
S-5A Sub-Basin (West Palm Beach Canal)				
EAA[2]	N/A[3]	12.38	N/A	106.38
Lake Okeechobee	26.57	7.40	130.24	35.41
East Beach Water Control District	2.35	2.34	4.73	4.73
Total	**28.92**	**22.12**	**134.97**	**146.52**
S-2/S-6 Sub-Basin (Hillsboro Canal)				
EAA[2]	N/A	16.96	N/A	172.74
Lake Okeechobee	6.65	1.05	68.55	11.60
East Shore Water Control District and Closter Farms	2.08	2.08	14.61	14.61
Total	**8.73**	**20.09**	**83.16**	**198.94**
S-2/S-7 Sub-Basin (North New River Canal)				
EAA[2]	N/A	26.48	N/A	126.37
Lake Okeechobee	12.44	1.86	128.19	19.86
Total	**12.44**	**28.34**	**128.19**	**146.23**
S-3/S-8 Sub-Basin (Miami Canal)				
EAA[2]	N/A	7.22	N/A	140.98
Lake Okeechobee	9.41	2.15	120.72	28.73
C-139	3.20	3.20	17.84	17.84
South Shore Drainage District	0.85	0.85	5.67	5.67
South Florida Conservancy District	2.39	2.39	17.66	17.66
Total	**15.86**	**15.81**	**161.89**	**210.90**

[1]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 Chapter 40E-63, Florida Administrative Code (F.A.C.) for determining EAA Basin TP load reductions. Any inflows from the Water Conservation Areas are not represented in this table, as they are not used in the EAA Basin-scale Compliance Model.

[2]EAA represents each sub-basin's portion of total EAA Basin TP load and volume from runoff.

[3]N/A – not applicable.

Table 4. EAA sub-basin inflow and outflow FWM TP concentration for WY2012.

EAA Sub-Basin	Lake Inflow FWM Concentration (ppb)	Total Outflow FWM Concentration (ppb)
S-5A (West Palm Beach Canal)	165	122
S-2/S-6 (Hillsboro Canal)	79	82
S-2/S-7 (North New River Canal)	79	157
S-3/S-8 (Miami Canal)	63	61

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 applied to pre-BMP baseline predicted loads. **Figure 2** depicts the variation of WY2012 sub-basin monthly rainfall compared to the total monthly rainfall for the EAA Basin. A more detailed summary of WY2012 rainfall and predicted load adjustments based on Chapter 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 WY2012.

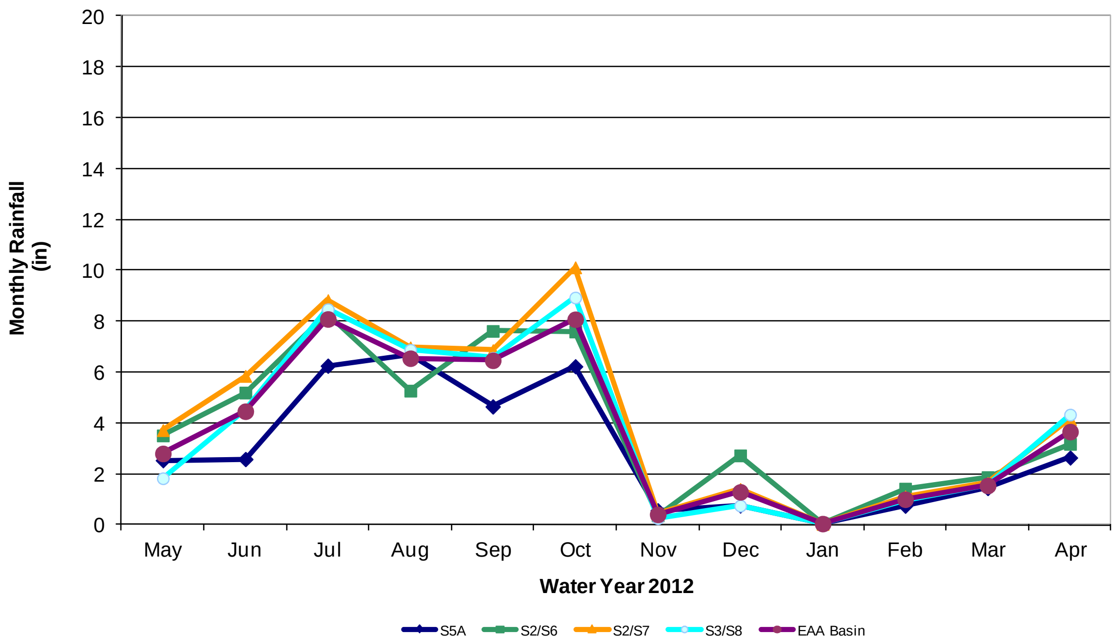

Figure 2. WY2012 EAA Basin and sub-basins monthly rainfall distribution trend.

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 3)**. A wider range of variation is seen with runoff TP loads among the sub-basins (**Figure 4**).

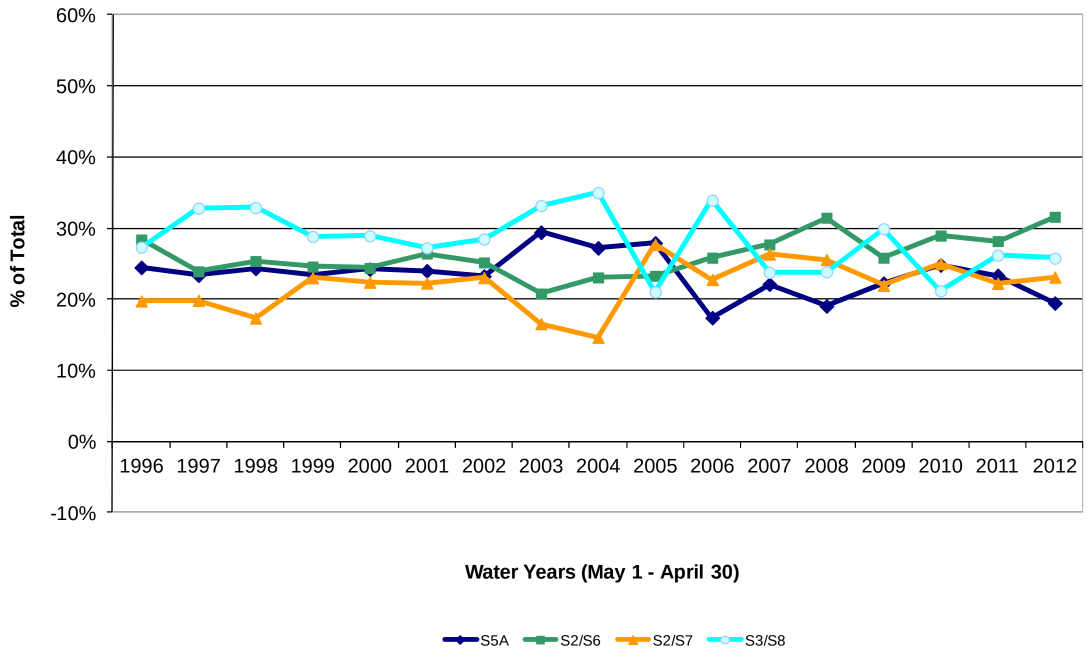

Figure 3. WY1996–WY2012 EAA sub-basin annual runoff volume percent relative contribution trend of basin total.

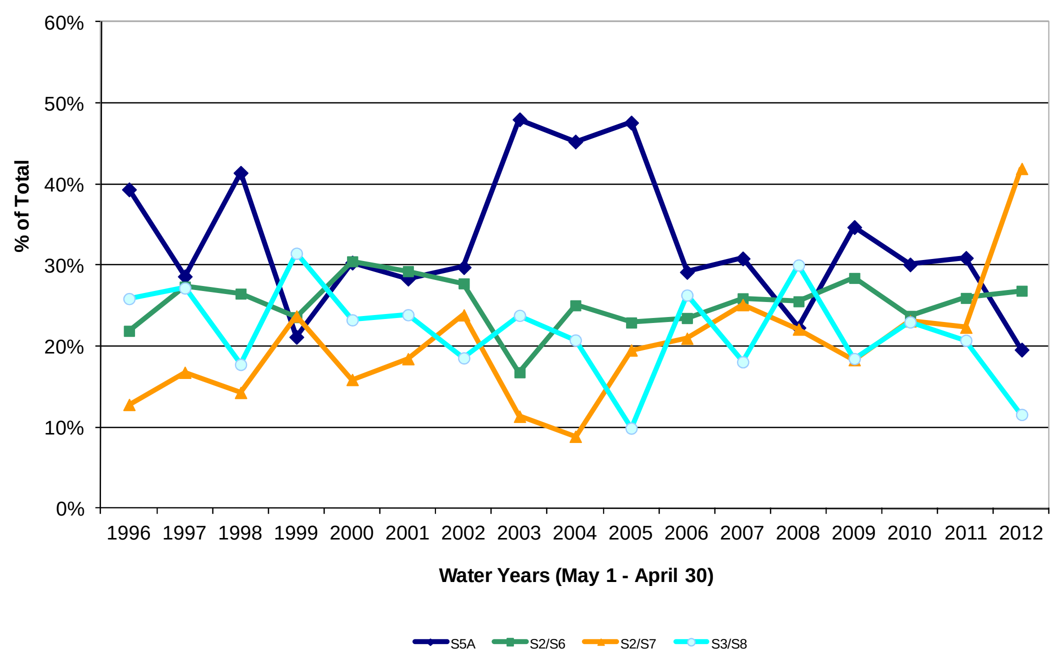

Figure 4. WY1996–WY2012 EAA sub-basin annual TP load percent relative contribution trend of basin total.

EAA PERMIT-LEVEL MONITORING DATA

The WY2012 TP concentrations and load data for individual farms within the EAA Basin 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, F.A.C. Farm water quality monitoring is required on a flow proportional basis and it is generally accomplished through automatic samplers for most farms, or daily grab samples during discharges for a few farms. **Table 5** 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's FWM TP concentration, observed TP unit area load, and the rainfall adjusted unit area load for WY2012.

Table 5 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 (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 are discussed in Chapter 3 of the *2006 South Florida Environmental Report* (SFER) – *Volume I* (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 5 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; an "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 Chapter 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**:
  - Baseline is the TP load per unit area measured for the baseline year for a farm, which includes a 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 WY2011.

- o WY2012 (adjusted unit area load) is the TP load per unit area for the current water year for a farm, which includes a 10-year base period rainfall adjustment.

- **WY2012 Percent TP Reduction** is the WY2011 TP load reduction for the farm compared to the baseline year.
- **WY2012 TP Concentration** is the FWM TP concentration for the farm for WY2011.
- **WY2012 TP Unit Area Load** is the observed TP load per unit area for the current water year for a farm.

Table 5. WY2012 permit-level data for the EAA Basin. [Note: lbs/ac = pounds per acre.]

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac)		WY2012 Percent TP Reduction	WY2012 Unit Area Load (lbs/ac)	WY2012 TP Concen-tration (ppb)	Comments
				Baseline	WY2012				
26-001-01	767.8	Y	1994	2.12	0.37	83%	0.54	58.9	
26-002-01	897.8	N	2001	Unable to Calculate	0.00	Unable to Calculate	0.00	N/A[1]	Pasture area with no recorded flows
26-003-01	597.8	N	1999	0.27	0.00	100%	0.00	N/A	No reported flows for WY2012
26-004-01	4501.6	N	1999	1.22	0.08	93%	0.13	63.3	
26-006-01	1198.4	N	1998	1.19	0.12	90%	0.17	79.4	
26-007-01	653.3	N	1999	2.07	0.68	67%	1.01	152.3	
26-008-01	120.0	Y	1994	2.12	0.37	83%	0.54	58.9	
26-009-01	159.8	N	1999	0.74	0.00	100%	0.00	N/A	No reported flows for WY2012
26-010-01	1231.0	N	1995	1.81	0.38	79%	0.57	335.2	
26-010-02	9961.3	N	1995	5.83	0.06	99%	0.09	32.9	
50-002-01	5656.4	Y	1994	3.21	1.56	52%	0.80	512.9	
50-002-02	9285.4	Y	1994	2.90	0.79	73%	0.41	162.4	
50-003-01	242.0	Y	1994	0.40	0.37	7%	0.70	112.8	
50-003-02	520.0	Y	1994	0.62	0.10	85%	0.18	116.5	
50-003-03	117.6	N	1995	0.22	Unable to Calculate	Unable to Calculate	Unable to Calculate	Unable to Calculate	<75% annual load sampled (68.9% sampled)
50-003-04	320.0	Y	1994	0.91	0.07	92%	0.13	50.1	
50-004-01	908.9	Y	1994	3.68	1.65	55%	0.85	330.9	
50-005-01	319.8	Y	1994	0.91	0.17	81%	0.33	111.3	

[1]N/A – not applicable.

Table 5. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac)		WY2012 Percent TP Reduction	WY2012 Unit Area Load (lbs/ac)	WY2012 TP Concen-tration (ppb)	Comments
				Baseline	WY2012				
50-005-02	232.9	Y	1994	0.06	0.20	-226%	0.38	297.1	Low baseline unit area load value
50-005-03	320.0	Y	1994	0.26	0.09	67%	0.16	51.3	
50-005-04	309.6	Y	1994	1.49	0.02	98%	0.05	84.8	
50-005-05	747.0	Y	1994	1.95	0.01	99%	0.02	63.8	
50-005-06	502.0	Y	1994	1.56	0.02	99%	0.04	70.4	
50-006-01	397.2	Y	1994	4.53	0.42	91%	0.21	92.5	
50-006-02	359.3	Y	1994	5.50	0.18	97%	0.18	75.0	
50-006-03	640.3	Y	1994	3.55	0.18	95%	0.18	125.4	
50-007-01	6472.6	Y	1994	1.56	0.21	87%	0.21	55.4	
50-007-02	5716.7	Y	1994	15.11	1.63	89%	0.84	131.5	
50-008-01	7292.1	Y	1994	0.34	0.49	-42%	0.72	89.9	Low baseline unit area load value
50-009-04	317.0	N	1999	5.19	1.92	63%	1.92	217.7	
50-009-05	1479.4	Y	1994	1.54	1.79	-16%	3.38	200.4	
50-010-01	784.2	N	1995	2.42	0.91	62%	0.91	203.5	
50-010-02	5327.1	N	1994	1.80	0.47	74%	0.60	89.7	
50-010-03	5826.3	Y	1994	1.31	0.14	89%	0.24	43.3	
50-010-04	7159.0	Y	1994	4.76	0.84	82%	0.84	154.4	
50-010-06	10487.3	N	2007	0.99	0.34	66%	0.50	109.6	South Florida Conservancy District[1]
50-011-01	1747.7	Y	1994	2.76	0.38	86%	0.38	149.4	
50-011-03	14337.8	Y	1994	5.79	0.28	95%	0.28	104.6	
50-011-04	4066.0	Y	1994	5.21	0.31	94%	0.31	88.6	
50-011-06	638.0	N	2000	0.82	0.13	84%	0.20	74.7	
50-012-01	1021.5	Y	1994	4.06	0.42	90%	0.42	142.4	
50-013-01	1362.6	N	1997	2.98	1.70	43%	0.87	173.4	
50-014-01	1520.4	Y	1994	1.37	0.05	97%	0.09	100.3	
50-015-01	3276.4	Y	1994	2.62	0.55	79%	0.28	200.9	
50-015-02	2554.5	Y	1994	5.28	0.46	91%	0.24	198.7	
50-016-01	1497.3	Y	1994	15.11	0.66	96%	0.34	79.5	
50-017-01	895.0	Y	1994	3.22	0.32	90%	0.60	86.0	
50-018-01	5890.2	Y	1994	2.82	1.32	53%	0.68	280.7	
50-018-02	6645.6	Y	1994	3.54	0.99	72%	0.51	134.0	
50-018-03	9062.3	Y	1994	1.98	1.02	48%	0.53	106.7	
50-018-04	1913.1	Y	1994	3.88	0.32	92%	0.47	73.3	
50-018-05	1845.8	N	1995	3.64	0.68	81%	1.01	162.4	
50-018-06	1255.1	Y	1994	1.46	0.52	64%	0.77	109.9	
50-018-07	1117.4	Y	1994	2.12	0.37	83%	0.54	58.9	
50-018-08	3208.6	Y	1994	2.28	0.18	92%	0.27	64.6	
50-018-09	1736.6	Y	1994	4.22	0.91	78%	1.35	132.6	
50-018-10	8261.8	Y	1994	3.05	0.45	85%	0.45	102.9	

[1]A small portion of the South Florida Conservancy District was 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 best management practice (BMP) permit issued under Chapter 40E-63, F.A.C., and permit-level monitoring are required. The baseline line water years and baseline adjusted unit area loads from the portion of this basin that historically discharged to the EAA were assigned to the entire basin after diversions were completed.

Table 5. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac)		WY2012 Percent TP Reduction	WY2012 Unit Area Load (lbs/ac)	WY2012 TP Concen-tration (ppb)	Comments
				Baseline	WY2012				
50-018-11	1871.1	Y	1994	19.73	1.64	92%	1.65	174.2	
50-018-12	1655.2	Y	1994	1.78	0.70	61%	0.36	85.4	
50-018-13	594.3	Y	1994	0.40	0.89	-123%	0.46	102.7	Low baseline unit area load value
50-018-14	569.9	N	1994	2.21	0.72	67%	1.36	111.6	
50-018-15	757.3	Y	1994	1.12	1.85	-65%	3.49	293.6	
50-018-16	240.0	Y	1994	4.11	1.89	54%	3.56	96.4	
50-018-17	488.1	Y	1994	3.10	0.28	91%	0.52	201.9	
50-018-18	357.7	Y	1994	0.64	0.31	52%	0.58	95.2	
50-018-19	314.3	Y	1994	35.32	2.45	93%	4.63	136.1	
50-018-20	380.6	Y	1994	3.59	0.60	83%	1.12	127.7	
50-018-22	4481.6	Y	1994	8.18	0.27	97%	0.40	88.6	
50-018-23	2946.0	Y	1994	2.22	0.99	56%	1.47	286.3	
50-018-24	3804.1	Y	1994	1.96	0.33	83%	0.49	105.7	
50-018-25	3808.4	Y	1994	4.99	0.16	97%	0.31	109.7	
50-019-01	568.4	Y	1994	1.54	0.12	92%	0.23	91.8	
50-019-02	1210.0	Y	1994	1.38	0.16	89%	0.30	148.5	
50-019-04	316.6	Y	1996	0.44	0.11	74%	0.21	53.0	
50-019-03	1051.4	Y	1994	0.58	0.11	81%	0.21	54.7	
50-020-01	320.0	Y	1994	3.32	0.28	92%	0.28	102.9	
50-021-01	2558.0	Y	1994	8.92	0.37	96%	0.37	164.7	
50-022-01	320.0	Y	1994	0.80	0.02	97%	0.04	33.8	
50-023-01	278.0	Y	1994	11.83	2.09	82%	2.10	460.7	
50-024-01	574.0	N	1995	6.43	0.15	98%	0.29	96.1	
50-025-01	823.7	Y	1994	3.68	0.23	94%	0.12	65.2	
50-027-01	2771.8	Y	1994	2.40	0.46	81%	0.46	107.4	
50-027-02	798.5	Y	1994	1.22	0.23	81%	0.23	76.1	
50-027-03	1353.1	Y	1994	2.32	0.34	85%	0.34	271.1	
50-027-04	2520.0	Y	1994	2.10	0.41	81%	0.41	116.3	
50-028-01	220.0	Y	1994	14.54	0.92	94%	0.93	102.6	
50-029-01	530.6	Y	1994	4.30	0.25	94%	0.48	86.8	
50-030-01	446.1	Y	1994	14.14	0.10	99%	0.10	93.0	
50-031-01	1608.9	Y	1994	2.56	0.92	64%	0.92	100.5	
50-031-02	1387.0	Y	1994	5.48	1.20	78%	1.20	362.4	
50-031-03	602.4	Y	1994	8.57	1.04	88%	1.04	154.1	
50-032-01	305.7	Y	1994	0.84	1.72	-105%	3.25	174.8	
50-033-02	6196.8	N	1994	12.52	1.87	85%	0.96	413.5	East Beach Water Control District[1]
50-034-01	7897.1	Y	1994	1.68	0.10	94%	0.10	108.3	
50-034-02	600.5	Y	1994	3.37	0.42	88%	0.42	185.7	

[1]A small portion of the East Beach Water Control District was 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 Chapter 40E-63, F.A.C., and permit-level monitoring are required. The baseline line water years and baseline adjusted unit area loads from the portion of this basin that historically discharged to the EAA were assigned to the entire basin after diversions were completed.

Table 5. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac)		WY2012 Percent TP Reduction	WY2012 Unit Area Load (lbs/ac)	WY2012 TP Concen-tration (ppb)	Comments
				Baseline	WY2012				
50-034-03	4611.8	Y	1994	4.08	0.27	93%	0.51	109.6	
50-034-04	4138.0	Y	1994	1.54	0.15	90%	0.29	146.3	
50-035-01	478.5	Y	1994	5.74	0.21	96%	0.21	139.8	
50-035-02	1634.3	N	1997	2.98	1.70	43%	0.87	173.4	
50-035-03	120.0	N	1999	8.71	6.83	22%	3.51	180.8	
50-037-01	1184.4	Y	1994	6.70	0.00	100%	0.00	N/A[1]	No reported flows for WY2012
50-038-01	1285.0	Y	1994	3.71	0.37	90%	0.19	70.8	
50-039-01	62.5	N	1995	4.01	0.20	95%	0.20	110.3	
50-039-02	143.1	N	1995	4.25	1.39	67%	1.39	166.1	
50-040-01	216.2	N	1995	1.40	0.80	43%	0.41	192.1	
50-040-02	498.6	N	1995	3.61	0.64	82%	0.33	172.4	
50-041-01	108.8	N	1998	2.69	0.81	70%	0.81	119.2	
50-041-02	300.4	N	1998	2.44	0.03	99%	0.06	74.9	
50-042-01	320.0	N	1995	0.14	0.50	-245%	0.93	315.2	Low baseline unit area load value
50-044-01	2168.8	N	1996	5.02	1.10	78%	0.57	138.9	
50-045-01	281.8	N	1995	4.35	0.23	95%	0.23	144.5	
50-045-02	160.6	N	1995	1.41	1.87	-33%	1.88	230.9	
50-046-01	35.0	N	1994	2.21	0.72	67%	1.36	111.6	
50-047-01	630.3	N	1996	1.46	0.33	77%	0.33	95.0	
50-047-02	640.0	N	1995	0.84	0.41	51%	0.41	84.1	
50-047-03	1832.0	N	1997	0.44	0.54	-23%	0.54	112.0	Low baseline unit area load value
50-047-04	198.5	N	1996	0.68	0.18	73%	0.18	60.5	
50-047-05	314.0	N	1997	0.55	1.68	-204%	1.68	210.2	Low baseline unit area load value
50-047-07	3494.2	N	1996	0.67	0.71	-6%	0.37	80.5	Low baseline unit area load value
50-047-08	1557.7	N	1996	0.96	0.91	6%	0.91	128.5	
50-048-01	1185.1	N	1995	1.25	0.88	30%	0.88	68.8	
50-048-02	640.0	N	1995	0.36	0.14	62%	0.26	126.8	
50-051-01	811.4	N	1995	0.97	0.44	55%	0.44	102.4	
50-053-01	148.9	N	1995	5.16	0.14	97%	0.14	103.1	
50-054-01	9379.9	N	1996	1.16	0.40	66%	0.20	102.9	
50-054-02	960.0	N	1996	0.50	1.41	-183%	0.72	216.3	Low baseline unit area load value
50-054-03	1227.2	N	1996	0.35	0.02	93%	0.01	22.0	
50-054-04	3684.3	N	1996	0.82	0.66	19%	0.34	75.2	
50-055-01	392.9	N	1997	0.86	0.06	94%	0.06	24.2	
50-055-02	810.4	N	1999	0.45	0.16	64%	0.16	69.3	
50-055-03	2871.2	N	1996	0.74	0.19	75%	0.19	48.8	
50-056-01	849.8	N	1996	0.98	1.13	-14%	1.35	140.5	
50-058-01	157.0	N	1995	0.02	0.00	100%	0.00	N/A	No reported flows for WY2012
50-059-01	11522.9	N	1996	2.35	2.19	7%	1.13	278.8	

[1]N/A – not applicable.

Table 5. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac) Baseline	Rain Adjusted Unit Area Load (lbs/ac) WY2012	WY2012 Percent TP Reduction	WY2012 Unit Area Load (lbs/ac)	WY2012 TP Concen-tration (ppb)	Comments
50-059-02	1767.6	N	1997	1.07	1.94	-81%	1.00	168.8	
50-059-03	709.5	N	1996	1.65	0.72	57%	0.37	138.7	
50-059-04	306.1	N	1996	1.14	2.21	-93%	1.13	250.9	
50-060-01	8137.2	N	1995	0.18	0.13	25%	0.13	26.2	
50-060-02	7613.8	N	1995	0.75	0.46	38%	0.46	69.7	
50-061-01	639.5	N	1995	1.44	0.03	98%	0.03	94.9	
50-061-03	3434.3	N	1995	0.76	0.17	78%	0.32	69.9	
50-061-05	313.7	N	1995	1.89	0.72	62%	1.37	85.9	
50-061-06	237.0	N	1995	1.68	0.13	92%	0.25	83.1	
50-061-07	318.2	N	1995	1.24	0.13	89%	0.25	40.5	
50-061-08	375.2	N	1999	1.76	1.98	-13%	1.02	174.9	
50-061-10	25062.2	N	1996	0.60	0.13	78%	0.19	44.1	
50-061-12	730.0	N	1995	2.55	0.34	87%	0.64	126.2	
50-061-13	1059.6	N	1995	1.16	0.17	85%	0.33	170.5	
50-061-15	6760.2	N	1995	1.91	0.39	80%	0.39	98.9	
50-061-17	1598.1	N	1995	12.22	1.96	84%	1.01	171.7	
50-061-18	1555.1	N	1995	9.82	0.54	94%	0.54	20.4	
50-061-20	156.1	N	1994	1.80	0.47	74%	0.60	89.7	
50-061-22	3739.3	N	1996	0.49	0.25	48%	0.38	53.8	
50-062-01	4625.8	N	1996	0.20	0.20	0%	0.37	56.5	
50-062-02	10754.2	N	1996	0.46	0.31	33%	0.59	65.6	
50-062-03	1188.3	N	1996	0.54	0.18	66%	0.34	60.0	
50-062-04	901.2	N	1996	0.26	0.26	1%	0.48	140.3	
50-062-05	5249.6	N	1996	0.41	0.31	24%	0.59	40.8	
50-062-09	7658.9	N	1997	0.22	0.03	87%	0.05	57.1	
50-062-10	8772.4	N	1997	0.72	0.42	42%	0.42	40.7	
50-062-11	960.0	N	1996	0.44	0.31	30%	0.58	330.8	
50-063-01	9792.2	N	1996	0.45	0.19	59%	0.35	99.5	
50-064-01	898.7	N	1997	2.98	1.70	43%	0.87	173.4	
50-064-03	145.0	N	1997	2.98	1.70	43%	0.87	173.4	
50-064-04	1150.4	N	1997	2.98	1.70	43%	0.87	173.4	
50-065-02	938.1	N	1995	3.64	0.87	76%	0.87	172.3	
50-065-03	3751.7	N	1997	2.98	1.70	43%	0.87	173.4	
50-065-05	929.8	N	1997	2.98	1.70	43%	0.87	173.4	
50-065-06	453.9	N	1997	2.98	1.70	43%	0.87	173.4	
50-065-07	513.0	N	1995	3.92	0.59	85%	0.59	99.3	
50-065-08	628.0	N	1997	2.98	1.70	43%	0.87	173.4	
50-065-10	792.3	N	1995	1.55	0.39	75%	0.39	66.8	
50-067-01	1143.9	N	1996	0.40	0.11	72%	0.16	40.7	
50-067-02	10257.1	N	1996	0.94	0.14	85%	0.21	112.1	
50-067-03	681.6	N	1996	1.02	1.06	-3%	1.57	73.0	
50-067-04	3819.5	N	1996	0.55	0.78	-41%	1.16	147.5	Low baseline unit area load value
50-067-05	7322.6	N	1996	0.42	0.10	75%	0.15	37.3	
50-067-06	1277.2	N	1999	0.49	0.22	55%	0.33	34.9	

Table 5. Continued.

Basin ID	Basin Acreage	Early Baseline	Baseline Year	Rain Adjusted Unit Area Load (lbs/ac)		WY2012 Percent TP Reduction	WY2012 Unit Area Load (lbs/ac)	WY2012 TP Concen-tration (ppb)	Comments
				Baseline	WY2012				
50-067-07	1975.5	N	1999	0.54	0.27	50%	0.40	54.9	
50-067-09	1277.7	N	1999	0.54	0.53	1%	0.78	710.4	
50-067-10	2551.8	N	1999	1.21	0.10	92%	0.14	31.1	
50-067-11	6179.0	N	1999	0.85	0.17	79%	0.26	42.4	
50-068-01	2615.8	N	1996	1.13	1.66	-46%	0.85	276.5	
50-069-01	317.5	N	1996	1.06	0.58	46%	1.09	356.2	
50-070-01	245.0	N	1995	3.82	1.18	69%	1.18	188.5	
50-070-02	244.0	N	1995	3.09	0.61	80%	0.61	106.1	
50-073-01	67.8	N	2001	Baseline Year	0.00	Unable to Calculate	0.00	N/A	Not used for agriculture; has on-site retention area and does not discharge
50-077-01	3168.0				0.43		0.80	140.7	Closter Farms (715 Farms)[1]
50-078-01	71.6	N	1999	8.71	0.78	91%	1.46	96.6	
50-080-01	8108.5				0.29		0.55	111.6	East Shore Water Control District[1]
50-081-01	210.0	N	2004	0.66	0.34	49%	0.63	73.4	
50-081-02	4845.5	N	1994	1.31	0.43	67%	0.64	113.4	South Shore Drainage District[1]
50-082-01	484.5	N	1995	9.82	Unable to Calculate	Unable to Calculate	Unable to Calculate	Unable to Calculate	<75% annual load sampled (60% sampled)

[1]Closter Farms (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 Chapter 40E-63, F.A.C., and permit-level monitoring are required.

Figures 5, **6**, and **7** depict the spatial distribution of TP concentrations, rainfall adjusted unit area loads, and observed unit area loads found in the EAA, respectively. These figures are graphical representations of the **Table 5** data from individual permit holders. Each basin ID is mapped as a whole, and no information is available to account for localized variations within a basin.

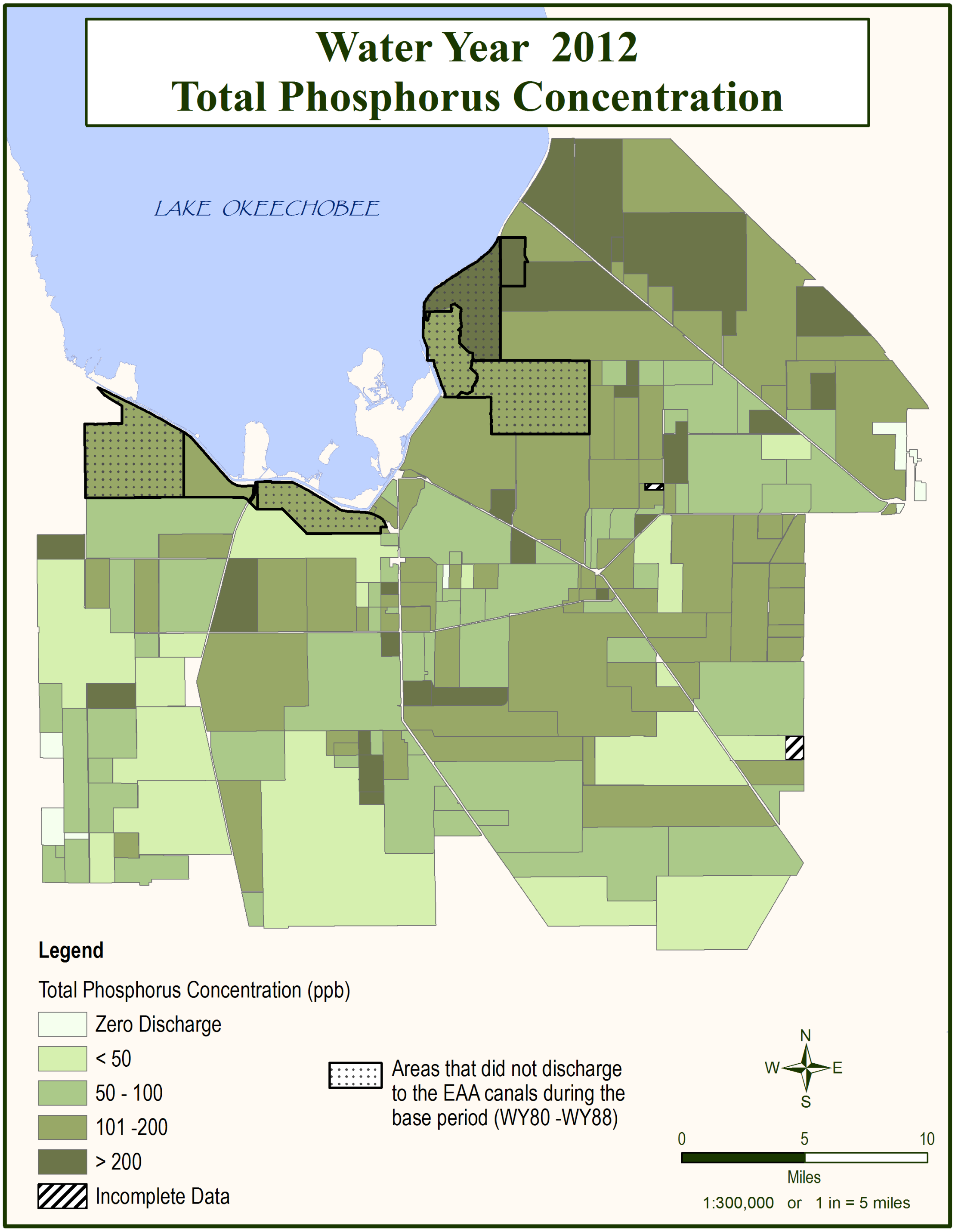

Figure 5. WY2012 flow-weighted mean (FWM) TP concentrations in parts per billion (ppb) in the EAA Basin.

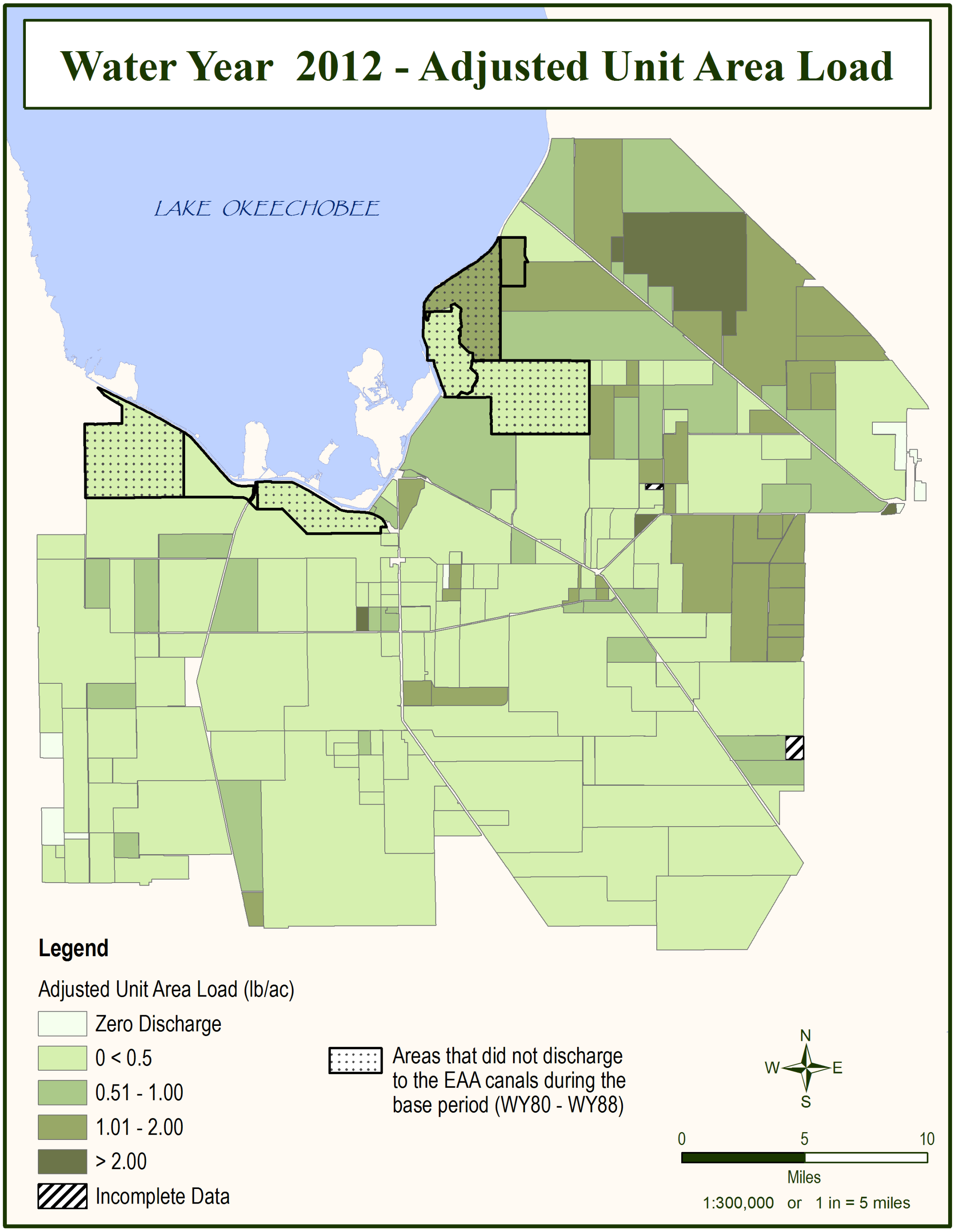

Figure 6. WY2012 rainfall-adjusted unit area TP load in pounds per acre (lbs/ac) in the EAA Basin.

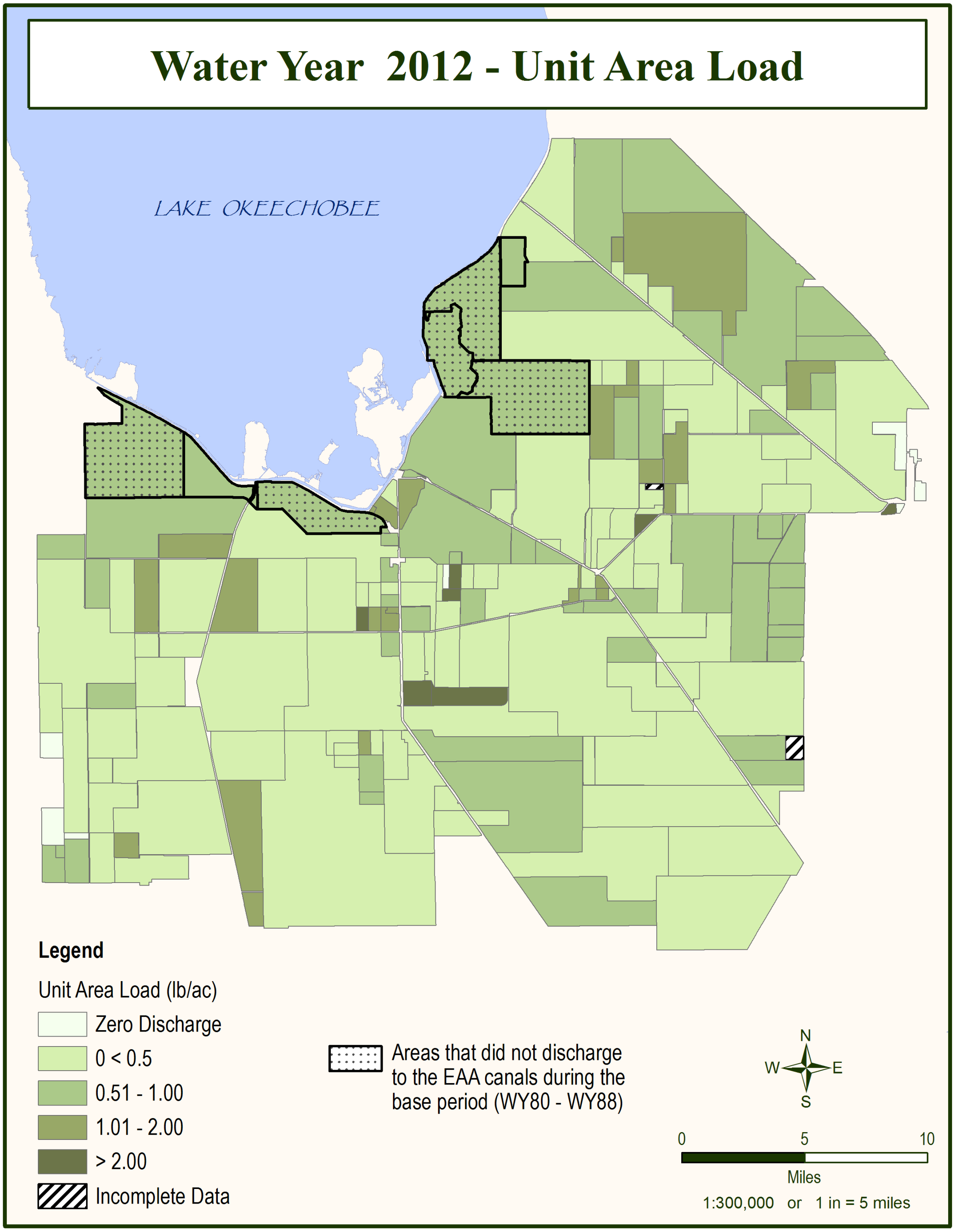

Figure 7. WY2012 observed TP unit area load in the EAA Basin.

AGRICULTURAL PRIVILEGE TAX INCENTIVE CREDITS

The Everglades Forever Act 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 6** lists the Everglades Agricultural Privilege area-wide incentive credit schedule and tax credits earned to date for the EAA.

Table 6. Everglades Agricultural Privilege Tax area-wide incentive credits for the EAA Basin. [Note: EFA = Everglades Forever Act; Min. =Minimum; Phos. = Phosphorus.]

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	79	54	310.98	15.55	295.43	FY13
2013	2012	25	**71**	46	341.43	15.55	325.88	FY14

Note: Water Year 2012 (Calendar Year 2013 / FY2014) 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

C-139 BASIN SUPPLEMENTAL EVALUATION

C-139 BASIN COMPLIANCE CALCULATION DETAILS

Compliance with C-139 Basin mandates to maintain discharges at or below the collective average annual phosphorus loading based proportionally on the historical rainfall during the baseline period is defined by mathematical equations and methodology dictated by Chapter 40E-63, F.A.C. The equations relevant to WY2012 compliance are reproduced in **Figure 8**. **Figure 9** presents the monthly rainfall totals for the C-139 Basin during WY2012 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 WY2012 is below the target and meets the performance measure for WY2012. 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 Chapter 40E-63, F.A.C. Since the C-139 Basin 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. The 2010 amended rule includes incentives for farm-level monitoring through the option to participate in demonstration projects with measurement of BMP effectiveness. Also under the amended rule, permittees may claim that no additional BMPs are practicable, given full BMP implementation and permit basin monitoring demonstrating no increasing trends.

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

The target, limit and adjusted rainfall will be calculated according to the following equations and explanation:

$$\text{Target} = \exp(-17.0124 + 4.5995\ X + 3.9111\ C - 1.0055\ S)$$

Explained Variance = 74.2%, Standard Error of Estimate = 0.5440

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 to 12, inches) for the current year:

$$m_1 = \text{Sum}[\ r_i\ ] / 12$$

$$m_2 = \text{Sum}[\ r_i - m_1\ ]^2 / 12$$

$$m_3 = \text{Sum}[\ r_i - m_1\ ]^3 / 12$$

$$X = \ln(12\ m_1)$$

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

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

$$\text{Limit} = \text{Target} \exp(1.440\ SE)$$

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

$$SE = 0.5440\ [\ 1 + 1/10 + 4.8500\ (X-X_m)^2 + 8.1932\ (C-C_m)^2 + 0.9247\ (S-S_m)^2 + 4.5950\ (X-X_m)\ (C-C_m) - 0.3624\ (X-X_m)\ (S-S_m) - 4.0048\ (C-C_m)\ (S-S_m)\ ]^{\ 0.5}$$

$$\text{Adjusted Rainfall} = \exp[X + 0.8503\ (C - C_m) - 0.2186\ (S - S_m)]$$

Where :

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

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

Adjusted Rainfall = equivalent rainfall for mean C and S variables (inches)

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

C = coefficient of variation calculated from 12 monthly rainfall totals

S = skewness coefficient calculated from 12 monthly rainfall totals

X_m = average value of the predictor in calibration period = 3.8434

C_m = average value of the predictor in calibration period = 0.9087

S_m = average value of the predictor in calibration period = 0.8200

Figure 8. Chapter 40E-63, Florida Administrative Code (F.A.C.) (referred to as Rule 40E-63 in the figure), Appendix B2 excerpt of hydrologic adjustment and basin compliance mathematical equations to calculate annual TP reductions.

WY2012 C-139 Basin compliance TP load calculation

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

Month	Rainfall (in)			
May	2.34 in		m_1 =	3.71
June	7.91 in		m_2 =	10.25
July	9.32 in		m_3 =	15.28
August	6.48 in		X =	3.795
September	4.68 in		C =	0.902
October	7.63 in		S =	0.508
November	0.83 in		SE =	0.593
December	0.54 in			
January	0.03 in		Target[1] TP Load =	31.5 mtons
February	0.98 in		Limit[2] TP Load =	74.1 mtons
March	0.91 in		Observed TP Load =	15.3 mtons
April	2.82 in		Predicted[3]=	31.5 mtons
Total Rainfall	44.47 in		% Reduction =	51%

Notes:

[1] Target load is adjusted for reduction in C139 land area (168450 ac./ 169700 ac.)

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

[3] Predicted load = Target load

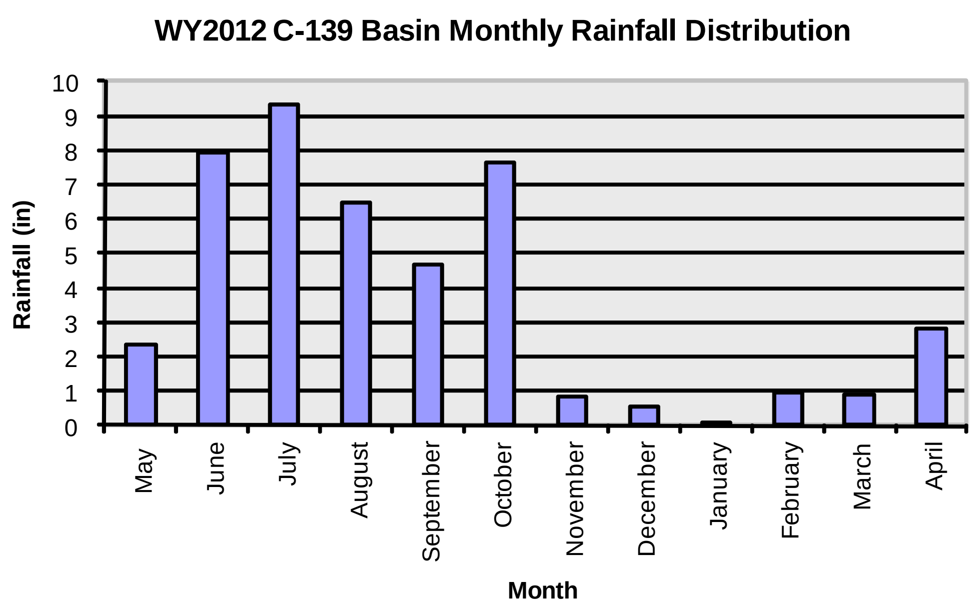

Figure 9. WY2012 C-139 Basin monthly rainfall, total rainfall, calculated target, limit, and observed TP loads, based upon Chapter 40E-63, F.A.C., Appendix B2.

C-139 BASIN-LEVEL MONITORING DATA

Chapter 40E-63, F.A.C., 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 Chapter 40E-63 outline data collection requirements. Data collection efforts for WY2012 were consistent with Chapter 40E-63 and supporting appendices.

During WY2012, 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 an inflow and outflow boundary point, respectively, for the EAA and C-139 basins. **Table 7** provides WY2012 TP sampling statistics for all the District-monitored locations in the C-139 Basin.

Table 7. Summary statistics for WY2012 TP monitoring data for the C-139 Basin.

Structure	Sampling Point	Sample Type	Number Sampled	Number Used	Minimum (ppb)	Maximum (ppb)	Number Flagged	Flow Curve Rating[1]
G-342A	G342A	Grab	40	0	38	538	0	Fair
		Composite[2]	23	23	63	483	0	
G-342B	G342B	Grab	39	3	38	494	0	Good
		Composite[2]	18	18	57	257	0	
G-342C	G342C	Grab	40	2	41	480	0	Good
		Composite[2]	16	16	56	266	0	
G-342D	G342D	Grab	40	1	70	500	0	Poor[3]
		Composite[2]	21	20	74	339	0	
G-406	G406	Grab	52	0	72	473	0	Good
		Composite[2]	52	21	66	486	0	
G-136	G136	Grab	52	0	25	327	0	Fair
		Composite[2]	25	22	31	282	0	

[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]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.

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 TP load limitations. The TP load ultimately discharging to the Everglades is not the same as the TP loads leaving C-139 Basin outflow structures 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). **Table 8** summarizes the overall WY2012 flow, TP load, and FWM concentration at six primary basin outflow structures.

Table 8. C-139 Basin flows, TP loads, and FWM concentrations by source for WY2012.

Source	TP Load (mt)	Flow (kac-ft)	TP FWM Concentration (ppb)	Percent of Total Load	Percent of Total Flow
C-139 Basin to EAA					
G-136 Total[1]	**3.2**	**17.8**	**145**	**20.9%**	**22.8%**
C-139 Basin to Stormwater Treatment Areas 5/6 (STA-5/6)					
G-342A	2.8	12.6	178	18.1%	16.1%
G-342B	1.4	10.4	111	9.3%	13.3%
G-342C	1.2	9.2	108	8.0%	11.7%
G-342D	3.8	15.3	199	24.6%	19.6%
G-406[2]	2.9	12.9	184	19.1%	16.5%
STA-5/6 Total	**12.1**	**60.4**	**163**	**79.1%**	**77.2%**
C-139 Basin					
Basin Total	**15.3**	**78.2**	**159**	**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 Stormwater Treatment Area 5 (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 Stormwater Treatment Area 6 (STA-6), unless diversion is necessary through G-407 to Water Conservation Area 3.

The C-139 Basin exported 15.3 mt of TP during WY2012, less than the 20.2 mt of TP during WY2011. During WY2012, 12.1 mt of TP was exported to STA-5 and STA-6 via G-342A–D structures and G-406 (79.1 percent), and 3.2 mt (20.9 percent) to the L-1 canal via G-136.

Although the C-139 Basin received more rainfall in WY2012 (44.47 inches) than in WY2011 (40.97 inches), the total runoff volume was less in WY2012 [78.2 thousand acre-feet (kac-ft)] compared to WY2011 (106.3 kac-ft). The WY2012 FWM TP concentration was 159 ppb for the C-139 Basin, which was 3 percent higher than in WY2011 (154 ppb). Factors that potentially affected the WY2012 TP runoff and load include (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 relatively low throughout the 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, which 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. In part, the results of these analyses were incorporated to the amendment to Chapter 40E-63, F.A.C., refining the load performance methodology for the basin to incorporate monthly rainfall statistics to the regression for determining performance relative to base period conditions. 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.

WY2012 rainfall in the C-139 Basin was approximately 5 inches below average rainfall, relative to the WY1980–WY2012 period (**Figure 10**). **Figure 11** shows how the amount of annual rainfall in the C-139 Basin compares with the amount of rainfall translated into excess runoff. In general, a higher annual rainfall corresponds to a higher runoff coefficient. However, monthly rainfall distribution also affects the fraction of rainfall resulting in runoff. Evaluation of the intra-annual data has contributed to better understanding, future prediction, and control of TP discharges.

The scatter plot of monthly flow versus monthly FWM TP concentration in **Figure 12** implies that monthly TP concentrations from the C-139 Basin increase with monthly flow. In general, the WY2012 monthly flow and FWM TP concentration follow the trend stated above with the exception of the flow and concentration measured in May 2011. There was a small amount of flow in May 2011 following dry conditions for the previous six months, and it is likely that this first flush resulted in the high monthly FWM TP concentration of 409 ppb. Due to the low volume of May 2011 discharges, this had little impact to the annual observed TP load. The next highest monthly FWM TP concentration in WY2012 was 268 ppb, which coincided with the highest monthly flow volume in July 2011. Over 44 percent of the annual TP load from the C-139 Basin was discharged in July.

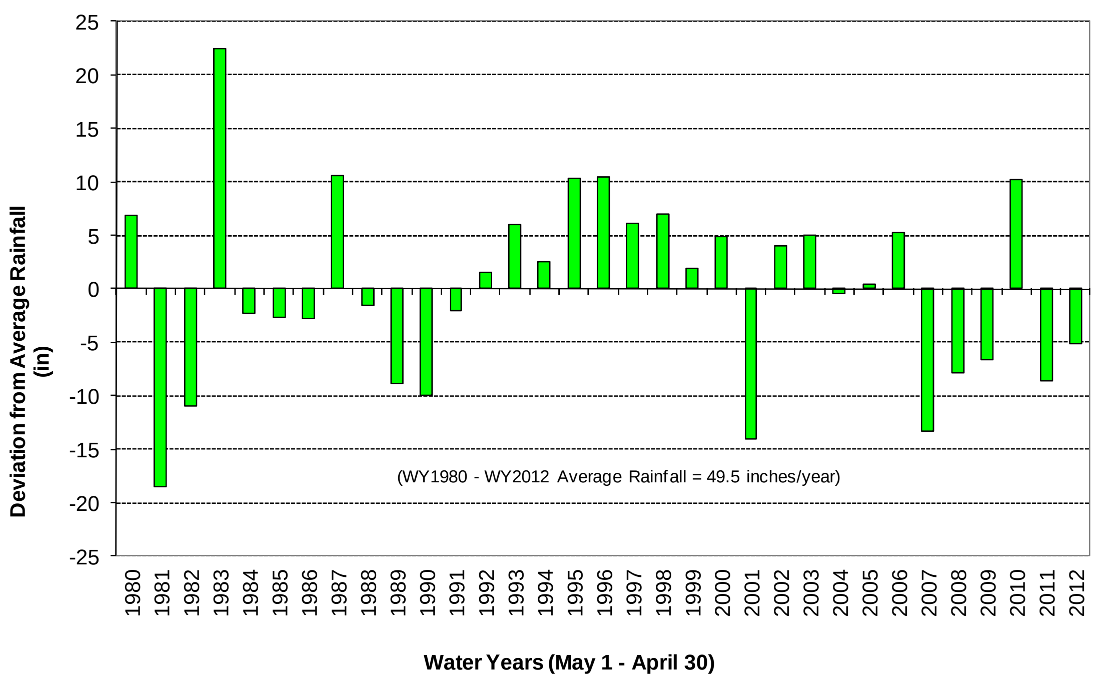

Figure 10. WY1980–WY2012 C-139 Basin annual rainfall deviation from the long-term average.

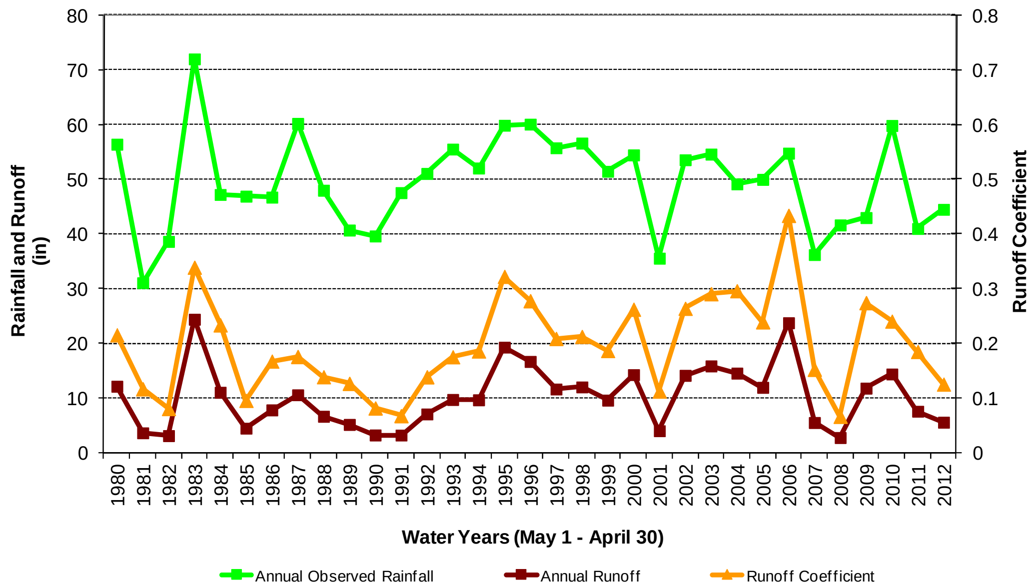

Figure 11. WY1980–WY2012 C-139 Basin annual rainfall and runoff relationship.

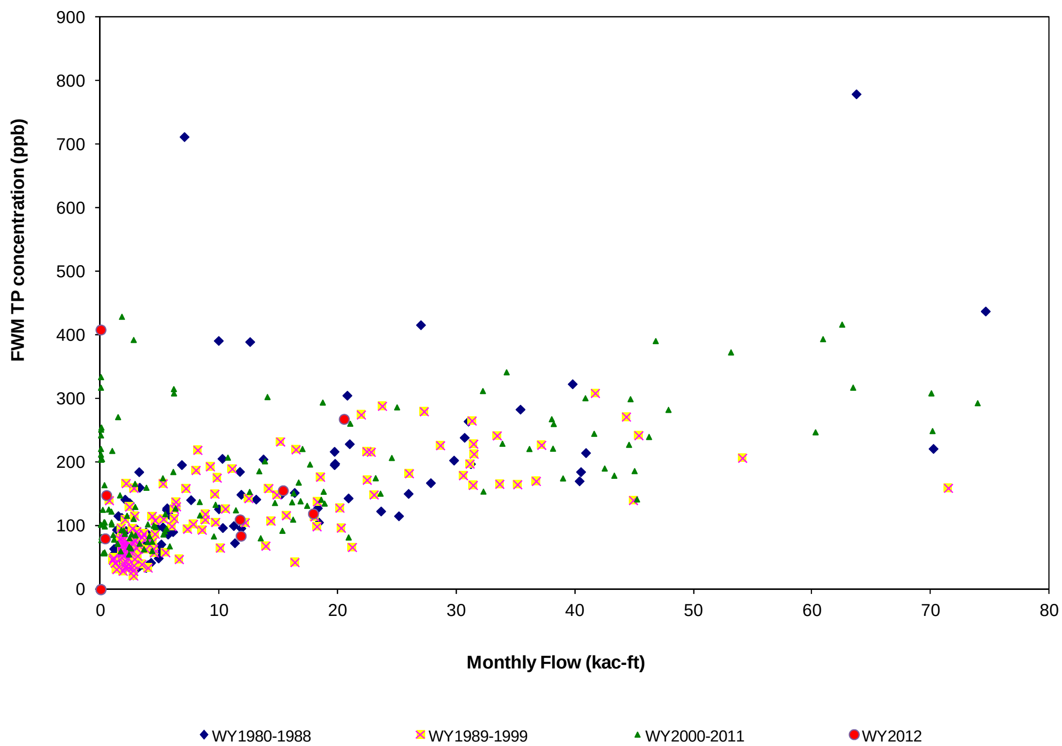

Figure 12. C-139 Basin monthly flow volume versus monthly FWM TP concentration for selected water years.

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. The amended Chapter 40E-63, F.A.C., defines use of the data from these monitoring sites to compute loads and unit area loads allowing the District to compute whether landowners within several levels of sub-basins met the performance measure, even if the C-139 Basin as a whole did not. This monitoring project has eight automatic samplers for determining water quality and flow data from C-139 Basin sub-basins (**Figure 13**). Three automatic samplers were installed in WY2006 (G150, SM00.2TW/SMSBV, and DF02.1TW/DFNBV), four were installed in WY2007 (C139S1, C139S2, 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 9** summarizes station names, sampling start date, and number of samples for each collection type during WY2012. The water quality data from these sites are stored in the District's DBHYDRO database under project name C139D.

WY2012 data from these sub-basin sites will not be used for performance determination now or in the future as WY2013 is the first full year with required implementation of comprehensive BMP plans. Chapter 40E-63, F.A.C., also defines a process to verify if monitoring at each site was successful and if the data is representative of sub-basin discharges. It also contains adjustments to ensure comparability to C-139 Basin unit area load target results. In addition, several of the sites' flow computation methodologies were not fully established in WY2012 for calculation of WY2012 flows, loads, and FWM 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 WY2011, 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 operational details are completed for these sites, flow and stage data will be recorded daily (or in even finer increments) with FWM TP concentration data collected weekly.

Table 9. C-139 Basin upstream automatic sampling stations under the C139D Monitoring Project.

Flow Station Name	Water Quality Station Name	First Auto Collection	Number of WY2012 Samples Grab/Auto	Type of Flow Calculation	First Flow or Velocity Record
G150	G150	10/25/06	52/23	culvert	5/3/89
C139S1	C139S1	12/20/06	52/50	index velocity meter	2/28/07
C139S2	C139S2	10/25/06	52/43	index velocity meter	8/30/06
C139S3	C139S3	10/25/06	52/40	index velocity meter	10/20/06
C139S4	C139S4	1/2/08	52/45	index velocity meter	9/27/07
C139S6	C139S6	6/11/08	29/36	index velocity meter	3/16/08
SMSBV	SM00.2TW	4/25/06	52/50	index velocity meter	12/19/05
DFNBV	DF02.1TW	4/25/06	39/22	index velocity meter	1/7/06

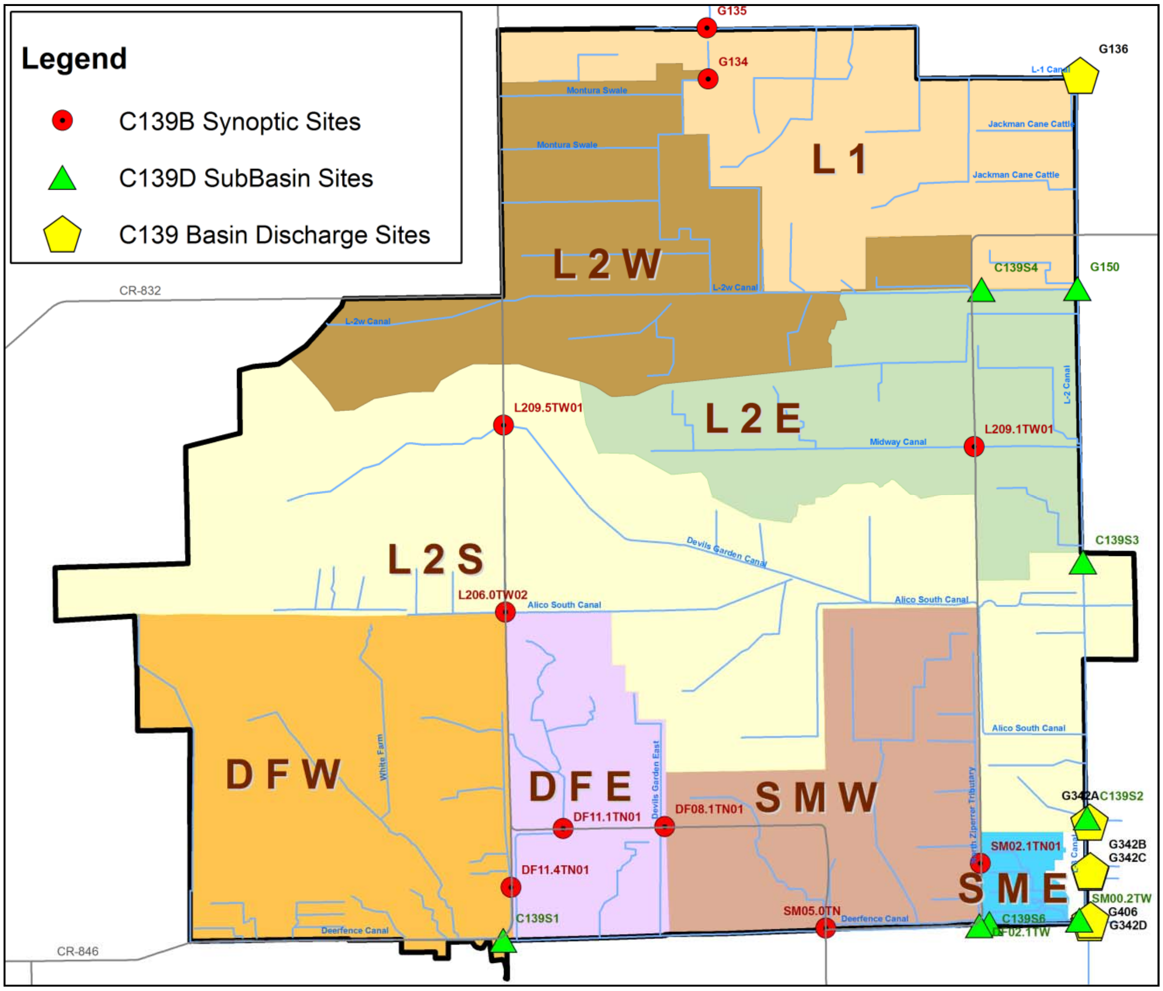

Figure 13. Upstream synoptic, sub-basin, and C-139 Basin discharge (performance) monitoring sites and sub-basins location map.