Chapter 4: Phosphorus Source Controls for the Basins Tributary to the Everglades Protection Area

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SUMMARY

This chapter provides an update on the South Florida Water Management District (SFWMD or District) source control program for phosphorus in basins tributary to the Everglades Protection Area (EPA). The Everglades phosphorus source control program is one of the strategies to achieve water quality standards for the EPA and is a strategic priority under the District's Everglades Program. The Everglades Forever Act (EFA) and the Conceptual Plan for Achieving Long-Term Water Quality Goals (Long-Term Plan) outline District responsibilities and schedules to implement basin-specific solutions to control phosphorus at the source. These solutions are implemented through both regulatory and non-regulatory efforts in basins within the Everglades Construction Project (ECP) area and areas outside of the original ECP area, known as non-ECP basins.

This update covers District efforts in ECP and non-ECP basins during Water Year 2007 (WY2007) (May 1, 2006–April 30, 2007) and includes basin-specific reporting of compliance status, phosphorus levels and monitoring data, and source control strategies as indicators of success. The following 10 basins, identified in **Figure 4-1**, discharge to the EPA: Everglades Agricultural Area (EAA), C-139, C-11 West, North New River Canal (NNRC), North Springs Improvement District (NSID), Feeder Canal, L-28, C-111, Village of Wellington's ACME Improvement District (ACME), and Boynton Farms. A source control strategy has been developed for each basin consistent with the requirements of the EFA and the Long-Term Plan. The strategy includes implementation of Best Management Practices (BMPs) for phosphorus reduction, regulatory programs, voluntary programs, educational programs, and integration with local and regional projects. The District is required to implement, monitor, optimize, and report on the progress of the source control strategy for each basin on an annual basis.

Basin-specific updates within this chapter present WY2007 flow, phosphorus concentration and load data as well as compare the annual data with performance measures established by specific mandates. Preliminary analysis of the data has been made to compare annual and seasonal results with past performance for each basin. As climatic variations from year to year have significant impact on the flows and phosphorus loads discharged from each basin,

discussion of the present year's rainfall patterns relative to each basin is included. Source control updates for each basin are included to describe activities that were performed during WY2007 and to provide the status of long-term efforts relating to Everglades phosphorus source controls. The status of many projects being performed by others, including research, BMP demonstration projects, and construction projects, are also briefly updated herein with reference to additional information sources. Finally, the future direction for the District's source control program is discussed with emphasis on meeting long-term water quality goals.

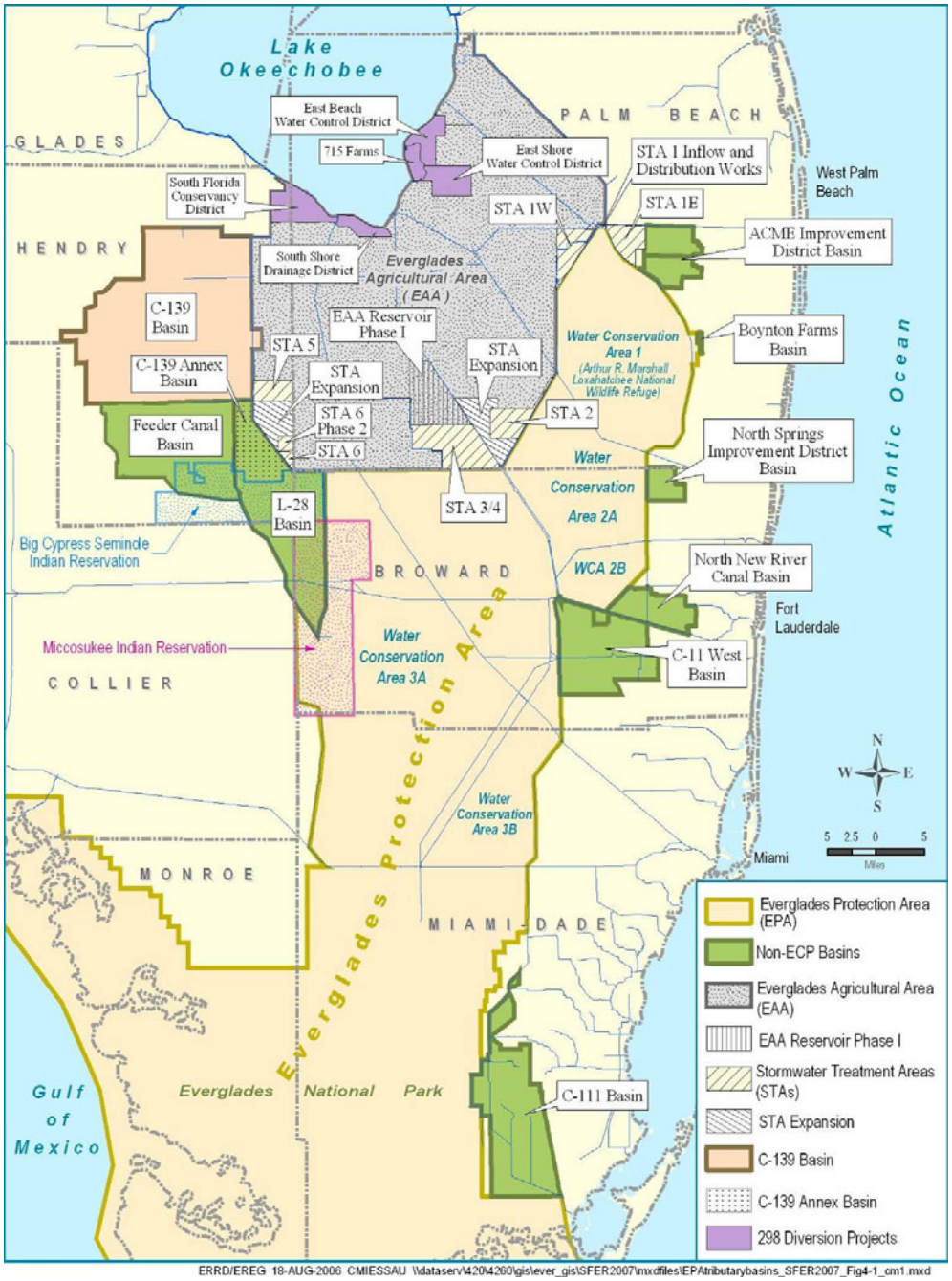


Figure 4-1. Everglades Construction Project (ECP) and non-Everglades Construction Project (non-ECP) basins tributary to the Everglades Protection Area (EPA).

WATER YEAR 2007 BASIN UPDATE OVERVIEW

The Everglades Forever Act (EFA) mandates specific performance levels for controlling phosphorus in discharges from the Everglades Construction Project (ECP) basins, the Everglades Agricultural Area (EAA), and C-139 basins. The EAA and C-139 basins' success indicators for meeting those performance levels are outlined in District rules, Chapter 40E-63, Florida Administrative Code (F.A.C.). For the non-ECP basins, the EFA requires the Florida Department of Environmental Protection (FDEP) to issue long-term compliance permits to the District to regulate phosphorus levels in discharges. During the initial phase of implementation under the Long-Term Plan, the FDEP permits will be based upon Best Available Pollution Reduction Technologies (BAPRT) and include Technology-Based Effluent Limitations (TBELs).

For the ECP basins, runoff is generally directed to STAs for treatment before entering the EPA. Therefore, the TP load summary for the ECP basins should not be confused with the TP load that actually enters the EPA after treatment. The treatment effects of STAs in further reducing the ECP basin runoff loads is presented in Chapter 5 of this volume. For the non-ECP basins, runoff entering the EPA does not currently undergo treatment in an STA; however, significant progress with regional projects during WY2007 was made for the ACME basin and C-139 Annex sub-basin (an area within the L-28 basin) to allow for runoff from these basins to be directed to an STA for treatment prior to discharge into the EPA.

The EAA continues to meet the required performance levels of the EFA as evidenced by an average reduction in TP loads of 46 percent over the past three years, and maintenance of those levels is critical to continued success. However, WY2007 was the first compliance year since WY1996 that the EAA did not achieve a minimum goal of 25 percent for TP load reduction for an individual year. Despite not achieving the desired 25 percent minimum level during WY2007, the basin remains in compliance. Compliance levels for the EAA are defined by rule in Chapter 40E-63 (F.A.C), where it stipulates that as long as the annual percent reduction does not fall below 25 percent in each of three consecutive years or the observed load in any individual year does not exceed an upper load limit defined within the rule's compliance calculation, then the basin is determined to be in compliance with the EFA.

For the C-139 basin, WY2007 marks the fifth year of mandatory BMP implementation. Despite a low TP load and dry conditions, the basin did not meet its requirement to maintain historical TP load levels. Because the previous water year (WY2006) marked the fourth consecutive year of basin noncompliance with the EFA to maintain historical loads, the District initiated rule development pursuant to Chapter 120, Florida Statutes, during WY2007 to ensure that the objectives of the EFA are met. In addition to BMPs, continuation of supplemental source control activities and investigations initiated in WY2006, or earlier, were continued in WY2007.

The District continued to monitor the discharges from each non-ECP basin to evaluate the effectiveness of the source control strategies and to track the direction of compliance with the TP concentration limits for the C-111 basin and the proposed TBELs for the C-11 West, NNRC, Feeder Canal, and L-28 basins. It is currently expected that the EFA long-term compliance permit containing the TP concentration limits for the C-111 basin and the first non-ECP TBEL requirements will be issued during WY2008. For WY2007, discharges from the C-11 West, NNRC, and L-28 basins would have met their proposed permit-required TBELs. However, the Feeder Canal basin would not have met its proposed permit-required TBEL. Further, the Feeder Canal basin produced its highest annual flow-weighted TP concentration on record. Despite a dry year, unusually heavy rainfall events during the period of late August 2006 through mid-September 2006 coincide with the high TP concentration in discharges from the Feeder

Canal basin. Ensuring the timely implementation of Water Quality Improvement Plans (WQIPs) for the Feeder Canal basin is necessary to ensure it meet its TBEL proposed in the upcoming EFA long-term compliance permit.

Results from total phosphorus (TP) data collected during WY2007 for each ECP and non-ECP basin are summarized in **Table 4-1a**. Of the 210 mt of runoff TP load generated by the combined ECP and non-ECP basins, the ECP basins accounted for 85 percent of the total runoff load. Relatively low rainfall amounts characterized WY2007 with a majority of runoff from all basins occurring between August and September 2006. Details on WY2007 hydrologic events are reported in Chapter 2 of this volume. Additional basin-specific highlights are provided below.

EAA Basin

- An estimated 18 percent TP load reduction occurred for WY2007, which is the first time in 12 years that the goal of achieving a minimum 25 percent reduction in annual phosphorus loads was not met. However, the basin is still in compliance with EFA-mandated load reductions requirements as outlined in the rule.

- Five-year BMP permit renewals were required of EAA basin permit holders. Staff is working with landowners to optimize the BMP plans contained in their permits, when applicable.

- University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) analysis of farm-level data was conducted under the rule-required EAA BMP Master Research Permit to identify factors affecting TP loading from farms, and to enhance BMP performance though improved selection and implementation. Results from the analysis are pending, and will determine the scope of future BMP effectiveness research.

- High phosphorus sources and tributaries with increasing trends, such as Lake Okeechobee and the East Beach Water Control District (EBWCD), were evaluated.

C-139 Basin

- Basin loads exceeded historical levels for the fifth consecutive year despite drought year conditions with relatively low rainfall and basin runoff. There has been a progressive increase in supplemental projects to optimize the mandatory BMP program, and to evaluate factors outside the BMP program control that can significantly affect the basin ability to meet the historical loading levels. Rule development was initiated with public workshops to solicit stakeholder input.

- Monitoring and data analysis projects were implemented to identify upstream TP sources and potential water quality improvement projects, including BMPs, that can be developed to control those sources. The comprehensive upstream subregional continuous flow and auto-sampler monitoring was expanded to seven sites reflecting hydrologic sub-basins. Grab sample and streamflow collection were conducted at eighteen historical locations. However, data collection was hampered by dry WY2007 conditions.

- Phase II of the C-139 Basin Hydrology and Water Quality Analysis was substantially advanced. The project includes application of the WamView model to evaluate water

quality improvement projects involving changes to the water management system, BMPs, or other conditions affecting phosphorus loading from the basin.

- To improve the effectiveness of BMP plans, the District commissioned evaluation of available upstream data which included phosphorus speciation and some indication of relative contribution. A preliminary report was prepared to support BMP optimization efforts with landowners.

- An integrated regulatory compliance strategy was initiated to ensure that water quality requirements of environmental resource and water use permits for the basin are being met. These efforts include workshops and one-on-one consultations with landowners. Division staff are also working on streamlining authorizations to facilitate modifications from the original permits that favor TP reduction.

Non-ECP Basins

- Analysis of TP concentrations in WY2007 continues to indicate a wide variation between non-ECP basins. Observed TP flow-weighted mean (FWM) concentrations ranged between 6 and 215 parts per billion (ppb).

- Source controls and WQIPs in the C-11 West, C-111, NNRC, and NSID basins continue to be successful strategies in these basins. The C-11 West basin and the C-111 basin TP levels were between 6 and 15 ppb. There was no flow from the NNRC or NSID basins to the EPA in WY2007.

- In December 2006, the ACME basin ceased pumping runoff directly into the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge), thereby mitigating impacts from elevated concentrations from this basin. Conveyance improvements within the ACME basin were implemented to direct all runoff into the C-51 canal so that discharges receive treatment in STA-1E prior to discharge to the Refuge. A phosphorus source control strategy will continue to be implemented in this basin.

- Also in December 2006, the infrastructure to divert all runoff from the C-139 Annex (approximately 25 percent of the area within the L-28 basin) to STA-6 was completed. District staff continued to coordinate regulatory compliance requirements with the landowner to implement a phosphorus source control strategy for diversion discharges.

- For WY2007, approximately 31.4 metric tons (mt) of TP load was discharged by non-ECP basins to the EPA. The majority of TP load was from the Feeder Canal basin (comprised of primarily agricultural land use), which contributed 18.89 mt TP, or 60 percent, of the total non-ECP basin load.

- District staff continued the integrated regulatory compliance efforts in the Feeder Canal basin, similar to C-139 efforts, to ensure that all existing regulatory requirements for environmental resource and water use permits are being met by landowners. Also, the District continued its oversight of the McDaniel Ranch BMP projects and required BMP implementation.

- As required by the EFA, TBELs which establish limits on phosphorus discharges to meet the Everglades criterion have been proposed to FDEP for inclusion in the long-term compliance permit for the C-11 West, NNRC, Feeder Canal, and L-28 basins.

Also in accordance with the EFA, the phosphorus concentration limits for discharges into Everglades National Park set forth in the Federal Everglades Settlement Agreement is expected to be incorporated into the long-term compliance permit, which will set concentration limits for the C-111 basin.

Table 4-1a. Summary of ECP and non-ECP basin discharge total phosphorus (TP) concentrations (flow-weighted mean, or FWM) and loads for Water Year 2007 (WY2007).

Basin[1]	Primary Land Use	FWM TP Concentration (ppb)	TP Load (mt)
ECP Basins			
Everglades Agricultural Area (EAA)	Agricultural	166.4	149.5
C-139	Agricultural	305.3	29.1
non-ECP Basins			
C-11 West	Urban	15	2.3
North New River Canal (NNRC)	Urban	(no flow)[2]	(no flow)[2]
North Springs Improvement District (NSID)	Urban	(no flow)[2]	(no flow)[2]
Feeder Canal	Agricultural	215	18.8
L-28	Agricultural	47	5.1
C-111	Urban	6	1.0
ACME Improvement District (ACME)	Urban/Equine	129	4.2
Boynton Farms	Agricultural	(N/A)[3]	(N/A)[3]

[1] ECP basin discharges receive further treatment downstream through the Stormwater Treatment Areas prior to discharge to the EPA.

[2] No discharges from NSID and NNRC basins to the EPA during WY2007.

[3] No instrumentation in place for flow monitoring from this area.

SOURCE CONTROL STRATEGY OVERVIEW

The source control strategy for the basins tributary to the Everglades Construction Project (ECP), which includes the EAA and C-139 basins, relies on an EFA-mandated regulatory program that requires BMP implementation and specific phosphorus load limits in discharges from the basins. Continued implementation of the BMP mandatory programs in the EAA and C-139 basins, continued implementation of the WQIPs for the non-ECP basins, and achievement of the required levels of performance in TP loading from these basins are necessary for the District to achieve the phosphorus criterion in the EPA and fulfill its obligations under the EFA and the federal Everglades Settlement Agreement. During WY2007 the District continued to implement the primary source control activities listed in **Table 4-1b** on a basin-specific basis. A detailed update on these activities is provided in the ECP and non-ECP sections of this chapter under the source control strategy heading.

EAA Basin

Source control activities for the EAA basin consist of continuing the current level of BMP implementation as mandated in the Long-Term Plan and improving the understanding of the relationships between Lake Okeechobee inflows, EAA basin runoff, and downstream points of entry into Stormwater Treatment Areas (STAs) along with the driving factors that govern those relationships. The District will continue to rely on the findings and recommendations made by the UF/IFAS for improving BMP effectiveness at the farm level through research and enhanced extension services.

C-139 Basin

Source control activities for the C-139 basin consist of mandatory BMPs which have been increased on an annual basis based on achieving compliance with historical, pre-BMP phosphorus levels. Currently, permittees in the basin are required to implement 35 points of BMPs since the basin was not in compliance for four consecutive years prior to WY2007. As mandated by rule, the regulatory program is being revised as necessary to achieve compliance. In accordance with the Long-Term Plan, the District is conducting supplemental projects to improve the performance of source controls, such as BMP demonstration projects, and enhancing upstream monitoring and analysis of data. The District is conducting exhaustive investigations to understand all factors affecting the basin's ability to reach compliance with historical phosphorus levels.

Non-ECP Basins

The non-ECP permit requires the implementation of basin-specific Water Quality Improvement Plans (WQIPs) to ensure progress toward ultimately achieving established water quality standards in discharges from each of the non-ECP basins. The WQIPs are being implemented to control TP at the source and include a combination of voluntary BMPs; training and education; cooperative agreements; modification of stormwater system permits to include water quality criteria; basin-specific regulatory programs; and full integration with ongoing and future Comprehensive Everglades Restoration Plan (CERP) and other local construction projects.

Table 4-1b. Summary of ECP and non-ECP source control activities for WY2007.

Basin	Water Quality Improvement and Related Projects	BMP Development and Implementation	Education and Training
ECP Basins			
EAA	Supplemental Long-Term Plan Projects	Permit-required BMPs; EAA – Everglades Protection District (EPD) BMP Research	Onsite BMP Verifications; UF/IFAS BMP Training Workshops; Development of UF/IFAS Extension Materials; UF/IFAS One-on-One BMP Consultation Program
C-139	Supplemental Long-Term Plan Projects	Permit-required BMPs; C-139 and Western Basins BMP Grant Program; C-139 Basin Vegetable Production Demonstration Project	On-site BMP Verifications; Compliance Workshops with Landowners
non-ECP Basins			
C-11 West	Broward County Water Preserve Area (CERP); South Broward Drainage District and Central Broward Water Control District Improvements	Broward Everglades Working Group (BEWG) Comprehensive Pollution Reduction Action Plan; C-11W Nursery BMP Grant Program; Urban, Equine & Golf Course BMPs; Environmental Resource Permit (ERP)-required BMPs	Educational Public Service Announcements (PSAs); Know-The-Flow Workshops; Web Site Development
NNRC	WCA-2 and WCA-3 Diversion (CERP)	BEWG Comprehensive Pollution Reduction Action Plan; Urban, Equine & Golf Course BMPs	Educational PSAs; Know-The-Flow Workshops; Web Site Development
NSID	Hillsboro Site 1 Impoundment (CERP)	BEWG Comprehensive Pollution Reduction Action Plan; BMP Cooperative Agreement; Golf Course BMPs; ERP-required BMPs	Educational PSAs; Know-The-Flow Workshops; Web Site Development
Feeder Canal	Big Cypress/L-28 Interceptor Modifications (CERP); Seminole Tribe Water Conservation Plan (WCP) Project; McDaniel Ranch surface water management system	C-139 and Western Basins BMP Grant Program; BMPs required under existing regulatory programs	On-site BMP verifications; BMP education and training workshops; one-on-one compliance efforts

Table 4-1b. Continued.

Basin	Water Quality Improvement and Related Projects	BMP Development and Implementation	Education and Training
L-28	STA-6 Expansion (ECP); C-139 Annex Diversion; Seminole Tribe WCP Project; Miccosukee Tribe Water Management Plan Project	C-139 Annex BMP implementation; ERP-required BMPs	On-site BMP verifications
C-111	C-111 Project; C111 Spreader Canal (CERP); Combined Structural and Operational Plan (CSOP)	C-111 Basin Nursery Grant Program; Mobile Irrigation Lab	Educational PSAs; Web Site Development
ACME	ACME Basin B Discharge Project (CERP); Race Track Lake Expanded Water Quality Treatment Marsh; ACME Conveyance Improvements for ACME Basin B Discharge Project	BMP Cooperative Agreement; Enforcement of fertilizer and manure ordinances; ERP-required BMPs	Educational PSAs; Web Site Development
Boynton Farms	Palm Beach County Agricultural Reserve Water Reservoir (CERP)	Alternatives Evaluation including structural BMP and diversion options; ERP-required BMPs	Coordinate with landowners to promote BMP education and training

INTRODUCTION

The long-term Everglades water quality goal is to meet water quality standards established by the Everglades Forever Act (EFA), including compliance with the phosphorus criterion in the Everglades Protection Area (EPA) utilizing a Long-Term Plan (Burns and McDonnell, 2003) that consists of an optimal combination of source control strategies, Stormwater Treatment Areas (STAs), Advanced Treatment Technologies, and integration with Comprehensive Everglades Restoration Plan (CERP) projects. Chapter 8 of this volume provides further information on the Long-Term Plan. The restoration program incorporates a strong science base and an adaptive implementation philosophy to allow continuous improvement to achieve and maintain the long-term water quality goal. Controlling phosphorus at the source is the foundation of the water quality improvement component of the Everglades Restoration Program.

The District has identified 10 basins with discharges tributary to the EPA in which phosphorus source control programs are to be implemented (**Figure 4-1**). The background and details of the source control programs for these basins, including the requirements for implementing Best Management Practice (BMP) Plans, Discharge Monitoring Plans, and Water Quality Improvement Plans (WQIPs); research and demonstration projects; data evaluation; compliance methodologies and determinations; and education and outreach activities have been extensively reported in previous *South Florida Environmental Reports*.

To assure compliance with the EFA, the District must comply with specific source control requirements stipulated in permits issued by the FDEP. These are the Everglades Construction Project (ECP) and the non-Everglades Construction Project (non-ECP) permits. Both permits incorporate a comprehensive approach for controlling phosphorus, including implementation of BMPs utilizing regulatory, cooperative, and educational programs. The District is required by permit to report on the results of these programs annually. This chapter and related appendices serve as the reporting mechanism to fulfill this requirement.

ECP BASINS

The Everglades Construction Project (ECP) permits require the District to construct, maintain, and operate the ECP in the Everglades Agricultural Area (EAA) and C-139 basins, the largest tributary sources to the EPA. The ECP permits regulate the construction and operation of the STAs and require the District to provide reasonable assurance that the EAA and C-139 basins are complying with a mandated phosphorus source control program for discharges to the STAs.

The source control program is defined in Chapter 40E-63, Florida Administrative Code (Rule 40E-63). BMP plans are approved through the regulatory program and are implemented by individual permittees. BMPs are assigned an “equivalent” point value, with the intent of providing a comprehensive BMP plan. The regulatory program relies on technical information developed by others (e.g., university, industry, non-profit organizations, etc.) and is focused on implementation within the framework of Rule 40E-63. Although research is a component of optimization efforts, the BMP regulatory program is not a research program. A discussion of the BMP “equivalent” point system and relevance to BMP plans, along with observations made regarding EAA BMP plans and farm level phosphorus results for WY2007, is presented in Appendix 4-2.

Further, the Long-Term Plan stipulates that the District perform supplementary activities designed to maintain and improve upon the contribution of source controls to the overall water quality improvement goals in the basins. This chapter provides Water Year 2007 (WY2007) (May 1, 2006 through April 30, 2007) total phosphorus (TP) results for the ECP basins and an update on the progress of their regulatory and Long-Term Plan required activities. Chapter 5 of this volume provides an update on STA performance, compliance, and optimization as required by the ECP permit.

NON-ECP BASINS

The non-ECP permit regulates the operation and maintenance of water control structures, within the control of the District, that discharge into, within, or from the EPA and are not included in the ECP project. The non-ECP permit requires the implementation of basin-specific Water Quality Improvement Plans (WQIPs) to ensure progress toward ultimately achieving established water quality standards in discharges from each of the non-ECP basins. The WQIPs are being implemented to control TP at the source and include a combination of BMP implementation; training and education; cooperative agreements; modification of stormwater system permits to include water quality criteria; basin-specific regulatory programs; and full integration with ongoing and future Comprehensive Everglades Restoration Plan (CERP) and other local construction projects. As required by the EFA, the non-ECP permit is expected to be modified to require compliance with the TP concentration limits for the C-111 basin and with TBELs for the C-11 West, NNRC, Feeder Canal, and L-28 basins. The proposed TBELs will define TP concentration limits in discharges from "into" structures associated with these four non-ECP basins. This chapter provides an update of the WQIPs for each non-ECP basin. TP data is presented in this chapter to evaluate the success of the WQIPs and compliance of non-ECP basins with the TP concentration limits or their proposed TBELs. While this chapter focuses on TP reduction in non-ECP basin discharges to the EPA, this volume's Chapter 3A and associated appendices provide an updated comprehensive evaluation of water quality as required by non-ECP permit conditions.

Eight basins that discharge directly to the EPA are not part of the ECP. Five of these basins have "into" structures that are operated and maintained by the District and are permitted under the non-ECP permit: C-11 West, NNRC, Feeder Canal, L-28, and C-111. The non-ECP permit is expected to be modified to require TBELs in TP concentration for discharges from the "into" structures associated with these five basins. These "into" structures are S-9 and S-9A (C-11 West), G-123 (NNRC), S-190 (Feeder Canal), S140 (L-28), and S-18C, S-332D, and S-174 (C-111). There are three remaining non-ECP basins that were capable of discharge directly to the EPA in WY2007 through structures that are not owned or operated by the District: ACME, NSID, and Boynton Farms. Pursuant to the EFA and Long-Term Plan, the District has implemented source control programs in each of these basins through development of WQIPs equivalent to those required under the non-ECP permit. As part of the WQIPs, the ACME basin ceased pumping of untreated runoff into the Refuge in December 2006, after completion of the necessary conveyance improvements for diversion of these flows to the C-51 canal, which is then generally directed to STA-1E.

This chapter provides an update of the source control activities in the ECP and non-ECP basins for WY2007. Phosphorus results and a summary of activities are provided for each basin. Additionally, an overview of activities anticipated for WY2008 is provided as future direction for the Everglades source control program. A more detailed summary of monitoring data and assessment methods are contained in Appendix 4-1.

SOURCE CONTROLS IN THE ECP BASINS

For the EAA and C-139 basins the EFA mandates a regulatory source control program, a monitoring program to assess program effectiveness, and limits on the annual TP load in the discharges leaving these two basins. The load limits for both basins are based on historical data or "baseline periods" defined by the EFA statute. TP load limits from these tributary basins are critical to the success of the ECP because STAs were designed based on historical data. It is the source control program's mandated implementation of BMPs in the EAA and C-139 basins that regulate TP loads in discharges from the basins prior to inflow to an STA. The scope of the regulatory program is defined in Rule 40E-63, F.A.C.

The EFA mandate for the EAA basin is to achieve a reduction of the TP loads discharged from the basin of 25 percent when compared to the pre-BMP baseline period. Achieving the target reduction of 25 percent is the minimum goal for every year. The methodology to assess compliance with the 25 percent reduction goal is outlined in Rule 40E-63. For the EAA basin to meet compliance requirements, as specified in the rule, the actual TP load is evaluated against two criteria. For the first criterion, the actual annual TP load cannot exceed an estimated annual target load in three consecutive years. In other words, if the EAA basin does not achieve the minimum 25 percent estimated load reduction at least once every three years, then compliance is not achieved. For the second criterion, compliance will not be achieved for any individual year if the actual TP load exceeds the upper 90 percent confidence limit of the estimated target load.

If the EAA basin is determined to be out of compliance based on the target or limit criteria, then, in accordance with the rule, the data collected by the individual permittees under an approved discharge monitoring plan for each farm is used as a secondary compliance method. This secondary method assesses individual farm TP load contributions and individual farm compliance. There is not a provision in the rule for use of the permittee's TP loads from individual farms for determining compliance as long as the basin-level TP load reduction requirement is met. The District collects monitoring data from the EAA basin at discharge locations to evaluate the overall effectiveness of the BMPs in achieving and maintaining compliance with the TP load reduction requirement. The EAA landowners collect monitoring data for individual farms discharges conditioned upon District-approved discharge monitoring plans.

The EFA mandate for the C-139 basin has similar compliance and monitoring requirements for the TP loads leaving the basin with a few modifications. For the C-139 basin to be in compliance it must also meet "target" and limit levels. However, the C-139 basin mandate is to maintain historical loads observed during the baseline period with no additional requirement of achieving load reductions in future years with BMP implementation. Therefore, the estimated target load and predicted load are the same. A secondary compliance determination for individual landowners in the C-139 basin is also specified in the EFA. Remedial actions for individual landowners, if the basin is out of compliance, are conditioned upon the proportional share of the total phosphorus load discharged from the basin. Currently, the secondary compliance method is structured as an optional farm level compliance and monitoring program incorporated into the rule. The specific procedures for determining EAA and C-139 basin compliance, basin-level data collection efforts, and farm-level discharge monitoring plans are outlined in Appendix A and B, respectively, in Rule 40E-63.

Since BMPs effectiveness to remove TP is essential for the program success, investigation to improve the selection, design criteria, and implementation of BMPs is ongoing and occurs through different mechanisms based on the needs for program success in each basin. This ECP source controls section provides a WY2007 update on compliance with TP loading limits and source control strategies for the EAA and C-139 basins. The compliance update includes WY2007 phosphorus results, monitoring program updates, short-term and long-term variations, and investigative issues. The source control strategies update includes program accomplishments, ongoing activities, and planned initiatives.

EAA BASIN UPDATE

During WY2007, the TP loads discharged from the basin were decreased by 18 percent compared to the predicted load. While the TP load from the EAA basin did not meet the minimum annual 25 percent reduction goal for the first time in 12 years of compliance determination, the basin is in compliance since the limit was not exceeded and three consecutive years of falling below 25 percent are required before being determined out of compliance. Because the EAA basin has been in compliance each year since the program's inception, the secondary compliance method at the farm level has not been utilized. An EAA basin map and the representative monitoring locations for determining WY2007 compliance with the TP load reduction requirement is shown in **Figure 4-2**.

The District has initiated evaluation of basin-wide and farm-level TP data, Lake Okeechobee and diversion area inputs, review of construction activities within the basin, basinwide monitoring issues, and the modeled baseline to understand the factors resulting in this year's performance. The purpose of the data evaluation will be to determine whether the performance is within levels of statistical uncertainty, or if it indicates the start of new trends or long-term effects not previously appreciable (e.g., the effect of Lake Okeechobee inflows on farm performance). These findings will determine whether reexamination of source control implementation and redirecting focus in the EAA basin is warranted.

Water Year 2007 Phosphorus Results for the EAA Basin

This section provides an update on the observed WY2007 TP loads in comparison to the basin's EFA mandated load limits as defined by Rule 40E-63. Additional information regarding monitoring for the water year with regard to basin-level compliance structures is documented to clarify datasets utilized for the annual compliance calculations. In an effort to focus the BMP source control efforts, sub-basin flows, related TP loads, and FWM concentrations are presented as well as short-term and long-term variations and applicable phosphorus data investigation. Farm-level phosphorus data is presented in Appendix 4-2.

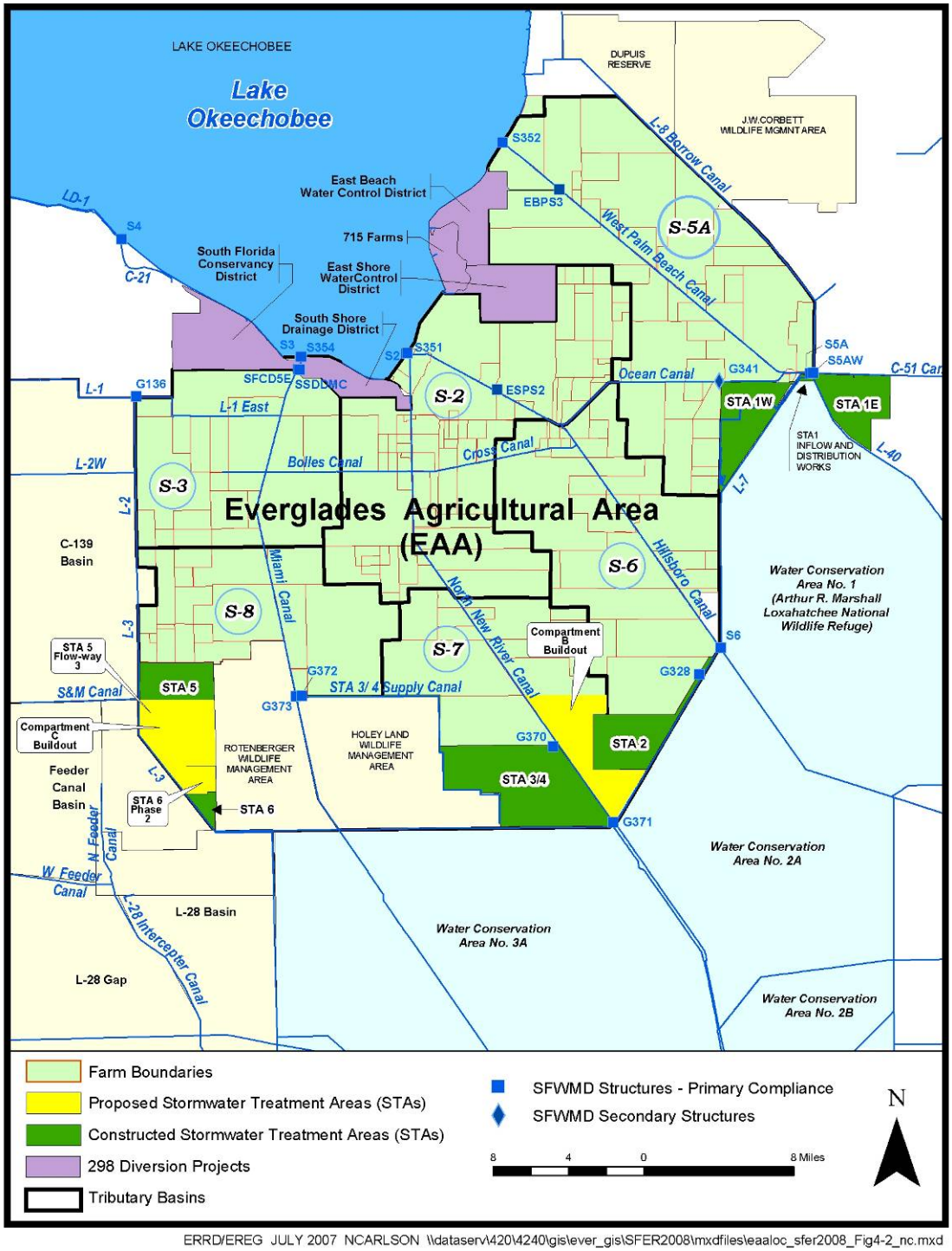


Figure 4-2. The Everglades Agricultural Area (EAA) basin and primary compliance water control structures within the ECP boundary.

Compliance with Phosphorus Limits

Table 4-2 provides a summary of the WY2007 results for the total observed and predicted TP loads, where the observed load is the measured load based on samples collected during the water year, and the predicted load is the pre-BMP baseline period load adjusted for hydrologic variability associated with rainfall. The target loads (adjusted by 25 percent) are calculated based on the 50th percentile confidence level value for predicted loads, while limit loads are calculated based on the 90th percentile. The alternate confidence levels accommodate for possible statistical error in the model. Limit loads provide for a higher confidence level so that a single year of exceedance verifies noncompliance while the target loads are evaluated based on exceedance for three consecutive years. The comparison for WY2007 shows that the EAA basin achieved an 18 percent TP load reduction.

Table 4-2. Results of WY2007 EAA basin TP compliance calculations.

WY2007 EAA TP Load	
Predicted TP load (adjusted for WY2007 rainfall amounts and monthly distribution relative to baseline period)[1]	182 mt
Target TP load (Predicted TP load reduced by 25%)	137 mt
Limit TP load (upper 90% confidence limit for target load)	200 mt
Observed WY2007 TP load from the EAA with BMPs implemented	150 mt
WY2007 TP load reduction (relative difference between observed and predicted TP loads)	18%
Three-year average TP load reduction	46%

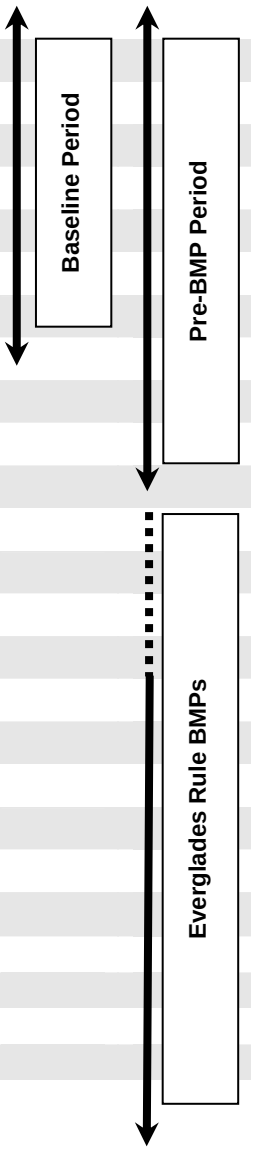
WY2007 EAA TP Concentration	
Observed annual average EAA TP concentration prior to BMP implementation (WY1980–WY1988)[1]	173 ppb
Observed WY2007 TP concentration from the EAA with BMPs implemented	166 ppb
Three-year (WY2005-WY2007) flow-weighted mean TP concentration	133 ppb

[1] The baseline period of record is October 1978–September 1988 in accordance with EFA requirements. Compliance under Rule 40E-63 bases compliance on the water year periods from May 1 through April 30 that fall within the October 1978–September 1988 range, that is, WY1980–WY1988.

The data for all calculated water years are summarized in **Table 4-3**. This table presents observed and predicted (baseline period rainfall adjusted) TP data and annual rainfall and flow measurements. Additionally, the TP values presented are attributable only to the EAA basin (farms, cities, and industries) and do not represent the cumulative TP being discharged through the EAA boundary structures from all sources.

Table 4-3. WY1980–WY2007 EAA basin TP measurements and calculations.

Water Year	Observed TP Load (mt)	Predicted TP Load[1] (mt)	% TP Load Reduction[2]	Annual Rain (in)	Annual Flow (kac-ft)	Baseline and BMP Status Timeline
1980	167	154	-9%	53.50	1,162	
1981	85	98	13%	35.05	550	
1982	234	255	8%	46.65	781	
1983	473	462	-2%	64.35	1,965	
1984	188	212	11%	49.83	980	
1985	229	180	-27%	39.70	824	
1986	197	240	18%	51.15	1,059	
1987	291	261	-12%	51.97	1,286	
1988	140	128	-9%	43.43	701	
1989	183	274	33%	39.68	750	
1990	121	120	-1%	40.14	552	
1991	180	219	17%	50.37	707	
1992	106	179	41%	47.61	908	
1993	318	572	44%	61.69	1,639	
1994	132	160	17%	50.54	952	
1995	268	388	31%	67.01	1,878	
1996[3]	162	503	68%	56.86	1,336	
1997	122	240	49%	52.02	996	
1998	161	244	34%	56.12	1,276	
1999	128	249	49%	43.42	833	
2000	193	425	55%	57.51	1,311	
2001	52	195	73%	37.28	667	
2002	101	227	55%	49.14	1,071	
2003	81	125	35%	45.55	992	
2004	82	229	64%	46.76	961	
2005	182	444	59%	50.98	1,190	
2006	153	270	44%	50.08	1,035	
2007	150	182	18 %	37.23	727	



Note: Dashed vertical line indicates the period for which BMPs were not fully implemented (WY1992–WY1995).

[1] "Predicted TP Load" represents the base period load, adjusted for rainfall variability.

[2] "%TP Load Reduction" values for WY1980–WY1988 represent the compliance model calibration period.

[3] 1996 was the first year of compliance measurement for the EAA basin.

Figures 4-3 through **4-6** represent the TP data graphically. In **Figure 4-3**, each bar represents the actual (observed) annual TP tonnage from the EAA basin in each water year, and the dashed line represents the annual TP tonnage predicted by the rule-mandated model. The annual percent reduction of TP is calculated as the relative difference between the actual (bar) EAA basin TP load and the predicted (dashed line) base period TP load (adjusted for rainfall). The minimum requirement of 25 percent reduction, called the target load, is depicted as the lower (yellow) line. As this figure indicates, the EAA basin consistently outperformed its mandated target goal from WY1996 through WY2006. In WY2007, the observed load exceeded the target, but was below the limit load shown as the upper (red) line in the figure. The limit load is defined as the upper 90 percent confidence limit for the target load and accounts for statistical variability in the rule-mandated prediction model. Because one year above the limit load or three consecutive years above the target load is required for the basin to be out of compliance, the EAA basin is considered in compliance following WY2007.

As shown in **Figure 4-4**, if the EAA basin had met the minimum requirement of a 25 percent reduction in TP load for the 12 years that the program has been fully implemented, 833 metric tons (mt) would have been prevented from leaving the basin. However, because prior to WY2007 the basin had exceeded the minimum requirements, 1,767 mt of TP were prevented from leaving the EAA basin as runoff. This comparison is based on what would have been expected under the same hydrologic conditions during the pre-BMP baseline period.

The EAA basin percent TP load reduction trend is presented in **Figure 4-5**. The solid line shows the three-year trend of percent load reduction. The diamond ("♦") symbol represents the annual measurements. An upward trend in the solid line in **Figure 4-5** denotes a reduction in loads, that is, an overall long-term improvement in the water quality of EAA basin runoff discharges.

TP concentrations are calculated in addition to load; however, concentrations are not evaluated to determine EAA basin compliance. The annual concentrations and three-year trends presented are true "annual flow-weighted" mean values calculated by dividing the total annual cumulative TP load by the total annual cumulative flow. **Figure 4-6** shows the TP concentration trends for the EAA discharges.

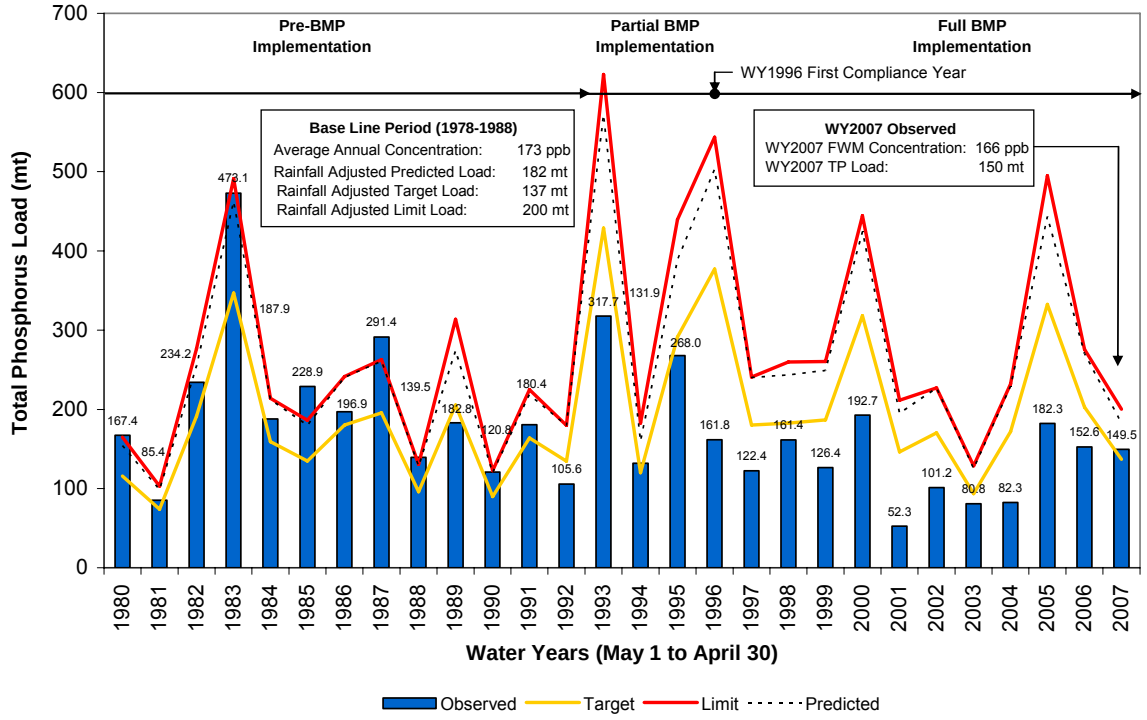


Figure 4-3. EAA basin TP loads observed (measured) and predicted (calculated).

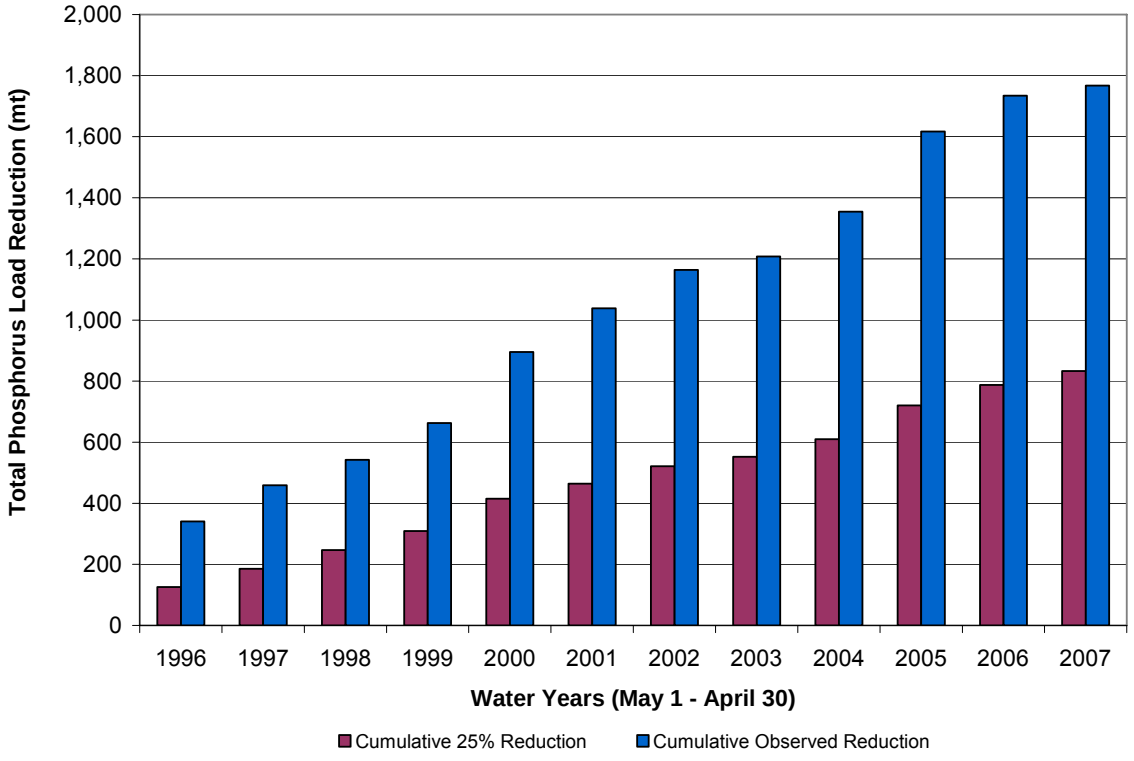


Figure 4-4. EAA basin cumulative percent TP load reduction trend.

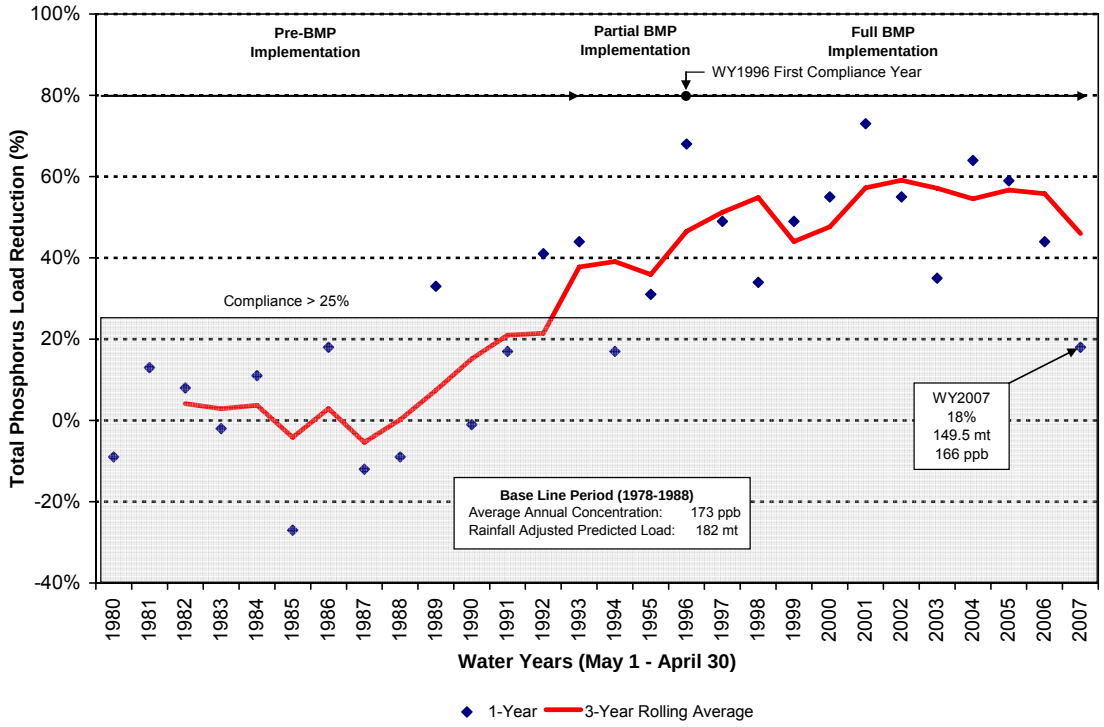


Figure 4-5. EAA basin percent TP load reduction trend.

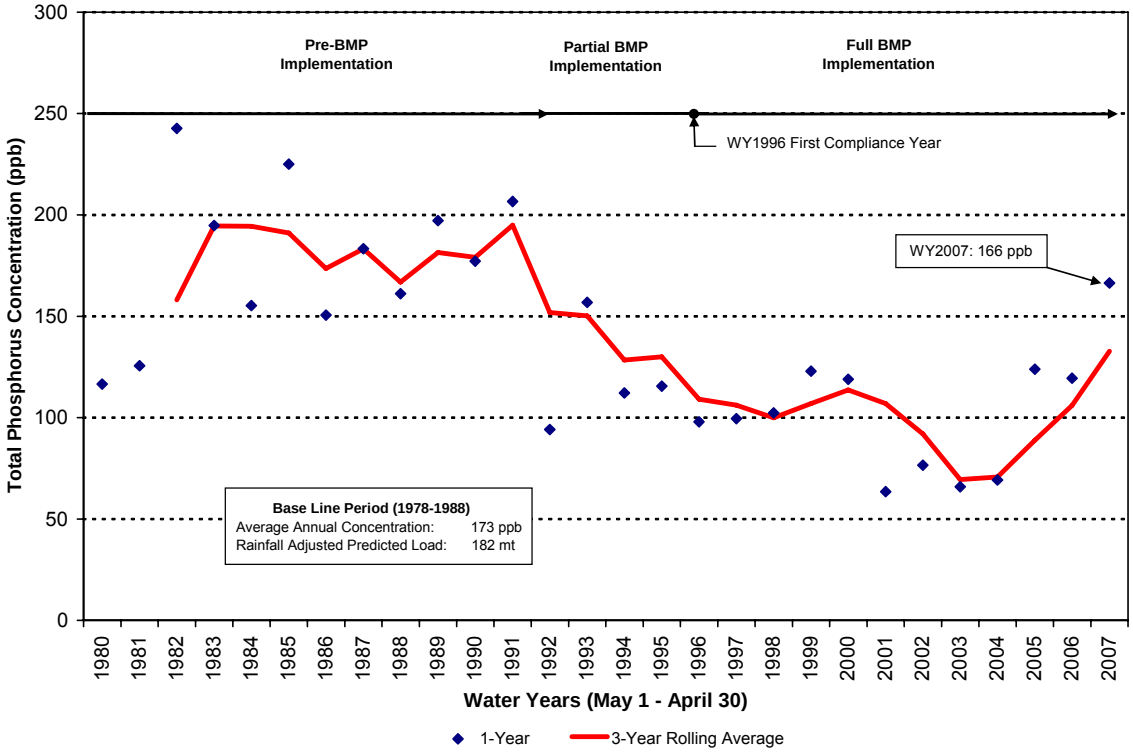


Figure 4-6. EAA basin TP FWM concentration trend.

EAA Basin-Level Monitoring

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 STAs, inflow sources from external basins, and the addition of new water control structures. To interpret phosphorus 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, shown in **Figure 4-2,** include the South Florida Conservancy District (SFCD), South Shore Drainage District (SSDD), 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).

Depending on the inflow source and the entry point into the EAA basin, water quality within the basin can be influenced, although the extent of the influence is generally difficult to interpret. Therefore, separate accounting of TP loads from various sources is required to develop conclusions about TP loads originating from lands (or sub-basins) within the overall EAA basin. The TP loads in runoff from the sub-basin lands are conveyed primarily to STAs by the West Palm Beach Canal (WPB) (S5A sub-basin), the Hillsboro Canal (HILLS) (S6 sub-basin and a portion of the S2 sub-basin), the North New River Canal (NNR) (S7 sub-basin and remaining portion of S2 sub-basin), and the Miami Canal (MIA) (S8 and S3 sub-basins). The accounting of tributary sources and flow configurations to the Everglades is complex, and the reported TP loads attributed to the farms, cities, and industries within the EAA basin should not be confused with the total load being delivered to the Everglades.

The number of structures defining the boundary of the S3/S8 sub-basin during WY2007 (**Table 4-4**) was reduced compared to the WY2006 monitoring points as a result of construction activities associated with the completion of the STA-3/4 diversion/bypass structures and the re-routing of the STA-5 outflow canal. Due to these changes in boundary conditions, a reduction in the number of representative monitoring locations occurred and adjustments were made to the compliance determination methods in accordance with Rule 40E-63.

Currently, the EAA basin-level compliance determination is based on monitoring at various inflow and outflow points defining the boundary of the sub-basins (S5A, S2/S6, S2/S7, and S3/S8) in any given water year and the conveyance canals serving those sub-basins. Currently, the assumption from a water budget perspective is inter sub-basin transfers of flows through the Cross, Ocean, and Bolles Canals are negligible in the overall accounting of runoff from the EAA basin. This assumption will not longer be valid upon completion of the EAA Reservoir Phase I and Everglades Conveyance and Regional Treatment (ECART) projects which are due for completion in 2010. District staff has initiated evaluation of how model assumptions will need to be revised.

Table 4-4. EAA sub-basin inflow and outflow monitoring points during WY2007.

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	●	

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

Based on the new boundary conditions, **Table 4-5** presents the summaries of flows and TP loads for each sub-basin identified in **Table 4-4**. The summaries in **Table 4-5** 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 150 mt and runoff volume of 727,000 acre-feet (ac-ft), is noted in this table. More detailed WY2007 information on the annual load, flow, and TP flow-weighted mean (FWM) concentration at each of the individual inflow and outflow structures for each sub-basin in **Table 4-4,** along with TP data collection statistics and the current quality level of flow information at each structure, can be found in Appendix 4-1 of this volume.

Table 4-6 presents a summary of the inflow and outflow TP concentrations for WY2007, 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, S-354) to the EAA sub-basins for WY2007 ranged between 140 ppb and 210 ppb. High lake inflow TP concentrations to the EAA are often cited as cause for concern in maintaining the actual performance level of BMPs reducing TP loads because the lake is a major source of irrigation water. An evaluation of this relationship has been initiated to ascertain the relationships between the lake inflows and EAA basin phosphorus levels.

While the accounting of flows and TP loads associated with EAA basin runoff and from other sources flowing into and out of the EAA basin is complicated, it is possible to determine the contributions from each of these sources by reviewing the total observed load at the basin outflow structure. For instance, during WY2007, 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 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 chapter 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. Therefore, this type of detailed information is reported in other chapters of this volume, specifically Chapter 3C and Chapter 5, which provide a comprehensive picture of flow and TP loads (and the source) being discharged to the EPA and on STA performance, respectively.

Table 4-5. EAA sub-basin flows and TP loads by source for WY2007.

S5A Sub-Basin (WPB Canal)	Load (mt)		Flow (kac-ft)	
Source	Inflow	Outflow	Inflow	Outflow
EAA*	N/A	46.11	N/A	160.97
Lake	31.12	3.32	120.40	11.63
EBWCD	4.49	4.49	9.87	9.87
Total	**35.61**	**53.93**	**130.27**	**182.47**

S2/S6 Sub-Basin (HILLS Canal)	Load (mt)		Flow (kac-ft)	
Source	Inflow	Outflow	Inflow	Outflow
EAA*	N/A	38.83	N/A	201.61
Lake	19.22	2.63	81.95	9.28
ESWCD & Closter	3.86	3.83	18.91	18.91
Total	**23.08**	**45.30**	**100.87**	**229.80**

S2/S7 Sub-Basin (NNR Canal)	Load (mt)		Flow (kac-ft)	
Source	Inflow	Outflow	Inflow	Outflow
EAA*	N/A	37.63	N/A	191.75
Lake	35.93	3.90	153.25	13.46
Total	**35.93**	**41.53**	**153.25**	**205.21**

S3/S8 Sub-Basin (MIA Canal)	Load (mt)		Flow (kac-ft)	
Source	Inflow	Outflow	Inflow	Outflow
EAA*	N/A	27.28	N/A	173.15
Lake	27.44	4.72	159.09	27.33
C-139	0.93	0.93	5.49	5.49
SSDD	0.96	0.96	6.12	6.12
SFCD	2.04	2.04	14.89	14.89
Total	**31.37**	**35.94**	**185.58**	**226.97**

Note: 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 for determining EAA basin phosphorus 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 4-6. EAA sub-basin inflow and outflow FWM TP concentration for WY2007.

EAA Sub-Basin		Lake Inflow FWM Concentration (ppb)	Total Outflow FWM Concentration (ppb)
S5A	(WPB Canal)	210	240
S2/S6	(HILLS Canal)	190	160
S2/S7	(NNR Canal)	190	164
S3/S8	(MIA Canal)	140	128

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 basinwide 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 variation on runoff is the basis for the rainfall adjustments that are applied to pre-BMP baseline predicted loads. **Figure 4-7a** 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. During WY2007, the S2/S7 sub-basin received the highest amounts of rainfall, and the S3/S8 sub-basin received the lowest. **Figure 4-7b** depicts the variation of WY2007 sub-basin monthly rainfall compared to the total monthly rainfall for the EAA basin. A more detailed summary of the WY2007 rainfall and predicted load adjustments based on Rule 40E-63 compliance calculations for the EAA is provided in Appendix 4-1 of this volume. Chapter 2 of this volume provides more in-depth explanations of the hydrologic events that occurred throughout the District during WY2007.

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 4-8a)**. However, with runoff TP loads among the sub-basins, a wider range of variation is seen (**Figure 4-8b**). Typically, when the S5A sub-basin receives more rainfall than the other sub-basins, the runoff TP load from S5A is correspondingly higher and amounts to 30 to 50 percent of the EAA basin total annual runoff TP load.

During WY2007, the S5A sub-basin received less than the EAA basin-wide average rainfall and had the lowest runoff volume, but its TP load was the greatest among the EAA sub-basins. With runoff volume percent contribution less than all other sub-basins, the main factor appears to be higher concentrations of TP in the discharges. **Table 4-6** shows that the S5A sub-basin outflow TP FWM concentration was, by far, the highest and in fact was the only sub-basin whose outflow concentration was higher than its inflow concentration.

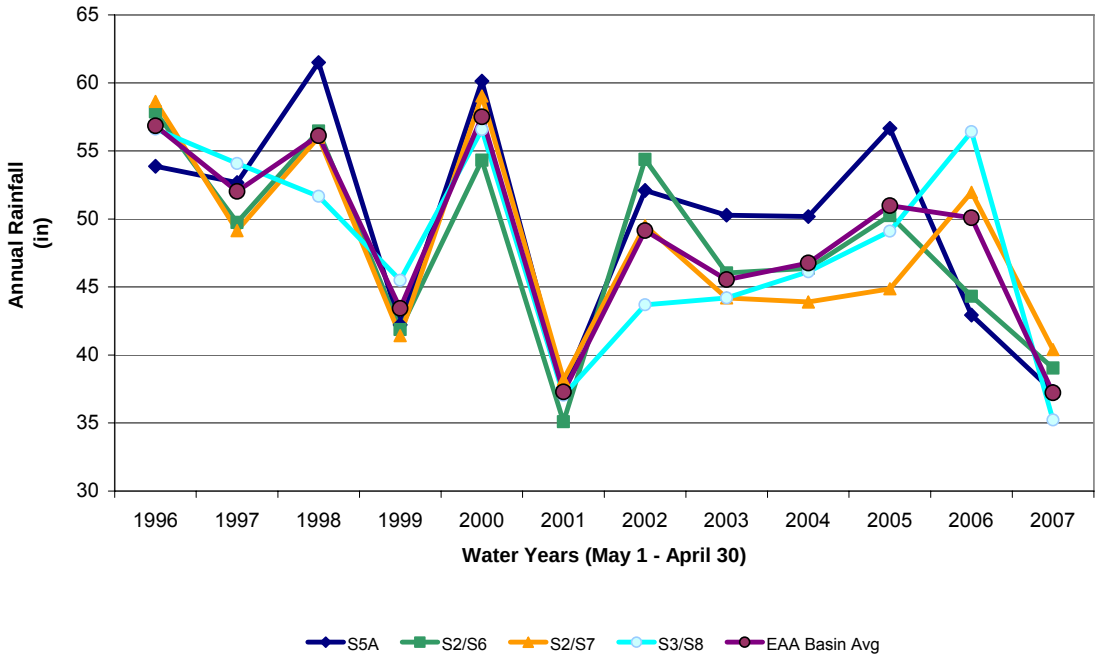


Figure 4-7a. WY1996–WY2007 EAA sub-basin annual rainfall distribution trend.

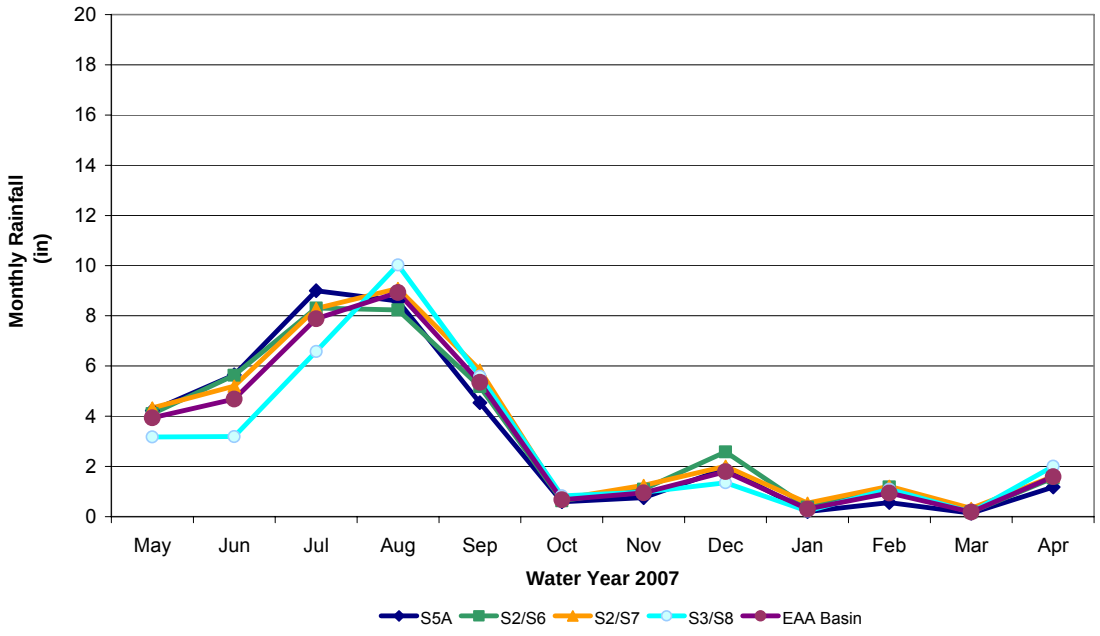


Figure 4-7b. WY2007 EAA sub-basin monthly rainfall distribution trend.

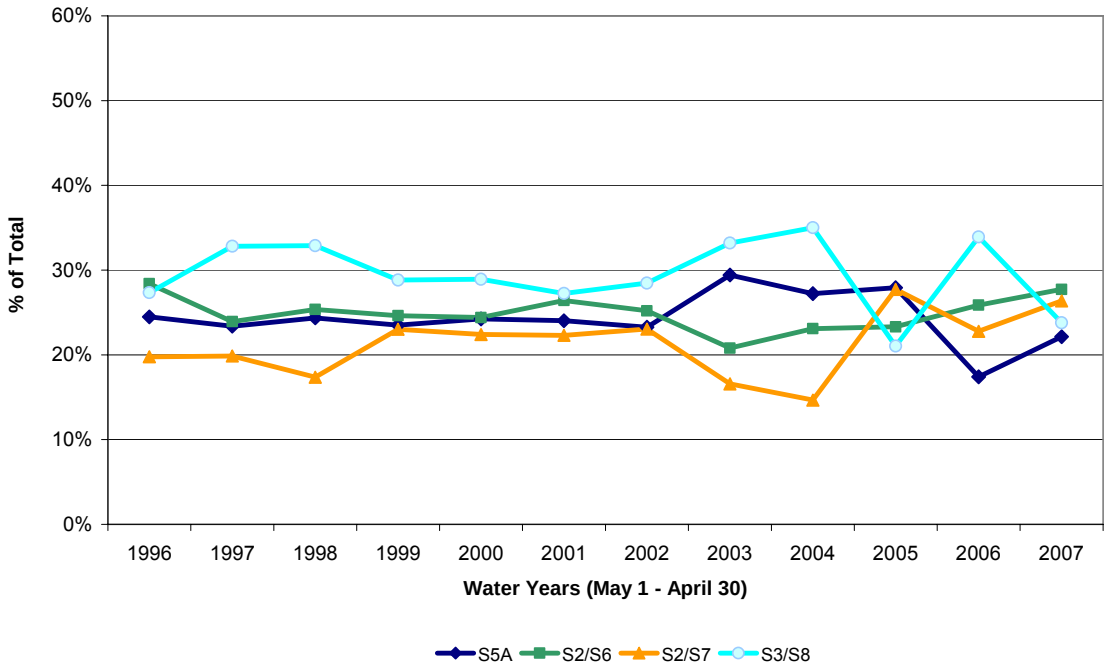


Figure 4-8a. WY1996–WY2007 EAA sub-basin annual runoff volume percent "relative" contribution trend of basin total.

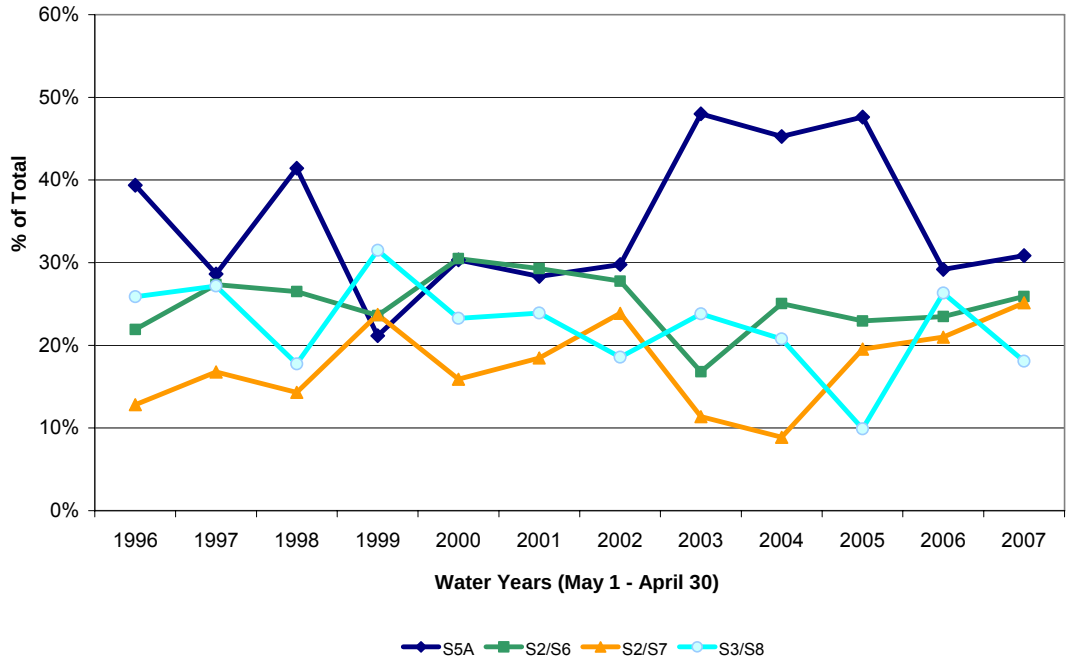


Figure 4-8b. WY1996–WY2007 EAA sub-basin annual TP load percent "relative" contribution trend of basin total.

EAA Basin Phosphorus Investigation

The EAA basin as a whole experiences many variations throughout the water year from both a hydrologic and a water quality standpoint. Compared on a water-year-by-water-year basis since the full implementation of BMPs in WY1996, Lake Okeechobee discharges to the EAA typically have had higher TP concentrations than EAA basin discharges. Within the EAA basin, variations in rainfall and lake inflows also exhibit significant variances from east to west, making a complex picture more difficult to interpret when considering individual phosphorus sources within the basin.

Figures 4-7a, 7b and **Figures 4-8a, 8b** are presented to make general observations of variations seen in rainfall, runoff volumes, and runoff TP loads from year to year. The EAA basin as a system is influenced by many factors that contribute to higher or lower TP loads in runoff and distribution of the runoff loads throughout the basin. Determining the cause and effect relationships is important in order to understand how the current level of BMP performance can be maintained. These relationships will be the subject of an evaluation as a WY2008 Long-Term Plan activity.

Preliminary evaluation indicates that Lake Okeechobee inflows during WY2007 and during periods of higher output were minimal. EAA basin discharges followed similar trends to those of EAA farms, and of water control districts and farms located outside EAA boundaries (ECP diversion areas). Nevertheless, farm performance generally appeared similar to that of previous years. Histograms depicting the distribution of annual rainfall adjusted unit area TP loads (RAUL) and RAUL levels indicated that levels and distribution were similar to those of previous years of better performance. Pending review is the potential effect of individual farms on basin-wide annual levels. For instance, as discussed in previous consolidated reports, the average annual cumulative total volume of water discharged from farm structures is greater than the observed volume of water discharged from the District water control structures surrounding the EAA. This is partly because EAA canal water and the surface water discharged from some farm structures is drawn back for irrigation or freeze protection by others, thus, there is a tremendous amount of water that is recycled within the EAA and not discharged through the District water control structures. Factors such as concentrated rainfall events, farm irrigation timing, and variation in farm discharge levels may affect TP concentration and ability to recycle within the basin, thus impact discharges at District structures.

Source Control Strategy

The source control strategy for the EAA basin primarily relies on an EFA-mandated regulatory program for BMP implementation for which compliance determinations began in WY1996. Rule 40E-63 states that the use of Everglades Works of the District (EWOD) within the EAA basin requires a permit for a BMP plan for each crop or land use within each sub-basin or farm. As in prior years, permittees in the EAA basin implemented a 25-point BMP plan during WY2007. Plans are comprehensive, generally consisting of nutrient management, water management, and sediment controls. Changes to the BMP plans require District approval. Permittees are also required to collect water quality and quantity data at farm discharges (permit level) through approved Discharge Monitoring Plans. Refer to Appendix 4-2, Table 1, for permit-level data for the EAA, and Table 3 for a summary of BMPs and BMP "equivalent" points. Also refer to Appendix 4-2 of this volume, or Chapter 3 in the *2006 South Florida Environmental Report – Volume I* (SFER) under the *EAA Best Management Practice Plans* section, for more information on BMP plans and "equivalent" points and a discussion of BMP effectiveness. Water quality data collected at the permit level are used as indicators of overall BMP performance and used as a secondary means of compliance if the EAA is found out of compliance at the basin level, but cannot be related directly to individual BMP performance.

The original guidance document for the design of BMPs and implementation of BMP plans in the EAA is the Procedural Guide for the Development of Farm-Level Best Management Practice Plans for Phosphorus Control in the Everglades Agricultural Area, Version 1.1, developed by the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) (Bottcher et al., 1997). Additional research has been conducted to improve BMP effectiveness and design by the UF/IFAS pursuant to the EFA and Rule 40E-63 requirements and via the Everglades Agricultural Area – Everglades Protection District (EAA-EPD) Master Research Permit. Investigation to improve the selection, design criteria, and implementation of BMPs is ongoing. Updates to this document for individual BMPs can be found at http://edis.ifas.ufl.edu. These documents include design criteria for construction, as applicable, and operation of BMPs, and farm management. District staff uses these updated technical sources as reference when conducting BMP field verifications and revising BMP plans. The update on source control activities describes the current investigations to enhance the body of knowledge on BMPs in the EAA. The District's current emphasis is on working cooperatively with the EAA-EPD to develop a scope of work for future research to continue enhancing BMP effectiveness.

In addition to the research pursuant to the EAA-EPD Master Permit, BMP research is conducted by individual landowners, other agencies, or within the UF/IFAS system. BMPs recommended by research or based on findings during verification of BMP implementation at individual farms are incorporated with consideration of the flexibility in how the BMPs can be implemented and verified from farm to farm based on site-specific conditions. As indicated in the UF/IFAS Procedural Guide, the industry definition for a BMP is an "on-farm operational procedure designed to reduce P losses in drainage waters to an environmentally acceptable level." Based on Rule 40E-63 permittees are required to revise their BMP plan to enhance performance only if the basin is not in compliance and they have not met a Maximum Unit Area Load on a farm level. Since the EAA basin has been in compliance with the required phosphorus loading levels over the years and without a mandated need to enhance performance, implementation of more effective BMP practices depends on the District's ability to disseminate practices that are not only effective but, most important, easy and economical to implement, so that they can be voluntarily incorporated.

Additionally, the source control strategy in the EAA basin includes supplemental Long-Term Plan projects for the purpose of maintaining or improving the current level of performance. Elevated phosphorus concentrations from Lake Okeechobee and increasing phosphorus loading trends from EBWCD have been identified as factors that could hinder performance in the long term. The District has initiated evaluation of available Lake Okeechobee inflow data and increased monitoring within EBWCD to assess causes for the phosphorus levels and define an appropriate control strategy. Unknown contributions from urban, agricultural, and industrial activities within EBWCD are being considered as to their effect on the phosphorus levels being observed. Additional description on these initiatives is provided in the *Summary of Water Year 2007 Activities* section that follows.

Update on Source Control Activities for the EAA Basin

Summary of Water Year 2007 Activities

During WY2007, the District implemented the ongoing EFA-mandated regulatory BMP program and made progress on the Long-Term Plan supplemental projects as detailed in the *2007 SFER – Volume I, Chapter 4*. The following is an update on these activities:

1. **BMP Regulatory Program:** At the end of WY2007, there were 481,415 acres under 33 EWOD permits in the EAA. All EAA EWOD permits expired on June 30, 2007, and are in the process of renewal. The rule requires that at application renewal the BMP plan be reviewed equivalent to new permit applications. Accordingly, records on BMP implementation have been reviewed, and BMP plans have been revised, when needed. Post-permit compliance activities continued in these farm basins through on-site BMP verifications. BMP verifications were prioritized based on farm location, water quality history, size, and date of previous verification.
2. **BMP Replacement Water:** Rule development was initiated to update the methodology for BMP Replacement Water to more accurately represent other District modeling efforts which have indicated no appreciable reduction in runoff volume has occurred since BMP implementation. Additionally, planned changes to the conveyance system from ongoing CERP/Acceler8 projects in the EAA basin are being evaluated to identify if revised assumptions are needed for runoff water budget calculations. This will ensure that the significance of pre- and post-BMP hydrology is accounted for in determining runoff reductions and for changes in the EAA conveyance system.
3. **298 Diversion Projects:** Prior to 2001, the diversion areas discharged exclusively to Lake Okeechobee and therefore were not part of the EAA baseline period. Currently, diversion areas are treated as pass-through waters that are directed to the STAs for treatment but are not evaluated for compliance with the 25 percent reduction goal for TP loading. The calculations to determine the load from the EAA boundary subject to the baseline period definition are adjusted to eliminate the diversion loads entering into the EAA sub-basins, in accordance with the EFA statute. Defining a separate method for evaluating the impact of BMPs on TP loads in these recent tributaries (diversion areas) to the EPA is required by the EFA [§373.4592(4)(f)(4), F.S.], and the District is in the process of defining a performance measure. As indicated above, additional data are being collected within EBWCD because of the increasing trends in TP load. These data will be collected through October 2007 and will be assessed to determine a comprehensive source control strategy. The strategy may need to be developed in coordination with the FDEP if significant contributions from urban and industrial sources are found. The type of sources and timeline for implementing the

control strategies may need to be considered when measuring the effectiveness of BMPs for the different areas within EBWCD.

4. **BMP Research:** In addition to the Everglades Regulatory Program, the EFA and Rule 40E-63 require EAA landowners, through the Everglades Agricultural Area – Everglades Protection District (EAA-EPD), to sponsor a program of BMP research, testing, and implementation to monitor the efficacy of established BMPs in improving water quality in the EPA. Although the BMP regulatory program is not a research program, it is through the Master Permit for BMP Research, Testing and Implementation that the District regulates research on BMP effectiveness and outreach that serves to meet and maintain the performance goals of the Everglades Construction Project, and to optimize the Everglades Regulatory Program. The Master Permit is issued to the EAA-EPD, and research is conducted by UF/IFAS in Belle Glade. The activities under the EAA-EPD Master Permit for 2007 were as follows:

    - UF/IFAS submitted a detailed plan describing a statistical analysis to be conducted in the EAA using available basin and farm-level data. This plan was approved in March 2007. Six hypotheses and associated questions were developed to assess how factors such as rainfall, soil depth, land use, farm size, farm location, irrigation water quality, and rainfall detention affect phosphorus loading from farms. A report of the findings is expected early in WY2008. The UF/IFAS' goal is that by incorporating the results and recommendations from this analysis into BMP outreach tools, BMP performance will improve because of better BMP selection and implementation. Completion of the one-on-one consultation program for 42 farms in the S5A and S6 sub-basins as of April 2007.
    - Seven BMP training workshops were conducted between September 2006 and April 2007 for growers in the EAA.

    A description of the outreach conducted under the bullets above and the feedback obtained from growers is described in the Implementation and Verification of BMPs for Reducing P Loading from the Everglades Agricultural Area 2007 Annual Report (Daroub et al., 2007).

5. **EAA TP Load Reduction Compliance Model:** Initial consultations were conducted with District CERP/Acceler8 staff and project documents were reviewed to identify potential impacts on current compliance modeling assumptions for EAA basin water budgets and runoff TP loads associated with the construction of two major EAA basin projects: the EAA Reservoir Phase I, and the ECART system. Preliminary investigations indicate that substantial changes to the water budget accounting of runoff volumes and TP loads will likely be needed to accurately measure future EAA basin compliance with the 25 percent reduction goal.

6. **EAA Basin Data Evaluation (Long-Term Plan Project "EAA Basins – Source Controls," FY2004–FY2007):** The District completed Phase I of an evaluation to characterize EAA basin discharges in more detail. Several evaluation possibilities were proposed and a work plan was established for evaluation of Lake Okeechobee inflow impacts to the EAA sub-basins with regard to BMP performance.

Anticipated Activities for Water Year 2008

1. **BMP Regulatory Program:** Renewal of EAA EWOD permits will be completed and BMP plans will be revised, as needed. BMP verifications will be emphasized based on the analysis of farm-level results for WY2007 using a prioritized list based on farm location, water quality history, size, and date of previous verification.
2. **BMP Replacement Water:** The rule development process to update the methodology to more accurately represent runoff reductions and planned changes to the conveyance system from ongoing CERP and Acceler8 projects in the EAA basin will be completed.
3. **298 Diversion Projects:** Complete the EBWCD monitoring and interagency coordination, as needed, to define a comprehensive source control strategy. Substantially complete performance measures for evaluating the effectiveness of BMPs in these recent tributaries (diversion areas) to the EPA to meet the requirements in the EFA [§373.4592(4)(f)(4), F.S.].
4. **BMP Research:** Evaluate the final statistical evaluation report to be submitted by UF/IFAS. Based upon the results of the analysis and outreach efforts completed during WY2007, a proposed scope of work for continued research on BMP effectiveness, as necessary to meet EFA, rule, and master permit requirements, is due. Develop a new scope of work with emphasis on enhancing BMP performance through improved selection and implementation, and conduct field investigations to address gaps in existing research or new needs.
5. **EAA TP Load Reduction Compliance Model:** Continue coordination efforts with CERP/Acceler8 staff and develop a technical plan to update the EAA compliance assessment methodology sequenced with construction project timelines. Rule development is anticipated to be necessary as part of the compliance assessment update.
6. **EAA Basin Data Evaluation (Long-Term Plan Project "EAA Basins - Source Controls," FY2004–FY2006):** Begin Phase II of this project with the primary objective to develop an understanding of the relationship between Lake Okeechobee inflows and EAA basin runoff, and the associated impacts on maintaining BMP performance levels in the EAA. Additional information on this project can be found under "EAA Basin Source Controls" on the Long-Term Plan web site linked at: http://www.sfwmd.gov/everglades.

C-139 BASIN UPDATE

The goal of the source control program in the C-139 basin is to maintain TP loads at or below historical levels. The EFA mandates that landowners within the C-139 basin not collectively exceed the annual average TP load observed during baseline period before BMP implementation. The Rule 40E-63 allows for the option of a permit-level discharge monitoring plan to be considered as a secondary compliance methodology should the C-139 basin be determined to be out of compliance. None of the permits issued to date include an optional discharge monitoring plan; therefore, only C-139 basin-level data is reported herein. The C-139 basin and the representative monitoring locations during WY2007 for determining compliance with TP load reduction are shown in **Figure 4-9**.

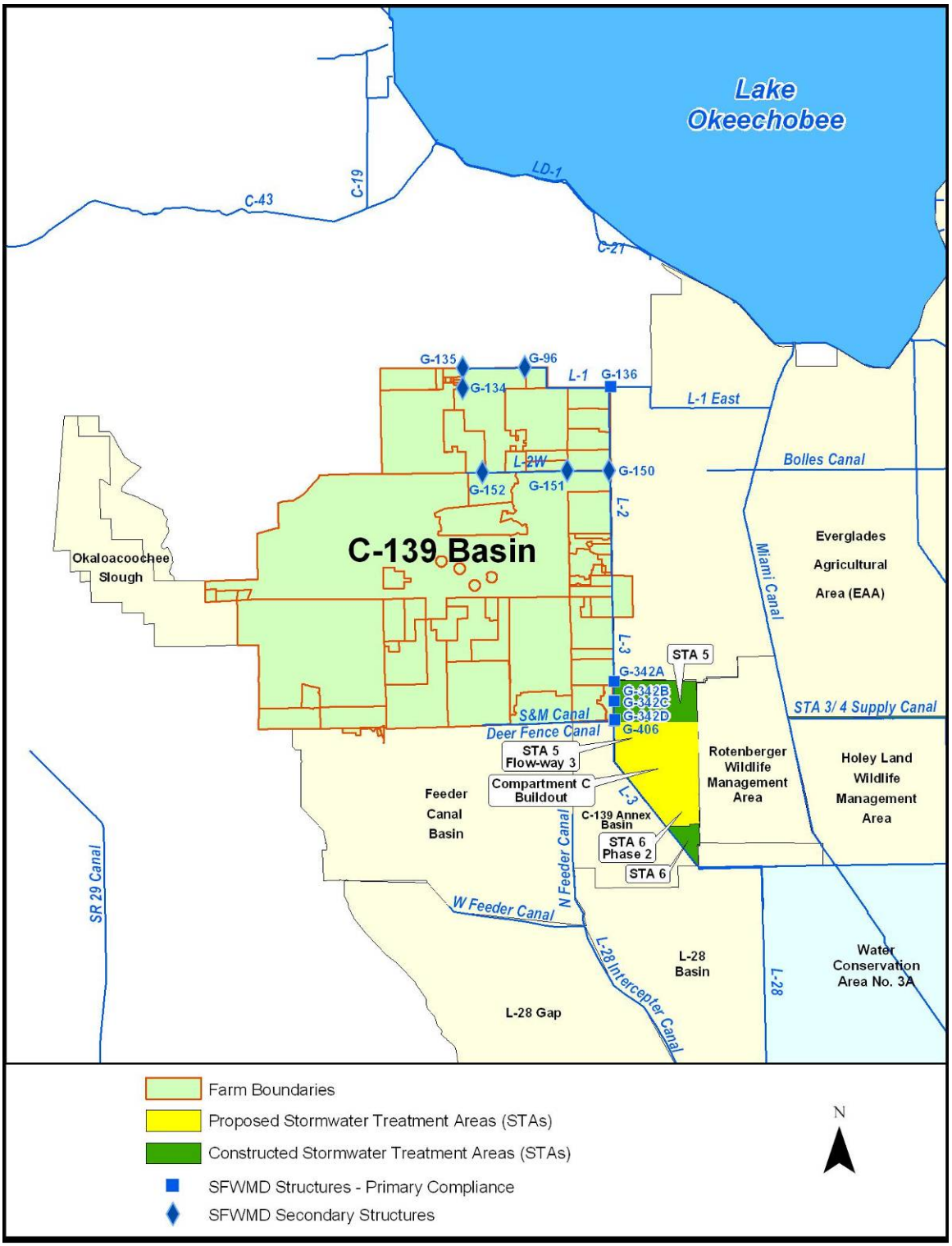


Figure 4-9. The C-139 basin and primary compliance water control structures within the ECP boundary during WY2007.

Water Year 2007 Phosphorus Results for the C-139 Basin

This section provides an update on the observed WY2007 TP loads in comparison to the basin's EFA-mandated load limits as defined by Rule 40E-63. In an effort to focus the BMP source controls efforts, individual flows, related TP loads, and FWM concentrations are presented as well as short-term and long-term variations and applicable phosphorus data investigation.

Compliance with Phosphorus Limits

The C-139 basin continued to exceed historical phosphorus levels during WY2007. This was the fifth year of program implementation and first complete year where BMP implementation was at the maximum 35-point level. The District has initiated rule development given that the BMP program, as currently devised, has not been able to reverse the noncompliance trend and meet the objectives of the EFA. For that effect, the District has initiated technical evaluations to improve the effectiveness of the BMPs currently permitted; to understand other factors affecting compliance, which may not be addressed solely with BMP implementation; and to evaluate water quality improvement projects or initiatives to address them. These initiatives are described in the C-139 basin *Source Control Strategy* section.

Table 4-7 provides a summary of the results of the WY2007 compliance analysis for total observed and predicted TP loads, where the predicted load is the pre-BMP baseline period load adjusted for differences in rainfall volume. Compliance is determined by comparing the observed TP load for the current water year to the predicted target load from the pre-BMP baseline period. Target loads are calculated based on the 50^{th} percentile confidence level under the year's rainfall conditions, while limit loads are calculated based on the 90^{th} percentile. The alternate confidence levels accommodate for possible statistical errors in the model. A single-year exceedance of limit loads verifies noncompliance, while the target loads are accounted towards noncompliance only when exceeded for three consecutive years.

The observed, predicted target, and predicted limit TP data for the C-139 basin, along with the annual rainfall and flow measurements are presented in **Table 4-8**. The table presents these data since 1980, which includes the intermediate years after the baseline was selected and before BMP implementation was started. The TP values presented in **Table 4-8** are attributable only to the C-139 basin.

Table 4-7. Results of WY2007 C-139 basin TP compliance calculations.

WY2007 C-139 Basin TP Load	
Target (Predicted) TP load (adjusted for WY2007 annual rainfall amount)	7.3 mt
Limit TP load (upper 90 percent confidence limit for target load)	13.5 mt
Observed WY2007 TP load from the C-139 basin with BMP implementation (Level IV)	29.1 mt

WY2007 C-139 Basin TP Concentration	
Observed annual average C-139 basin TP concentration prior to BMP implementation (WY1980–WY1988)[1]	227 ppb
Observed WY2007 TP concentration from the C-139 basin with BMP implementation at Level IV	305 ppb
Three-year (WY2005–WY2007) flow-weighted mean TP concentration	247 ppb

[1] The baseline period of record is October 1978–September 1988 in accordance with EFA requirements. Compliance under Rule 40E-63 bases compliance on the water year periods from May 1 through April 30 that fall within the October 1978-September 1988 range, that is, WY1980-WY1988.

Figure 4-10 shows the data from **Table 4-8** graphically. In **Figure 4-10**, each bar represents the actual (observed) annual TP tonnage from the C-139 basin in each water year, and the lines represent the annual predicted TP target and limit loads after being adjusted for rainfall by the rule- mandated method. **Figure 4-11** shows the annual FWM TP concentration of discharge from the C-139 basin shown by both individual yearly concentration values and the three-year moving average FWM TP concentration. However, compliance in the C-139 basin is determined by TP load discharged from the basin, not concentration.

In accordance with Rule 40E-63, the observed runoff TP load leaving the C-139 basin is measured at the primary compliance sites of G-136, G342A-D (STA-5 inflow structures), and G-406. The rule methodology assumes that no external flows (i.e., surface water supply deliveries or STA-5 backflow) coming into the C-139 canal system and therefore a provision to factor these into measuring load leaving the basin is absent. During WY2007 a small amount of TP load came into the C-139 basin through G-136 and backflow through the STA-5 inflow structures. These external loads into the C-139 basin (0.244 mt) were minimal in comparison to the total load (29.1 mt) leaving the basin, and thus would not have impacted compliance determination if these had been factored in. *2008 SFER–Volume I, Chapter 5* presents STA-5 inflow TP loads and concentrations that may be slightly different than results presented in this chapter because of this. To ensure external factors are accounted for when necessary to accurately measure C-139 basin TP loads, a rule revision is under consideration.

Table 4-8. WY1980 through WY2007 C-139 basin TP measurements and calculations.

Water Year	Observed TP Load (mt)	Predicted Target TP Load[1] (mt)	Predicted Limit TP Load[1] (mt)	Annual Rain (in)	Annual Flow (kac-ft)	Baseline and BMP Status Timeline
1980	34.7	42.1	76	56.39	172	
1981	4.1	3.6	7	31.06	51	
1982	6.1	8.8	16	38.61	44	
1983	148.1	115.2	222	71.98	344	
1984	40.4	20.2	36	47.19	156	
1985	14.6	19.6	35	46.88	63	
1986	17.0	19.3	34	46.71	110	
1987	37.7	55.0	101	60.19	149	
1988	28.2	21.6	38	47.96	94	
1989	14.2	11.0	20	40.69	73	
1990	5.5	9.8	18	39.62	46	
1991	5.0	20.8	37	47.53	45	
1992	12.3	27.9	50	51.04	100	
1993	26.3	39.4	71	55.49	137	
1994	21.8	30.2	54	52.03	136	
1995	61.9	53.8	98	59.85	272	
1996	48.5	55.2	101	60.24	236	
1997	45.9	40.1	72	55.74	165	
1998	35.6	42.9	77	56.65	170	
1999	35.6	29.9	53	51.92	136	
2000	52.4	36.4	65	54.46	202	
2001	17.1	6.4	12	35.70	56	
2002	65.9	35.8	64	54.23	200	
2003	77.3	39.1	70	55.40	224	Level I BMPs [2]
2004	69.0	25.4	45.3	49.90	204	Level II BMPs
2005	40.3	27.1	48.3	50.68	168	Level III BMPs
2006	106.9	34.6	62.0	53.79	333	Level IV BMPs
2007	29.1	7.3	13.5	36.85	77	Level IV BMPs

Baseline Period

Pre-BMP Period

[1] Using the rainfall adjustment, target loads are calculated based on the 50th percentile value for predicted loads under the year's rainfall conditions, while limit loads are calculated based on the 90th percentile.

[2] First year of compliance measurement is WY2003.

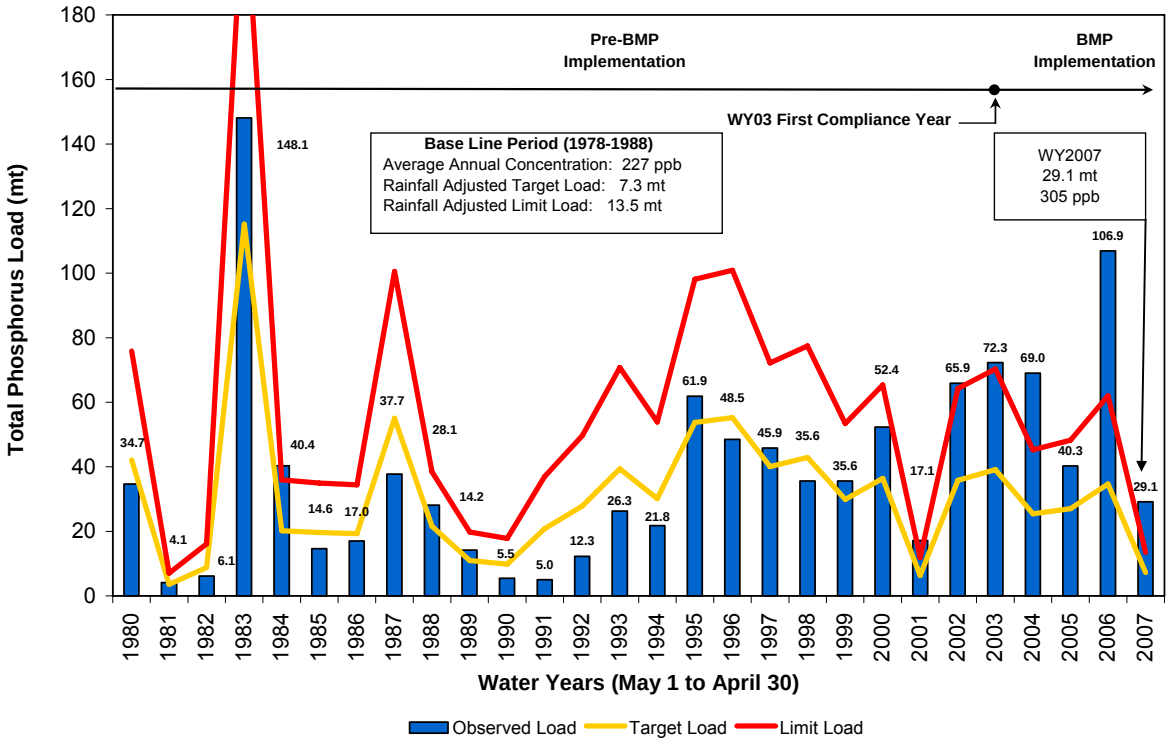


Figure 4-10. C-139 basin TP loads observed (measured) and predicted (calculated).

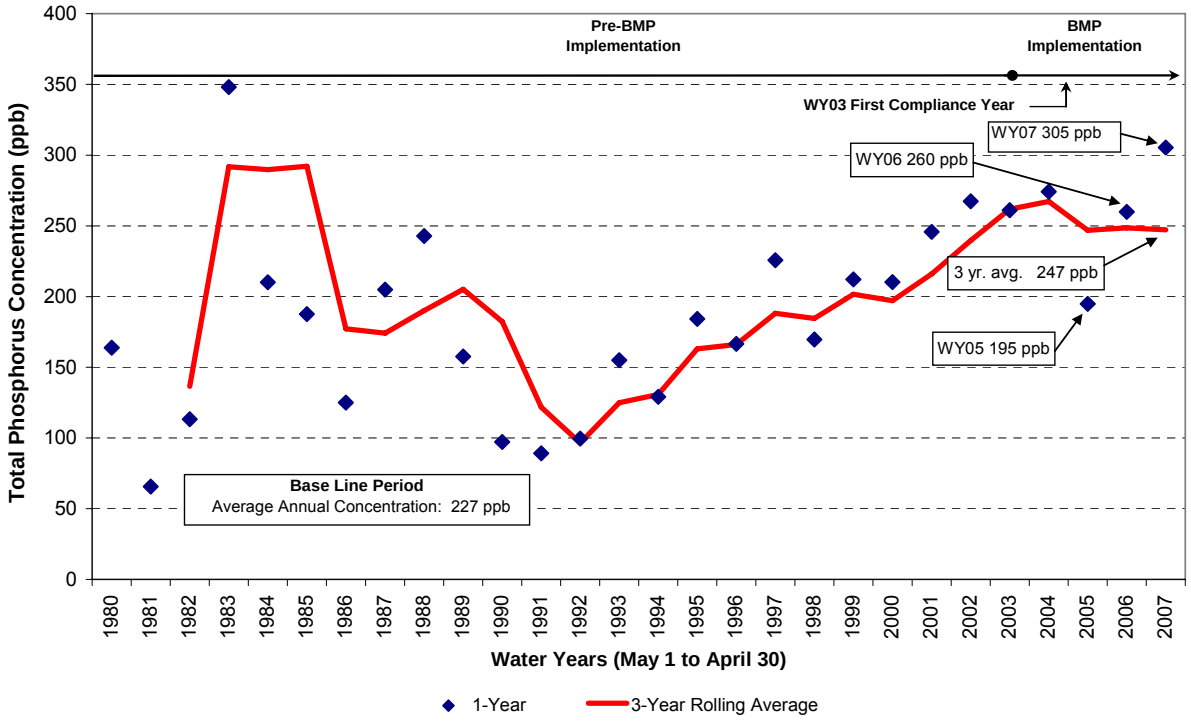


Figure 4-11. C-139 basin FWM TP concentrations and three-year moving averages.

C-139 Basin Phosphorus Loads, Flows, and Phosphorus Flow-Weighted Mean Concentrations by Structure

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 STA-5; and G-406 discharging into the L-3 canal when STA-5 cannot receive additional discharges. The overall flow, TP load, and FWM concentration at the six primary basin outflow structures are summarized in **Table 4-9**.

Table 4-9. C-139 basin flows, TP loads, and FWM concentrations by source for WY2007.

C-139 to EAA Source	TP Load (mt)	Flow (kac-ft)	FWM (ppb)	% of Total Load	% of Total Flow
G-136 Total [1]	**0.9**	**5.5**	**133**	**3.1%**	**7.1%**

C-139 to STA-5 Source	TP Load (mt)	Flow (kac-ft)	FWM (ppb)	% of Total Load	% of Total Flow
G-342A	8.2	22.1	301	28.2%	28.6%
G-342B	10.1	22.3	367	34.7%	28.8%
G-342C	1.1	4.0	223	3.8%	5.2%
G-342D	2.5	11.9	170	8.6%	15.4%
G-342A–D Total	**21.9**	**60.3**	**294**	**75.3%**	**78.0%**

C-139 to WCA-3A Source	TP Load (mt)	Flow (kac-ft)	FWM (ppb)	% of Total Load	% of Total Flow
G-406 Total[2]	**6.3**	**11.5**	**444**	**21.6%**	**14.9%**

[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 the STA-5 bypass structure. It is used when STA-5 capacity constraints preclude C-139 basin runoff from being sent for treatment. Bypassed discharge through G-406 flows to the south and into the northwest section of Water Conservation Area 3A (WCA-3A).

During WY2007, the basin received 36.85 inches of rainfall, discharged 77.3 kac-ft of runoff volume and 29.1 mt of TP load with an annual FWM TP concentration of 305 ppb. The highest concentrations during the year were observed at the G-406 structure with an annual FWM concentration of 443 ppb. G-406 shall only be used as an overflow structure, when no additional flow can be discharged to STA-5, thus discharge through this structure typically reflects peak conditions. The runoff flows through G-406 accounted for only 15 percent of the total basin outflow. However, the TP load represented 22 percent of the total basin runoff load because of the higher concentrations occurring at G-406.

The continuation of the noncompliance trend and observed phosphorus levels during this lower rainfall year indicates that the basin is unable to approach historical levels even in years where there is significantly less runoff to manage. BMPs were required at the maximum level of

effort provided by the rule; however, their effectiveness in curtailing increasing runoff and load trends is not likely to have been fully realized as described in the C-139 basin *Source Control Strategy* section.

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

A preliminary review of rainfall, runoff volumes, and water quality data was conducted to identify causes for this year's results. It was concluded from the evaluation that an influential factor is the temporal distribution of rainfall impact on the ability to retain runoff. The three major canals serving the basin (Deer Fence Canal, S&M, and L1-L2-L-3) have limited capacity to detain and re-circulate runoff. Reported land use intensification since the baseline period is assumed to have increased flood control in upstream areas of higher phosphorus use. Because surface water for irrigation is not available to most landowners in the basin and there is limited allocation from the groundwater sources, a common landowner practice is to maximize storage during the growing season (August to May). Runoff at the time of an intense rainfall during this period is likely compounded with previously stored runoff. As land uses intensify and historical drainage levels are more controlled, if discharges from multiple sources are timed concurrently during these events the limitations of the existing drainage system may be accentuated (e.g., more use of overflow structure G-406).

Dry WY2007 conditions can be seen in the annual rainfall as a departure from average depicted in **Figure 4-12** for WY1980–WY2007. The four lowest rainfall water years for this basin were WY1981, WY2001, WY2007, and WY1982, in order from least to most rain. Because the target TP load for the basin is rainfall adjusted, lower rainfall amounts result in a lower TP performance measure target. **Figure 4-13** 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, a reduction in annual rainfall corresponds to a lower rainfall to runoff ratio. WY2007, with a ratio of 0.15, was the greatest of the four lowest rainfall years previously stated and produced a total runoff volume greater than seven of the water years within the period of record shown. This relationship of higher annual runoff volume with relatively little change in annual rainfall amount tends to indicate that land use intensification or other basin changes may have either decreased storage or increased the level of flood protection within the basin.

The timing of rainfall also appears to have had a significant impact on the basin. **Figure 4-14** shows the daily rainfall, runoff volume, and TP load occurring during WY2007. Flow and TP load for the basin in WY2007 are primarily a result of discharge occurring during the months of July, August, and September 2006. Although the annual rainfall amount ranks less than the 8th percentile, this three-month period falls above the 95^{th} percentile. Minimal discharge was reported from the basin in the remaining months of the year. The heavy rainfall associated with Tropical Storm Ernesto appears to have caused the majority of the runoff and associated load.

The cumulative impacts on basin runoff and TP loads from the C-139 basin are shown in **Figure 4-15**, contrasting similar total rainfall years of WY2007 and WY1982 and depicting the impact of a concentrated period of rainfall. Review of runoff volume and water quality for previous lower rainfall level years (1982, 1990, and 2001) suggests dramatic changes in the basin. Whereas 38.61 inches of rainfall caused 6.1 mt of phosphorus at a concentration of 113 ppb in WY1982; WY2007 load was at 29.1 mt and 305 ppb with 36.85 inches. This was the second highest annual TP FWM concentration (305 ppb), and the WY2007 TP load was greater than 10 water years with higher annual rainfall since WY1980.

The figures presented (**Figures 4-12** through **4-15**) make general observations of variations seen in rainfall, runoff volumes, and runoff TP loads between the current and previous water years. Besides the impact of WY2007 rainfall distribution, there are many other factors affecting this year's result including the general increasing trend in TP concentrations observed since WY1991 and stark increase since WY2005. A comprehensive investigation of factors affecting these trends is being conducted concurrent with rule development and are described in the update of source control activities for WY2007 and proposed WY2008 evaluations in the C-139 basin *Source Control Strategy* section.

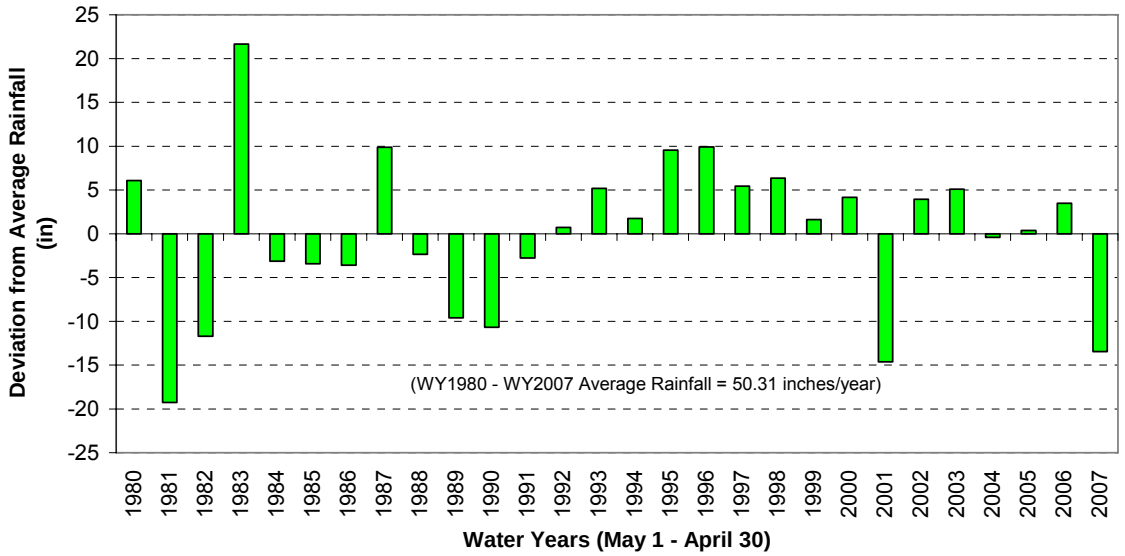


Figure 4-12. WY1980–WY2007 C-139 basin annual rainfall deviation from long-term average.

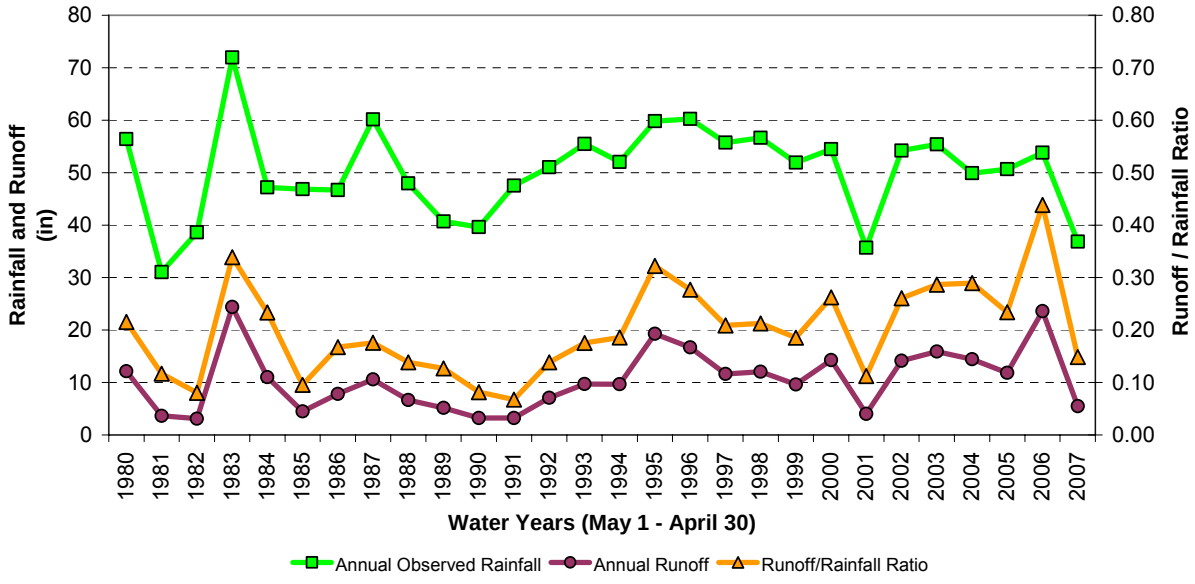


Figure 4-13. WY1980–WY2007 C-139 basin annual rainfall and runoff relationship.

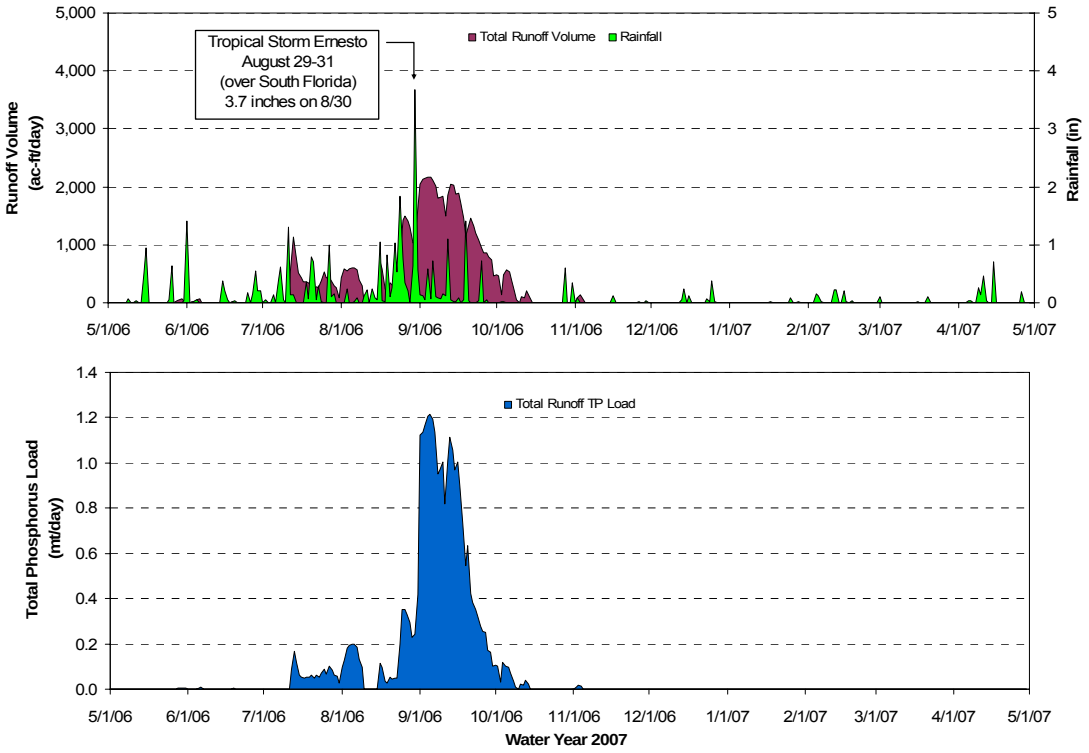


Figure 4-14. WY2007 timeline of C-139 basin daily rainfall, runoff (top), and TP load (bottom).

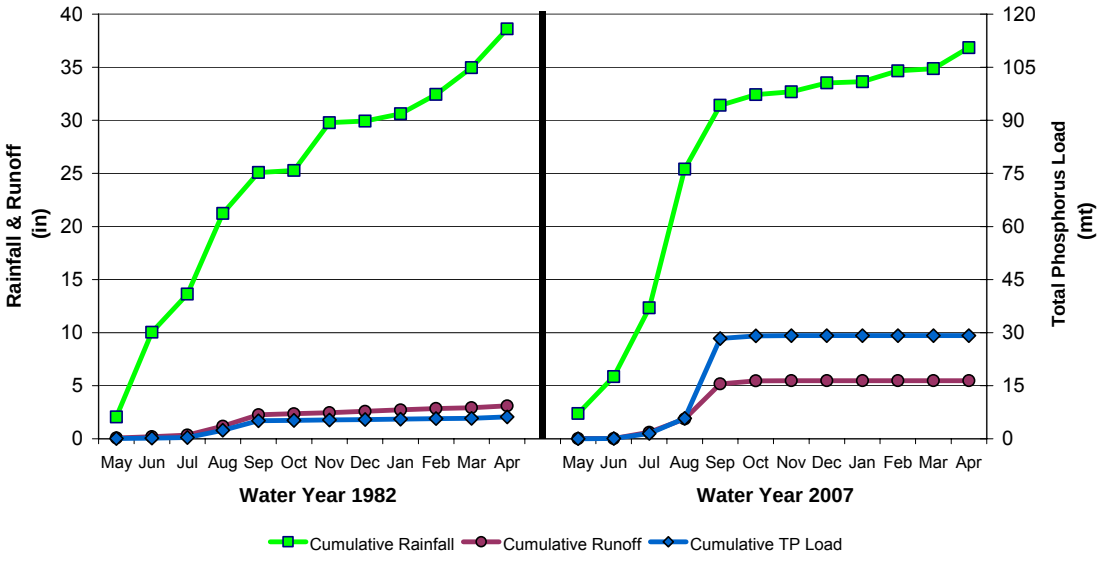


Figure 4-15. WY1982 and WY2007 comparison of C-139 basin cumulative monthly rainfall, runoff, and TP load.

C-139 Basin Phosphorus Investigation

The C-139 basin, like the EAA, is a complex system influenced by many factors making it sometimes difficult to explain cause-and-effect relationships that contribute to higher or lower TP loads in runoff from the basin. Determining these relationships provides understanding of how to improve the current level of BMP performance. These relationships are the subject of a C-139 Basin Phosphorus Water Quality and Hydrology Analysis that is being completed in phases from WY2006 through WY2008. Determination of factors contributing to TP load and affecting compliance is the common goal of several efforts targeted at reducing the discharge of phosphorus from the C-139 basin through surface water runoff. Additional monitoring sites have been installed throughout the basin during WY2007 to aid in the District's understanding of the relationships. The applicability of these relationships to the compliance methodology defined by Rule 40E-63 is also being investigated as part of the rule development process. Described below are factors assumed to affect C-139 phosphorus loading and compliance with historical levels:

Irrigation: In contrast with the EAA, use of surface water for irrigation is not available in the C-139 basin. As agricultural development has intensified, the historically rain-fed system has been supplemented with groundwater. There are no documented references on phosphorus levels in groundwater, however, anecdotal sources indicate that these could be elevated (600 ppb). Because of its sandy soils, there is high percolation of irrigation waters in the C-139 basin and thus demand for additional input from groundwater sources. Excess irrigation water that is discharged or lost cannot be recycled within the basin because of the limited storage capacity in basin canals and lack of authorization to withdraw canal water. In contrast, there is more opportunity for water economy in the EAA, as landowners can recycle available surface water supplies within the basin. Surface water is supplied via Lake Okeechobee with no additional input from groundwater. For compliance purposes, runoff for measuring compliance is estimated based on the daily net balance of runoff versus Lake Okeechobee inflows to the EAA. Groundwater inputs in the C-139 are reflected in the historical baseline and are not discounted for compliance.

Runoff management: The C-139 basin as a whole receives many variations throughout the water year from both a hydrologic and a water quality standpoint. Rainfall distribution, both spatially and temporally, influences runoff patterns from the basin to a significant degree. High amounts of rainfall occurring over a short period of time appear to generate significantly greater runoff amounts than if the same rainfall amounts were distributed over several more months. This result may be indicative of the current capabilities of the drainage and water management system within the basin to detain and dispose of excess rainfall amounts. Additionally, rainfall that occurs in the western parts of the basin, which is primarily native and improved pasture, will take longer to translate into runoff, as opposed to a faster runoff response in areas adjacent to the main drainage canals (L-2, L-3, S&M, and Deerfence canals) where more land is in row crop, citrus, and sugar cane production. Water management systems serving these agricultural developments are not all permitted to current surface water management criteria. Pasture lands, which cover approximately 50 percent of the basin, mostly discharge via open connections and some via pump.

Seasonality: August and September mark the start of the growing season, and also are the months where the basin receives significant rainfall. For vegetable operations, which are associated with the highest fertilizer application rates, the fall season planting is where the majority of nutrients are applied to the fields. In addition, the water table is likely to be strictly maintained at this time of year for planting equipment and early plant development. The generally sandy soils of the basin have limited binding capacity for phosphorus. Any excess synthetic fertilizers containing phosphorus are easily lost to the groundwater or travel with runoff.

Land use intensification: Conversion of pasture areas to more intensive agricultural uses is a component that appears to have contributed to more excess runoff and thus higher TP loads since program implementation. However, it likely does not explain the full picture of what transpired in the basin that caused higher amounts of runoff and TP loads. It has been put forward that land use intensification started concurrent with imposition of the Agricultural Privilege Tax ($4.95 per acre) on agricultural interests in the basin. The tax serves to maintain STA-5. In contrast with the EAA tax rate structure, which provides for a reduction in the tax to a minimum of $24.89 per acre based on phosphorus loading reductions beyond the mandated 25 percent reduction, there is no economical incentive in the form of a lower C-139 basin tax rate for landowners to reduce TP loads. A historical evaluation of basin changes since the baseline period is planned concurrent with rule development. The EFA states that the C-139 basin shall maintain compliance with historical levels despite new surface inflows. Therefore, source controls within the basin need to be effective enough to counterbalance more intensive use. Since growers favor basinwide approaches, there is no accountability on an individual landowner level for maintaining historical levels with or without intensification.

Compliance model capabilities: In contrast to the EAA basin compliance model which evaluates the monthly distribution of basin rainfall to predict the rainfall-adjusted load during the baseline period, the C-139 basin model has no such adjustment. Therefore, a basin-wide average rainfall of 52 inches occurring in two different water years will yield the same prediction of runoff TP load during the baseline period, irrespective of the distribution of the rainfall during the water year. The EAA basin model will yield differing predictions of runoff load for the same rainfall amount by accounting for distribution during the water year. Since rainfall distribution is not a factor for predicting baseline levels under the current compliance model, and this factor appears decisive in the annual runoff amounts, the District will explore whether and how rainfall distribution could be considered when predicting historical baseline levels in the revised rule. The issue at stake is not whether intense rainfall events cause increased runoff and load levels, but whether the predicted baseline can be estimated with consideration of these circumstances for an apples-to-apples comparison.

Source Control Strategy

The source control strategy for the C-139 basin has primarily relied on the EFA-mandated regulatory program with increasing levels of BMP implementation based on compliance status with the basin load limits. The first year of BMP implementation and compliance determination was WY2003. BMP implementation levels and compliance actions since program inception are summarized in **Table 4-10**.

During WY2007, C-139 basin permittees were required to implement Level IV BMPs, which are equivalent to 35 points, the maximum level of effort provided by the rule. WY2007 was the first full water year where Level IV BMPs were implemented. Permittees were required to initiate implementation of their 35-point BMP plan since November 2005. Since a majority of flow and load occurs during the wet season, from May through October, any benefits arising from the implementation of BMPs need to be observed during this period to impact annual results.

Table 4-10. WY2003–WY2007 C-139 basin BMP implementation summary.

Compliance Water Year	BMP Level	Compliance with Rule	Compliance Action
WY2003	Initial Implementation of Level I – 15 points	No	Go to Level II Full Implementation in November 2003
WY2004	Implement Level II – 15 points with site verification visits	No	Go to Level III Full Implementation in November 2004
WY2005	Implement Level III – 25 points with site verification visits	No	Go to Level IV Full Implementation in November 2005
WY2006	Implement Level IV – 35 points with site verification visits	No	Initiate Rule Development
WY2007	Continue Level IV	No	Continue Rule Development Process

Note: A water year (WY) is defined as May 1–April 30.

Rule 40E-63 states that the use of EWOD within the C-139 basin requires a permit that approves a permittee-implemented BMP plan. The BMP program for the C-139 basin was modeled after the BMP permit plans developed for the EAA adjusted to the conditions found in the C-139 basin based on comments provided by stakeholders at the time of rule development in 2002. To verify BMP implementation and opportunities for optimization, the District conducts BMP inspections on a regular basis. Field inspections have verified that the majority of permittees have adopted BMPs in their day-to-day operations, and that the maximum point level is generally met. However, there is room for optimization in terms of implementation. Some of the permitted BMPs reflect practices that were implemented prior to the source control program and, thus, increasing the level of BMP requirements may not necessarily reduce phosphorus load unless BMP plans are optimized. As it stands today, permittees have been able to select BMPs based on convenience without evaluating what would be the most effective or balanced plan for their properties (e.g., use of ERP-permitted impoundments already constructed as the sole BMP). Developing basin-specific BMP plans that better address site conditions such as water management, soils, water conservation, and phosphorus usage seems necessary. The District has intensified inspections and one-on-one outreach targeted at making improvements.

There is a need for research on how BMPs can be more effective and practical to implement. Regretfully, in contrast with the rule for the EAA which requires farm-level monitoring plans that provide useful data to verify BMP implementation, operation, and effectiveness, this requirement does not exist for the C-139 basin. Landowners have elected not to conduct farm-level monitoring, and there is not adequate information on the effect of the individual BMP plans on the farms. In some cases, individual farm monitoring may not be feasible because of joint drainage configurations or sheet runoff. There is also need for conducting research and demonstration projects to verify and quantify the water quality benefits of BMPs that are only presumed to be beneficial, but that cannot be validated. Finally, it is necessary to provide for a learning curve and period for realization of benefits when new BMPs or optimized BMPs are implemented.

Future improvements to performance are anticipated through changes to the regulatory program, including requirements for implementation of all defined categories of BMPs (nutrient management, water management, sediment controls, and pasture management) for all properties, as applicable. In addition to the mandated regulatory program, the source control strategy in the C-139 basin includes supplemental Long-Term Plan projects to further improve the existing regulatory program of BMPs. An update is provided in the next section.

Since permittees in the C-139 basin are not required to collect water quality and quantity data at farm-level discharges, the District initiated in 2005 water quality and quantity monitoring of upstream areas throughout the basin as part of its efforts to understand upstream contributions and devise more effective source control strategies. Because of the high seasonality of discharge within the basin and relatively recent implementation, there is limited data available since equipment installation. Generally, available data indicates high reactive phosphorus concentration in canal waters and surface water management treatment systems, indicating the need to prevent any unnecessary application of synthetic fertilizers containing phosphorus. Data on flow contribution from hydrological sub-basins is scarce.

Update on Source Control Activities in the C-139 Basin

Summary of Water Year 2007 Activities

During WY2007, the District continued the comprehensive plan to strengthen the mandatory regulatory program with funding provided by the Long-Term Plan and state appropriation funds for the following C-139 basin source control initiatives as detailed in the *2007 SFER – Volume I, Chapter 4*. The following is an update of these activities:

1. **BMP Regulatory Program:** Mandatory BMP verification visits were continued during WY2007. At the 35-point BMP level, additional visits are necessary for one-on-one outreach and BMP refinement. In various cases, planned infrastructure improvements necessary for achieving the 35-point BMP level are not yet complete; thus, alternative BMP plans with equivalent requirements are being implemented. The District has observed a significant improvement in the understanding and implementation of BMPs as the permit requirements have become more stringent. Due to not meeting the TP load requirements for four consecutive years in WY2006, rule development for Rule 40E-63 in the C-139 basin (C-139 rule) was initiated in January 2007. C-139 EWOD permits were set to expire on May 31, 2007. The first rule development action was to extend the expiration date of these permits until the amendments for the entire C-139 rule can be completed. The District has been gathering information from the five years of implementing the BMP program and the supplementary source control projects in order to assure that the C-139 rule amendments will be effective.
2. **C-139 Basin Phosphorus Water Quality and Hydrology Analysis (Long-Term Plan Project "C-139 Basin - Source Controls," FY2006–FY2007):** Phase II of the C-139 Basin Phosphorus Water Quality and Hydrology Analysis was initiated. Phase II of the analysis consists of development of a calibrated hydrologic and water quality model and modeling tools, identification and evaluation of five conceptual regional water quality improvement projects to test the model, staff training and a public workshop. The public workshop was held in June 2006 to provide the results of Phase I and get stakeholder input and ideas on water quality improvement projects. The Watershed Assessment Model (WAM) was chosen for the modeling portion of this project. Calibration of the model was completed and a final calibration report was submitted to the District in April 2007. Five

regional water quality improvement projects identified by stakeholders and District staff were chosen for evaluation using the WAM model.

3. **C-139 Basin Monitoring Network Optimization (Long-Term Plan Project "C-139 Basin - Source Controls," FY2006–FY2009):** In an effort to improve the source control program, the District has identified areas where additional water quality data is necessary. Four additional TP concentration and flow monitoring stations have been installed within the basin to assist in characterizing discharges from the eight sub-basins identified in Phase I of the C-139 Basin Phosphorus Water Quality and Hydrology Analysis. These four monitoring stations will supplement the three that were installed during WY2006, resulting in a total of seven monitoring stations. These data are being analyzed under the C-139 Phosphorus Transport and Cycling project.

4. **C-139 Basin Upstream Synoptic Monitoring:** As part of monitoring initiatives, the District continued collecting water samples at 18 sites that represent locations upstream of basin regulatory compliance points. These sampling locations give "snapshots" of phosphorus concentrations throughout the watershed in the wet season (April 1–October 30). The samples are collected weekly if flowing. In WY2007, weekly samples from May 1, 2006 through October 31, 2006, and April 1, 2007–April 30, 2007 were collected at the 18 sites. The parameters tested are TP, total dissolved phosphorus (represents total soluble phosphorus or TSP), and ortho-phosphorus (represents soluble reactive phosphorus or SRP). In addition, flow measurements coincident with the grab sample collections were initiated for an eight-week period in September and October 2006. These WY2007 data are being analyzed under the C-139 Basin Phosphorus Transport and Cycling project. The 18 sites monitored during WY2007 were evaluated to optimize the monitoring locations and make sure there was no duplication of monitoring within the C-139 Basin Monitoring Network. This evaluation resulted in replacing three sites where data was duplicated with three new sites that will provide additional information on the phosphorus levels throughout the basin.

5. **C-139 Basin Vegetable Production Demonstration Project (Long-Term Plan Project "C-139 Basin - Source Controls," FY2005–FY2008):** The goal of the C-139 basin Vegetable Production Demonstration contract project is to optimize phosphorus fertilization rates through soil testing specifically for C-139 basin soils. When excess fertilizer is applied to a crop, there may be no positive response by the crop and excess phosphorus may be lost through leaching or runoff. This three-year project is being conducted by the UF/IFAS Southwest Florida Research and Education Center in Immokalee and the UF/IFAS Hendry County Cooperative Extension Service in LaBelle. Results of the first year were provided to the District in November 2006, and included four demonstration sites (Cushman et al., 2006). Five demonstration sites were monitored during the 2006 fall-to-winter and 2007 winter-to-spring growing seasons. The results were presented at the May 1, 2007, Vegetable Field Day. General results indicate that there are no significant differences in the standard parameters (yield, size) when lower UF/IFAS recommended rates are applied, in comparison to landowner rates for some vegetables. Some participants have reduced their application rates in response to the results, although these are still above the recommended UF/IFAS rates. Additionally, the demonstration project has brought to light additional parameters that determine the quality of the crop, hardiness (e.g., resistance to extreme weather events), and marketability. Long-term evaluation is required to enhance recommendations, keeping in mind all factors so that crops are not affected.

6. **C-139 Basin Phosphorus Transport and Cycling (Long-Term Plan Project "C-139 Basin - Source Controls," FY2006–FY2007):** Water quality and flow data collected in WY2006 through the C-139 Basin Monitoring Network and C-139 Basin Upstream Synoptic Monitoring were analyzed to evaluate C-139 basin phosphorus sources, transport, cycling, and export. The WY2006 report provided recommendations for further optimizing the monitoring programs in the C-139 basin such as collecting flow measurements concurrent with grab samples and completing installation of the Monitoring Network. These recommendations were implemented for WY2007 and should provide additional data for the WY2007 analysis. Due to limited data in WY2006, it was difficult to ascertain the phosphorus sources, transport, cycling, and export in the C-139 basin. However, the results show that dissolved phosphorus continues to be a significant portion of the TP discharged in the basin (Community Watershed Fund, 2007).
7. **C-139 and Western Basins BMP Grant Program (Long-Term Plan Project "C-139 Basin - Source Controls," FY2004–FY2007):** WY2007 was the final year for funding the existing BMP Grant Program. The District will continue monitoring progress and water quality of cost-shared projects under the program. A report summarizing the project results since FY2002 can be found on the District's Everglades Regulation Publication web site at www.sfwmd.gov under *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation, Publication* tab.
8. **Integrated Permit Compliance:** Degree of water quality treatment and attenuation, water storage, and conservation are some of the factors, besides nutrient application, that affect the phosphorus loads. EWOD permit BMP implementation addresses nutrient controls, while Surface Water Management (SWM) or ERP addresses water quality treatment, attenuation and storage, and Consumptive Water Use (WU) authorizations addresses water use and conservation. The integrated regulatory approach is initiated to achieve the EFA-mandated water quality goads by incorporating review of SWM or ERP and WU authorizations in the basin to ensure that they effectively supplement the efforts of the Everglades BMP Program.
9. **Solicit Landowner Feedback:** The District continued to conduct workshops to solicit input from landowners and permittees, and provide updates on the results of projects and investigations described above. Workshops were held on September 21, 2006 and April 19, 2007.

Anticipated Activities for Water Year 2008

1. **BMP Regulatory Program:** Level IV BMP verifications and outreach efforts will continue to ensure improved BMP implementation and effectiveness. Rule development for the C-139 rule will continue in order to improve the BMP program. The focus will be on optimizing current BMPs, requiring more comprehensive BMP plans, and refining the current compliance methodologies. Six rule development workshops have been scheduled to allow stakeholders to provide ideas and input. The input and ideas provided at these workshops, along with the information gained from five years of implementing the BMP program and the supplementary source control projects will be used so that modifications to the rule will be effective in the long term. The last workshop is scheduled for December 2007, and it is anticipated that the revised rule will become effective in the early part of WY2009.
2. **C-139 Basin Phosphorus Water Quality and Hydrology Analysis (Long-Term Plan Project "C-139 Basin - Source Controls," FY2006–FY2007):** Phase II will be continued and completed. The WAM model will be used to evaluate alternative water quality

improvement projects, and provide a tool for evaluating farm-level BMPs. The results of modeling of the water quality improvement projects is expected in August 2007, and completion of the tool for evaluating farm-level BMPs is expected in September 2007. The Phase II report is anticipated to be completed in January 2008, and the user's manual and workshop with stakeholders will be completed by February 2008.

3. **C-139 Basin Monitoring Network Optimization (Long-Term Plan Project "C-139 Basin - Source Controls," FY2006–FY2009):** Two additional monitoring locations are being installed within the C-139 basin to track discharge characteristics from the eight sub-basins identified under Phase I of the C-139 Basin Phosphorus Water Quality and Hydrology Analysis.
4. **C-139 Basin Upstream Synoptic Monitoring:** This monitoring initiative will continue in WY2008 with 18 monitoring locations. This includes three new locations that replaced three locations that were duplicative because of the installation of sites for the C-139 Basin Monitoring Network.
5. **C-139 Basin Vegetable Production Demonstration Project (Long-Term Plan Project "C-139 Basin - Source Controls," FY2005–FY2008):** This project will continue to include presentation of WY2007 results in a second annual report and dissemination through an annual workshop with vegetable growers. The WY2007 five demonstration sites are planned to be monitored in the 2007 fall to 2008 spring growing season with results to be disseminated to vegetable growers through the spring 2008 Vegetable Field Day.
6. **C-139 Basin Phosphorus Transport and Cycling (Long-Term Plan Project "C-139 Basin - Source Controls," FY2006–FY2007):** WY2007 water quality and flow data will be analyzed to evaluate phosphorus sources, transport, and cycling. This analysis, along with the WY2006 analysis, will provide a better understanding of the characteristics of phosphorus discharges in the C-139 basin and provide valuable information for future BMP development.
7. **C-139 and Western Basins BMP Grant Program (Long-Term Plan Project "C-139 Basin - Source Controls," FY2004–FY2006):** The District will continue monitoring progress and water quality of cost-shared projects under the program through the end of WY2008.
8. **Integrated Permit Compliance:** The District will continue this coordinated initiative to bring landowners in the C-139 basin in compliance with ERP, consumptive water use permits, and EWOD permits.
9. **BMP Demonstration Grant Program:** There is a great need for site-specific information on BMP effectiveness in the C-139 basin. It is anticipated that funds will be available to provide grants to landowners for BMP demonstration projects. These projects will focus on water management and nutrient management. The grants will provide funds for monitoring of effectiveness of currently implemented BMPs, and optimization through design or operational enhancements. Grants may also be provided for design, implementation, and monitoring of newly proposed BMPs.
10. **Technical Evaluations of Factors affecting Compliance:** In addition to agricultural practices-based research and BMP optimization, the District has initiated an evaluation of factors affecting the annual TP load compliance of the C-139 basin. The work plan for this effort includes technical evaluation of data from the basin's historical record, from the baseline period through present, with emphasis on statistical trends and correlation with identifiable changes in climate, land use, drainage facilities, or system operation. Initial

work will focus on issues related to the rule development process with long-term goals of providing insight to improving water quality from the basin.

FUTURE DIRECTION FOR THE ECP BASINS

The EAA was in compliance with the mandated phosphorus loading levels during WY2007, and the three-year average phosphorus reduction of 46 percent continues to be well above the 25 percent reduction requirement. However, the basin did not meet the target 25 percent TP load reduction compared with the predicted load this individual year. Evaluations are under way to explain whether this is an incidental exceedance or the beginning of a trend.

On the other hand, the BMP regulatory program in the C-139 basin has not yet met the requirements of maintaining TP loads at or below historical levels in five years of implementation. Enhancement of the BMP mandatory programs in the C-139 basin through rulemaking and supplementary projects is necessary. Additional water quality and quantity data are necessary to better understand upstream contributions and the effectiveness of the program so that specific causes can be identified and corrected. This effort has been initiated at the sub-basin level consistent with the hydrological and regulatory constraints. On the other hand, it has become apparent that the modeling prediction based on historical levels needs reexamination. In particular, factors that may not have been considered of concern when the initial model was derived may need to be incorporated. This evaluation will be conducted concurrent with rule development. Compliance with the requirements of the EFA is required for the District to improve performance of STA-5, achieve the phosphorus criterion in the EPA, and fulfill its obligations under the EFA and the federal Everglades Settlement Agreement.

Planned activities for the EAA basin consist of continuing the current level of implementation as mandated in the Long-Term Plan, while increasing BMP verification activities in areas where permit-level data indicates an increase in TP load discharged. The District will continue to evaluate the relationships between Lake Okeechobee inflows, EAA basin runoff, and downstream points of entry into STAs, along with the driving factors that govern those relationships. The District will continue to rely on the findings and recommendations made by the UF/IFAS for improving BMP effectiveness at the farm level through research and enhanced extension services.

As mandated by Rule 40E-63, rule development has been initiated for the C-139 basin and will continue through WY2008. Although additional time is required for the BMP program and supplementary source control projects to affect TP loading to the levels required by the EFA and ECP performance, there is limited understanding of current conditions for developing a more effective program. The information gained from five years of implementing the BMP program and the supplementary source control projects will be used so that modifications to the rule will be effective in the long term. Current water quality monitoring initiatives and technical analyses in parallel with interactive landowner workshops and interdivision regulatory coordination are intended to fill the void. In addition, a grant program for landowner BMP demonstration projects will be initiated to provide much needed information on site-specific BMP effectiveness. The District will continue to develop and build upon a knowledge base to assess the most effective and feasible strategies.

SOURCE CONTROLS IN THE NON-ECP BASINS

The EFA initially allowed for a more flexible adaptive approach to water quality improvement in discharges for the non-ECP basins as compared to the ECP basins' mandatory BMP program. This was, in large part, based on the non-ECP basins having historically contributed approximately 12 percent of the total load discharging to the EPA compared to the 88 percent contribution by the ECP basins. Because of the relatively small TP contribution by the non-ECP basins, they were allowed to discharge directly to the EPA with source control programs initiated in WY1998 to address the quality of the basins' discharges. However, the 2003 EFA requires the implementation of basin-specific WQIPs to ensure progress toward ultimately achieving established water quality standards in discharges from each of the non-ECP basins. The 2003 EFA established that the Long-Term Plan constitutes the best available phosphorus reduction technology (BAPRT). The Long-Term Plan for the non-ECP basins proposes a combination of source control BMPs and integration with diversion and construction activities planned as part of the CERP and other local construction projects. The WQIPs for each non-ECP basin (described in detail in Section II of the *2006 SFER – Volume I, Chapter 3*) include a combination of source controls (BMPs), diversion strategies, and capital improvement projects consistent with the Long-Term Plan's direction to rely on source controls and integration with CERP and other local construction projects. Therefore, the WQIPs are considered BAPRT.

The distribution of loads from the non-ECP basins to the EPA by water year is presented in **Figure 4-16a**, and the location of non-ECP basins and associated structures that discharge into the EPA are depicted in **Figure 4-16b**.

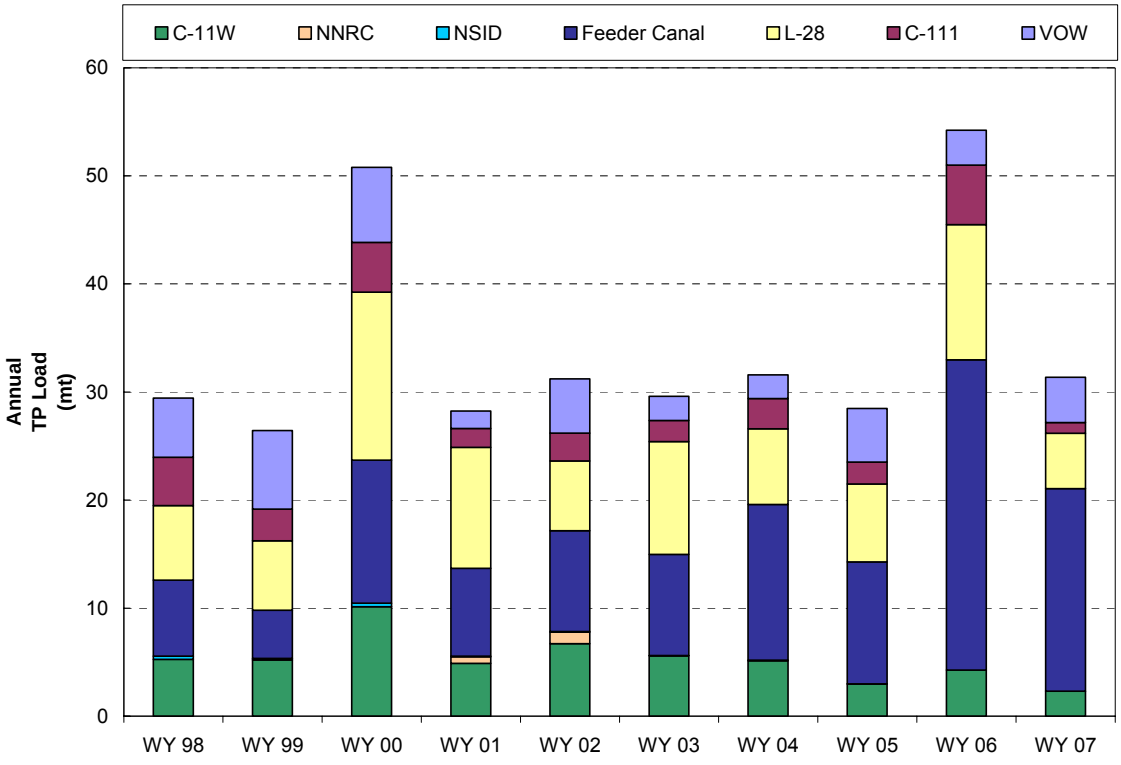


Figure 4-16a. Non-ECP basin TP loads into the EPA for WY1998 through WY2007.

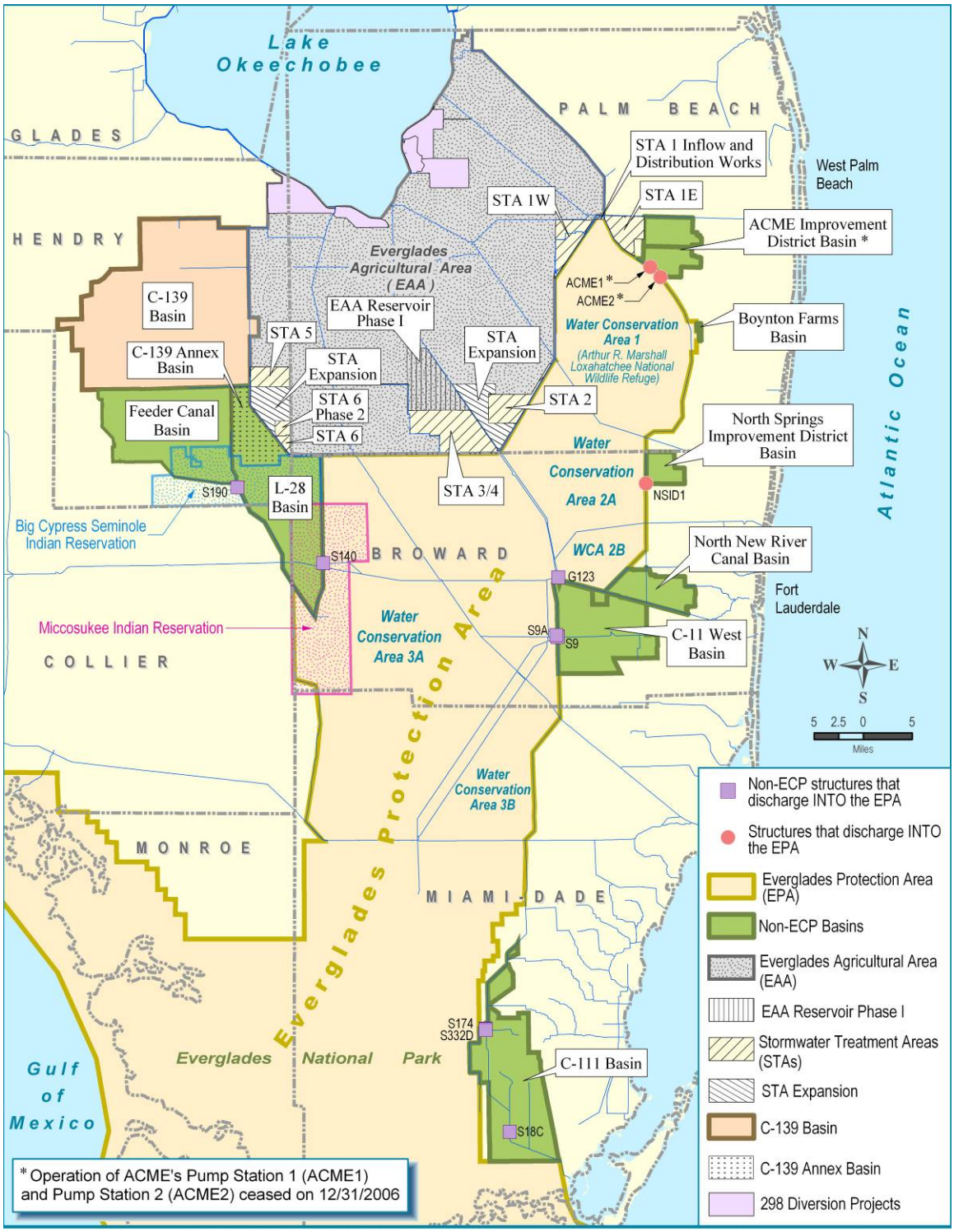


Figure 4-16b. The non-ECP basins and primary compliance water control structures discharging to the EPA.

As required by the 2003 EFA, the non-ECP permit is expected to be modified to require compliance with the TP concentration limits for the C-111 basin and with TBELs for the C-11 West, NNRC, Feeder Canal, and L-28 basins. This proposed permit requirement stemmed from the EFA requirement that discharge limits for long-term compliance permits allowing phosphorus discharges into the EPA be based upon TBELs established through BAPRT until 2016. A TBEL is defined as the minimum waste treatment requirement, established by the FDEP, based on treatment technology. Effluent limitations means any restriction established by FDEP on quantities, rates, or concentrations of chemical, physical, biological, or other constituents which are discharged from sources into waters of the state.

According to the 2003 EFA, the TP concentration limits for the C-111 basin discharges into Everglades National Park shall be based on the methods as set forth in Appendix A of the federal Everglades Settlement Agreement, which indicates that the TP long-term limit of 11 ppb is to be met by December 31, 2006. The 11 ppb limit shall apply to the combined flow-weighted mean TP concentration (for non-ECP "into" structures S-18C, S-332D, and S-174) for the water year ending September 30. To aid in tracking compliance, the Settlement Agreement also established that less than 53.1 percent of the concentrations composited across all inflow structures should exceed 10 ppb. Because the reporting water year for the C-111 basin ends on September 30, 2007, WY2007 results will be reported by letter to the FDEP and is expected to be included in *2009 SFER – Volume I*. **Table 4-11** summarizes the proposed TBEL for the C-11 West, NNRC, Feeder Canal, and L-28 basins and its associated non-ECP "into" structures.

Table 4-11. Proposed Technology-Based Effluent Limitations (TBELs) for C-11 West, NNRC, Feeder Canal, and L-28 basins.

Criteria	Non-ECP Basin			
	C-11 West (S-9 and S-9A)	North New River Canal (G-123)	Feeder Canal (S-190)	L-28 (S-140)
Limit - In any year, annual* (combined) FWM TP concentration (in ppb) should not be greater than:	25	32	155	96
Target - In three or more consecutive years, annual* (combined) FWM TP concentration (in ppb) should not be greater than (ppb):	20	22	109	37
Compliance will not be tested in Water Years when rainfall exceeds (inches):	59.5" (measured at S-9 and S-124)	65.7" (measured at S-124 and S-125)	58.4" (measured at S-190)	58.0" (measured at S-140)

* Water Year: May 1–April 30

The water quality in basin discharges is monitored to track the success of the source control activities in each basin and to determine compliance with the TP concentration limits or the proposed TBEL for each non-ECP "into" structure. Because the reporting water year for the C-111 basin ends on September 30, 2007, WY2007 results for this basin, including a determination if it complies with TP concentration limits, will be reported by letter to FDEP and is expected to be included in the *2009 SFER – Volume I*. **Table 4-12** summarizes the WY2007 compliance status for the C-11 West, NNRC, Feeder Canal, and L-28 basins with their proposed TBELs (expected to be established in WY2008).

This section provides an update on the WY2007 phosphorus data and the source control activities for individual non-ECP basins. Annual flow, TP load, and TP FWM concentration for individual non-ECP structures are tabulated in Appendix 4-1, Table 4.

Table 4-12. Summary comparison of WY2007 observed TP FWM concentrations to proposed non-ECP permit TBEL compliance measurement targets and limits.

Basin (Structures)	Observed TP FWMC (ppb)	Proposed TBEL FWMC (ppb) Target/Limit	Meets Proposed Target?	Meets Proposed Limit?	Meets Compliance Test?
C-11 West (S-9 and S-9A)	15	20/25	Yes	Yes	Yes
NNRC (G-123)	No Discharge	22/32	No Discharge[1]	No Discharge[1]	No Discharge[1]
Feeder Canal (S-190)	215	109/155	No	No	No
L-28 (S-140)	Not Applicable[2]	37/96	Not Applicable[2]	Not Applicable[2]	Not Applicable[2]

[1] Proposed compliance test is not applied with "no discharge."

[2] C-139 Annex flows and TP load must be excluded from calculation. C-139 Annex TP load exceeded S-140. TP load and TBEL verification cannot be done.

C-11 WEST BASIN UPDATE

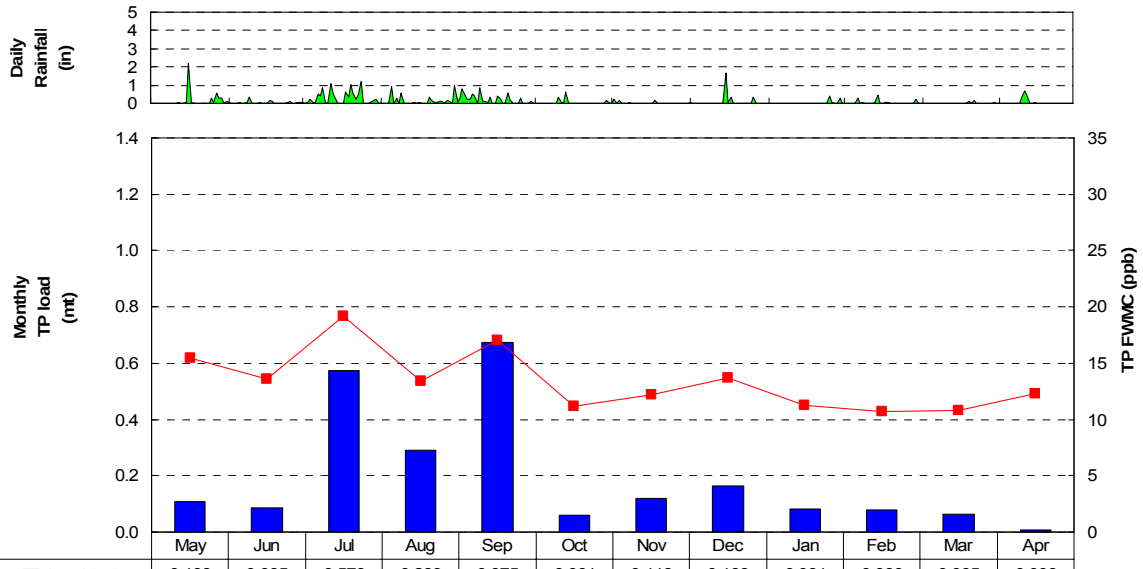
Water Year 2007 Phosphorus Results for C-11 West Basin

Of the three Broward County non-ECP basins, only the C-11 West basin regularly discharges to the EPA. Discharges from this basin are comprised of stormwater runoff and groundwater seepage returns through structures S-9 and S-9A into Water Conservation Area 3A (WCA-3A). The S-9A pump structure became operational in early 2003, and a divide structure (S-381) was completed in early 2005 (C-11 West Critical Project). This construction project changed the operation of the water management system by separating and returning seepage water with less phosphorus to WCA-3A, thereby decreasing the pumping frequency at the larger S-9 structure.

Figure 4-17a summarizes the daily rainfall and the monthly TP load, FWM TP concentration, rainfall (average of stations S-9 and S-124), and flow volume in WY2007 for structures S-9 and S-9A. The S-9 and S-9A combined FWM TP concentration and TP load for WY2007 were 15 ppb and 2.31 mt, respectively. The proposed permit-required FWM TP concentration TBEL for the non-ECP "into" structures S-9 and S-9A combined is 20 ppb, with an annual limit of 25 ppb. Further, the WY2007 rainfall measured at the S-9 and S-124 stations (averaged) is 33.3 inches. Therefore, in accordance with **Table 4-11**, these "into" structures would have been in compliance with their proposed EFA water quality requirements. **Figure 4-17b** summarizes the annual TP load, FWM TP concentration, rainfall, and flow volume for structures S-9 and S-9A from WY1998 through WY2007.

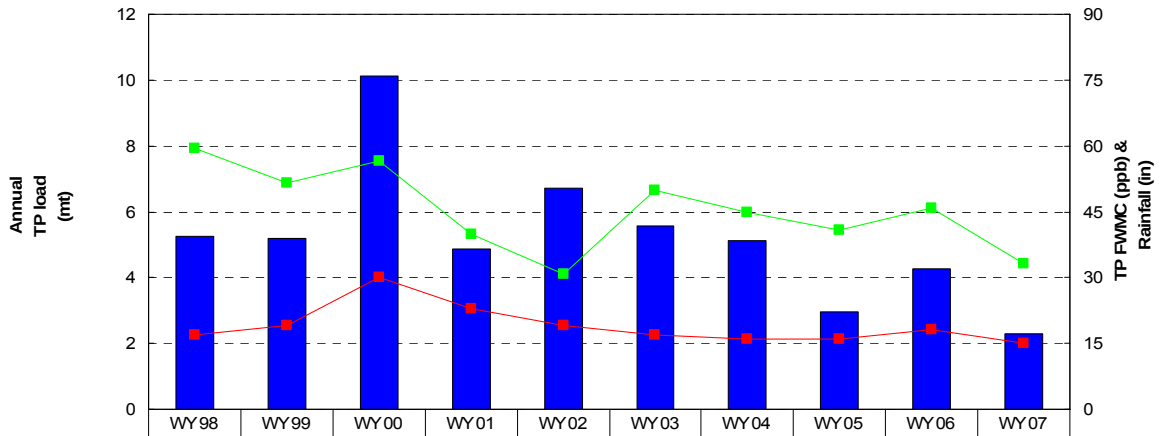
The FWM TP concentration for C-11 West basin between WY1998 and WY2003 was 21.9 ppb. During this period, only the S-9 pump station discharged seepage and stormwater runoff from the basin into the EPA. The FWM TP concentration for C-11 West basin between WY2004 (right after completion of the S-9A pump structure) and WY2007 was 16.5 ppb. During this period, the S-9 pump station discharged mostly stormwater runoff from the basin into the EPA, and the S-9A pump station discharge mostly seepage from the basin into the EPA.

A summary of the upstream water quality data used to identify high phosphorus areas within the basin and a map of the C-11 West basin showing these data are available online in the Non-ECP Upstream Monitoring WY2007 report on the District's Everglades Regulation Publications web site at www.sfwmd.gov under the *What We Do, Permitting/ Regulation, Who to Contact, Everglades Regulation, Publications* tab.



	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
TP Load (mt)	0.108	0.085	0.573	0.289	0.675	0.061	0.118	0.163	0.081	0.080	0.065	0.008
TP FWMC (ppb)	15	14	19	13	17	11	12	14	11	11	11	12
Rainfall (in)	3.875	1.34	9.05	4.34	5.935	1.54	0.645	2.49	0.85	1.18	0.36	1.65
Flow Vol. (kac-ft)	5.656	5.043	24.213	17.466	32.228	4.464	7.831	9.648	5.836	6.037	4.865	0.526

Figure 4-17a. C-11 West basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2007 (bottom).



	WY98	WY99	WY00	WY01	WY02	WY03	WY04	WY05	WY06	WY07
TP Load (mt)	5.250	5.193	10.125	4.881	6.716	5.580	5.122	2.972	4.262	2.306
TP FWMC (ppb)	17	19	30	23	19	17	16	16	18	15
Rainfall (in)	59.5	51.6	56.6	39.9	30.7	50.0	45.0	40.9	45.8	33.3
Flow Vol. (kac-ft)	250.350	221.585	273.612	172.045	283.618	264.301	257.317	149.987	189.815	123.812

Figure 4-17b. C-11 West basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY1998–WY2007.

Source Control Strategy

The WQIP for the C-11 West basin includes a combination of ongoing source control activities by basin stakeholders and integration with the Broward County Water Preserve Area (BCWPA) CERP Project. Source control activities include incorporating more stringent stormwater system permit requirements and maintenance programs; requiring landscape contractors to implement fertilizer and landscape maintenance BMPs; adopting ordinances supporting BMPs; implementing upstream monitoring to identify and respond to areas of concern; implementing operational changes to improve water pretreatment; implementing local capital improvement projects that provide water quality benefits; and educating residents on how they can protect the Everglades through workshops, special events, television, radio, mailings, web sites, brochures, and newsletters.

Update on Source Control Activities for C-11 West Basin

Summary of Water Year 2007 Activities

During WY2007, the District and stakeholders continued the implementation of the WQIPs for the C-11 West basin, as detailed in the *2006 SFER – Volume I, Chapter 3*. Following is an update on each of these activities.

1. **Long-Term Plan Revisions:** The Long-Term Plan for the C-11 West basin was revised on September 1, 2006, to add funding of some components of the BCWPA CERP Project. The Long-Term Plan was also revised on January 31, 2007, to extend the existing source control program timelines and funding for the period from FY2007 through FY2010 to account for the latest CERP project timelines.
2. **Broward Everglades Working Group:** The District assisted Broward County in the implementation of the C-11 West Basin Pollution Reduction Action Plan of April 2006 (http://www.sfwmd.gov/org/erd/longtermplan/pdfs/C-11April_06_v2_wAppendix.pdf), which can be found on the District's Long-Term Plan web site through www.sfwmd.gov under the *Everglades* section, *Long-Term Plan for Achieving Everglades Water Quality Goals* link..
3. **C-11 West Basin Nursery BMP Grant Program (Long-Term Plan Project "C-11 West Basin," FY2005–FY2006):** As of July 2007, the District and FDACS had awarded thirty nursery growers within the C-11 West basin over $515,000 for the implementation of nursery BMPs as part of the C-11 West Basin Nursery BMP Grant Program. Also, as of July 2007, nine of these nursery growers had completed implementation of the BMPs totaling about $100,000. Due to budget cuts in the FDACS FY2008 budget, eleven of these grants, totaling about $200,000 were rescinded in August 2007. It is expected that the remaining grant work, totaling about $215,000, will be completed by May 2008.
4. **BCWPA CERP Project:** The USACE completed the Project Implementation Report (PIR) for the BCWPA CERP Project in April 2007. Flows from the C-11 West basin to WCA-3A will be significantly reduced, along with a significant reduction in the resulting TP load to WCA-3A, once this project is completed. Start of construction of this project is currently scheduled in 2008. More detail on this project is available in Chapter 7A of this volume, at the CERP web site (www.evergladesplan.org), and the Acceler8 web site (www.evergladesnow.org).

5. **South Broward Drainage District (SBDD) Improvements:** SBDD got approval for a permit modification to implement operational changes to its S8 pump, which have resulted in an additional 0.5-inch detention for improved water management and treatment. Closure of two unrestricted outfalls within SBDD's S-8 basin is expected to be completed by 2008. The SBDD also completed design and construction of several components of new drainage facilities for its S9/S10 sub-basin including: permanent closure of all three SBDD's unrestricted outfall west of the S-381 structure; and completion of two additional control structures and closure of one unrestricted outfall east of S-381, all expected to be completed by 2008.
6. **Central Broward Water Control District (CBWCD) Improvements:** The CBWCD continues the implementation of its capital improvement projects to increase the basin water storage capacity for improved flood control and water quality. The projected completion date is 2008.
7. **Educational Public Service Announcements (Long-Term Plan Project "C-11 West Basin," FY2005–FY2006):** The District renewed its contract for a third year with Comcast Cable Network for airing the five Everglades educational public service announcements (PSAs) (30-second videos with the theme "From our Gutters to the 'Glades"). Over 8,800 educational PSAs (including over 2,500 Spanish language versions of the educational PSAs) were scheduled to be aired on nineteen major networks in the Broward County non-ECP basins (C-11 West, NNRC, and NSID) from December 2006 through October 2007. The District also undertook initiatives to have the educational PSAs aired on local community access channels from cities and towns in Broward County non-ECP basins.
8. **Know-The-Flow Education and Training Program:** Broward County continued offering monthly Know-The-Flow workshops to property managers, homeowner associations, local government agencies, and other interested parties and individuals. The "Know-the-Flow" workshops present information about primary, secondary, and tertiary stormwater management systems as well as plant diversity, fertilization, and irrigation practices in layman terms.
9. **Everglades Web Site Development:** Links to the Districts' Everglades4Ever web site (www.sfwmd.gov/everglades4ever) and Broward County's NatureScape web site (www.broward.org/naturescape) have been provided on the web sites of most Broward County stakeholders (municipalities, Chapter 298 districts, and others). The Everglades4Ever web site targets residents in general and includes reference to many of the activities previously described above.

Anticipated Activities for Water Year 2008

In addition to continuing the source control activities previously described, the following are planned for WY2008:

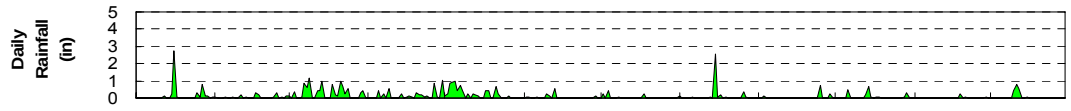
1. **C-11 West Basin Nursery BMP Grant Program:** The District will continue its efforts to provided cost-share funding to assist nursery growers in this basin with implementation of nursery BMPs.
2. **Indian Trace Development District (ITDD) Improvements:** ITDD will submit a permit modification request to implement operational changes to its two pump structures, resulting in an additional 0.5-inch detention for improved water management and treatment.

NORTH NEW RIVER CANAL BASIN UPDATE

Water Year 2007 Phosphorus Results for North New River Canal Basin

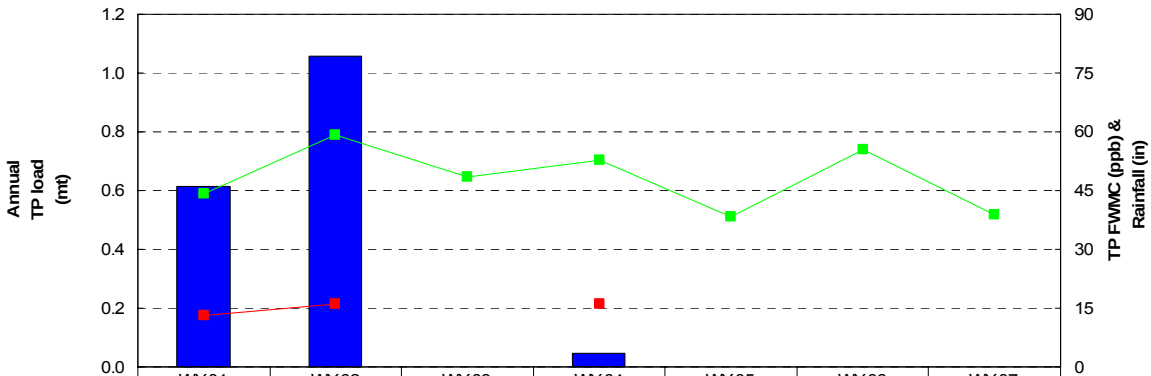
The NNRC basin in Broward County is able to discharge to the EPA, specifically WCA-3A, through structure G-123, although it seldom occurs. The structure is primarily used for water supply to WCA-3A, although it is sometimes necessary to use this structure for flood control during large storm events. In December 2001, the District implemented operational changes to the system for the purposes of water supply to the WCAs from this basin; there has been no flow or insignificant flow volumes discharged in the last four water years. There was no discharge from the NNRC basin to the EPA in WY2007.

Figure 4-18a summarizes the daily rainfall and the monthly TP load, FWM TP concentration, rainfall (average of stations S-124 and S-125), and flow volume in WY2007 for the G-123 structure. **Figure 4-18b** summarizes the annual TP load, FWM TP concentration, rainfall, and flow volume for the G-123 structure from WY2001–WY2007. A summary of the upstream water quality data used to identify high phosphorus areas within the basin and a map of the NNRC basin showing these data are available online in the Non-ECP Upstream Monitoring WY2007 report on the District's Everglades Regulation Publications web site at www.sfwmd.gov under the *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation, Publications* tab.



	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
TP Load (mt)	0	0	0	0	0	0	0	0	0	0	0	0
TP FWMC (ppb)	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Rainfall (in)	4.7	1.8	9.2	4.9	7.1	1.5	1.0	3.5	1.2	1.9	0.4	1.8
Flow Vol. (kac-ft)	0	0	0	0	0	0	0	0	0	0	0	0

Figure 4-18a. North New River Canal basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2007 (bottom) (NF = no flow for period).



	WY01	WY02	WY03	WY04	WY05	WY06	WY07
TP Load (mt)	0.615	1.057	0	0.046	0	0	0
TP FWMC (ppb)	13	16	NF	16	NF	NF	NF
Rainfall (in)	44.1	59.1	48.5	52.8	38.2	55.3	38.82
Flow Vol. (kac-ft)	38.379	52.047	0	2.299	0	0	0

Figure 4-18b. North New River Canal basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2001–WY2007 (NF = no flow for period).
Note: G-123 flow and water quality data incomplete prior to WY2001.

Source Control Strategy

The WQIP for the NNRC basin includes a combination of ongoing source control activities by basin stakeholders and integration with the WCA-2 and WCA-3 Diversion CERP Project. Source control activities include incorporating more stringent stormwater system permit requirements and maintenance programs; requiring landscape contractors to implement fertilizer and landscape maintenance BMPs; implementing upstream monitoring to identify and respond to areas of concern; implementing operational changes and local capital improvement projects that provide water quality benefits; and educating residents on how they can protect the Everglades through workshops, special events, television, radio, mailings, web sites, brochures, and newsletters.

Update on Source Control Activities for North New River Canal Basin

Because this basin is also located in Broward County, some of the training and education activities being implemented in the C-11 West basin also apply to the NNRC basin, and updates can be found in the C-11 West basin subsection of this chapter.

Summary of Water Year 2007 Activities

During WY2007, the District and stakeholders continued the implementation of the WQIPs for the NNRC basin as detailed in the *2006 SFER – Volume I, Chapter 3*. Following is an update on each of these activities. Also, the Long-Term Plan for the NNRC basin was revised on January 31, 2007, to extend the existing source control program timelines and funding for the period from FY2007 through FY2010, and to allow continued operation of the G-123 structure until completion of the WCA-2 and WCA-3 Diversion CERP Project (currently planned for after 2020), only as may be absolutely necessary for water supply emergencies or emergency flood protection within the basin.

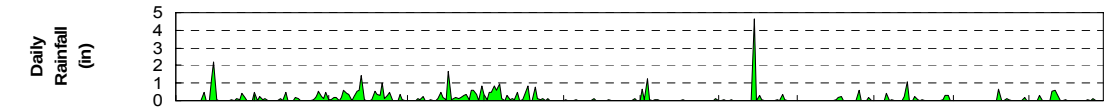
NORTH SPRINGS IMPROVEMENT DISTRICT BASIN UPDATE

Water Year 2007 Phosphorus Results for North Spring Improvement District Basin

The North Springs Improvement District (NSID) basin in Broward County is able to discharge to the EPA, specifically WCA-2A, through NSID Pump Station 1 (NSID1); however, it is only permitted when the stormwater conveyance system that normally discharges to tide exceeds its capacity. The basin did not discharge to the EPA during WY2007. Pump management BMPs that were implemented in WY2001 drastically reduced the frequency and volume of pumping to the EPA. The last two confirmed discharges from NSID1 into WCA-2A occurred in July 2002 and September 2004.

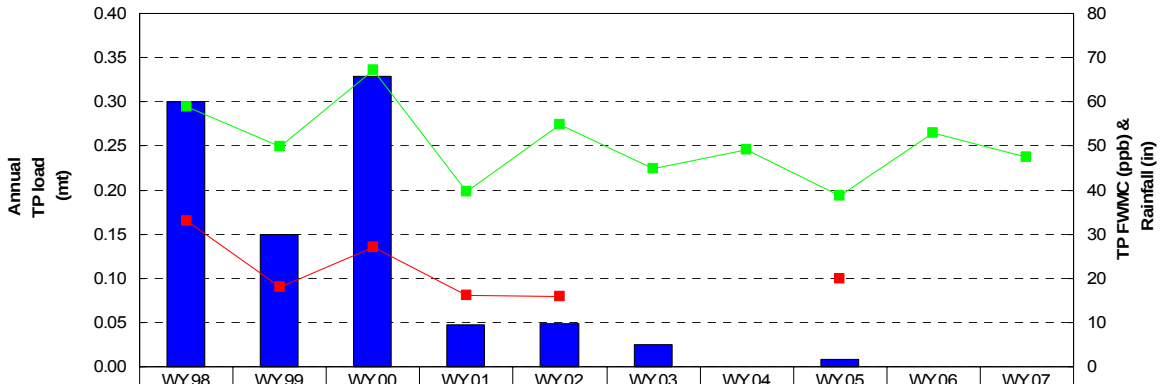
Figure 4-19a summarizes the daily rainfall and the monthly TP load, FWM TP concentration, rainfall (average of G-56, S-38, and S-39 stations), and flow volume in WY2007 for the NSID1 structure. **Figure 4-19b** summarizes the annual TP load, FWM TP concentration, rainfall, and flow volume for the NSID1 structure from WY1998–WY2007. A summary of the upstream water quality data used to identify high phosphorus areas within the basin and a map of the NSID basin depicting these sites are available online in the Non-ECP Upstream Monitoring

WY2007 report on the District's Everglades Regulation Publications web site at www.sfwmd.gov under the *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation, Publications* tab.



	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
TP Load (mt)	0	0	0	0	0	0	0	0	0	0	0	0
TP FWMC (ppb)	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Rainfall (in)	4.9	3.6	8.5	7.1	7.1	1.3	1.9	5.7	1.4	2.8	1.1	2.1
Flow Vol. (kac-ft)	0	0	0	0	0	0	0	0	0	0	0	0

Figure 4-19a. North Springs Improvement District basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2007 (bottom) (NF = no flow for period).



	WY98	WY99	WY00	WY01	WY02	WY03	WY04	WY05	WY06	WY07
TP Load (mt)	0.300	0.150	0.329	0.048	0.049	0.025*	0	0.009	0	0
TP FWMC (ppb)	33	18	27	16	16	NDF	NF	20	NF	NF
Rainfall (in)	58.8	49.8	67.1	39.6	54.9	45.0	49.2	38.7	53.0	47.4
Flow Vol. (kac-ft)	7.364	6.762	9.881	2.412	2.494	0.688	0	0.354	0	0

Figure 4-19b. North Springs Improvement District basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY1998–WY2007 (NF = no flow for period; NDF = no data with flow available).
* calculated with annual flow and arithmetic mean concentration

Source Control Strategy

The WQIP for the NSID basin includes a combination of ongoing source control activities by basin stakeholders and integration with the Hillsboro Site 1 Impoundment CERP Project. Source control activities include incorporating more stringent stormwater system permit requirements and maintenance programs; requiring landscape contractors to implement fertilizer and landscape maintenance BMPs; implementing upstream monitoring to identify and respond to areas of concern; implementing operational changes that provide water quality benefits; and educating residents on how they can protect the Everglades through workshops, special events, television, radio, mailings, web sites, brochures, and newsletters.

Update on Source Control Activities for North Springs Improvement District Basin

Because this basin is also located in Broward County, some of the training and education activities being implemented in the C-11 West basin also apply to the NSID basin, and updates can be found in the C-11 West basin subsection of this chapter.

Summary of Water Year 2007 Activities

During WY2007, the District and stakeholders continued the implementation of the WQIPs for the NSID basin, as detailed in the *2006 SFER – Volume I, Chapter 3*. Following is an update on each of these activities:

1. **Long-Term Plan Revisions:** The Long-Term Plan for the NSID basin was revised on January 31, 2007. The revision included: extending the existing source control program timelines and funding for the period from FY2007 through FY2010 to account for the latest CERP project timelines; clarifying the implementation of source control programs through existing regulatory programs such us the ERP process; and allowing diversion of current NSID basin discharges away from WCA-2A to the CERP Hillsboro Site 1 Project, except as necessary to maintain regional flood protection.
2. **BMP Cooperative Agreement (Long-Term Plan Project "North Springs Improvement District Basin," FY2006):** The NSID submitted a BMP implementation plan as required by its May 2006 BMP cooperative cost-share agreement with the District. The agreement provides $27,610.60 in cost share for implementation of BMPs and operational measures to further improve water quality in discharges to the EPA. Implementation of the plan is expected to be completed by 2008.
3. **BMP Implementation through Existing Regulatory Process:** The District has utilized the existing ERP program, as opposed to creating a specific program, to require the NSID to submit an ERP permit modification to incorporate a plan including: an appropriate long-term or interim phosphorus source controls (BMP) program, and revisions to their existing system to met EFA-required water quality standards. The ERP modification is expected to be issued by December 2007.
4. **Hillsboro Site 1 Impoundment CERP Project:** Detail on this project is available in Chapter 7A of this volume, and at the CERP and Acceler8 web site (www.evergladesnow.org).

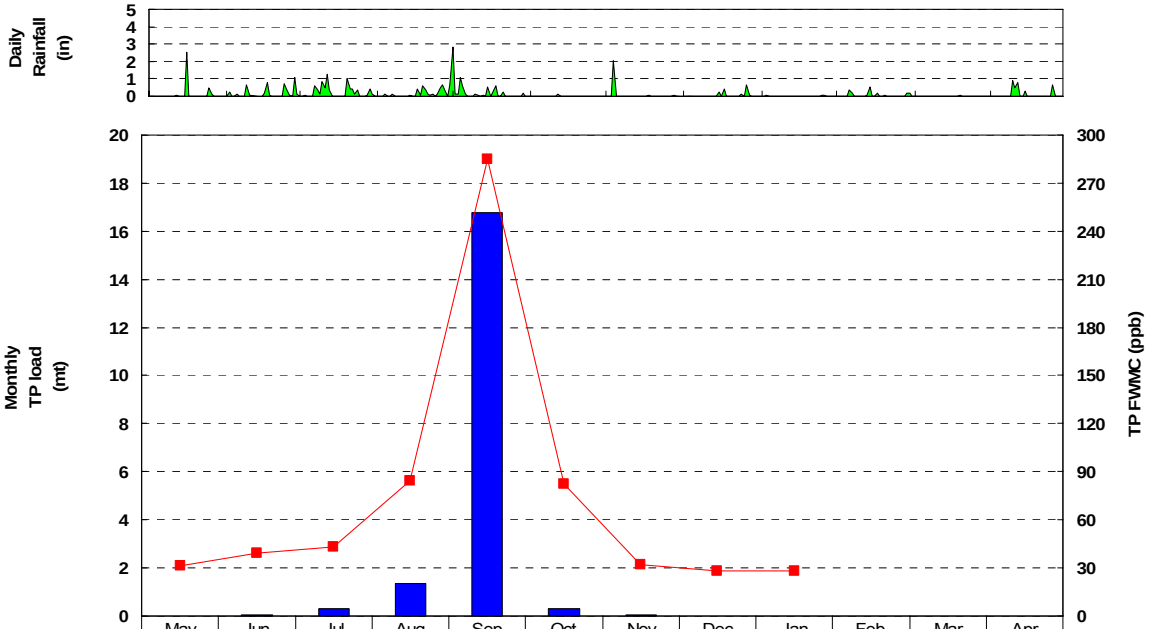
FEEDER CANAL BASIN UPDATE

Water Year 2007 Phosphorus Results for Feeder Canal Basin

The Feeder Canal basin is located in Hendry County. This basin is divided into three major areas: McDaniel Ranch area, a portion of the Big Cypress Seminole Indian Reservation, and the West Feeder area (comprised of multiple private landowners). The canals and structures within this basin provide flood protection and convey excess runoff to WCA-3A for water supply and environmental use. Discharges occur at the lower southeastern corner of the basin through the S-190 structure into the L-28 Interceptor Canal and, eventually, into WCA-3A.

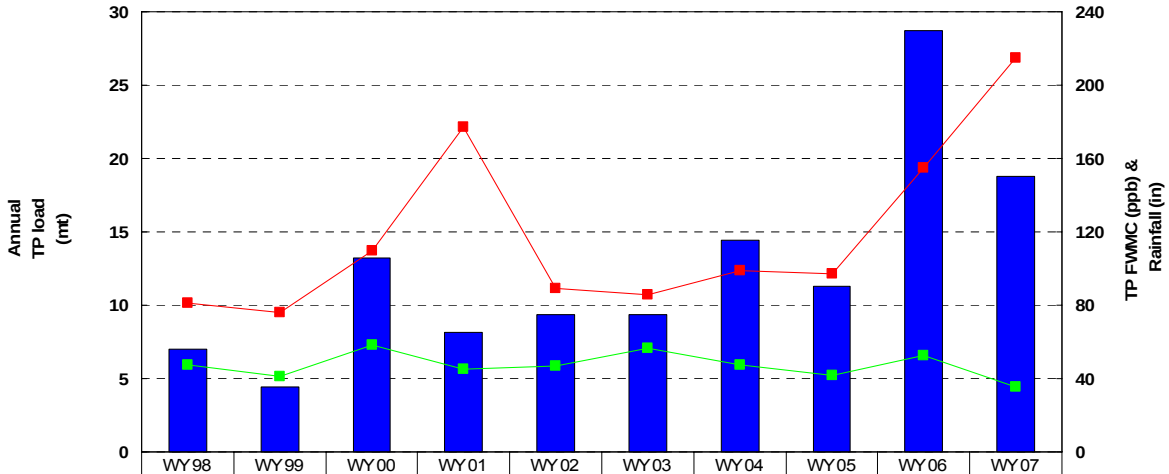
Figure 4-20a summarizes the daily rainfall and the monthly TP load, FWM TP concentration, rainfall (at station S-190), and flow volume in WY2007 for the S-190 structure. **Figure 4-20b** summarizes the annual TP load, FWM TP concentration, rainfall, and flow volume for the S-190 structure from WY1998 through WY2007. The S-190 FWM TP concentration and TP load for WY2007 were 215 ppb and 18.8 mt, respectively. This TP concentration is the highest recorded for the last ten water years and the TP load is the second highest recorded for the last ten water years. The large TP load in WY2007 may be explained by the rainfall events experienced during the period of late August 2006 through mid-September 2006 (see **Figure 4-20a**). The WY2007 TP concentration exceeds the 50 ppb levels expected based on activities described under the current WQIP and the Long-Term Plan. The proposed permit-required FWM TP concentration TBEL for the non-ECP "into" structure S-190 is 109 ppb, with an annual limit of 155 ppb. Further, the WY2007 rainfall measured at the S-190 station is 35.6 inches. Therefore, in accordance with **Table 4-11**, the S-190 "into" structure would also not have been in compliance with its proposed TBEL.

Upstream water quality data to identify high phosphorus areas within the Feeder Canal basin are collected from the McDaniel Ranch area, the West Feeder area and the Seminole Tribe, and maps can be found online in the Non-ECP Upstream Monitoring WY2007 report on the District's Everglades Regulation Publications at www.sfwmd.gov under the *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation, Publications* tab, and the Seminole Agreement Working Group Progress Reports web site at www.sfwmd.gov/org/reg/esp/pdfs/seminole/index.htm.



	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
TP Load (mt)	0.002	0.050	0.302	1.339	16.755	0.286	0.023	0.000	0.000	0	0	0
TP FWMC (ppb)	31	39	43	84	285	82	32	28	28	NF	NF	NF
Rainfall (in)	3.22	4.47	7.08	7.32	4.13	0.11	2.25	1.62	0.32	1.84	0.07	3.14
Flow Vol. (kac-ft)	0.063	1.035	5.699	12.917	47.613	2.815	0.583	0.001	0.001	0	0	0

Figure 4-20a. Feeder Canal basin daily rainfall (top) and the monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2007 (bottom).



	WY 98	WY 99	WY 00	WY 01	WY 02	WY 03	WY 04	WY 05	WY 06	WY 07
TP Load (mt)	7.026	4.453	13.241	8.141	9.329	9.358	14.410	11.288	28.717	18.757
TP FWMC (ppb)	81	76	110	177	89	86	99	97	155	215
Rainfall (in)	47.3	41.0	58.4	44.9	47.0	56.4	47.5	42.0	52.3	35.6
Flow Vol. (kac-ft)	70.317	47.504	97.586	37.286	84.982	88.026	117.699	94.581	150.359	70.727

Figure 4-20b. Feeder Canal basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY1998–WY2007.

Source Control Strategy

The WQIP for the Feeder Canal basin consists of a combination of a voluntary BMP incentive program in the West Feeder area, mandatory BMPs in the McDaniel Ranch area, and integration with the Big Cypress/L-28 Interceptor Modifications CERP Project and the Seminole Tribe Big Cypress Reservation Water Conservation Plan (WCP). Mandatory BMPs and completion of a stormwater treatment system by June 2007, are required by permit and a landowner's agreement between the McDaniel Ranch and the Seminole Indian Tribe of Florida (Landowner's Agreement). These activities were included in the WQIP under the Long-Term Plan as necessary activities expected to reduce concentrations in discharges from the site to 50 ppb TP. It is anticipated that the WCP project will also result in the design TP level of 50 ppb. For the remainder of the basin, including the West Feeder area, the District is using an integrative permit compliance approach to achieve an interim water quality target of 50 ppb TP prior to the completion of the Big Cypress/L-28 Interceptor Modifications CERP Project, which is designed to eliminate direct discharge from this basin to the EPA.

Update on Source Control Activities for Feeder Canal Basin

Summary of Water Year 2007 Activities

During WY2007, the District and stakeholders continued the implementation of the WQIPs for the Feeder Canal basin, as detailed in the *2006 SFER – Volume I, Chapter 3*. Following is an update on each of these activities:

1. **Long-Term Plan Revisions:** The Long-Term Plan for the Feeder Canal basin was revised on January 31, 2007. The revision included: incorporating current water quality improvement plans and schedules for the Seminole Tribe WCP and the McDaniel Ranch areas to meet 50 ppb; reflecting the current schedule of completion for the Big Cypress/L-28 Interceptor Modifications CERP Project; seeking acceleration of CERP project to an earlier date; extending the existing source control program timelines and funding for the period of FY2007–FY2009 to account for the latest construction project timelines; and relying on ERP water quality requirements and source controls, that is BMP implementation through ERP conditions, for the Feeder Canal basin to ensure that the TP water quality goals for the Feeder Canal basin are met.
2. **C-139 and Western Basins BMP Grant Program (Long-Term Plan Project "Feeder Canal Basin," FY2004–FY2006):** The District completed its BMP incentive program. From FY2002 through FY2006, the program awarded approximately $500,000 to the BMP implementation project within the Feeder Canal basin. Annual update reports, C-139 and Western Basins Best Management Practices Grant Program Report, which provide detailed descriptions of the grant program and projects funded since FY2002, can be found on the District's Everglades Regulation Publications web site at www.sfwmd.gov under the *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation, Publications* tab.
3. **Seminole Tribe WCP Project:** The District continues to track the progress of the project. The Seminole Tribe and the U.S. Army Corps of Engineers (USACE) started construction contracts for some components of the Seminole Tribe WCP project. The project, currently scheduled to be completed by late 2008, is designed to improve water quality, restore wetland hydrology, increase water storage capacity, and enhance flood protection within the reservation.

4. **McDaniel Ranch:** The McDaniel Ranch surface water management system was required to be completed and certified by June 30, 2007, however, delays are anticipated. The District is working with landowners within the McDaniel Ranch area to ensure appropriate water quality treatment and implementation of BMPs.

5. **Integrative Permit Compliance:** The District utilized existing regulatory programs, as opposed to creating a specific program, to improve water quality for this basin with a target of 50 ppb TP. The District's strategy has been to integrate compliance efforts within the Feeder Canal basin by ensuring that landowners are in compliance with their existing permit requirements and to incorporate BMPs as conditions of Surface Water Management Permits or ERPs, or through landowner agreements. The District has prepared a detailed inventory of all landowners within the basin and the status of their permits, including lack thereof. Currently, the District is meeting with landowners to ensure that they comply with these permits as well as to facilitate implementation of phosphorus source control BMPs.

6. **Big Cypress/L-28 Interceptor Modifications CERP Project:** The current projected completion date is after 2020 (CERP Band 4, 2020–2025). The District will continue to pursue alternatives to accelerate this project.

7. **Additional Upstream Monitoring:** The District has collected water samples (grabs) at six locations within the West Feeder Canal sub-basin since September 2005. The samples are collected weekly, if flowing, during the wet season (April 1–October 30). The parameters tested are TP, total dissolved phosphorus (represents TSP), and ortho-phosphorus (represents SRP). These sampling locations give "snapshots" of phosphorus concentrations throughout the sub-basin and will be analyzed as part the Feeder Canal Basin Phosphorus Water Quality and Hydrology Analysis contract to confirm the level of success from existing BMPs or highlight the need for additional BMPs.

8. **Feeder Canal Basin Phosphorus Water Quality and Hydrology Analysis (Long-Term Plan Project "Feeder Canal Basin," FY2007–FY2009):** Rainfall events experienced during the months of June 2005 through August 2005 and again between late August 2006 and mid-September 2006 appear to have adversely affected the TP levels recorded for WY2006 and WY2007. In light of these TP results, a Feeder Canal Basin Phosphorus Water Quality Analysis contract has been initiated to evaluate the sources of phosphorus within the basin and to understand the relationship between phosphorus load and concentrations with rainfall and runoff conditions. This study will evaluate TP trends and contributing factors with the objective of optimizing the source control program. A comprehensive summary of historical grab and auto-sampler sampling results throughout the basin, as well as a summary of historical rainfall and runoff conditions for different locations within the basin had been prepared by the District in anticipation to this contract. The first contract deliverables and contract completion are expected in late 2007 and mid-2008, respectively.

Anticipated Activities for Water Year 2008

1. **McDaniel Ranch:** The District will continue working with McDaniel Ranch area owners to ensure discharges from this area meets a TP concentration of 50 ppb.
2. **Integrative Permit Compliance:** District's regulation staff will continue meeting with landowners to ensure they comply with the required permits as well as to facilitate implementation of phosphorus source control BMPs.
3. **Feeder Canal Basin Phosphorus Water Quality and Hydrology Analysis (Long-Term Plan Project "Feeder Canal Basin," FY2007–FY2009):** Depending on the results and recommendations of the Feeder Canal Basin Phosphorus Water Quality Analysis contract, the District will consider an additional water quality and/or hydrology analysis..

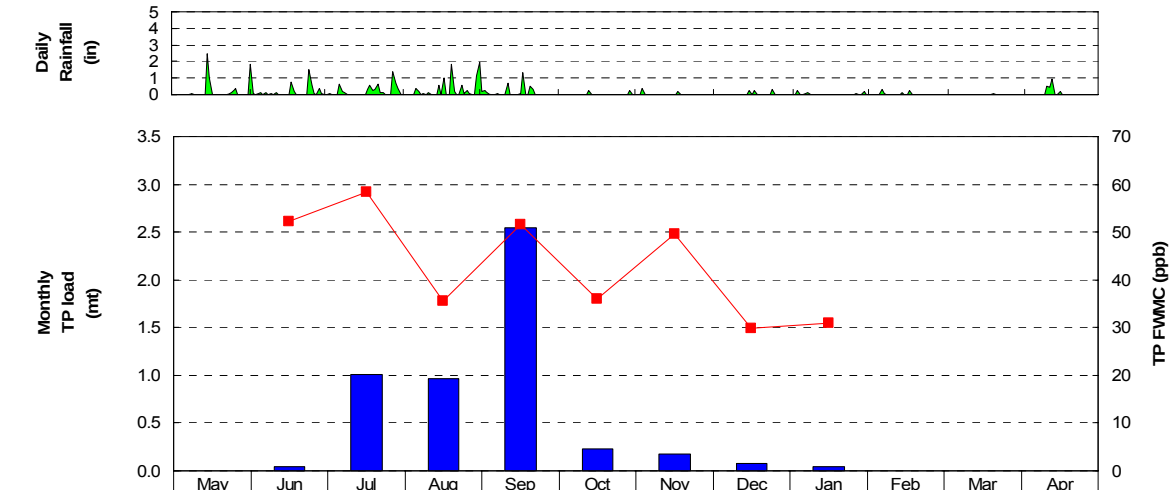
L-28 BASIN UPDATE

Water Year 2007 Phosphorus Results for L-28 Basin

The L-28 basin is located within portions of Broward, Hendry, and Collier counties and is entirely occupied by four landowners: the C-139 Annex (U.S. Sugar Corporation), the Big Cypress Seminole Indian Reservation, the Miccosukee Indian Reservation, and the Big Cypress National Preserve. The surface water management system in the L-28 basin provides drainage and flood protection in addition to providing water supply to WCA-3A when necessary. The L-28 borrow canal is the primary drainage canal conveying stormwater runoff to the S-140 structure which discharges directly into WCA-3A. A substantial reduction of flows from the L-28 basin is expected starting in WY2008 as a result of the diversion of the C-139 Annex flow into STA-6.

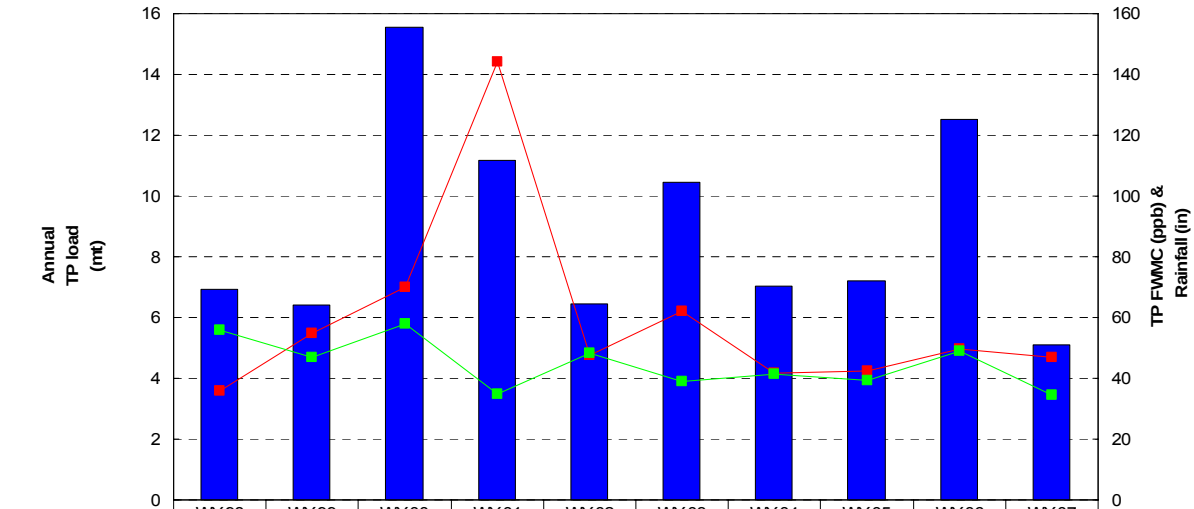
Figure 4-21a summarizes the daily rainfall and the monthly TP load, FWM TP concentration, rainfall (at station S-140), and flow volume in WY2007 for the S-140 structure. **Figure 4-21b** summarizes the annual TP load, FWM TP concentration, rainfall, and flow volume for the S-140 structure from WY1998–WY2007. The S-140 FWM TP concentration and TP load for WY2007 were 47 ppb and 5.12 mt, respectively. This TP concentration and load includes flow and TP loads from the C-139 Annex. The proposed permit-required FWM TP concentration TBEL for the non-ECP "into" structure S-140 is 37 ppb, with an annual limit of 96 ppb. This TP concentration shall exclude TP loads generated by the C-139 Annex. Because the C-139 Annex TP load in WY2007 (5.26 mt as per publication referenced below) exceeds the TP load for the S-140 structure in WY2007 (5.12 mt), compliance verification of the proposed TBEL for non-ECP "into" structure S-140 would not have been able to be performed for WY2007.

Upstream water quality data for the C-139 Annex sub-basin and the Seminole Tribe, and maps can be found online in the Non-ECP Upstream Monitoring WY2007 report on the District's Everglades Regulation Publications at www.sfwmd.gov under *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation, Publications* tab, and the Seminole Agreement Working Group Progress Reports web site at www.sfwmd.gov/org/reg/esp/pdfs/seminole/index.htm.



	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
TP Load (mt)	0	0.044	1.015	0.967	2.549	0.230	0.181	0.082	0.048	0	0	0
TP FWMC (ppb)	NF	52	58	36	52	36	50	30	31	NF	NF	NF
Rainfall (in)	4.22	6.1	5.97	8.74	3.44	0.6	0.7	0.96	0.66	0.84	0.08	2.15

Figure 4-21a. L-28 basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2007 (bottom) (NF = no flow for period).



	WY98	WY99	WY00	WY01	WY02	WY03	WY04	WY05	WY06	WY07
TP Load (mt)	6.920	6.414	15.543	11.185	6.460	10.444	7.018	7.215	12.507	5.117
TP FWMC (ppb)	36	55	70	144	48	62	42	42	50	47
Rainfall (in)	55.7	46.8	58.0	35.0	48.2	39.0	41.3	39.2	49.0	34.5
Flow Vol. (kac-ft)	155.848	94.543	180.011	62.972	109.994	136.424	136.152	137.976	203.575	88.518

Figure 4-21b. L-28 basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY1998–WY2007.

Source Control Strategy

The WQIP for the L-28 basin consists of a combination of diversion of C-139 Annex flows to STA-6 (which has been flow-capable since December 2006), and integration with the CERP Project Component RR4, the Miccosukee Tribe Water Management Plan (WMP) and the Seminole Tribe WCP. The CERP Project Component RR4, currently scheduled to be completed after 2015, includes the relocation and enlargement of the S-140 pump structure to improve hydro-period restoration in the western portion of WCA-3A and increase flows to the region. The Seminole Tribe WCP, implemented under the NRCS PL-83-566 Small Watershed Project Program, proposes construction of 3,835 acres of retention areas designed to improve water quality for flows from the Seminole Reservation lands only; it is currently planned for completion in 2010. The Miccosukee Tribe WCP, currently scheduled to be completed after 2015, is a critical project to construct a managed wetland on the Miccosukee Indian Reservation. The project will convert approximately 900 acres of tribally owned cattle pastures into wetland retention/detention to provide water storage capacity, as well as water quality enhancement for Miccosukee Indian Reservation lands water that will be discharged to WCA-3A through the S-140 pump station.

Update on Source Control Activities for L-28 Basin

Summary of Water Year 2007 Activities

During WY2007, the District and stakeholders continued the implementation of the WQIPs for the L-28 basin, as detailed in the *2006 SFER – Volume I, Chapter 3*. Following is an update on each of these activities:

1. **Long-Term Plan Revisions:** The Long-Term Plan for the L-28 basin was revised on January 31, 2007, to incorporate current WQIPs and schedules for the Seminole Tribe WCP and the Miccosukee WMP. District will propose revisions to the Long-Term Plan to incorporate current WQIPs and schedules for the Seminole Tribe WCP and the Miccosukee WMP.
2. **C-139 Annex Diversion:** The District completed the expansion of STA-6 (addition of Section 2) in December 2006 under its Acceler8 Program (see www.evergladesnow.org under the *Projects, EAA STAs* section). The U.S. Sugar Corporation (USSC) completed construction in December 2006 of the new pump station that will divert runoff from the C-139 Annex to Sections 1 and 2 of STA-6. The District and USSC developed a methodology for compliance TP limits to ensure that C-139 Annex discharges do not exceed historical levels and STA-6 (Sections 1 and 2) design loads. The compliance methodology and a BMP and water quality monitoring plan will be incorporated into the ERP for the C-139 Annex.
3. **Seminole Tribe WCP Project:** The District continues to track the progress of this project. The Seminole Tribe has completed the conceptual engineering design of the Seminole Tribe WCP, and its construction completion is projected for 2010. The 2003 Long-Term Plan recommended modification of the plan to convert Water Retention Area 7 (WRA-7) to an STA by 2010 at a cost of approximately $20 million; however, as of the end of WY2007, this modification had not been authorized.
4. **Miccosukee Tribe WMP Project:** The 2003 Long-Term Plan recommended the accelerated completion of the Miccosukee WMP by 2010; however, funding for this project has not yet been authorized and the project is currently scheduled to be completed after 2015.

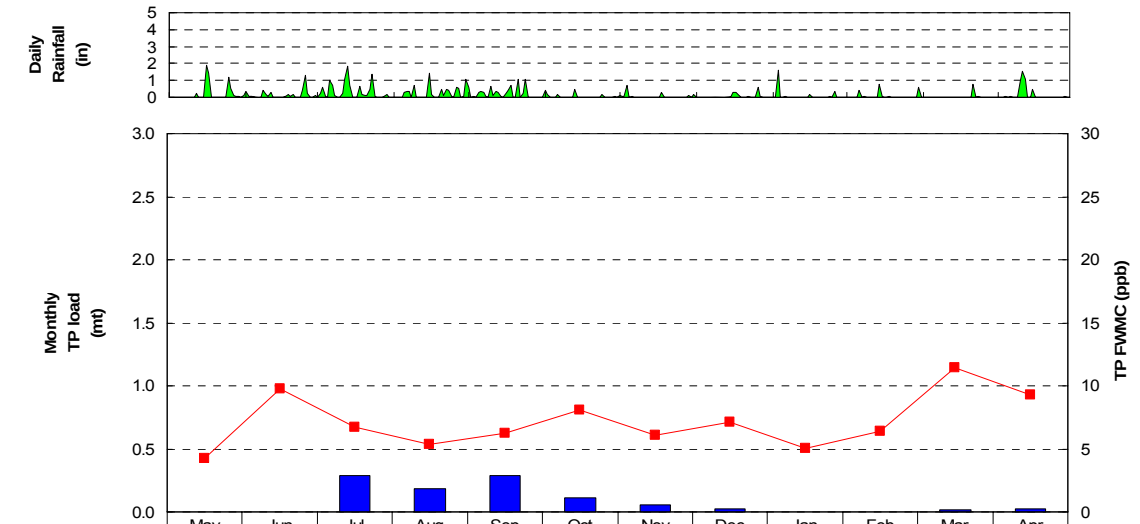
C-111 BASIN UPDATE

WY2007 Phosphorus Results for C-111 Basin

The C-111 basin is located in the southernmost portion of Miami-Dade County adjacent to Everglades National Park (ENP). Canals in this basin provide drainage and flood protection, water supply, and protection from saltwater intrusion into local groundwater. Discharges from this basin are directed to the ENP, specifically to Taylor Slough (by way of the L-31N and L-31W borrow canals – non-ECP "into" structures S-332D and S-174) and ENP's panhandle (by way of the C-111 canal – non-ECP "into" structure S-18C).

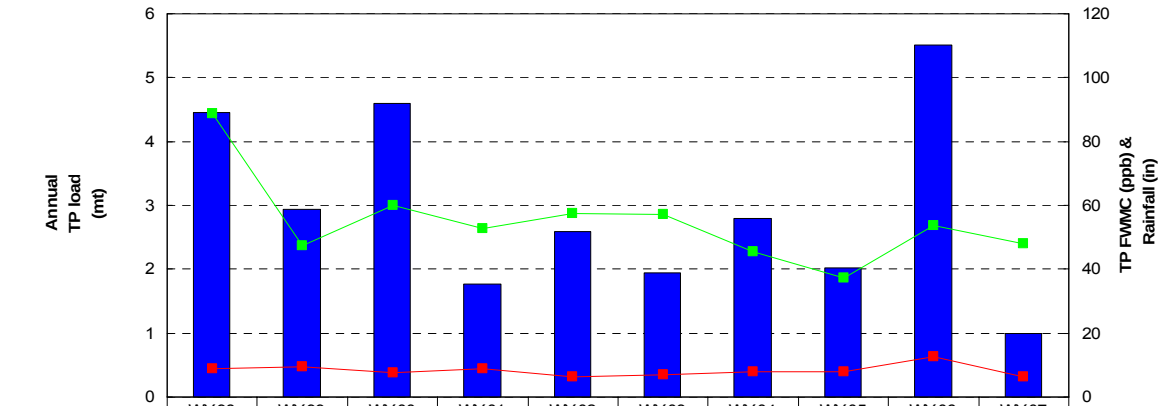
Figure 4-22a summarizes the daily rainfall and the monthly TP load, FWM TP concentration, rainfall (average of stations S-174, S-177, S -18C, S-332, and HOMES.FS), and flow volume in WY2007 from the C-111 basin to the ENP. **Figure 4-22b** summarizes the annual TP load, FWM TP concentration, rainfall, and flow volume for the C-111 basin to the ENP from WY1998–WY2007. The S-18C, S-332D, and S-174 combined FWM TP concentration and TP load for WY2007 were 6 ppb and 1.0 mt, respectively. The proposed permit-required FWM TP concentration limits for the non-ECP "into" structure S-18C, S-332D, and S-174 is based on the water year ending September 30. Further, reporting of the compliance determination for these structures for the water year ending September 30 is proposed to be done by way of a letter to be sent to FDEP in January of the following water year.

Water quality data and maps for upstream structures S-176, S-178, and S-332B as well as the "within" structures S-175 and S-332 can be found online in the Non-ECP Upstream Monitoring WY2007 report on the District's Everglades Regulation Publications site at www.sfwmd.gov under the *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation, Publications* tab. In WY2007, there was no discharge through S-175 other than maintenance related.



	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
TP Load (mt)	0.004	0.002	0.287	0.186	0.286	0.109	0.053	0.025	0.004	0.001	0.015	0.020
TP FWMC (ppb)	4	10	7	5	6	8	6	7	5	6	11	9
Rainfall (in)	5.7	4.0	9.9	7.9	6.8	1.3	1.5	1.6	2.3	1.9	0.9	4.3
Flow Vol. (kac-ft)	0.713	0.203	34.632	28.317	37.088	10.945	7.106	2.888	0.626	0.065	1.061	1.761

Figure 4-22a. C-111 basin daily rainfall (top) and the monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2007 (bottom).



	WY98	WY99	WY00	WY01	WY02	WY03	WY04	WY05	WY06	WY07
TP Load (mt)	4.456	2.936	4.595	1.761	2.585	1.942	2.793	2.025	5.509	0.992
TP FWMC (ppb)	9	9	8	9	6	7	8	8	13	6
Rainfall (in)	88.8	47.4	60.1	52.8	57.3	57.1	45.5	37.4	53.8	48.1
Flow Vol. (kac-ft)	414.943	251.503	490.742	160.613	330.985	231.507	292.298	207.228	351.511	125.406

Figure 4-22b. C-111 basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY1998–WY2007.

Note: WY1998–WY2000 represented by structures S-18C, S-175, and S-332. WY2001–WY2007 represented by structures S-18C, S-174, and S-332D.

Source Control Strategy

The WQIP for the C-111 basin consists of a combination of BMP outreach activities through the University of Florida institutions and integration with the C-111 Project, the C-111 Spreader Canal CERP Project, the Modified Water Deliveries (MWD) Project, and the Combined Structural and Operational Plan (CSOP). The C-111 Project and the C-111 Spreader Canal CERP Project consist of modifications to the Central and Southern Florida Flood Control Project (C&SF), as authorized by the 1994 C-111 General Re-engineering Report (GRR), to restore the ecosystem in Taylor Slough and the Eastern Panhandle of the ENP. The MWD Project is a federal project designed to improve water deliveries to the ENP by restoring WCA-3B and Northeast Shark Slough as a functioning component of the historical Shark Slough hydrologic system. None of the features authorized under the MWD Project is located within the C-111 basin. CSOP will integrate and possibly modify the structural components of the MWD and C-111 projects into an operational plan that will maximize restoration while preserving other project purposes and explore opportunities for enhanced performance.

Update on Source Control Activities for C-111 Basin

Summary of Water Year 2007 Activities

During WY2007, the District and stakeholders continued the implementation of the WQIPs for the C-111 basin as detailed in the *2006 SFER – Volume I, Chapter 3*. Following is an update on each of these activities:

1. **C-111 Basin Nursery BMP Grant Program:** FDACS has continued a nursery BMP grant program for the C-111 basin similar to the one in the C-11 West basin. The C-111 grant program is based on the same principles as the C-11 West basin, but funding is provided solely by FDACS.
2. **Mobile Irrigation Lab:** The District, in partnership with NRCS, continues to sponsor the Mobile Irrigation Lab in this area to help local growers improve their irrigation practices. Additional information can be found on the District's web site at www.sfwmd.gov under the *Recreation, Info & Education, Water Conservation* tab. Also, the main sources of training and education in this basin continue to be the University of Florida's Tropical Research and Education Center and UF/IFAS.
3. **C-111 Project:** Construction of a continuous detention area from S-332B to the Frog Pond (northern levee of the S-332D detention area) is scheduled for the November 2007 through April 2008 dry season by the USACE. Construction of the final northern detention area (between S-332B North and the 8.5 Square Mile Area STA) is expected to occur in the November 2008 through April 2009 dry season. See http://www.saj.usace.army.mil for more information.
4. **C-111 Spreader Canal CERP Project:** The District has completed preparation of the Basis of Design Report and is now developing preliminary design drawings for the C-111 Spreader Canal CERP Project. The ecological system of the Southern Glades and Model Lands including downstream estuaries will have improved water quantity, timing, and distribution once the first phase of this project is completed in 2010. More detail on this project is available in Chapter 7A of this volume, and at the CERP and Acceler8 web site (www.evergladesnow.org).

5. **CSOP:** A Record of Decision for the CSOP is expected in the fourth quarter of 2007. It is expected that the CSOP will recommend several design refinements to the C-111 Project, modifying or replacing structural changes authorized by the 1994 GRR.

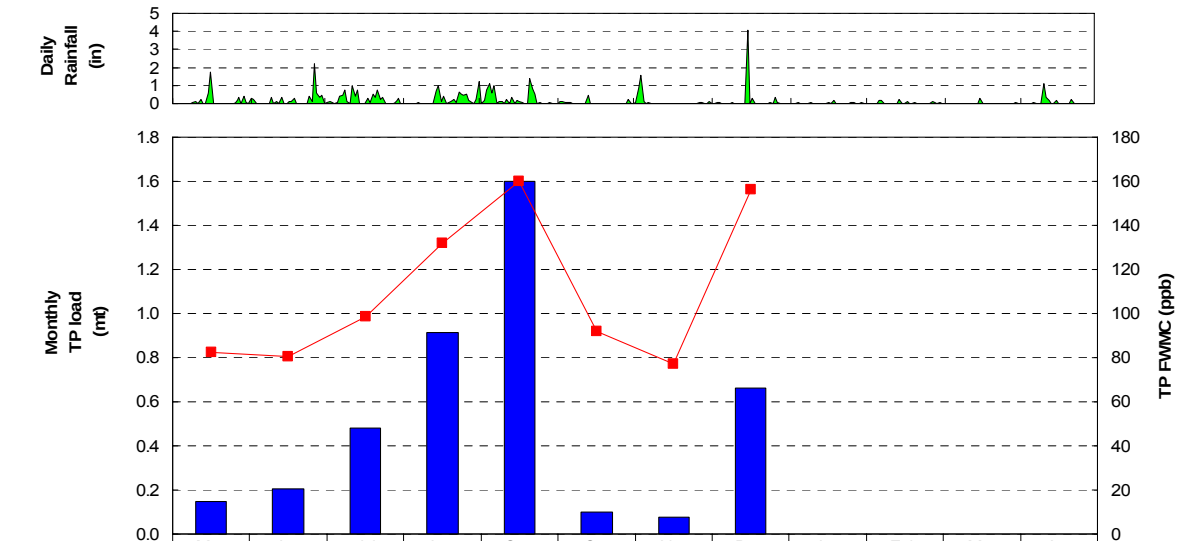
VILLAGE OF WELLINGTON'S ACME IMPROVEMENT DISTRICT BASIN UPDATE

Water Year 2007 Phosphorus Results for ACME Basin

The ACME Improvement District basin occupies approximately 30 square miles and is located east of WCA-1 in Palm Beach County. The ACME basin is divided into two sub-basins, Basins A and B. Up to December 2006, the majority of stormwater from Basin B, and limited drainage overflowed from the northern Basin A, discharge via two pumps known as ACME1 and ACME2 to the EPA, specifically WCA-1. After December 2006, runoff from both basins is discharged into the C-51 canal, which is then generally directed to STA-1E. Direct untreated flows from ACME1 and ACME2 structures into WCA-1 have ceased. Because of this, WY2007 is the last year for which TP load, FWM TP concentration, and flow volume from the ACME1 and ACME2 structures to the EPA will be reported.

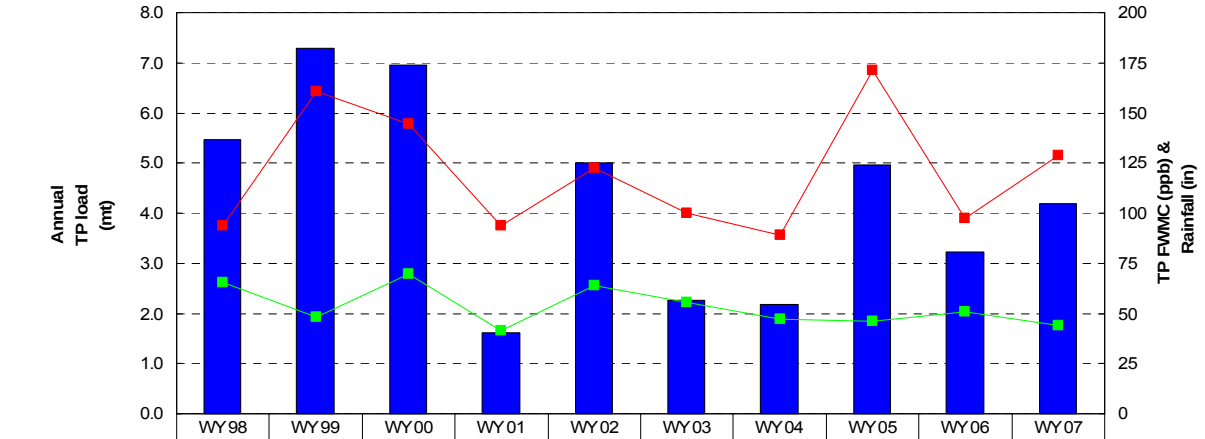
Figure 4-23a summarizes the daily rainfall and the monthly TP load, FWM TP concentration, rainfall (average of stations WCA1ME, LOXWS, and S-5A), and flow volume in WY2007 for the ACME1 and ACME2 structures. **Figure 4-23b** summarizes the annual TP load, FWM TP concentration, rainfall, and flow volume for the ACME1 and ACME2 structures from WY1998–WY2007. The ACME1 and ACME2 combined FWM TP concentration and TP load for WY2007 were 129 ppb and 4.19 mt, respectively.

A summary of the upstream water quality data used to identify high phosphorus areas within the basin and a map of the ACME basin showing these data are available online in the Non-ECP Upstream Monitoring WY2007 report on the District's Everglades Regulation Publications web site at www.sfwmd.gov under the *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation, Publications* tab.



	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
TP Load (mt)	0.150	0.203	0.480	0.914	1.601	0.100	0.075	0.662	0	0	0	0
TP FWMC (ppb)	82	80	99	132	160	92	77	156	NF	NF	NF	NF
Rainfall (in)	3.6	6.0	7.0	6.7	7.6	1.2	2.9	5.1	0.5	0.9	0.4	2.0
Flow Vol. (kac-ft)	1.477	2.048	3.943	5.628	8.115	0.886	0.788	3.437	0	0	0	0

Figure 4-23a. ACME Improvement District basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2007 (bottom).



	WY98	WY99	WY00	WY01	WY02	WY03	WY04	WY05	WY06	WY07
TP Load (mt)	5.469	7.278	6.947	1.612	5.006	2.254	2.184	4.969	3.235	4.185
TP FWMC (ppb)	94	161	144	94	122	100	89	171	97	129
Rainfall (in)	65.6	48.3	69.7	41.6	63.7	55.6	47.1	45.9	50.8	43.9
Flow Vol. (kac-ft)	47.292	36.734	39.010	13.948	33.194	18.282	19.889	23.563	26.928	26.322

Figure 4-23b. ACME Improvement District basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY1998–WY2007.

Source Control Strategy

The WQIP for the ACME basin consists of a combination of ongoing training and education initiatives, mandatory BMPs required by existing Village of Wellington (VOW) BMP ordinances, additional water quality requirements in stormwater management system permit conditions, and integration with the ACME Basin B Discharge CERP Project and the already completed ACME Improvement District Basin B Long-Range Plan Project. The ACME Basin B Discharge CERP Project includes improvements to the ACME C-1 canal and construction of a pump station (Pump Station #7) to allow diversion of Basin B flows to STA-1E by way of the C-51 canal. The project also includes the construction of an attenuation reservoir with Section 24. Construction of a temporary pump station to allow diversion of Basin B flows to STA-1E by way of the C-51 canal was completed in December 2006, and direct discharges from ACME Basin B into WCA-1 have ceased.

Update on Source Control Activities for ACME Basin

Summary of Water Year 2007 Activities

During WY2007, the District and ACME continued the implementation of the WQIPs for the ACME Basin B, as detailed in the *2006 SFER – Volume I, Chapter 3*. Following is an update on each of these activities:

1. **BMP Cooperative Agreement (Long-Term Plan Project "ACME Basin B," FY2005–FY2006):** The VOW submitted a BMP implementation plan as required by its July 2005 BMP cooperative cost-share agreement with the District. The agreement, amended in August 2006, provides $99,600 in cost share for implementation of BMPs to further improve water quality in discharges from the ACME Basins A and B. Implementation of the plan is expected to be completed by 2008.
2. **Race Track Lake Expanded Water Quality Treatment Marsh Project:** The District partially funded this project with a 2003 cost-share agreement between the VOW and the District. Construction is expected to be complete by 2008.
3. **Acme Basin B Discharge Projects:** Construction completion of the Pump Station #7 (the permanent structure) is expected by December 2007. The second phase of this project will incorporate 365 acres within Section 24, west of ACME, for future use in the project as a wetland area with floodwater storage capability and environmental feature. Completion of this second phase has been delayed and it is currently scheduled for completion by June 2010. As of July 2007, the District is pursuing a revision of the Long-Term Plan for the ACME basin to include a modification of the project schedule and a modification of the project cost to reflect updated construction and operation costs. More detail on this project is available in Chapter 7A of this volume, and at the CERP and Acceler8 web site (www.evergladesnow.org).

BOYNTON FARMS BASIN UPDATE

Water Year 2007 Phosphorus Results for Boynton Farms Basin

The Arthur R. Marshall Loxahatchee Refuge headquarters property, which is considered part of the EPA, although outside the eastern boundary of WCA-1, receives discharges from the Boynton Farms basin, but no discharges from this basin reach WCA-1. The basin preferentially discharges east to the Lake Worth Drainage District canal system at a reduced capacity, but the systems are not currently constructed with conveyance to the east for all flood protection. Water quality grab samples for the discharges from this basin have been collected by the District from April 2000 through the present on a limited number of flow events.

Water quality samples were collected in WY2007 for the Boynton Farms basin after two rainfall events. The grab samples for these events range from 600 to 1,800 ppb. Information regarding historical flow data from these properties is not available to the District; therefore, FWM TP concentration and load data from this basin to the EPA are not available. A summary of the upstream water quality data and a map of the Boynton Farms basin depicting these sites are available in the Non-ECP Upstream Monitoring WY2007 report on the District's Everglades Regulation Publications web site at www.sfwmd.gov under the *What We Do, Permitting/Regulation, Who to Contact, Everglades Regulation* section under the *Publications* tab.

Source Control Strategy

The WQIP for the Boynton Farms basin consists of ERP-required implementation of agricultural BMPs and integration with the Palm Beach County Agricultural Reserve Water Reservoir CERP Project. This CERP project, currently scheduled to be completed after 2015, includes using all or a portion of the lands within the Boynton Farms basin as a buffer and north to south conveyance, eliminating discharge to the EPA.

Update on Source Control Activities for Boynton Farms Basin

Summary of Water Year 2007 Activities

During WY2007, the District and stakeholders continued the implementation of the WQIPs for the Boynton Farms basin, as detailed in the *2006 SFER – Volume I, Chapter 3*. The District has utilized the existing ERP program, as opposed to creating a separate regulatory program, to require the two landowners within this basin to submit ERP permit modifications to incorporate a plan including: an appropriate long-term or interim phosphorus source controls (BMP) program, and revisions to their existing system to met EFA-required water quality standards. ERP modifications are expected to be issued by December 2007.

FUTURE DIRECTION FOR THE NON-ECP BASINS

Continued implementation of the WQIPs for the non-ECP basins, which are consistent with the Long-Term Plan, is necessary to ensure progress toward improving water quality. The District will track the implementation of the WQIPs and will continue working cooperatively with local governments, the 298 Districts, the Seminole Indian Tribe of Florida, the Miccosukee Tribe of Indians of Florida, and other state and federal agencies to ensure essential components of the WQIPs are completed as scheduled.

The District will evaluate TP data for the Feeder Canal basin to determine water quality trends and contributing factors. Additionally, the District will continue utilizing the existing regulatory programs to improve water quality as opposed to creating a separate regulatory program for this basin. The District's strategy is to integrate compliance efforts within the Feeder Canal basin by ensuring that landowners are in compliance with their existing ERP requirements and to incorporate BMPs as conditions of Surface Water Management Permits or ERPs, or through landowner agreements.

The District will continue coordinating with FDEP for the non-ECP permit renewal/modification process, which will establish long-term compliance permit requirements as well as TBELs. WQIPs (as described in the *2006 SFER – Volume I, Chapter 3*, and as updated in previous subsections) are expected to achieve the proposed permit-required TBELs.

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