



2026 Update on Everglades Water Quality and STA Performance

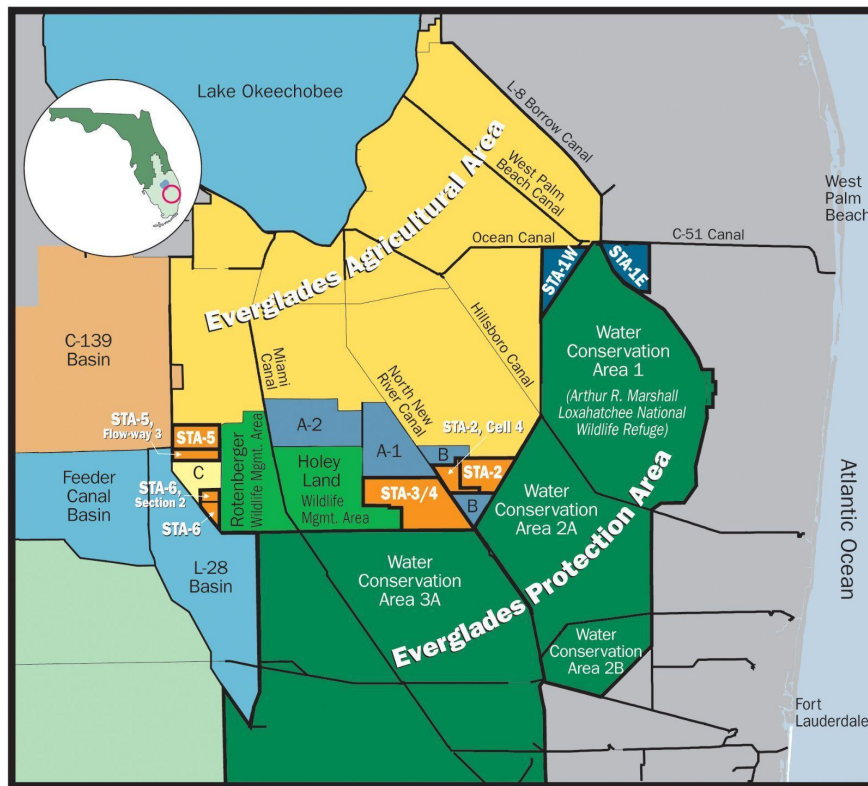


Fig. 1 Map of EAA featuring projects, not including expansions to STA-1W or the C-139 FEB (Source: SFWMD).

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Acronyms and Abbreviations

EAA - Everglades Agricultural Area

EPA - Everglades Protection Area

FDEP - Florida Department of Environmental Protection

FEB - Flow Equalization Basin

FWM - Flow Weighted Mean

NPDES - National Pollution Discharge Elimination System

NPS - National Park Services

PPB - Parts Per Billion

SFER - South Florida Environmental Report

SFWMD - South Florida Water Management District

STA - Stormwater Treatment Area

SAV - Submerged Aquatic Vegetation

TP - Total Phosphorus

USEPA - United States Environmental Protection Agency

USGS - United States Geological Survey

WQBEL - Water Quality Based Effluent Limit

WY - Water Year

Executive Summary

The effort to clean polluted water flowing into the Everglades started in the early 1990's and continues to this day. In 1992, a federal lawsuit against the state of Florida resulted in passage of the Everglades Forever Act, which mandated construction of taxpayer-funded filtration marshes called Stormwater Treatment Areas (STAs) to clean polluted water flowing south of Lake Okeechobee. Subsequent successful litigation brought by Friends of the Everglades and the Miccosukee Tribe in 2004 forced the state to comply with the Clean Water Act, resulting in an \$880 million state investment to expand and improve performance of the STAs south of Lake Okeechobee. The litigation also resulted in specific phosphorus limits for water exiting the STAs into the Everglades Protection Area (EPA). These standards are called the Water Quality Based Effluent Limit, or WQBEL.

The WQBEL mandated that each STA's outflow must stay below a total phosphorus (TP) concentration of 19 parts per billion (ppb) in any given water year, and must not exceed 13 ppb in more than 3 out of 5 years. WQBEL targets must be met for discharges into the Everglades Protection Area starting in May 2026, the beginning of Water Year 2027.

Today, just months ahead of this deadline, data taken from the last 5 years of South Florida Ecological Reports (SFERs) shows that this goal is not being met. STA 3/4 was the only STA to meet 3 out of 5 year 13 ppb exceedance limit under the WQBEL, while only STAs 1W and 2 went below the 19 ppb disqualifying limit at all.

The WQBEL standard is important because concentrations of phosphorus higher than 10 ppb in the Everglades results in the disappearance of periphyton, and at higher concentrations sawgrass begins to vanish as well. Cattails then dominate the landscape, and the Everglades food web is destroyed.

The question of whether all STAs can meet the WQBEL remains unresolved. If this court-mandated target is not met, damage from harmful nutrients will continue to compound.

Even if the WQBEL is met, the question of how much water will be available and whether it meets the needs of the Everglades remains a looming question. Friends of the Everglades' "Rescue the River of Grass" shows we need significantly more land for water storage and treatment to meet the needs of the Everglades and decompartmentalize the system.

Introduction

Past, Present and Future

Friends of the Everglades has been at the forefront of making sure that water flowing through the River of Grass is clean. In 2008 and 2010, Friends won lawsuits that substantially increased the size of filtration marshes known as Stormwater Treatment Areas (STAs) that clean polluted water before it enters the Everglades.^{2,18} The courts also set specific performance standards for those STAs.

It has been 15 years since those court victories, and the State of Florida is in the final stages of testing facilities they have constructed as a result of past litigation. In this briefing, we will look at whether the facilities are likely to meet the criteria established as a result of this past litigation brought by Friends of the Everglades and others. We will look closely at the observed data and show that (1) the Stormwater Treatment Areas are not currently meeting the water quality standards, and (2) are not on track to meet the water quality standards based on observed trends.



Fig. 2 Cattails (left) like higher nutrient concentrations, whereas periphyton (right) needs low nutrient concentrations. Both have their natural ranges, but within the Everglades Protection Area (EPA) periphyton health is vital for the entire ecosystem (Source: USGS (left); NPS (right)).

Why Does Water Quality Matter?

Water quality has a profound effect on the function of the Everglades ecosystem.^{18,19} In a healthy Everglades marsh, the basis of the food chain is periphyton, which is a complex symbiotic mixture of algae, cyanobacteria, microbes, and detritus.^{17,19} Periphyton converts sunlight into

biomass that serves as food and shelter for small fish and invertebrates, which are, in turn, food for wading birds and other piscivores. Without periphyton, the basic food web of the Everglades is lost.

When phosphorus, a common element of fertilizer, is added to an Everglades wetland at concentrations above about 10 ppb, periphyton begins to disappear, and at even higher concentrations, so does sawgrass.^{17,19} At some point, cattails dominate the landscape, and the Everglades food web is no more. A prominent Everglades scientist, Dr. Ronald Jones, has referred to cattails as “the tombstones of the Everglades.”

Because of fertilizer pollution in waters passing through the Everglades Agricultural Area to the Everglades Protection Area (EPA), much of the remaining Everglades has been severely damaged. According to the USEPA (p 37), about 21% of the remaining Everglades has soil phosphorus levels that classify it as “impacted” and dominated by cattails.¹⁹

Cleaning up the fertilizer pollution before it reaches the Everglades is a critical element not just of restoring the Everglades, but protecting what’s left.

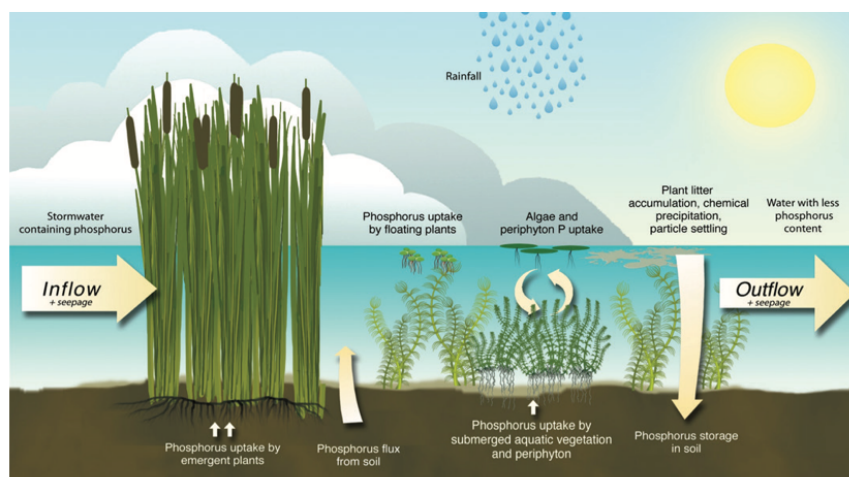


Fig. 3 Diagram showing how aquatic plants take phosphorus from the water column, cleaning the water (Source: SFWMD).

What’s Been Done to Clean Up Pollution coming from the Everglades Agricultural Area?

In 1992, the federal government sued the state of Florida over pollution in waters emanating from the Everglades Agricultural Area and its impact on the Everglades (US v. SFWMD 1992).²⁰ As a result of this litigation, in 1994 Florida passed the Everglades Forever Act, which started a slew of projects aimed at cleaning flows into the Everglades Protection Area (EPA).⁴ Soon after, the state started building Stormwater Treatment Areas (STAs), which are now specifically designed to reduce phosphorus levels to the 10 ppb level needed in the Everglades.^{9,18}

These STAs use different types of vegetation, along with carefully controlled inflows and outflows, to reduce phosphorus concentrations from Lake Okeechobee and runoff from nearby sugarcane fields (currently ranging from 122 to 235 ppb depending on the STA inflow location) down to about 13 ppb at STA outflow.

The reason for an apparent difference between STA outflows of 13 ppb and 10 ppb in the marsh is because they are measured differently. However, scientists consider STA outflow of 13 ppb to be the same as 10 ppb measured inside the marsh.

Inflows first encounter emergent vegetation, such as cattail and spike rush. Next, the “polishing cells” of submerged aquatic vegetation (SAV), such as hydrilla and algae, remove the last of the phosphorus before discharging into the Everglades.^{9,10,11}



Fig. 4 Aerial view of STA-3/4, with emergent vegetation area at the top of the STA (foreground), submerged aquatic vegetation (SAV) cells in the center, and the Everglades in the background (Source: EPA).

The STAs are highly engineered systems, and require constant attention and management.^{10,11} Water levels are carefully controlled to make sure the vegetation is kept at near optimal conditions. The state of Florida built and operates about 57,000 acres of STAs (excluding the not yet operational 6,500 acre A-2 STA), along with 3 Flow Equalization Basins (FEB), facilities that help even out inflows to the STAs, allowing them to maintain more optimal conditions. As a result of litigation from Friends of the Everglades and others, each of these STAs has specific numerical criteria that must be met.^{2,18}

The criteria are called the Water Quality-Based Effluent Limit, or WQBEL. Specifically, each STA must not exceed an outflow concentration of 19 ppb in any given water year (WY) (May through April) and must not exceed 13 ppb in more than 3 out of 5 years. Starting in May 2026 the WQBEL must be met for discharges into the Everglades Protection Area (EPA).¹⁸

In 2022, the National Academy of Sciences (Chapter 4) reviewed all of available data and found that only one of the 5 STAs was meeting the WQBEL standard.⁷ Moreover, they noted that only 3 options were available to improve performance:

1. Reduce in incoming phosphorus loads
2. Increase the size of the STAs
3. Increase the efficiency of the STAs

The Academy made several recommendations, including that the state of Florida present an adaptive management plan for how it planned on meeting the WQBEL, given the current level of performance. While SWMD's Restoration Strategies plan has helped to address efficiency of STAs and even expanded certain STAs, it is clear from TP outflow concentrations that by and large these problems have not been solved.^{10,11} SFWMD has stated that they have every intention of meeting the WQBEL, but the requested adaptive plan for meeting the WQBEL proposed by NASEM in 2023 has yet to be seen. Even if the WQBEL is met, does it include enough water flowing through the system? This question remains unanswered.

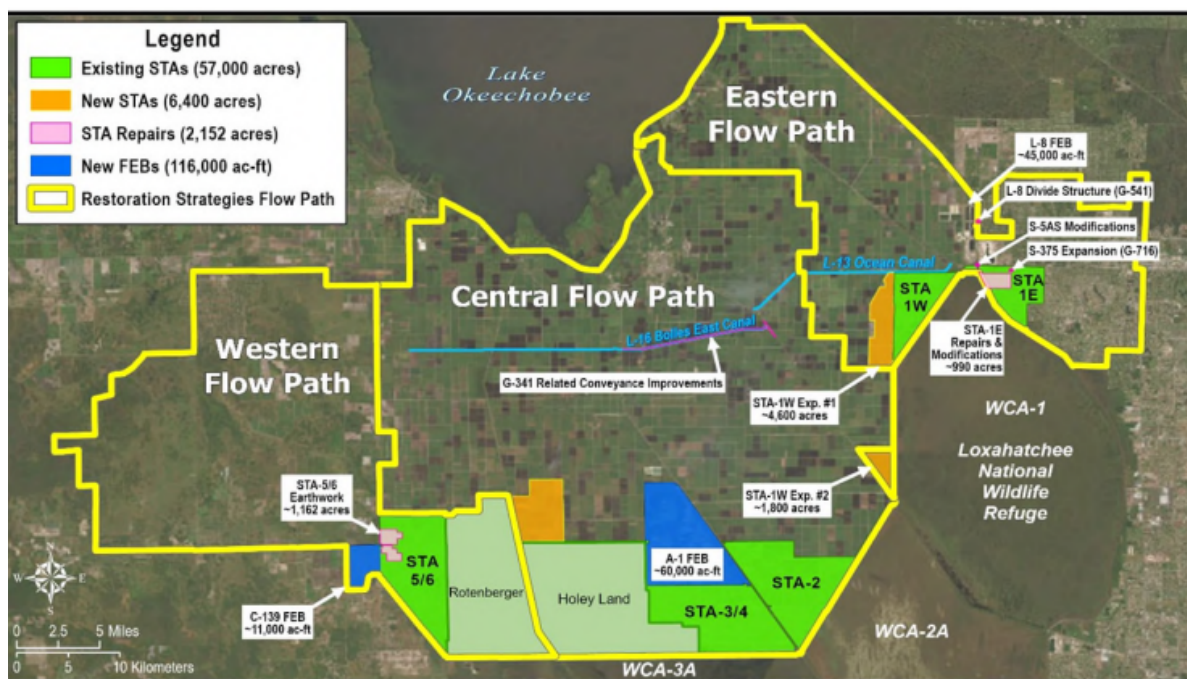


Fig. 5 Satellite map showing flow paths and location of STAs/other constructed wetlands in the Everglades Agricultural Area (Source: SFWMD).

Every year the Florida Department of Environmental Protection (FDEP) and the South Florida Water Management District (SFWMD) develop the South Florida Environmental Report (SFER), a comprehensive look at the hydrology, water quality, construction, monitoring, finances and other relevant topics. The performance of the STAs is a major topic, and from here we can see what progress has been made since the National Academy of Sciences Review in 2022.⁶

“Restoration Strategies”, the name given by the state for their efforts to clean up fertilizer polluted waters entering the Everglades Protection Area (EPA) from the Everglades Agricultural Area (EAA), is organized by flow paths (central, eastern and western), as shown in Figure 5.^{10,11}

Overall STA Performance

Performance of all STAs is organized into Figure 6 below. While trends are not as easily observed, compliance can be assessed quickly by referencing the green (13 ppb) and red (19 ppb) thresholds. From a quick assessment it is clear only STA-3/4 is meeting the WQBEL.

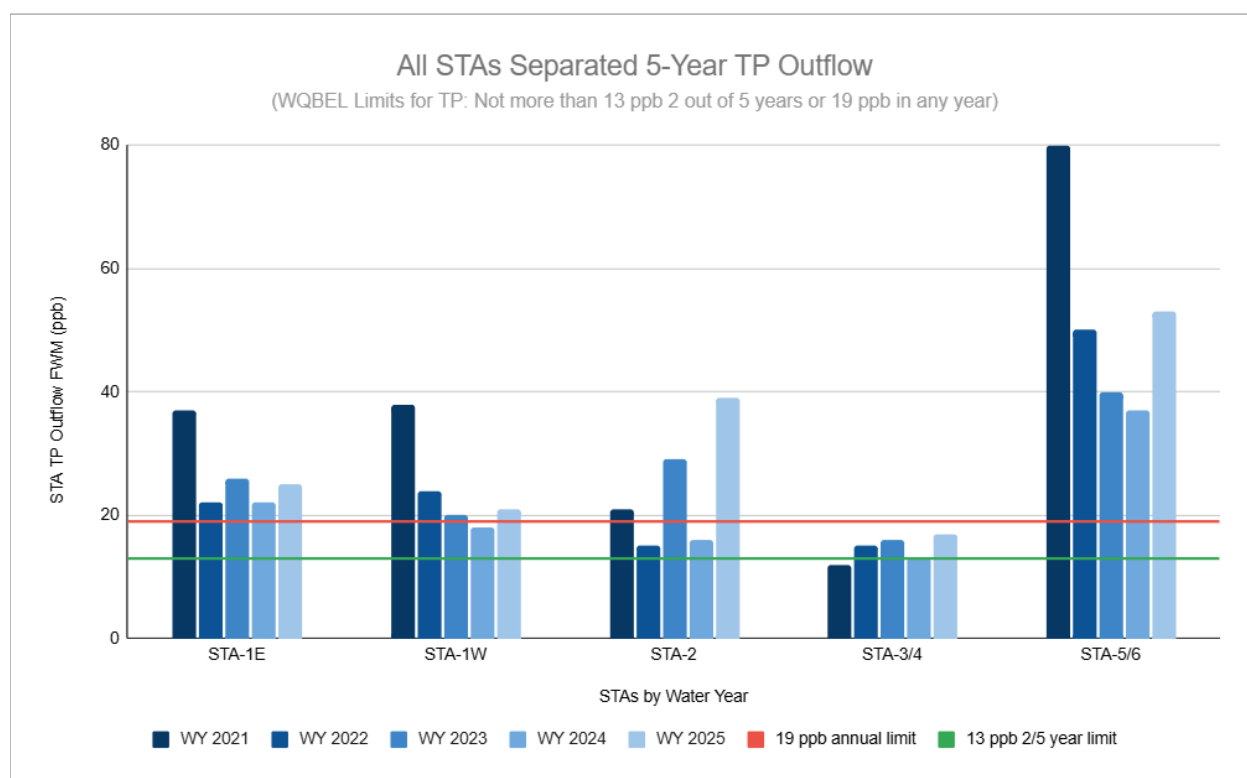


Fig. 6 Phosphorus levels over 5 years in all STAs and associated WQBEL limits (Source: SFWMD SFERs 2022-2026).

The Central Flow Path

The Central Flow path has 2 STAs that must meet the WQBEL: STA-3/4 and STA-2.

STA-3/4 performance has remained steady since the 2022 review by the National Academy of Sciences.⁷ It has neither significantly improved or worsened over the past 5 years, indicating that it is likely performing at its optimal level.

Although STA-3/4 met the WQBEL and is the best performing STA, it only met the minimum TP requirements of two years at or below 13 ppb and not exceeding 19 ppb in any year, and saw its worst year in WY 2025 at 17 ppb.

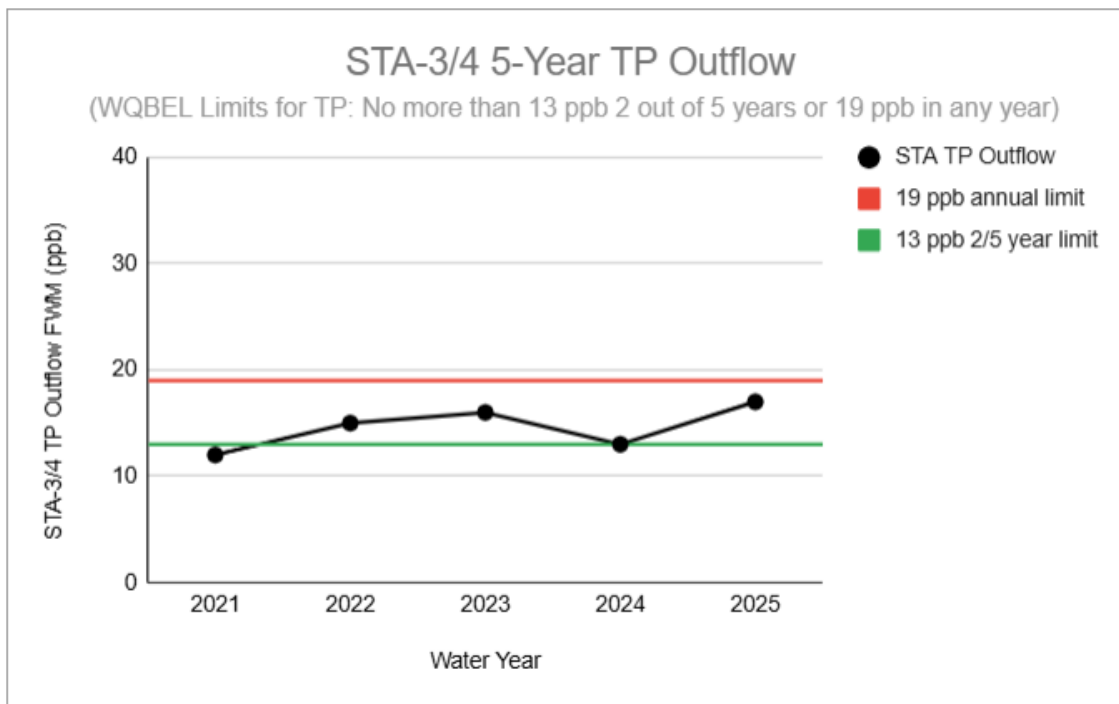


Fig. 7 Phosphorus levels over 5 years in STA-3/4 and associated WQBEL limits (Source: SFWMD SFERs 2022-2026).

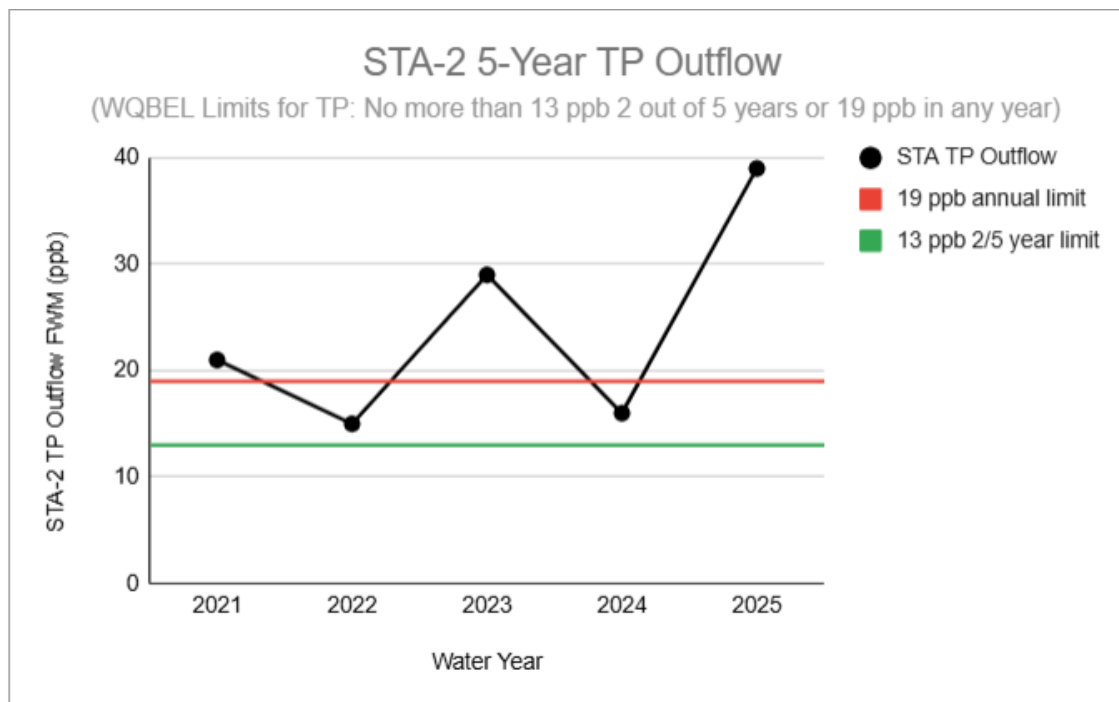


Fig. 8 Phosphorus levels over 5 years in STA-2 and associated WQBEL limits (Source: SFWMD SFERs 2022-2026).

STA-2 has been above 19 ppb in 3 of the last 5 years and at no time in the past 5 years has it reached 13 ppb. WY 2025 was an especially poor performing year, with TP reaching 39 ppb, well above the 19 ppb threshold.

The Eastern Flow Path

The Eastern Flow Path has 2 STAs that must meet the WQBEL: STA-1E and STA-1W.

Figure 9 shows the performance of STA-1E, which was above the 19 ppb limit 5 out of 5 years.

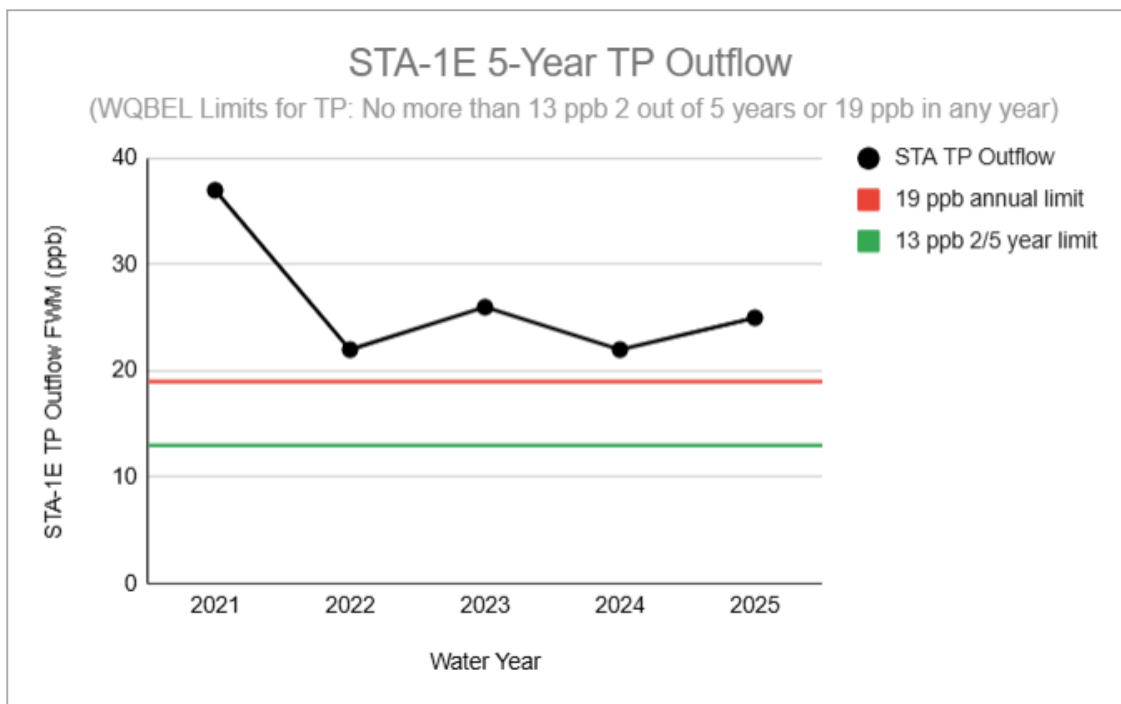


Fig. 9 Phosphorus levels over 5 years in STA-1E and associated WQBEL limits (Source: SFWMD SFERs 2022-2026).

Figure 10 shows the performance of STA-1W, which has failed in 4 of the last 5 years to stay below the 19 ppb limit and did not reach the 13 ppb goal. The 18 ppb observed in 2024 is the lowest recorded outflow concentration during this time period.

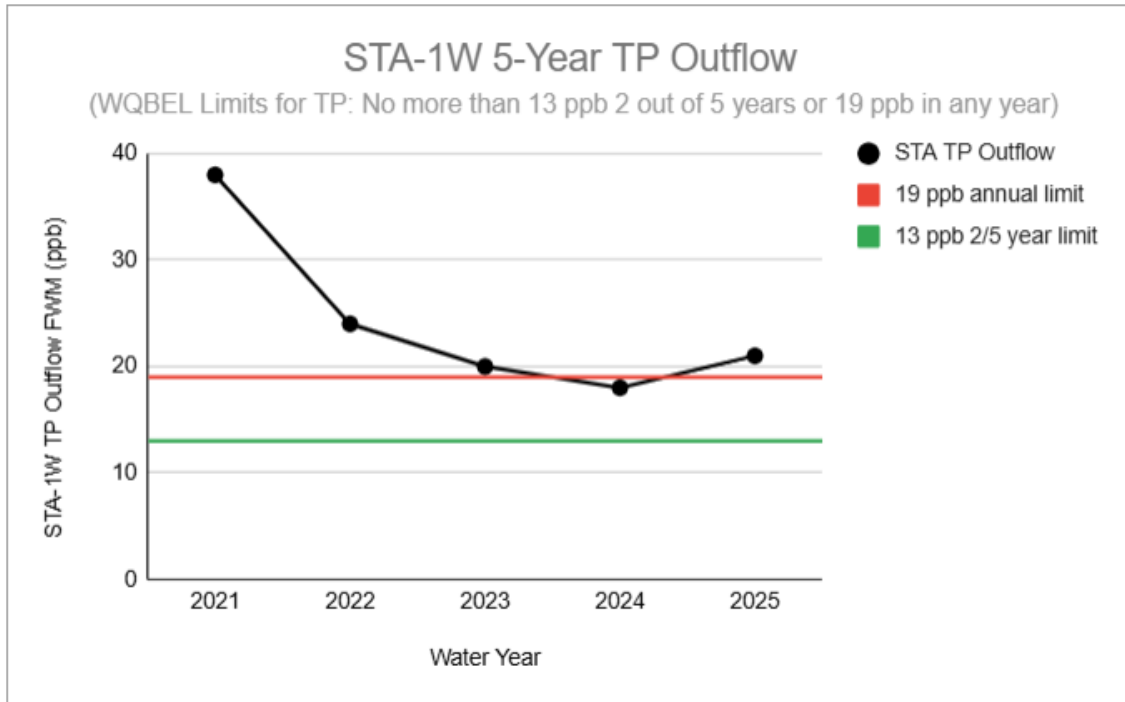


Fig. 10 Phosphorus levels over 5 years in STA-1W and associated WQBEL limits (Source: SFWMD SFERs 2022-2026).

The Western Flow Path

The Western Flow path has one STA that must meet the water quality standard: STA-5/6.

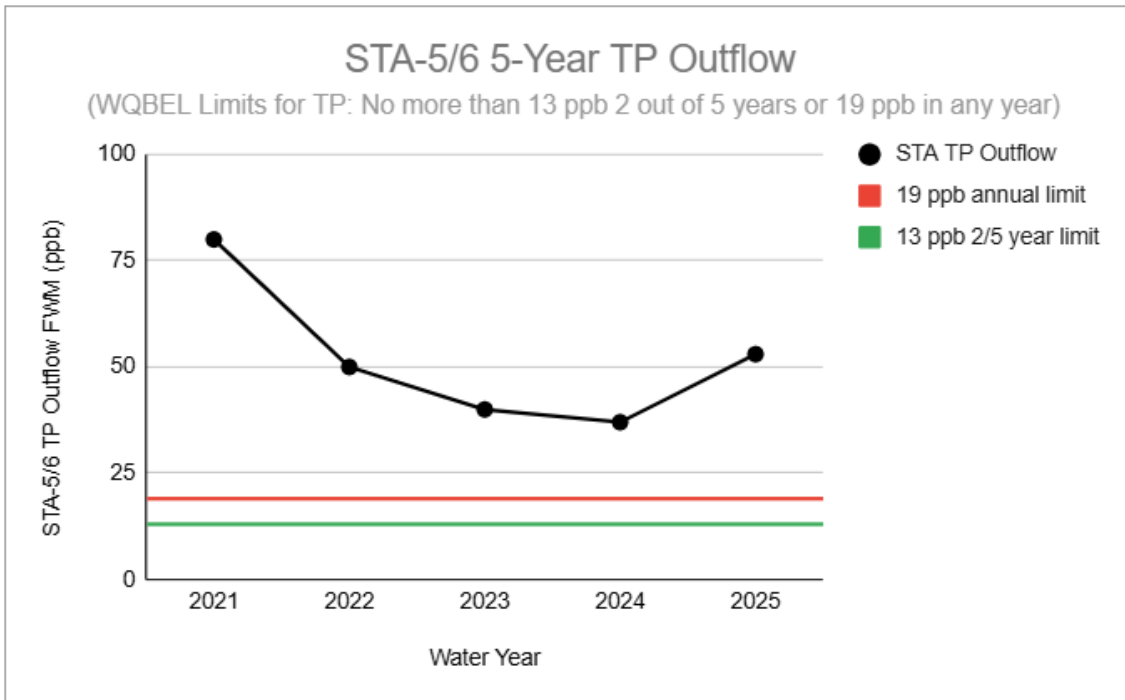


Fig. 11 Phosphorus levels over 5 years in STA-1W and associated WQBEL limits (Source: SFWMD SFERs 2022-2026).

Figure 11 shows that STA-5/6 is still a very long way from meeting the WQBEL. Outflow concentrations of TP have been well above the 19 ppb limit in 5 of the last 5 years, topping out at 80 ppb in WY 2021.

Conclusions

As the 2026 deadline approaches, the only STA to meet reach the WQBEL at all over the last 5 years was STA-3/4, which benefits from its location below the A-1 flow equalization basin (FEB), receiving the lowest concentrations of TP, the most Lake Okeechobee water and most water overall out of all the STAs. STA-2 had the second lowest inflow TP concentrations, but still did not meet the WQBEL.

Neither STA-5/6, nor STA-1E even touched the WQBEL range over 5 years, and STA-1W only spent one year below the annual limit (WQBEL is no more than 3/5 years above 13 ppb and never above 19 ppb in any year).

Over the last 5 years the average Total Phosphorus (TP) Flow Weighted Mean (FWM) concentration coming out of all STAs was 25 ppb. As of 2014, 14.8% (198,723 acres) of the freshwater Everglades were considered “impacted” by TP.¹⁹ Having 25 ppb, which amounts to 40 t/yr of TP (80,000 lbs/yr) on average, entering the EPA will not help keep the Everglades clean, and will only continue to damage it.^{7,19} Staying at or below the 13 ppb outflow threshold for each STA is essential for a healthy Everglades.

Connection to Rescue the River of Grass

Based on data taken from the last 5 years of South Florida Ecological Reports (SFERs), it is clear that most STAs are not meeting the WQBEL. With the WY 2027 (May 2026) deadline looming, the need for significantly more water storage and treatment in the Everglades Agricultural Area (EAA) is clear.

Restoration Strategies aims to help outflows into the EPA meet the WQBEL by improving performance of existing STAs.¹⁸ However even if the WQBEL is met, flows are marginal compared to the amounts needed for properly restoring Everglades flow and decompartmentalizing the system.^{5,8}

As a part of Friends of the Everglades’ “Rescue the River of Grass” campaign, storing an additional 1 million acre-ft of water in a ~77k acre reservoir, and creating ~26k acres of STA will accomplish many, if not all Everglades restoration goals. These goals include: meeting the WQBEL, preventing harmful discharges to the estuaries, restoring natural flow through the Everglades to Florida Bay, slowing saltwater intrusion, and decompartmentalization, taking apart barriers to flow.³

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Appendix

All STAs 5-Year Performance Table (WQBEL Limits for TP: No more than 13 µg/L in more than 3 out of 5 years or 19 µg/L in any year) *Data in SFER are not raw numbers							
WY	2021	2022	2023	2024	2025	5-Year Avg	5-Year Totals
Inflow Volume (acre-ft)	1,600,000	1,000,000	1,100,000	1,500,000	1,200,000	1,280,000	6,400,000
LOK Inflow (acre-ft)	162,000	108,000	43,000	85,000	344,600	148,520	742,600
Runoff Inflow (acre-ft)	1,438,000	892,000	1,057,000	1,415,000	855,400	1,131,480	5,657,400
LOK Inflow (%)	10.1	10.8	3.9	5.7	28.7	12	-
Runoff Inflow (%)	89.9	89.2	96.1	94.3	71.3	88	-
Inflow Volume from table (acre-ft)	1,606,000	1,027,000	1,084,000	1,468,775	1,216,194	1,280,394	6,401,969
Outflow Volume from table (acre-ft)	1,694,000	974,000	1,063,000	1,505,344	1,212,429	1,289,755	6,448,773
TP Inflow (t)	226	159	193	187	232	199	997
TP Outflow (t)	59	27	33	35	43.5	40	198
TP Retainage (t)	167	132	160	152	188.3	160	799
TP Retainage (%)	73.9	83.0	82.9	81.3	81.2	80	-
TP Inflow FWM (µg/L)	134	125	144	103	155	132	-
TP Outflow FWM (µg/L)	28	23	25	19	29	25	-
P/F	-	-	-	-	-	-	-

STA-1E 5-Year Performance Table (WQBEL Limits for TP: No more than 13 µg/L in more than 3 out of 5 years or 19 µg/L in any year) *Data in SFER are not raw numbers							
WY	2021	2022	2023	2024	2025	5-Year Avg	5-Year Totals
Inflow Volume (acre-ft)	323,000	173,000	124,000	145,000	95,000	172,000	860,000
LOK Inflow (acre-ft)	25,000	4,200	2,200	1,400	27,500	12,060	60,300
Runoff Inflow (acre-ft)	298,000	168,800	121,800	143,600	67,500	159,940	799,700
LOK Inflow (%)	7.7	2.4	1.8	1.0	28.9	8	-
Runoff Inflow (%)	92.3	97.6	98.2	99.0	71.1	92	-
Inflow Volume from table (acre-ft)	323,000	173,000	124,000	145,475	94,828	172,061	860,303
Outflow Volume from table (acre-ft)	284,000	143,000	101,000	133,921	78,567	148,098	740,488
TP Inflow (t)	55	25	18	19	18	27	135
TP Outflow (t)	13	4	3	4	2.4	5	26
TP Retainage (t)	42	21	15	15	15	22	108
TP Retainage (%)	76.4	84.0	83.3	78.9	83.3	81	-
TP Inflow FWM (µg/L)	138	119	115	107	151	126	-
TP Outflow FWM (µg/L)	37	22	26	22	25	26	-
P/F	F	F	F	F	F	-	F

STA-1W 5-Year Performance Table (WQBEL Limits for TP: No more than 13 µg/L in more than 3 out of 5 years or 19 µg/L in any year) *Data in SFER are not raw numbers							
WY	2021	2022	2023	2024	2025	5-Year Avg	5-Year Totals
Inflow Volume (acre-ft)	192,000	57,000	152,000	189,000	158,000	149,600	748,000
LOK Inflow (acre-ft)	7,200	3,300	9,100	1,300	38,600	11,900	59,500
Runoff Inflow (acre-ft)	184,800	53,700	142,900	187,700	119,400	137,700	688,500
LOK Inflow (%)	3.8	5.8	6.0	0.7	24.4	8	-
Runoff Inflow (%)	96.3	94.2	94.0	99.3	75.6	92	-
Inflow Volume from table (acre-ft)	192,000	57,000	152,000	189,000	158,105	149,621	748,105
Outflow Volume from table (acre-ft)	216,000	53,000	158,000	226,072	156,064	161,827	809,136
TP Inflow (t)	60	11	37	28	36	34	172
TP Outflow (t)	10	2	4	5	4	5	25
TP Retainage (t)	50	9	33	23	32	29	147
TP Retainage (%)	83.3	81.8	89.2	82.1	88.9	85	-
TP Inflow FWM (µg/L)	254	158	199	119	187	183	-
TP Outflow FWM (µg/L)	38	24	20	18	21	24	-
P/F	F	F	F	F	F	-	F

STA-2 5-Year Performance Table (WQBEL Limits for TP: No more than 13 µg/L in more than 3 out of 5 years or 19 µg/L in any year) *Data in SFER are not raw numbers							
WY	2021	2022	2023	2024	2025	5-Year Avg	5-Year Totals
Inflow Volume (acre-ft)	441,000	289,000	327,000	418,000	271,000	349,200	1,746,000
LOK Inflow (acre-ft)	72,000	38,000	29,000	7,000	60,500	41,300	206,500
Runoff Inflow (acre-ft)	369,000	251,000	298,000	411,000	210,500	307,900	1,539,500
LOK Inflow (%)	16.3	13.1	8.9	1.7	22.3	12	-
Runoff Inflow (%)	83.7	86.9	91.1	98.3	77.7	88	-
Inflow Volume from table (acre-ft)	440,000	289,000	327,000	417,938	271,372	349,062	1,745,310
Outflow Volume from table (acre-ft)	502,000	300,000	349,000	454,991	267,826	374,763	1,873,817
TP Inflow (t)	55	32	45	38	48	44	218
TP Outflow (t)	13	6	13	9	12.9	11	54
TP Retainage (t)	42	26	32	29	36	33	165
TP Retainage (%)	76.4	81.3	71.1	76.3	75.0	76	-
TP Inflow FWM (µg/L)	100	90	113	74	145	104	-
TP Outflow FWM (µg/L)	21	15	29	16	39	24	-
P/F	F	F	F	F	F	-	F

STA-3/4 5-Year Performance Table (WQBEL Limits for TP: No more than 13 µg/L in more than 3 out of 5 years or 19 µg/L in any year) *Data in SFER are not raw numbers							
WY	2021	2022	2023	2024	2025	5-Year Avg	5-Year Totals
Inflow Volume (acre-ft)	521,000	330,000	327,000	508,000	513,500	439,900	2,199,500
LOK Inflow (acre-ft)	47,000	56,000	3,000	67,000	152,000	65,000	325,000
Runoff Inflow (acre-ft)	474,000	274,000	324,000	441,000	361,500	374,900	1,874,500
LOK Inflow (%)	9.0	17.0	0.9	13.2	29.6	14	-
Runoff Inflow (%)	91.0	83.0	99.1	86.8	70.4	86	-
Inflow Volume from table (acre-ft)	521,000	330,000	327,000	507,677	513,524	439,840	2,199,201
Outflow Volume from table (acre-ft)	539,000	309,000	307,000	467,302	499,249	424,310	2,121,551
TP Inflow (t)	51	37	38	41	77	49	244
TP Outflow (t)	8	6	6	8	10.4	8	38
TP Retainage (t)	43	31	32	33	67	41	206
TP Retainage (%)	84.3	83.8	84.2	80.5	87.0	84	-
TP Inflow FWM (µg/L)	80	91	93	66	122	90	-
TP Outflow FWM (µg/L)	12	15	16	13	17	15	-
P/F	P	F	F	P	F	-	F

STA-5/6 5-Year Performance Table (WQBEL Limits for TP: No more than 13 µg/L in more than 3 out of 5 years or 19 µg/L in any year) *Data in SFER are not raw numbers							
WY	2021	2022	2023	2024	2025	5-Year Avg	5-Year Totals
Inflow Volume (acre-ft)	130,000	177,000	153,000	209,000	209,000	175,600	878,000
LOK Inflow (acre-ft)	2,500	6,400	0	1,500	9,000	3,880	19,400
Runoff Inflow (acre-ft)	127,500	170,600	153,000	207,500	200,000	171,720	858,600
LOK Inflow (%)	1.9	3.6	0.0	0.7	4.3	2	-
Runoff Inflow (%)	98.1	96.4	100.0	99.3	95.7	98	-
Inflow Volume from table (acre-ft)	130,000	178,000	153,000	208,678	178,366	169,609	848,044
Outflow Volume from table (acre-ft)	152,000	169,000	148,000	223,058	210,723	180,556	902,781
TP Inflow (t)	45	53	54	61	52	53	265
TP Outflow (t)	15	10	7	10	13.7	11	56
TP Retainage (t)	30	43	47	51	38	42	209
TP Retainage (%)	66.7	81.1	87.0	83.6	73.1	78	-
TP Inflow FWM (µg/L)	281	243	288	237	235	257	-
TP Outflow FWM (µg/L)	80	50	40	37	53	52	-
P/F	F	F	F	F	F	-	F