SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Everglades Works of the District Best Management Practices (BMPs) Regulatory Program

Susan Pascal
Environmental Resource Bureau
May 3, 2024

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Agenda

- Best management practices (BMPs)
- BMP Plans and Discharge monitoring verification program
- EAA performance

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EFA Best Management Practices

373.4592 Florida Statutes:

A practice or combination of practices determined by the South Florida Water Management District, in cooperation with the Florida Department of Environmental Protection, based on *research, field-testing, and expert review*, to be the *most effective* and practicable, *including economic and technological considerations*, on-farm means of improving water quality in agricultural discharges to a level that *balances water quality improvements and agricultural productivity*.

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Chapter 40E-63, FAC: BMP Regulatory Program

- Permit for Phosphorus (P) discharges into SFWMD canals:
  - ✓ Comprehensive BMP Plan
  - ✓ Discharge Monitoring Plan
  - ✓ Training
- BMP research through EAAEPD
- EAA Basin Performance
  - ✓ Reduce P by 25% in comparison to pre-BMP

Nutrient Management

Water Management

Particulate Matter and Sediment Controls

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WOD Permits - Comprehensive BMP Plans

BMP Plan A (53% of EAA)	BMP Plan B (44% of EAA)
Nutrient Application Control	Nutrient Application Control
Nutrient Spill Prevention	Nutrient Spill Prevention
Soil Testing	Soil Testing
Particulate Matter & Sediment Controls (4)	Particulate Matter & Sediment Controls (6)
Water Management (1.0-inch)	Water Management (0.5-inch)

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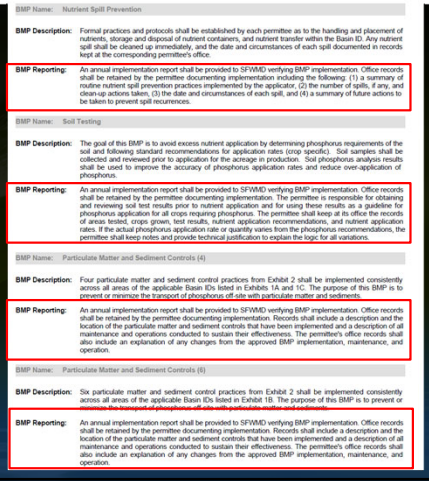
WOD BMP Descriptions and Reporting

- WOD permits describe the BMPs and the documentation required



BMP Name: Nutrient Spill Prevention

BMP Description: Formal practices and protocols shall be established by each permittee as to the handling and placement of nutrients, storage and disposal of nutrient containers, and nutrient transfer within the Basin ID. Any nutrient spill shall be cleaned up immediately, and the date and circumstances of each spill documented in records kept at the corresponding permittee's office.

BMP Reporting: An annual implementation report shall be provided to SFWMD verifying BMP implementation. Office records shall be retained by the permittee documenting implementation including the following: (1) a summary of routine nutrient spill prevention practices implemented by the applicator, (2) the number of spills, if any, and clean-up actions taken, (3) the date and circumstances of each spill, and (4) a summary of future actions to be taken to prevent spill recurrences.

BMP Name: Soil Testing

BMP Description: The goal of this BMP is to avoid excess nutrient application by determining phosphorus requirements of the soil and following standard recommendations for application rates (crop specific). Soil samples shall be collected and reviewed prior to application for the acreage in production. Soil phosphorus analysis results shall be used to improve the accuracy of phosphorus application rates and reduce over-application of phosphorus.

BMP Reporting: An annual implementation report shall be provided to SFWMD verifying BMP implementation. Office records shall be retained by the permittee documenting implementation. The permittee is responsible for obtaining and reviewing soil test results prior to nutrient application and for using these results as a guideline for phosphorus application for all crops requiring phosphorus. The permittee shall keep at its office the records of areas tested, crops grown, test results, nutrient application recommendations, and nutrient application rates. If the actual phosphorus application rate or quantity varies from the phosphorus recommendations, the permittee shall keep notes and provide technical justification to explain the logic for all variations.

BMP Name: Particulate Matter and Sediment Controls (4)

BMP Description: Four particulate matter and sediment control practices from Exhibit 2 shall be implemented consistently across all areas of the applicable Basin IDs listed in Exhibits 1A and 1C. The purpose of this BMP is to prevent or minimize the transport of phosphorus off-site with particulate matter and sediments.

BMP Reporting: An annual implementation report shall be provided to SFWMD verifying BMP implementation. Office records shall be retained by the permittee documenting implementation. Records shall include a description and the location of the particulate matter and sediment controls that have been implemented and a description of all maintenance and operations conducted to sustain their effectiveness. The permittee's office records shall also include an explanation of any changes from the approved BMP implementation, maintenance, and operation.

BMP Name: Particulate Matter and Sediment Controls (6)

BMP Description: Six particulate matter and sediment control practices from Exhibit 2 shall be implemented consistently across all areas of the applicable Basin IDs listed in Exhibit 1B. The purpose of this BMP is to prevent or minimize the transport of phosphorus off-site with particulate matter and sediments.

BMP Reporting: An annual implementation report shall be provided to SFWMD verifying BMP implementation. Office records shall be retained by the permittee documenting implementation. Records shall include a description and the location of the particulate matter and sediment controls that have been implemented and a description of all maintenance and operations conducted to sustain their effectiveness. The permittee's office records shall also include an explanation of any changes from the approved BMP implementation, maintenance, and operation.

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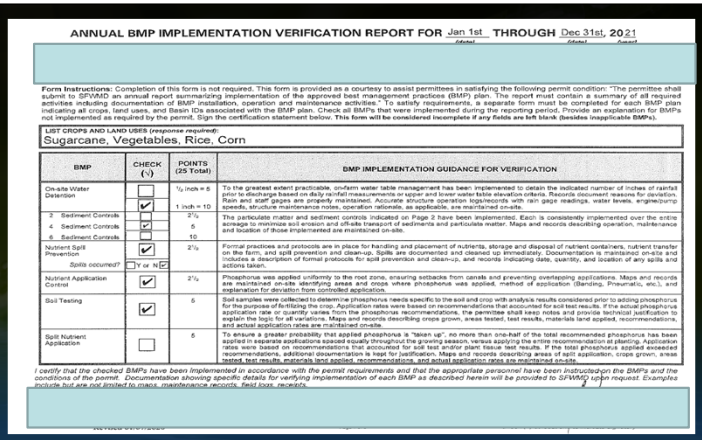
WOD Permit Annual BMP Report



ANNUAL BMP IMPLEMENTATION VERIFICATION REPORT FOR Jan 1st THROUGH Dec 31st, 2021

Form Instructions: Completion of this form is not required. This form is provided as a courtesy to assist permittees in satisfying the following permit condition: "The permittee shall submit to SFWMD an annual report summarizing implementation of the approved best management practices (BMP) plan. The report must contain a summary of all required activities including documentation of BMP installation, operation and maintenance activities." To satisfy requirements, a separate form must be completed for each BMP plan indicating all crops, land uses, and Basin IDs associated with the BMP plan. Check all BMPs that were implemented during the reporting period. Provide an explanation for BMPs not implemented as required by the permit. Sign the certification statement below. **This form will be considered incomplete if any fields are left blank (besides inapplicable BMPs).**

LIST CROPS AND LAND USES *(response required)*:
Sugarcane, Vegetables, Rice, Corn

BMP	CHECK (√)	POINTS (25 Total)	BMP IMPLEMENTATION GUIDANCE FOR VERIFICATION
On-site Water Detention	☐	½ inch = 5	To the greatest extent practicable, on-farm water table management has been implemented to obtain the indicated number of inches of rainfall prior to discharge based on daily rainfall measurements or upper and lower water table elevation criteria. Records document reasons for deviation. Rain and staff gages are properly maintained. Accurate structure operation logs/records with rain gage readings, water levels, engine/pump speeds, structure maintenance notes, operation rationale, as applicable, are maintained on-site.
	☑	1 inch = 10	
2 Sediment Controls	☐	2½	The particulate matter and sediment controls indicated on Page 2 have been implemented. Each is consistently implemented over the entire acreage to minimize soil erosion and off-site transport of sediments and particulate matter. Maps and records describing operation, maintenance and location of those implemented are maintained on-site.
4 Sediment Controls	☑	5	
6 Sediment Controls	☐	10	
Nutrient Spill Prevention	☑	2½	Formal practices and protocols are in place for handling and placement of nutrients, storage and disposal of nutrient containers, nutrient transfer on the farm, and spill prevention and clean-up. Spills are documented and cleaned up immediately. Documentation is maintained on-site and includes a description of formal protocols for spill prevention and clean-up, and records indicating date, quantity, and location of any spills and actions taken.
Spills occurred?	Y or N ☑		
Nutrient Application Control	☑	2½	Phosphorus was applied uniformly to the root zone, ensuring setbacks from canals and preventing overlapping applications. Maps and records are maintained on-site identifying areas and crops where phosphorus was applied, method of application (Banding, Pneumatic, etc.), and explanation for deviation from controlled application.
Soil Testing	☑	5	Soil samples were collected to determine phosphorus needs specific to the soil and crop with analysis results considered prior to adding phosphorus for the purpose of fertilizing the crop. Application rates were based on recommendations that accounted for soil test results. If the actual phosphorus application rate or quantity varies from the phosphorus recommendations, the permittee shall keep notes and provide technical justification to explain the logic for all variations. Maps and records describing crops grown, areas tested, test results, materials land applied, recommendations, and actual application rates are maintained on-site.
Split Nutrient Application	☐	5	To ensure a greater probability that applied phosphorus is "taken up", no more than one-half of the total recommended phosphorus has been applied in separate applications spaced equally throughout the growing season, versus applying the entire recommendation at planting. Application rates were based on recommendations that accounted for soil test and/or plant tissue test results. If the total phosphorus applied exceeded recommendations, additional documentation is kept for justification. Maps and records describing areas of split application, crops grown, areas tested, test results, materials land applied, recommendations, and actual application rates are maintained on-site.

I certify that the checked BMPs have been implemented in accordance with the permit requirements and that the appropriate personnel have been instructed on the BMPs and the conditions of the permit. Documentation showing specific details for verifying implementation of each BMP as described herein will be provided to SFWMD upon request. Examples include, but are not limited to maps, maintenance records, field logs, receipts.

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BMP Site Verifications

- **Prior**
  - ✓Review permit, BMP annual report, previous visit reports, operation criteria, and farm data
  - ✓Contact landowner or entity and provide list of documentation to be reviewed
- **During**
  - ✓Review documentation
  - ✓Field observations
- **After**
  - ✓Follow up – Pending information or questions
  - ✓Report (including recommendations, if applicable)

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Nutrient Application Control

- Uniform and controlled boundary application of P
- Discuss application methods
- Typical methods:
  - ✓Banding at the root zone
  - ✓Side-dressing
  - ✓Pneumatic controlled-edge application (e.g., AIRMAX)
  - ✓Controlled placement by fertilization under plastic near root zone
  - ✓Other methods considered on a case-by-case basis
- May observe application at initial site visit or follow up visit

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Nutrient Application Control

Banding (sugarcane & vegetables)

Vegetable Fertilization (mulched beds)

Side dressing (ratoon & corn)

Pneumatic applicator (corn & sod)

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Nutrient Spill Prevention

- Review permittee's spill prevention protocol documentation
- Protocols include guidelines on:
  - ✓Proper handling of materials that contain P
  - ✓Equipment operation that minimizes misplacement & spillage
  - ✓Location of nutrient transfer areas
  - ✓Training on spill prevention practices
  - ✓Clean-up procedures and documentation of spill occurrences
- If nutrient application services are contracted, both contractor and permittee should have documented protocol and be trained in all aspects of spill prevention

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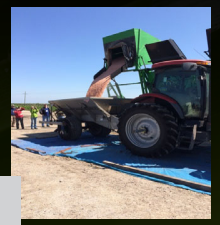
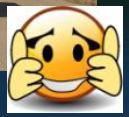
Nutrient Spill Prevention





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Soil Testing

- Goal: Avoid excess P application by determining soil P levels and using justified crop specific recommendations
- Soil samples collected and reviewed prior to P application for the acreage in production
- Permittee uses soil P analysis results to avoid over application of P
- Where application rate exceeds soil test recommendations, provide the logic for the difference

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Soil Test BMP Documentation

- For a representative sample of crops grown, soil test results, P recommendations and P application records are reviewed
  - ✓ Important: this information may be reviewed for all lessees, even if they are short-term
- Application rate of P nutrients is compared to recommended rate
- There may be specific considerations for any organic amendments based on the source, amounts applied, water quality, etc.

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Water Management BMPs

- Delayed discharge based on established criteria
  - ✓ Measuring daily rain events using a rain gage
  - ✓ Monitoring drainage canal elevations
- It allows for:
  - Runoff retention, and
  - Settling out of suspended solids
- Typical: 0.5 or 1.0 inch of rainfall
- When multiple permittees within a Basin ID, each permittee is responsible for BMP implementation

Staff gauge at discharge pump

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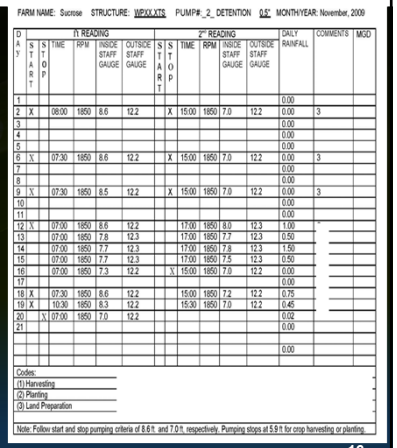
Water Management Documentation

- Pump logs – Review includes:
  - ✓ Discharges vs. rainfall detention
  - ✓ Upstream and downstream staff gauge readings
  - ✓ Pump operation data
  - ✓ Critical activities e.g. planting, harvest
  - ✓ Evidence that detention level cannot be met
- Detention graphs
  - ✓ Developed by SFWMD to assist in water management review



FARM NAME: Sucrose STRUCTURE: WPXX.XTS PUMP#: _2_ DETENTION 0.5" MONTH/YEAR: November, 2009

DAY	1ST READING START	1ST READING STOP	TIME	RPM	INSIDE STAFF GAUGE	OUTSIDE STAFF GAUGE	2ND READING START	2ND READING STOP	TIME	RPM	INSIDE STAFF GAUGE	OUTSIDE STAFF GAUGE	DAILY RAINFALL	COMMENTS	MOD
1													0.00		
2	X		08:00	1850	8.6	12.2		X	15:00	1850	7.0	12.2	0.00	3	
3													0.00		
4													0.00		
5													0.00		
6	X		07:30	1850	8.6	12.2		X	15:00	1850	7.0	12.2	0.00	3	
7													0.00		
8													0.00		
9	X		07:30	1850	8.5	12.2		X	15:00	1850	7.0	12.2	0.00	3	
10													0.00		
11													0.00		
12	X		07:00	1850	8.6	12.2			17:00	1850	8.0	12.3	1.00	*	
13			07:00	1850	7.8	12.3			17:00	1850	7.7	12.3	0.50		
14			07:00	1850	7.7	12.3			17:00	1850	7.8	12.3	1.50		
15			07:00	1850	7.7	12.3			17:00	1850	7.5	12.3	0.50		
16			07:00	1850	7.3	12.2		X	15:00	1850	7.0	12.2	0.00		
17													0.00		
18	X		07:30	1850	8.6	12.2			15:00	1850	7.2	12.2	0.75		
19	X		10:30	1850	8.3	12.2			15:30	1850	7.0	12.2	0.45		
20	X		07:00	1850	7.0	12.2							0.02		
21													0.00		
													0.00		

Codes:
(1) Harvesting
(2) Planting
(3) Land Preparation

Note: Follow start and stop pumping criteria of 8.6 ft. and 7.0 ft. respectively. Pumping stops at 5.9 ft for crop harvesting or planting.

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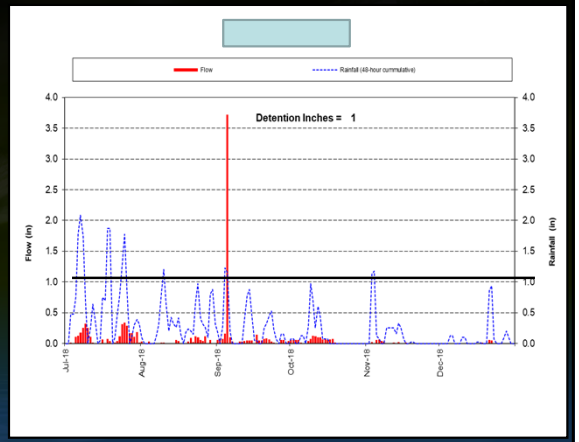
Water Management - Detention Example

- Detention graphs depict basin discharge and rainfall
- Determine adherence to water management BMP
- Time period consistent with verification period



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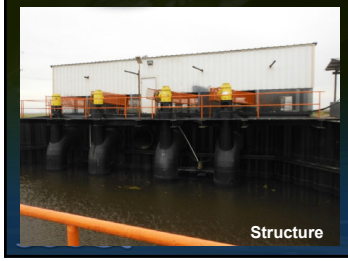
Water Management - Field Observation



There may be instances in which verification of staff gages being relative to each other is needed

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Particulate Matter & Sediment Controls BMP

- Permits generally require between 4 and 6 practices:
  - Canal cleaning
  - ✓Vegetation on ditch and canal banks
  - ✓Ditch bank berms
  - ✓Sediment sump in main canal and field ditches
  - ✓Slow field ditch drainage
  - ✓Leveling fields
  - ✓Floating aquatic vegetation
  - ✓Cover crops or flooded fields
- Practices are reported annually in BMP Annual Report

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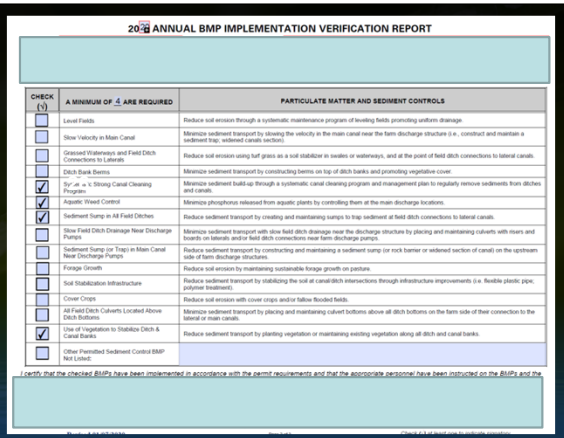
Particulate Matter & Sediment Controls BMP Reporting



20__ ANNUAL BMP IMPLEMENTATION VERIFICATION REPORT

CHECK (√)	A MINIMUM OF 4 ARE REQUIRED	PARTICULATE MATTER AND SEDIMENT CONTROLS
☐	Level Fields	Reduce soil erosion through a systematic maintenance program of leveling fields promoting uniform drainage.
☐	Slow Velocity in Main Canal	Minimize sediment transport by slowing the velocity in the main canal near the farm discharge structure (i.e., construct and maintain a sediment trap, widened canals section).
☐	Grassed Waterways and Field Ditch Connections to Laterals	Reduce soil erosion using turf grass as a soil stabilizer in swales or waterways, and at the point of field ditch connections to lateral canals.
☐	Ditch Bank Berms	Minimize sediment transport by constructing berms on top of ditch banks and promoting vegetative cover.
☑	Sy[illegible] & 'c Strong Canal Cleaning Program	Minimize sediment build-up through a systematic canal cleaning program and management plan to regularly remove sediments from ditches and canals.
☑	Aquatic Weed Control	Minimize phosphorus released from aquatic plants by controlling them at the main discharge locations.
☑	Sediment Sump in All Field Ditches	Reduce sediment transport by creating and maintaining sumps to trap sediment at field ditch connections to lateral canals.
☐	Slow Field Ditch Drainage Near Discharge Pumps	Minimize sediment transport with slow field ditch drainage near the discharge structure by placing and maintaining culverts with risers and boards on laterals and/or field ditch connections near farm discharge pumps.
☐	Sediment Sump (or Trap) in Main Canal Near Discharge Pumps	Reduce sediment transport by constructing and maintaining a sediment sump (or rock barrier or widened section of canal) on the upstream side of farm discharge structures.
☐	Forage Growth	Reduce soil erosion by maintaining sustainable forage growth on pasture.
☐	Soil Stabilization Infrastructure	Reduce sediment transport by stabilizing the soil at canal/ditch intersections through infrastructure improvements (i.e. flexible plastic pipe, polymer treatment).
☐	Cover Crops	Reduce soil erosion with cover crops and/or fallow flooded fields.
☐	All Field Ditch Culverts Located Above Ditch Bottoms	Minimize sediment transport by placing and maintaining culvert bottoms above all ditch bottoms on the farm side of their connection to the lateral or main canals.
☑	Use of Vegetation to Stabilize Ditch & Canal Banks	Reduce sediment transport by planting vegetation or maintaining existing vegetation along all ditch and canal banks.
☐	Other Permitted Sediment Control BMP Not Listed:	

I certify that the checked BMPs have been implemented in accordance with the permit requirements and that the appropriate personnel have been instructed on the BMPs and the

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Particulate Matter & Sediment Controls

- Goal is to field verify the BMP, however, some practices require documentation (e.g., maps, work orders/invoices, photos)
- Practices are implemented consistently throughout the farm
- Permittee is responsible for lessee's implementation and documentation

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Canal Cleaning and Floating Aquatic Vegetation (FAV) Control

- **Documentation**
  - ✓ Maps indicating dates and canal segments and ditches that were cleaned
  - ✓ If contracted, work orders/invoices
  - ✓ Criterion to determine cleaning needs and method
- **Observation**
  - ✓ To verify methods and sediment disposal
  - ✓ Weed barrier location, FAV coverage at time of visit
- **Caveats**
  - ✓ Canal cleaning and pumping off-site at the same time is not a BMP
  - ✓ Remove FAV mechanically, even if treated with herbicides
  - ✓ Herbicidal control of FAV limited to spot spraying of weedy areas

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Vegetation on Ditch and Canal Banks & Ditch Bank Berms

- **Observation**
  - ✓ Vegetated berms along canal banks
  - ✓ Herbicide overuse can kill canal vegetation causing soil erosion

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Leveling Fields, Sumps

- **Leveling fields** – Work orders/invoices, maps
- **Sediment sump upstream of discharge structure**
- **Field ditch sump**

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Slow Drainage, Cover Crops

- **Slow field ditch drainage**
  - ✓ **Culverts with risers**

- **Cover crops or flooded fields**
  - ✓ No P is applied to cover crops
  - ✓ Runoff from flooded and rice fields is not pumped directly off-site
  - ✓ Maps, work orders/invoices (e.g. cover crop seeds)

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Checklist for BMP Verification

- Nutrient spill prevention: Protocols are up to date
- Controlled application: Periodic field observation verifies implementation
- Soil Testing: Proper methods and technical documentation. Application recommendations for P buildup or maintenance do not meet the goal of this BMP
- Water management: Pump logs include appropriate comments when deviations occur. Follow rainfall and elevation criteria
- Particulate matter and sediment controls: Uniform implementation and timing
- Overall: Permittee is responsible for appropriate implementation by staff, contractors, and lessees

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Discharge Monitoring Plan - Verification

- P concentration, flow, and load are reported electronically
- Goal – Verify P loads are accurate:
  - ✓SFWMD approved flow rating equations for all discharge pumps
  - ✓Periodic flow verification using pump logs and rating equations
  - ✓Water quality submittals are up to date
  - ✓Periodic field audits of water quality sampling
- Laboratory results may be requested to verify consistency with levels reported
- Site visits also include review of water quality data (e.g., trends, comparison among farms, etc.)
- In some cases, improvements can be made if a relationship between P levels and farm activities is observed

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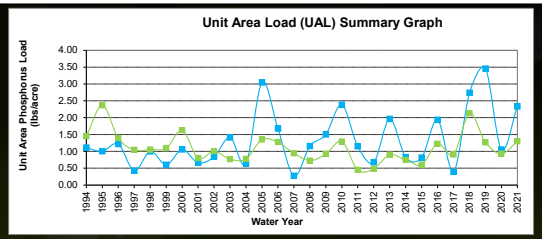
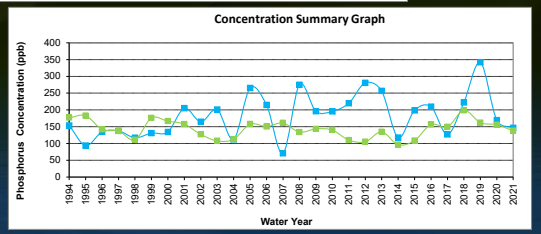
Water Quality Data





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EAA Basin P Load Performance

- TP data collected at EAA inflow and outflow points are used to calculate the measured EAA TP load in runoff for the current water year.
- A mathematical model is used to predict the EAA baseline period TP load in runoff that accounts for the current year's rainfall conditions.
- EAA Basin compliance is based on comparing the measured EAA Basin TP load for the current water year with the rainfall adjusted baseline period predicted TP load
- The WOD program has set a minimum goal of 25% reduction of TP load from the EAA, adjusted for rainfall when compared with the baseline period

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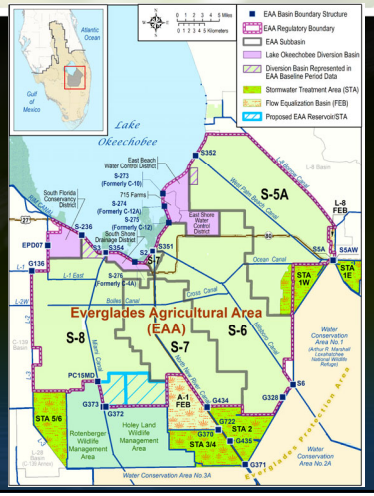
EAA Map of Inflows and Outflows



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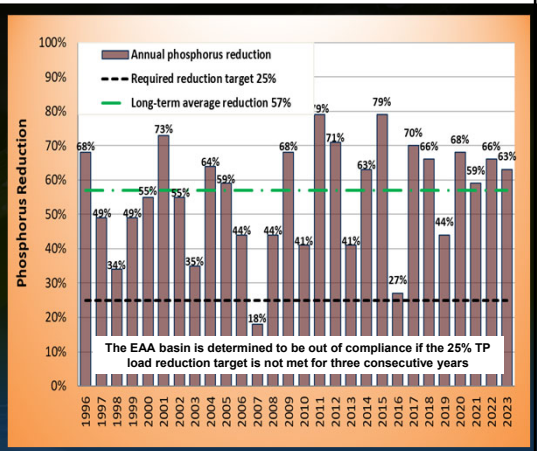
Assessment of Program Performance

- The EAA Basin is required to reduce TP loads by 25% compared to a period before the BMP Program.
- To do this assessment, TP loads are monitored at EAA outflow points.
- A mathematical model is used to estimate TP load before the BMP program given the same hydrologic conditions.

EAA Basin has a 23-year average load reduction of 57%!



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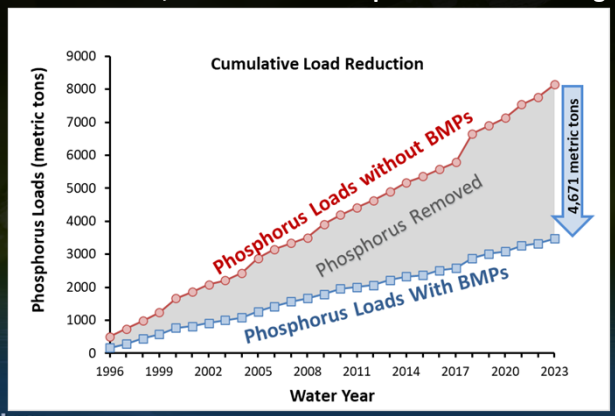
Reducing Phosphorus into Stormwater Treatment Areas (STAs)

BMPs Prevented 4,671 mtons of Phosphorus from Entering STAs



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Summary

- Celebrating 28 years of the BMP Regulatory Program – 1996- 2023
- The BMP Regulatory Program continues to be extremely successful with a long-term reduction of phosphorus in runoff averaging 57%
- The Program provides legally defensible verification of performance based on BMP implementation, field and records verification and water quality monitoring
- Ongoing implementation is essential as the program is the keystone of one of the biggest restoration projects in the world

*** And your role is key to program success! Thank You! ***

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Contacts

Gary Priest, P.E., Engineering Section Administrator
E-mail: gpriest@sfwmd.gov
Susan Pascal, Engineering Specialist 4
E-mail: spascal@sfwmd.gov
Youchao Wang, P.E., Lead Engineer
E-mail: ywang@sfwmd.gov

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Questions?

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