Best Management Practices (BMPs) Regulatory Program

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Agenda

- What are “best management practices” (BMPs)?
- Why is there a BMP regulatory program in the EAA?
- How are BMP Plans and Discharge Monitoring Plans verified?
- How well is the BMP regulatory program working?

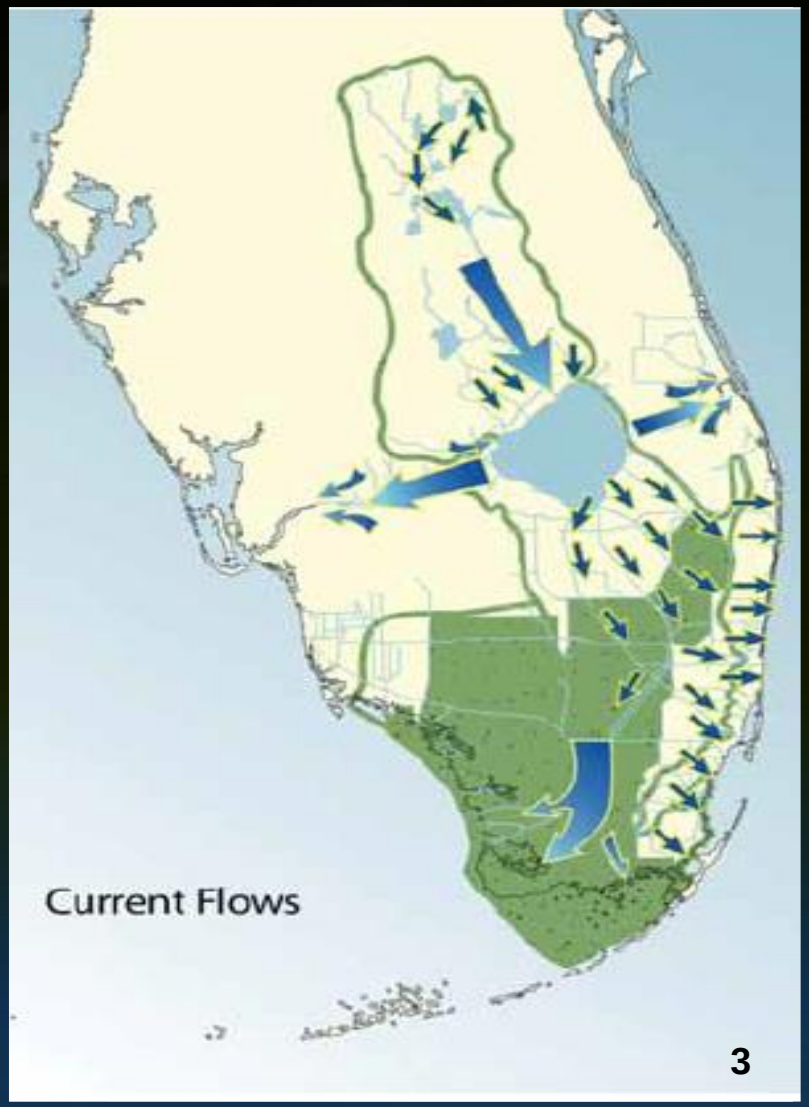
Best Management Practices

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*.

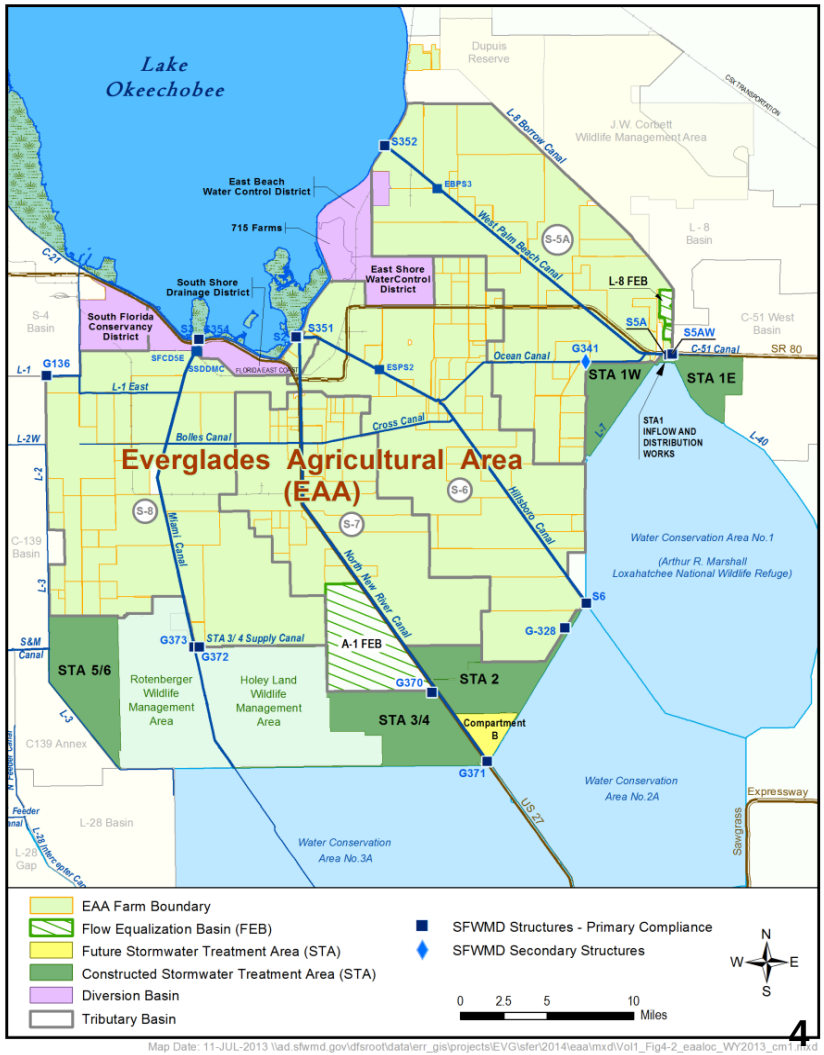
The Everglades Ecosystem

- Natural drainage: Kissimmee River – Lake Okeechobee – Everglades – Florida Bay
- 1800's – Drainage network for agriculture, flood control, and development
- 1988 – Conflicting priorities and lawsuits
- 1994 – Restoration plan is defined (Everglades Forever Act)



BMP Regulatory Program

- Permit for P discharges into SFWMD canals:
  - ✓Comprehensive BMP Plan
  - ✓Discharge Monitoring Plan
  - ✓Training
- BMP research through EAAEPD
- EAA Basin Performance
  - ✓ District monitoring
  - ✓ Tracking trends



BMP Site Verifications

- **Prior**
  - Review permit, BMP annual report, previous visit reports, operation criteria, and farm data
  - Contact landowner or entity – Site verification checklist
- **During**
  - Review documentation
  - Field observations
- **After**
  - Follow up – Pending information or questions
  - Report (including recommendations, if applicable)

Common BMP Plans

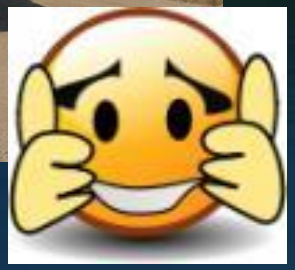
BMP Plan A (53% of EAA)
Nutrient Application Control
Nutrient Spill Prevention
Soil Testing
Particulate Matter & Sediment Controls (4)
Water Management (1.0-inch)

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

Nutrient Spill Prevention

- Formal practices and protocols for nutrient handling, transfer, and disposal. Protocols include guidelines on:
  - ✓Proper handling of materials that contain P
  - ✓Equipment operation to minimize misplacement & spillage
  - ✓Location of transfer areas
  - ✓Clean-up procedures and documentation
  - ✓Training on spill prevention practices
- Permittee is responsible for BMP implementation. If application services are contracted, both contractor and permittee should be trained in spill prevention practices and ready to assist in the event of a spill.

Nutrient Spill Prevention



Nutrient Application Control

- Uniform and controlled boundary application of P
- Typical methods observed:
  - ✓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

Nutrient Application Control

BMP Documentation

- Nutrient Spill Prevention
  - ✓ Formal Spill Prevention Protocol
  - ✓ Training attendance sheets
  - ✓ Record of spills reported
- Nutrient Application Control
  - ✓ If contracted, applicator invoices identifying fertilized areas, crop, and application method
- Observation of nutrient application and spill prevention practices by District staff typically occurs every three years or if there is a change to your applicator.

Soil Testing

- Goal: Avoid excess P application by determining soil P levels and using justified crop specific recommendations
- Soil samples shall be collected and reviewed prior to application for the acreage in production
- Soil P analysis results shall be used to improve the accuracy of the P application rates and reduce over-application of P
- The permittee is responsible for obtaining and reviewing soil P data as a guideline for application
- Where application rate or quantity differs from soil test recommendations, keep notes on the logic for the difference

Soil Test Methods

- Laboratories use different methods (extractants) to determine soil P levels
- The use of the appropriate soil test method reduces the potential for over-application. Ensure that the laboratory uses a method based on your soils and crops
- An appropriate method provides recommendations based on yield response curves developed by correlating laboratory-measured soil P levels with yield responses measured in the field
- The technical basis for the recommendations is requested on a case by case basis (e.g., yield response curves, site-specific pilot studies, applicable industry standards)

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 is necessary for <u>all</u> lessees, even if they are short-term
- Total P application rate of all P nutrients must not exceed P recommended rate
- Specific considerations for organic amendments. Requirements may vary based on the source, amounts applied, water quality, etc.

Soil Test – Verification Example

FARM 1

Total Acreage: 463
Crops: Sugarcane, vegetables
Verification Period: 2014 - 2015

F1A (32 ac)	F1B (31.6 ac)
F2A (34 ac)	F2B (33.7 ac)
F3A (35.3 ac)	F3B (35 ac)
F4A (35.5 ac)	F4B (35.8 ac)
F5A (33 ac)	F5B (33.4 ac)
F6A (34 ac)	F6B (34 ac)
F7A (27.3 ac)	F7B (28.4 ac)

Sweet corn
Sugarcane

** This is a fictional example*

Soil Test Verification Example* - Sweet Corn

Date	Laboratory	Field ID	Acreage	pH	Extractant Pw	IFAS Recommended P2O5 (lb/ac)
12/10/14	IFAS	F5A	33	6.9	10	67
		F6A	34	6.6	12	40
		F7A	27.3	6.0	10	67

Date	Invoice No.	Mix	%P	Ton	P Applied (lb/ac)
01/03/15	68229	8-5-30	5%	18.5	19.6
01/15/15	36521	11-37-0	10%	5.4	42.4

Total P applied = 62 lb/ac

** This is a fictional example*

Soil Test Verification Example* - Sugarcane

Date	Laboratory	Field ID	Acreage	Term	pH	Extractant Pm1	In-house Recommended P2O5 (lb/ac)
01/08/14	Waters	F5B	33.4	1st Ratoon	7.6	26	56

Date	Laboratory	Field ID	Acreage	Term	pH	Extractant Pm3	In-house Recommended P2O5 (lb/ac)
08/15/14	IFAS	F3B	35	Plant	5.7	28	20

Date	Invoice No.	Mix	%P	Ton	P Applied (lb/ac)	Comments
02/17/14	44556	6-14-39	14%	22.37	56	Permittee indicated that from the total invoice amount, 6.7 tons were applied in Field F5B
09/01/14	22334	7-12-34	12%	15.14	40	Permittee indicated that from the total invoice amount, 5.9 tons were applied in Field F3B

** This is a fictional example*

Water Detention

- Permit indicates if discharges start after 0.5, 1 or 1.5 inches of rain based on rain gages onsite
- Detention is based on water table depth and crop needs
- When multiple permittees within a Basin ID, each permittee is responsible for BMP implementation
- Control and critical elevations may be required for example:
  - ✓ Start and stop discharge elevations
  - ✓ Elevations associated with critical activities (e.g., harvesting, planting, land preparation)

Water Detention Documentation

- Detention plots – Tool to depict daily rainfall and flow
- Pump logs – Review includes:
  - ✓Did discharges occur after the rainfall detention level was met?
  - ✓Were start elevations met?
  - ✓Were stop elevations met?
  - ✓Were deviations because of critical activities and were they in accordance with critical elevations?
  - ✓Are appropriate comments included for deviations?
  - ✓Are deviations recurring, suggesting that the water detention BMP cannot be consistently achieved?

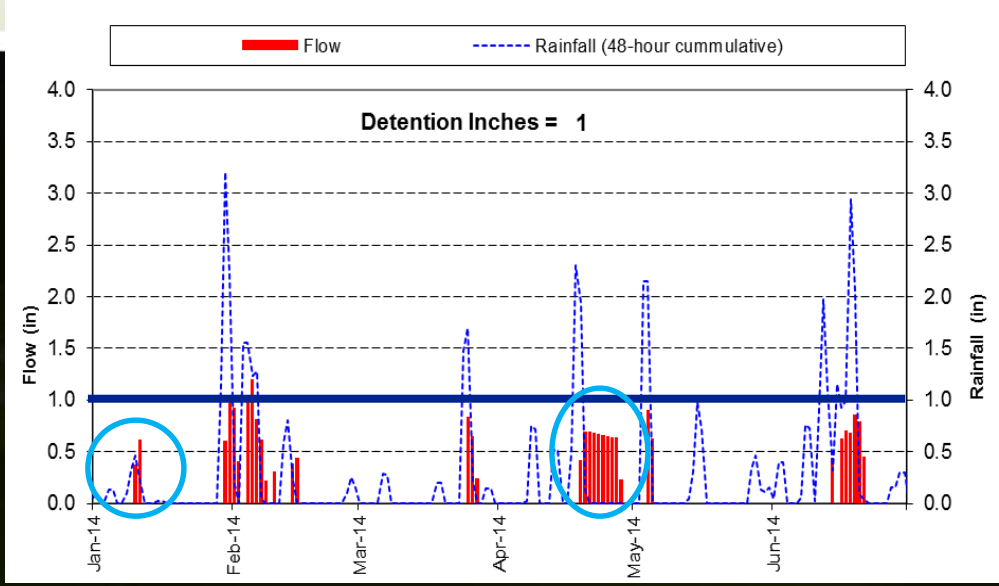
Field Observation

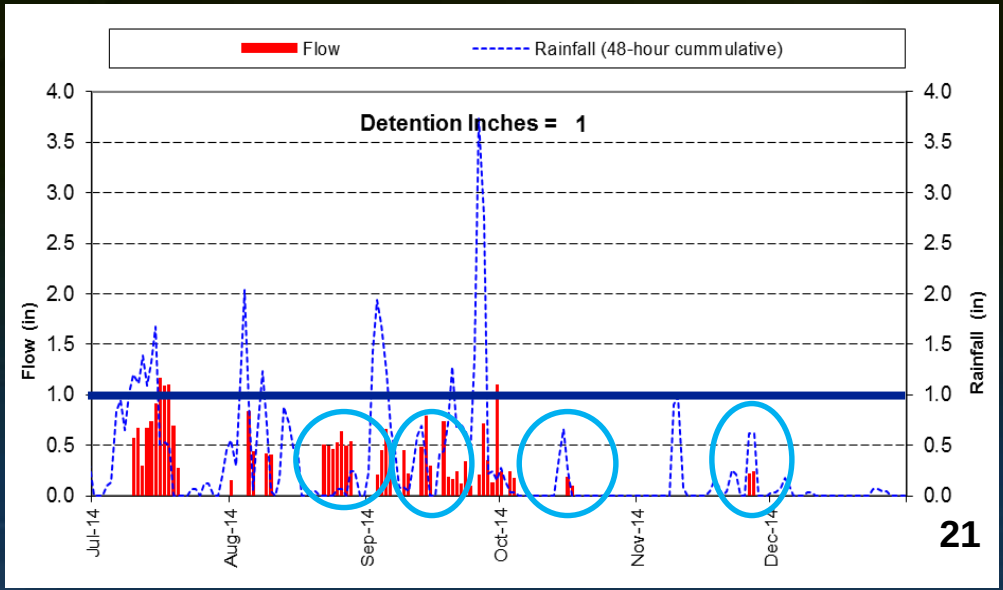
There may be instances in which verification of staff gages being relative to each other is needed

Water Detention – Verification Example*

Before the site visit:

- Screening of detention graphs:
  - ✓ Six discharge events prior to detention criterion
- Pump logs to be requested:
  - ✓ April 2014
  - ✓ August – September 2014





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Water Detention - Verification Example*

- Discharge criterion (rainfall or start/stop elevations) to achieve permitted detention
- Review requested pump logs for:
  - ✓ Structure operation in accordance with discharge criterion
  - ✓ Completeness
    - Staff gage readings. Minimum twice/day when continuous pumping
    - Daily raingage reading
    - Date, time, and pump speed (rpm)
    - Notes explaining special pumping events, maintenance activities, etc.

FARM NAME: Sucrose STRUCTURE: WPXX.XTS PUMP#: 2 DETENTION 0.5" MONTH/YEAR: November, 2009

DAY	1st READING						2nd READING						DAILY RAINFALL	COMMENTS	MGD
	START	STOP	TIME	RPM	INSIDE STAFF GAUGE	OUTSIDE STAFF GAUGE	START	STOP	TIME	RPM	INSIDE STAFF GAUGE	OUTSIDE STAFF GAUGE			
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

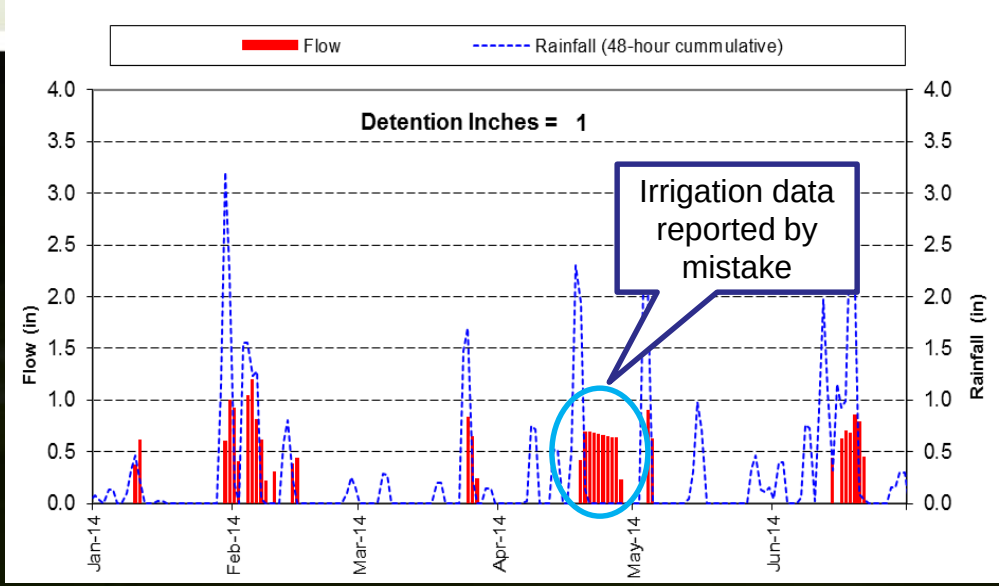
Note: Follow start and stop pumping criteria of 8.6 ft. and 7.0 ft, respectively. Pumping stops at 5.9 ft for crop harvesting or planting.

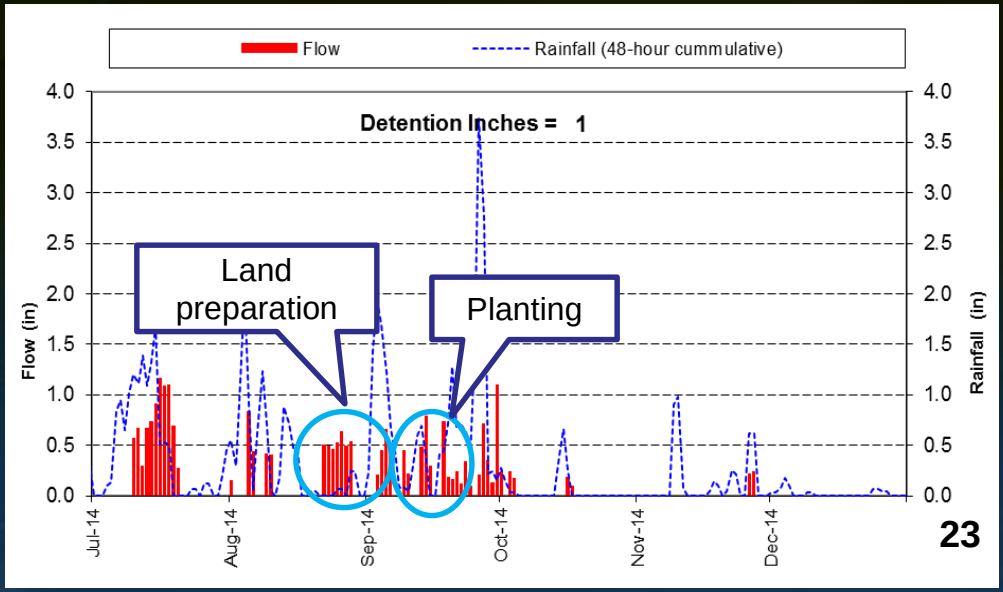
** This is a fictional example*

Water Detention – Verification Example*

Based on pump logs review:

- April 2014 – Request permittee to resubmit data
- August and September 2014 – Discharges met critical elevation criterion





** This is a fictional example*

Particulate Matter & Sediment Controls

- Permits 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

Particulate Matter & Sediment Controls

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

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
  - ✓ Important:
    - 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
- **Observation**
  - ✓ To verify methods and sediment disposal
  - ✓ Weed barrier location, FAV coverage at time of visit

Vegetation on Ditch and Canal Banks & Ditch Bank Berms

Observation

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

Sediment Control Practices

- **Leveling fields** – Work orders/invoices, maps

- **Sediment sump upstream of discharge structure** – Field observation; maintenance records (maps)

- **Field ditch drainage sump** – Field observation; consistently implemented throughout the farm

Sediment Control Practices

- **Slow field ditch drainage –** Field observation of culvert with risers (i.e., boards on)

- **Cover crops or flooded fields**

  Maps, work orders/invoices (e.g., cover crop seeds).

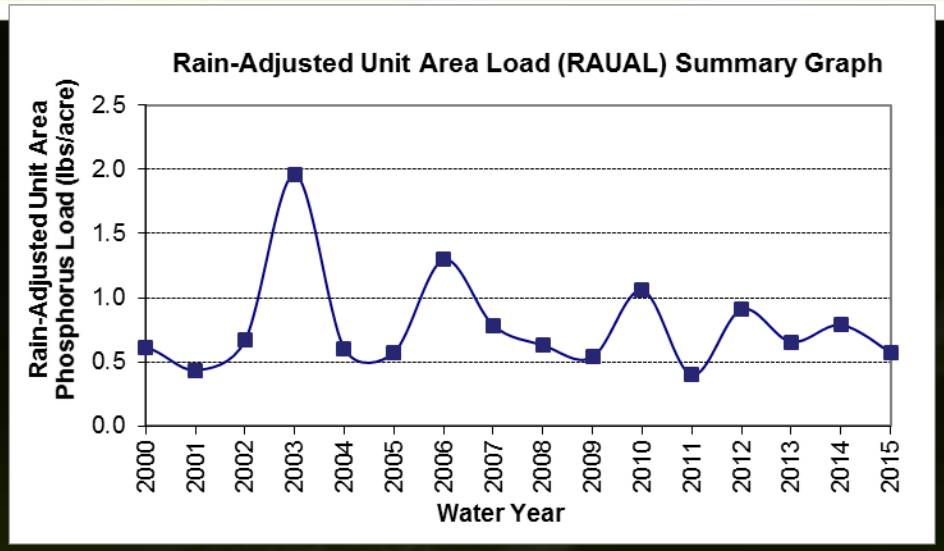
  No P is applied to cover crops

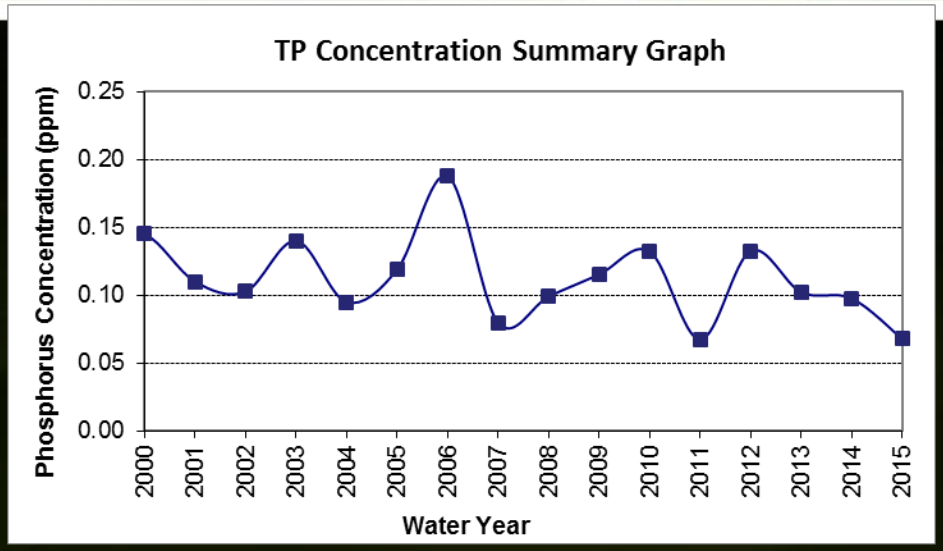
  Runoff from flooded and rice fields is not pumped directly off-site

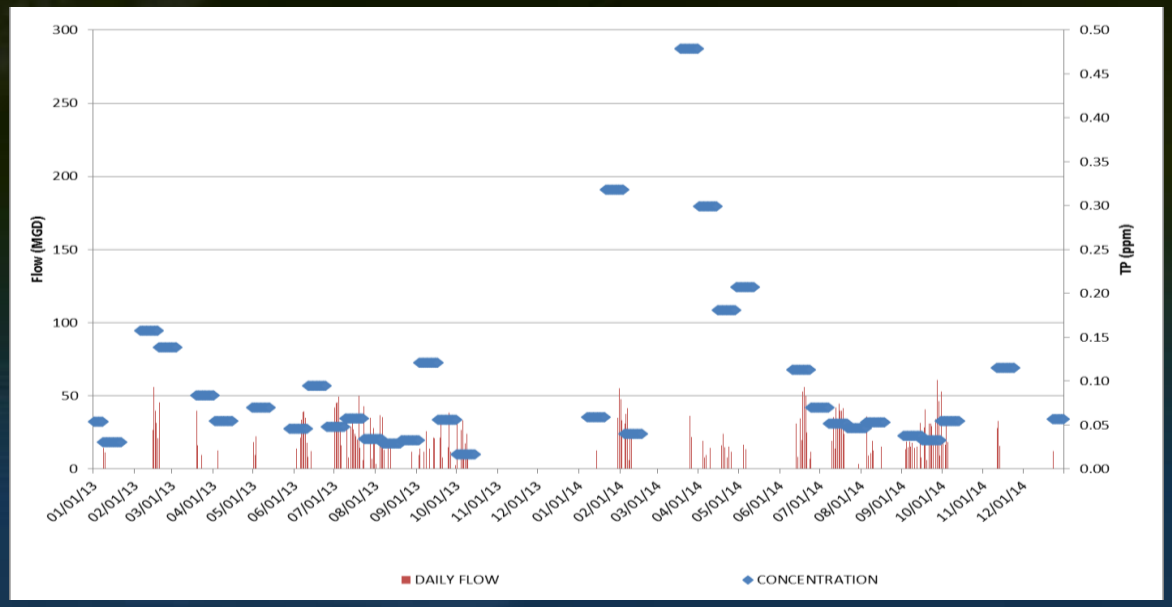
Water Quality Monitoring Plan - Verification

- P concentration, flow, and load are reported electronically
- Goal – Verify P loads are accurate:
  - ✓Equipment (autosampler, rain gage, staff gages)
  - ✓Flow verification
  - ✓Water quality submittal (up to date)
  - ✓Water quality audits (annually)
- 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

Water Quality Permittee Data







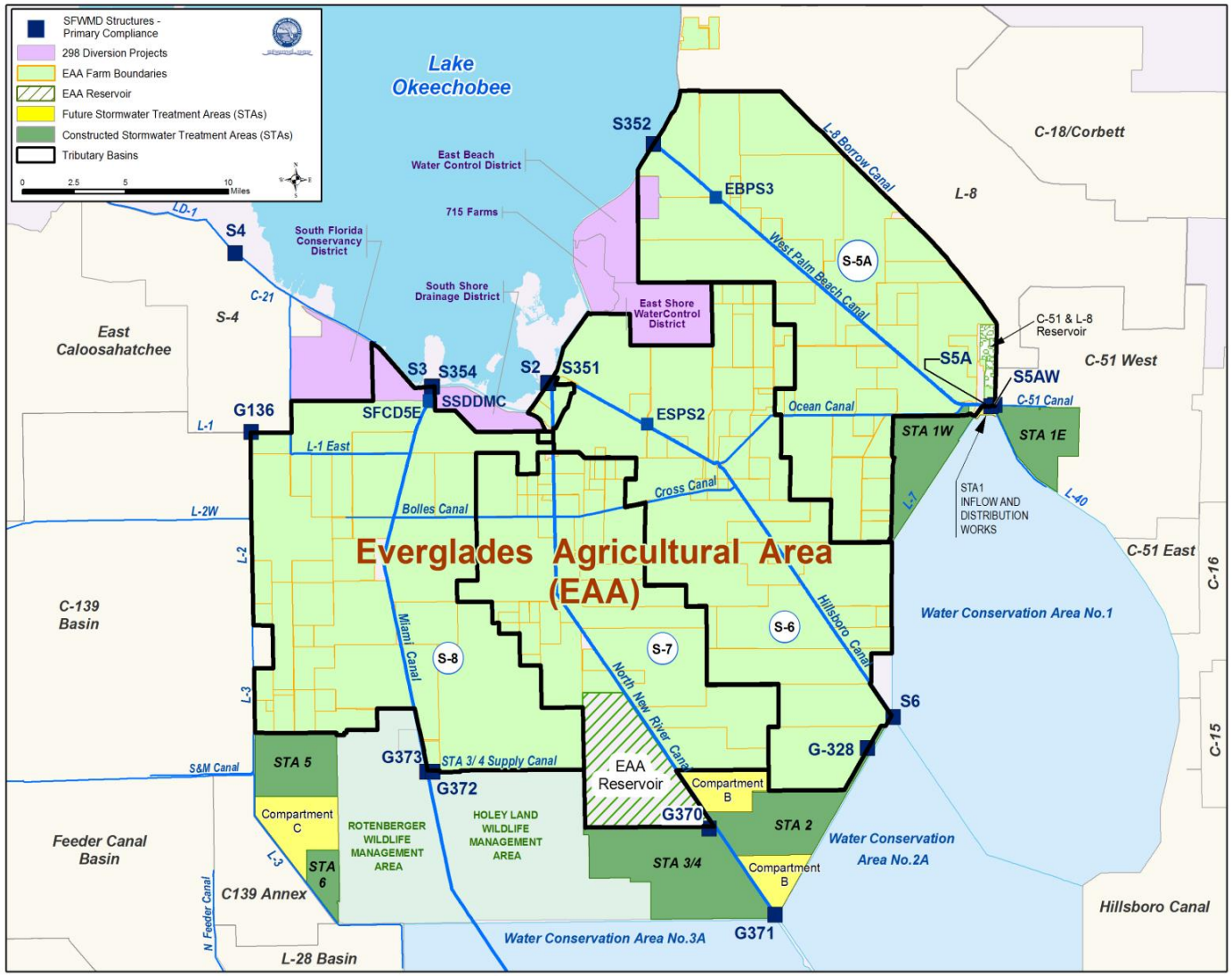
Checklist for BMP Verification

- 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

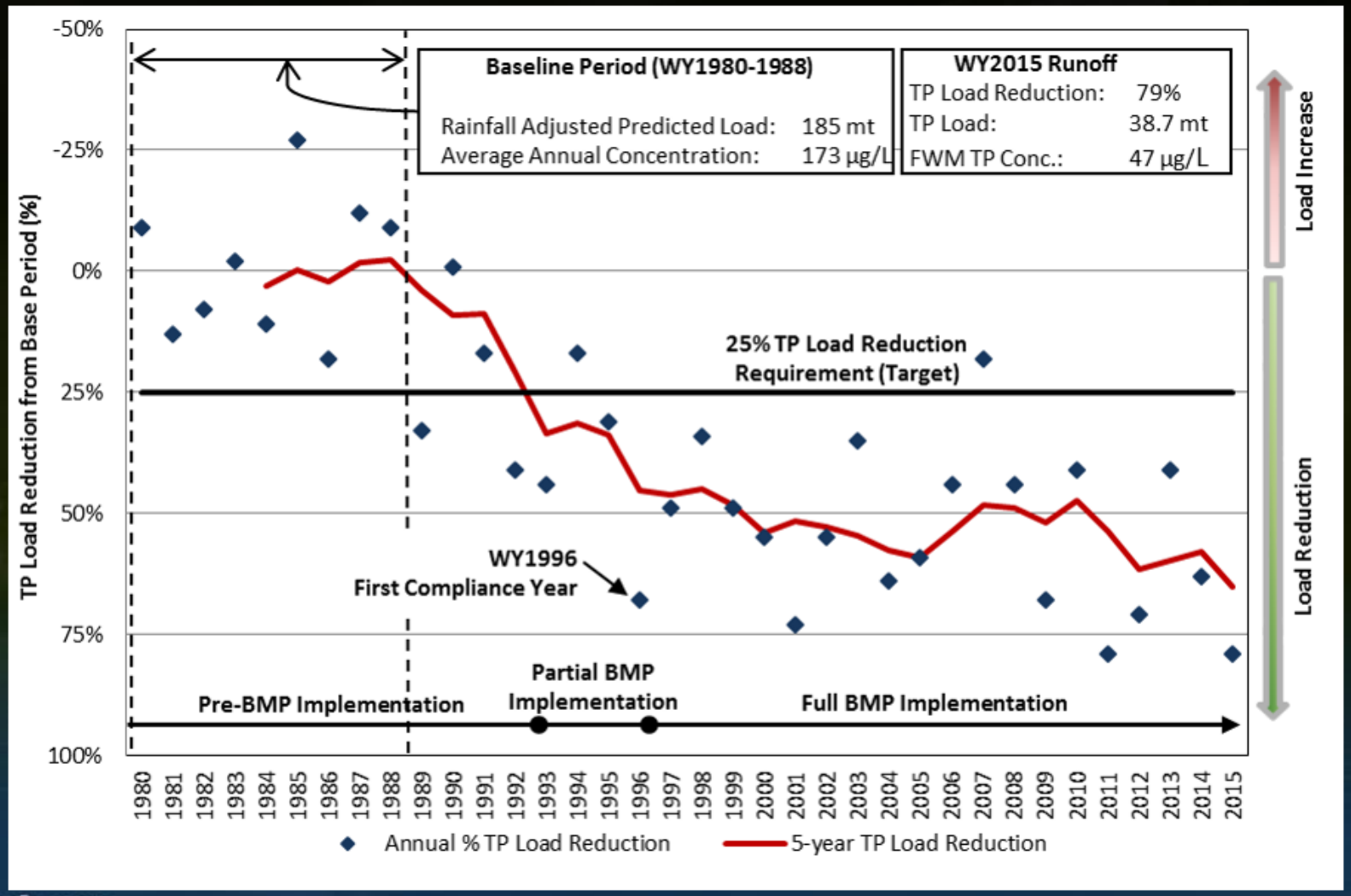
EAA Basin P Load Performance

- TP data collected at EAA outflow points represent total TP load leaving the EAA
- A mathematical model is used to calculate EAA runoff representative of permittee discharges from EAA. The model excludes inflow loads passing through from Lake Okeechobee and other sources (298 diversion areas and C-139 Basin)
- EAA Basin compliance is based upon the entire EAA Basin runoff load for current water year vs. rainfall adjusted base period runoff load
- EAA Basin runoff load requirement is to reduce at least 25% from the base period load, adjusted for rainfall

EAA Map of Inflows and Outflows

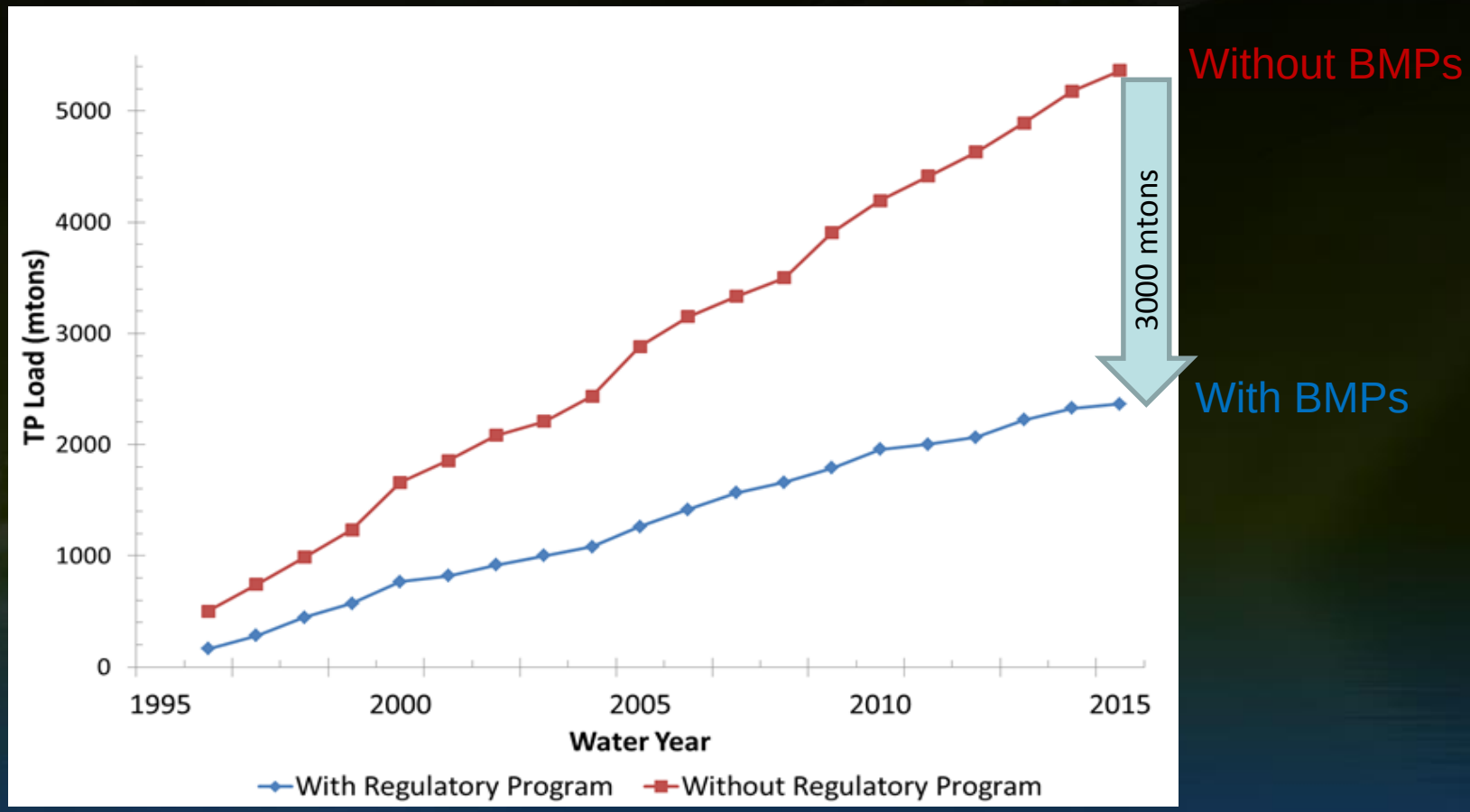


EAA Basin Historical Performance



Reducing Phosphorus into Stormwater Treatment Areas (STAs)

BMPs Prevented 3000 mtons of Phosphorus from Entering STAs



Summary

- Celebrating 20 years of the BMP Regulatory Program – 1995 - 2015
- The BMP Regulatory Program continues to be extremely successful with a long-term reduction of phosphorus in runoff averaging 56%
- 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! ***

Contacts

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Questions?