Best Management Practices (BMPs) Regulatory Program

Ximena Pernett, P.E.
Bureau of Everglades Regulation
September 25, 2014
Agenda

- What are “best management practices” (BMPs)?
- Why is there BMP regulatory program in the EAA?
- How are BMPs verified?
- What are the performance results for water year 2014?
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 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.
Everglades National Park

- Natural drainage: Kissimmee River – Lake Okeechobee – Everglades – Florida Bay
- 1800’s – Drainage network for agriculture, flood control, and commercial and residential development
- 1988 – Conflicting priorities and lawsuits
- 1994 – A restoration plan to protect the Everglades is defined (Everglades Forever Act)
Restoration Plan

- Regulatory BMP Program
- Stormwater Treatment Areas (STAs)
- Phosphorus (P) discharge monitoring plan
- Performance evaluation
- Tax incentives
- Continue research and education program
BMP Regulatory Program

- Permit for P discharges in SFWMD canals:
  - Comprehensive BMP Plan
  - Discharge Monitoring Plan
  - Training
- BMP research through EAAEPD
- EAA Basin Performance
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 BMPs

<table>
<thead>
<tr>
<th>Category</th>
<th>BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrient Management</strong></td>
<td>Nutrient application control</td>
</tr>
<tr>
<td></td>
<td>Nutrient spill prevention</td>
</tr>
<tr>
<td></td>
<td>Soil testing</td>
</tr>
<tr>
<td><strong>Water Management</strong></td>
<td>Water detention (0.5 – 1.5 inches)</td>
</tr>
<tr>
<td><strong>Particulate Matter &amp; Sediment Controls</strong></td>
<td>1. Canal cleaning program</td>
</tr>
<tr>
<td>(4 o 6 based on detention level)</td>
<td>2. Ditch bank berms or vegetation on ditch banks</td>
</tr>
<tr>
<td></td>
<td>3. Laser leveling</td>
</tr>
<tr>
<td></td>
<td>4. Sediment sump upstream of drainage structure</td>
</tr>
<tr>
<td></td>
<td>5. Sediment sump upstream of field ditches</td>
</tr>
<tr>
<td></td>
<td>6. Slow velocity in main canal near discharge structure</td>
</tr>
<tr>
<td></td>
<td>7. Cover crops</td>
</tr>
<tr>
<td></td>
<td>8. Grassed swales</td>
</tr>
<tr>
<td></td>
<td>9. Aquatic weed control and barriers at discharge locations</td>
</tr>
</tbody>
</table>
Nutrient Spill Prevention

**Documentation**
- Spill prevention protocol (handling, transfer, storage, disposal, etc.)
- On-going training (in-house or IFAS)
- Document spills and clean-up actions
- Important: If contracted out, permittee is still responsible

**Observation**
- Coordinate site visit to observe nutrient application (any form)
- Transfer areas away from ditches and canals
- Park hopper away from ditches and canals
- Clean-up nutrient spills immediately
- Shovel spilled nutrients back into hopper or spread on field
Nutrient Spill Prevention
Nutrient Application Control

- **Documentation**
  - If contracted, work orders/invoices to indicate equipment used
  - Review of records done for representative sample
  - Applicable to all crops and nutrient forms (dry, liquid, organic) applied in last 2-3 years

- **Observation**
  - Application is at the “root zone” (e.g., banding, side dressing, pneumatic applicator, etc.)
  - No overlapping application
  - Operator turns off equipment at crossing/turning points to prevent spills
Nutrient Application Control

Banding
(sugarcane, vegetables)

Side dressing
(ratoon, corn)
Nutrient Application Control

Vegetable Fertilization (mulched beds)

Pneumatic applicators (corn, sod)

Air Max
Soil Testing

- For a representative sample of crops grown, soil test results, P recommendations and P application records are reviewed
  - Important: This information is necessary for all lessees, even if they are short-term
- Fertilizer invoices indicating P content (or P$_2$O$_5$). If not a commercial fertilizer, analysis of P content should be provided
- Total P application rate of all material must not exceed P recommended rate
Soil Testing

- Standard recommendations are designed to provide the P needed not available in the soil based on technical documentation
- UF/IFAS and private entities have developed nutrient recommendations
- Clarification on the technical basis for the recommendations is requested on a case by case basis (e.g., yield response curves, site-specific pilot studies)
- If deviations from P recommended rates, technical basis needs to be provided
Water Detention

- Permit indicates if discharges start after 0.5, 1 or 1.5 inches of rain based on rain gage(s) onsite
- Detention level based on water table depth and crop needs
- Optional: Control/critical elevations may be developed specifying elevations when structure will discharge, for example:
  - Normal water elevation and when pump is turned off/on
  - Critical activities – harvesting, planting, land preparation, etc.
Screening using detention plots - These plots depict daily rainfall and flow

Verification using pump logs – In particular for discharges prior to permitted rainfall detention:

- Did discharges occur because start elevations were met? Were stop elevations met?
- Did discharges occur because of critical activities and in accordance with critical elevations?
- Are elevation criteria conducive to achieving the detention levels required in the permit?
Detention Plots

Request pump log
A complete pump log includes:

- Upstream and downstream staff gage readings indicating start and stop elevations. Minimum twice/day readings when continuous pumping
- Daily rain gage readings
- Date, time, and pump speed (rpm)
- Operator’s name
- Notes explaining special pumping events, maintenance activities, etc.

<table>
<thead>
<tr>
<th>Day</th>
<th>Start Time</th>
<th>Stop Time</th>
<th>RPM</th>
<th>Inside Staff Gauge</th>
<th>Outside Staff Gauge</th>
<th>Daily Rainfall</th>
<th>Comments</th>
<th>Mud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08:00</td>
<td>15:00</td>
<td>8.6</td>
<td>12.2</td>
<td></td>
<td>0.00</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>07:30</td>
<td>15:00</td>
<td>8.6</td>
<td>12.2</td>
<td></td>
<td>0.00</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>07:30</td>
<td>15:00</td>
<td>8.5</td>
<td>12.2</td>
<td></td>
<td>0.00</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

- These practices are reported annually (BMP Annual Report)
Particulate Matter & Sediment Controls

- Typically field verified. However, some practices required documentation (e.g., maps, work orders/invoices, photos)
- Practices implemented consistently throughout the farm
- Important: Permittee is responsible for lessee’s implementation and documentation
Canal Cleaning

- **Documentation**
  - Maps indicating dates and canal segments and ditches that were cleaned
  - If contracted, work orders/invoices
  - Criterion to determine canal cleaning needs and method
  - Important: Canal cleaning and pumping at the same time is not a BMP

- **Observation**
  - Recommended to verify methods and sediment disposal
Vegetation on Ditch and Canal Banks & Ditch Bank Berms

Observation
✓ Vegetated berms along canal banks
✓ Herbicide overuse can kill canal vegetation
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
Floating Aquatic Vegetation (FAV) Control

Documentation

- ✓ Maps indicating dates and canals/ditches cleaned
- ✓ If contracted, work orders/invoices;
- ✓ Indicate criteria to determine cleaning need and method
- ✓ Important: Remove FAV mechanically, even if treated with herbicides
- ✓ Herbicidal control of FAV limited to spot spraying of weedy areas

Observation

- ✓ Weed barrier location, FAV coverage at time of visit, FAV removal method and disposal
P concentration, flow, and load are reported electronically

Goal – Verify P loads are accurate:
- Equipment (autosampler, rain gage, staff gages)
- Flow
- Water quality audits

Site visits also include review of water quality data (e.g., trends, comparison among farms, etc.)

Laboratory results may be requested to verify consistency with levels reported

In some cases, improvements can be made if a relationship between P levels and farm activities is observed
EAA Basin P Load Performance

- EAA Basin runoff is a calculation of flows and P load leaving the EAA as a result of local EAA discharge.
- The mathematical model used to calculate EAA runoff excludes inflows (pass-through or irrigation) from Lake Okeechobee and other sources (diversion areas and C-139 Basin).
- EAA Basin compliance is based upon the entire EAA Basin runoff load vs. predicted runoff load.
- If the basin runoff load is at least 25% less than predicted load, the basin is in compliance.
EAA Map of Inflows and Outflows

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Everglades Agricultural Area (EAA)
EAA Basin Historical Performance

Base Period (WY1980-1988):
- Rainfall Adjusted Predicted Load: 285 mt
- Average Annual Concentration: 173 ppb

- TP Load Reduction: 63%
- TP Load: 104.5 mt
- FWM TP Conc.: 94 ppb

25% TP Load Reduction Requirement (Target)

First Compliance Year (WY1996)

Pre-BMP Implementation

Partial BMP Implementation

Full BMP Implementation

Annual % TP Load Reduction

5-year TP Load Reduction
The BMP Regulatory Program is the result of an exhaustive negotiation process.

The Program is the base of one of the biggest restoration projects in the world.

The Program provides a performance verification system based on implementation, training, research and P measurement which demonstrates its success.

*** ¡And You are part of this project! Thank You! ***
Contacts

- Carmela Bedregal, P.E., Section Leader
  Bureau of Everglades Regulation
  E-mail: cbedrega@sfwmd.gov
  Phone: (561) 682-2737

- Ximena Pernett, P.E., Staff Engineer
  Bureau of Everglades Regulation
  E-mail: xpernett@sfwmd.gov
  Phone: (561) 682-2928
Questions?