An Overview of Stormwater Management and the Role of Low Impact Design BMPs in Pinellas County Continued
6.6. LID BMP: Pervious Pavements

- Pervious concrete
- Pervious pavers
- Turf block
- Geoweb with sod
Pervious Pavement Considerations

Location
Design
Construction
Maintenance
Inspection
Pervious Pavement Considerations - Location

- Appropriate soils for retention systems
- Avoid high traffic volumes, frequent turning areas, heavy wheel loads
- Avoid areas with high potential for hazardous material spills
- Avoid areas with high levels of wind-blown sediment
- At least 75 feet from public or private potable water supply wells
- At least 15 feet from onsite wastewater disposal/treatment systems
Pervious Pavement Considerations – Design

- Flat or minimal slope
- SHWT at least 2’ below bottom
- Treatment volume based on retention curves
- Perc rate minimum 2”/hr
- Recovery in 72 hours (safety factor of 2)
- Edge constraint to prevent scour
Pervious Pavement Considerations – Design
Embedded Ring Infiltrometer Kit (ERIK)

Pervious Pavement Considerations - Construction

• Installation by certified trained personnel
• Excavate with light, wide tracked equipment
• Inspect bottom and install fabric, 24” overlap
• Install clean, washed stone in < or = 12” lifts, compact subgrade to 92% - 95%
• Check mixtures, pour, and finish
• Cover to allow curing
• Stabilize contributing areas before use
• Post signs to educate users
Placement, Striking, Pizza Cutter and 7 day Curing
ERIK
(Embedded Ring Infiltrometer Kit)
Pervious Pavement Considerations – Maintenance and Inspection

• Quarterly to annual vacuum sweeping
• Stabilization of contributing drainage area
• Check for nuisance ponding
• Check edge constraints and overflow areas for erosion
• ERIK testing
• Recertification
City of Largo
Unpaved Roads Improvements

Yellow = Project Area

Marcello Tavernari, P.E.
City of Largo
Unpaved Roads Improvements

March 28, 2017
March 28, 2017
Pervious Pavement – Exceptions for Walks and Bike Paths

• No slope constraints
• No edge constraints
• No ERIK required
• For soils with SHGWT 0-18” below, 80% subtracted from contributing area
• For soils with SHGWT >18” below, 100% subtracted from contributing area
• Vacuum sweeping and re-certification normally not required
Pervious Concrete Information

- Florida Concrete & Products Assn.
- http://www.fcpa.org/
- www.ConcreteParkingLots.com
- Manuals
- Training classes
- Training videos
6.7. LID BMP - Green Roof with cistern

- Vegetated roof cover
- Active (Intensive): Deep media, intended for public access
- Passive (Extensive): Shallow media, intended for maintenance access only, designed for aesthetics
Benefits Of Green Roofs

- Economic benefit
- Stormwater management
- Improve air quality
- Moderate urban heat island effect
- Thermal insulation
- Reduce energy consumption
- Sound insulation
- Health and horticultural therapy
- Recreation
- Food supply
- Habitat and wildlife biodiversity
- Aesthetics
Energy Benefits Of Green Roofs In Florida

- Based on UCF green roof monitoring
- Control = New Energy Star roof
- Green roof benefits increase with age while Energy Star roof benefits decline
- Green roofs increase solar panel efficiency

### Green Roof Heat Flux Reductions

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>18.8%</td>
<td>43.3%</td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td>49.4%</td>
</tr>
</tbody>
</table>
Florida Pilot Green Roofs

South Florida – 2003 – Bonita Bay Shadow Wood Preserve

Central Florida – 2005 – UCF Student Union

North Florida – 2011 – Escambia County One Stop Building

August 2003

August 2007
At Least 20 Green Roofs In Florida Since 2003

- UCF Student Union, physical science and Stormwater Lab (3)
- FSGE (Envirohome) (2) in Indialantic
- Bonita Bay
- New American Home in Orlando
- Charlotte County Stadium
- UF Perry Construction Yard Building
- Tecta-America Building in Sanford
- Romano Eco Center in Lake Worth
- Honda Headquarters in Clermont
- Escambia County Central Office One Stop Permit Building
- Residence on Casey Key
- Orlando Fire Station #1
- Environmental Center, Key West
- Kimley-Horn in Vero Beach
- Gulf Coast College in Panama City
- WAWA stores in select locations
- Disney Starbucks
FSGE Integrated Site Design

- green roofs, pervious pave, and landscape swales

- 4500+ gallons
Green Roof/Cistern System Design Considerations

- Building structural integrity
- Treatment volume per retention BMPs or design curve
- Waterproof membrane, drainage layer, pollution control media, growth media
- Preventing wind uplift – 3’ tall parapet
- Plants – selection, spacing, density
- Roof drain to cistern or other storage
- Irrigation – roof plants, excess for landscape
Roof Support For A Green Roof

Up to 70 lbs/SF

Up to 35 lbs/SF

Up to 50 lbs/SF

Up to 25 lbs/SF
CSTORM Model for Green Roof Cistern Design

• A green roof in Pinellas County will provide 44% annual retention of stormwater without a cistern.

• Combined with a cistern storing 2 inches of rainfall, the annual retention percentage increases to about 76%.
Maintenance Of Green Roofs

• Initial irrigation schedule follows ground level schedule.

• If used for pollution control credit, must maintain a log of irrigation times.

• If using a dedicated cistern, inspect for functioning at least once per month, this is primarily for cistern leaks and pump operation.

• For the first two years, pull unwanted vegetation at least once per month. Usually only once per year thereafter.

• Every year, replace plants to “fill in” where others have not survived.
## Green Roof Stormwater Price Comparison

<table>
<thead>
<tr>
<th>Down Town Orlando [Magnolia]</th>
<th>Lee Road and I-4</th>
<th>University Blvd.</th>
<th>International Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pond Price (Including Land Cost)</strong></td>
<td>$5,800,000.00</td>
<td>$1,550,000.00</td>
<td>$1,200,000.00</td>
</tr>
<tr>
<td><strong>Green Roof Price</strong></td>
<td>$1,400,000.00</td>
<td>$1,400,000.00</td>
<td>$1,400,000.00</td>
</tr>
<tr>
<td><strong>Realized savings</strong></td>
<td>$4,400,000.00</td>
<td>$150,000.00</td>
<td>-$200,000.00</td>
</tr>
</tbody>
</table>

Green Roof price includes fifty years of maintenance while the Pond price does not include any maintenance or fencing, green roof cost = $28/sq ft.
6.8. Wet Detention System

DESCRIPTION: A detention system with a permanent pool in which runoff is stored temporarily before discharge.
**Wet Detention System Processes Pollutant Removal**

- Occurs during quiescent period between storms
- Permanent pool crucial
  - Reduces energy, promoting settling
  - Habitat for plants and microorganisms
  - Must maintain aerobic bottom conditions
- Gravity settling
  - Pond geometry, volume, residence time, particle size
- Chemical flocculation
- Adsorption onto bottom sediments
- Biological processes
  - Metabolized by microorganisms
  - Uptake by aquatic plants, algae

http://clipart-library.com
Wet Detention Pollutant Removal

Average annual residence time is key factor

Max P removal is about 80%

BUT...

Max N removal is about 40%
Wet Detention Design Considerations

- Must have a permanent pool of water
- Appropriate soil type with high water table
- Use BMP Treatment Train to maximize treatment
- Increase performance by enlarging surface area to gain more volume instead of deepening
- Avoid short circuiting
- Increase efficiency with stormwater harvesting
Wet Detention Design Criteria

- Treatment efficiency based on residence time using graphs (Figures 6.8.2 and 6.8.3)
- Residence time: \( Rt = \frac{V}{Q} \) (\( V = \)Perm pool volume, \( Q = \) average annual flow rate)
- Control elevation: greater of normal wet season tailwater elevation or SHWT minus 6”
- Discharge: 1/2 BDV within 24 to 30 hrs.
- Mean pond depth > 6 feet
- Max depth < 12 feet or within aerobic zone
- Flow Path Ratio > 0.8 (Equation 6.8.2)
- Vegetated littoral zones optional
Wet Detention System Construction

- Verify location and dimensions; ensure all setbacks are met
- During excavation verify soil types are suitable
- If embankment is used, ensure proper compaction and use of anti-seep collars to prevent seepage
- Verify all elevations are consistent with permitted plan specifications
- Stabilize and vegetate around all inlets, outlets, structures
- Stabilize and vegetate side slopes
6.9. LID BMP - Stormwater Harvesting

DESCRIPTION: Harvesting retained or detained stormwater for non-potable uses, such as irrigation, car washing, toilet flushing, etc.

ADVANTAGES:
1. Lowers irrigation costs.
2. Increases BMP effectiveness (wet detention).
3. Reduces stormwater pollution into surface waters.
4. Saves potable water.
5. Enhances landscape vegetation.
6. Reduces groundwater use and salt water intrusion.
Wet Detention Design vs. Stormwater Harvesting Design

**TYPICAL X-SECTION OF A WET DETENTION SYSTEM**

1. The normal wet season tailwater elevation
2. The SHGWT minus six (6) inches

**TYPICAL X-SECTION OF A STORMWATER HARVESTING SYSTEM**

1. The normal wet season tailwater elevation
2. The SHGWT minus six (6) inches
Stormwater Harvesting Design Considerations

Zone 4 REV Curve

- Use Rate (inches/day over EIA)
- Runoff Volume of Water (inches over EIA)

- 90%
- 80%
- 70%
- 60%
- 50%
- 40%
- 30%
- 20%
Stormwater Harvesting Design Criteria

- Follow Wet Detention design criteria except for 6.8.4.(h) [recovery time] and (i) [outlet structure]
- Use Rate-Efficiency-Volume (REV) Curves and methodology in Section 6.9.7
- Establish stormwater storage volume in inches over the EIA (Equivalent Impervious Area) = CA
- Include back up supply
- Determine irrigation schedule
- Must have filtration system – sand filter or horizontal well
Project SMART - Florida

Regional wet detention pond serving roadway and commercial property

Wet detention pond cleaned, reshaped, revised to allow stormwater harvesting

Test case to verify design REV criteria

Water harvesting for irrigation of lawns
Community saved potable water as well as money.
Examples: Over 300 in Florida
Sources: Horizontal Subsurface Systems and G. Hartman
www.stormwater.ucf.edu

1. South Bay Utilities
   - Upscale residential irrigation demand
   - No CUP
   - No FPSC
   - No FDEP
   - 50¢/1,000 gallons
   - Shallow wells
   - Customer agreements
     900 homes - HOA
   - Coastal / fragile resource

• The collection and storage of roof runoff to reuse
• Reduces DCIA, runoff volume, loading, use of potable water
• Variety of uses from irrigation to potable uses
4 Types of Rainwater Harvesting Systems

1. Non-potable residential with rain barrel
2. Non-potable outdoor use with cistern
3. Non-potable indoor/outdoor use with cistern – Health Dept. approval
4. Potable use with cistern – Health Dept. approval
Rainwater Harvesting Design Criteria

- Effectiveness related to cistern volume and daily demand for harvested water
- 1” rain/SF = 0.6 gallons of water
- Divert first flush with diversion tee

![Zone 4 REV Curve](image)

![First Flush Diversion Tee](image)
Rainwater Harvesting Design Criteria

• Cistern can be above or below ground with overflow drain and auxiliary supply
• Water supply line must have meter
• Filter system depends on use of water. If no asphalt shingle roofs, use fine filters (5-20 microns)
Rainwater Harvesting Design Criteria

Safety Considerations
• Control access to cistern and pumps
• Label pipes “non-potable water”
• Separate from potable supply with backwater prevention, air gap

Permitting Considerations
• May require SWFWMD water use permit
• May require approval by Pinellas County Health Department and Pinellas County Development Services
6.11. Managed Aquatic Plant Systems (MAPS)

- Vegetated Littoral Zones
- Floating Wetland Mats*

*Still under study by County
*No treatment credit at this time
Vegetated Littoral Zones
BEEMATS – Floating Wetland Mats

Turning plants into pollution filters

Floating Wetland Mats

THE PLANTS
Thyme is a cooperation with six species:
- Thyme (Thymus capitatus)
- Thyme (Thymus vulgaris)
- Thyme (Thymus serpyllum)
- Thyme (Thymus pulegioides)
- Thyme (Thymus serpyllum)
- Thyme (Thymus pulegioides)

THE ROOTS
The plants are grown in a mixture of soil and pre-fertilized compost, which helps the plants grow to their full potential.

THE LEAVES
The leaves are highly efficient at filtering out pollutants from the water.

THE FRUIT
The fruits are harvested and composted to create a nutrient-rich soil.

THE SEEDS
The seeds are used to create new plants for the wetland.

THE WATER
The water is treated to remove pollutants and maintain a healthy ecosystem.

THE EXPERIMENT: AT THE LEE WARD RECLAMATION POND

AERIAL VIEW OF POND

- A pump seals the pond to minimize pollution.
- A pump seals the pond to minimize pollution.
- A pump seals the pond to minimize pollution.
- A pump seals the pond to minimize pollution.
- A pump seals the pond to minimize pollution.
6.10. Up-Flow Filter Systems

**DESCRIPTION:** Filters used in conjunction with wet detention systems to increase the overall treatment effectiveness.

**ADVANTAGES:**

- Applicable to ultra-urban redevelopment
- Filter media can be either sand or mixed media depending on target pollutants
- Up-flow design reduces clogging and maintenance
Up-Flow Filter Design Criteria

- Effectiveness: Dependent on annual volume filtered and the filter media
- Treatment volume: Use Table 6.1.2 to get % RO volume
- Use diversion structure to divert treatment volume and to bypass higher flows
- Filter media – Table 6.10.1 (update in BMPTRAINTS)
- Filter depth at least 30 inches, for nitrogen removal the filter must remain wet (anaerobic)
## Up-Flow Filter Media Selection

### Filtration Media Table

<table>
<thead>
<tr>
<th>DESCRIPTION OF MEDIA</th>
<th>MATERIAL</th>
<th>TSS REMOVAL EFFICIENCY</th>
<th>TN REMOVAL EFFICIENCY</th>
<th>TP REMOVAL EFFICIENCY</th>
<th>TYPICAL OPERATING LIMITING FILTRATION RATE (in/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&amp;G ECT (Wet)</td>
<td>Expanded Clay/Tire Chips</td>
<td>70%</td>
<td>55%</td>
<td>65%</td>
<td>96 in/hr</td>
</tr>
<tr>
<td>B&amp;G OTF (Wet)</td>
<td>Organic/Tire Chips</td>
<td>60%</td>
<td>45%</td>
<td>45%</td>
<td>96 in/hr</td>
</tr>
<tr>
<td>B&amp;G CTS12</td>
<td>Expanded Clay/Tire Chips</td>
<td>60%</td>
<td>45%</td>
<td>45%</td>
<td>96 in/hr</td>
</tr>
<tr>
<td>SAT</td>
<td>Sand</td>
<td>85%</td>
<td>30%</td>
<td>45%</td>
<td>2 in/hr</td>
</tr>
<tr>
<td>B&amp;G CTS24</td>
<td>Clay/Tire Crumb/Sand &amp; Topaz</td>
<td>90%</td>
<td>60%</td>
<td>90%</td>
<td>1.0 in/hr</td>
</tr>
</tbody>
</table>

### Notes

- All effectiveness estimates to nearest 5%.
- Phosphorus removal has limited life expectancy.
- Tire Chip 3/8" and no measurable metal content (approx. density ~ 730 lbs/SCY).
- Clay 5/8" and 3/8" blend (approx. density ~ 950 lbs/SCY).
- Expanded Clay 3/8" in blend (approx. density ~ 950 lbs/SCY).
- Tire chip 1-5 mm and no measurable metal content (approx. density ~ 730 lbs/SCY).
- Sand with less than 5% passing #200 sieve (approx. density ~ 2200 lbs/SCY).
- Local top soil is used over CTS media in dry basins, gardens, awnings, and strips, is free of roots & debris but is not used in other BMPs.

### Table

<table>
<thead>
<tr>
<th>MIX:</th>
<th>TN Removal %</th>
<th>TP Removal %</th>
<th>Water Storage Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&amp;G ECT</td>
<td>55</td>
<td>65</td>
<td>0.3</td>
</tr>
<tr>
<td>B&amp;G OTF</td>
<td>45</td>
<td>45</td>
<td>0.3</td>
</tr>
<tr>
<td>B&amp;G ECT3</td>
<td>45</td>
<td>45</td>
<td>0.3</td>
</tr>
<tr>
<td>SAT</td>
<td>30</td>
<td>45</td>
<td>0.3</td>
</tr>
<tr>
<td>B&amp;G CTS12</td>
<td>60</td>
<td>90</td>
<td>0.3</td>
</tr>
<tr>
<td>B&amp;G CTS24</td>
<td>75</td>
<td>95</td>
<td>0.3</td>
</tr>
<tr>
<td>UDM1*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UDM2*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UDM3*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UDM4*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* User Defined Media Mix
Up-Flow Filter Construction and Maintenance

Construction:
• Construct wet detention system or vault
• Construct up-flow filter per manufacturer and permitted plans and specifications

Inspection:
• Inspect pre-treatment BMPs and up-flow filter flow rate
• Inspect inlet and outlet structures for proper operation

Maintenance and Record Keeping:
• Clean all inlets and outlets
• Replace filter media (for P removal) every 2 years or as needed
• Owner/operator must keep maintenance log that includes annual stormwater volume filtered vs bypassed, inspection dates and forms, maintenance dates and activities
Upflow Filter Installation by Suntree Technologies
Improved Treatment Using Up-flow Filters with Wet Pond

Filters Work to remove more

• Filters can be designed to remove nitrogen without media replacement
• For phosphorus, media replacement time is specified
• Can be used in BMP & LID Treatment Train Applications with other treatment
Up-Flow Input from Wet Detention to Filter

- **Performance**
  - Concentration
  - Averages based on field data
  - Average yearly based on 1.0 inch design for filter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>TN</th>
<th>TP</th>
<th>TSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Influent Concentration (mg/L)</td>
<td>1.83</td>
<td>0.73</td>
<td>42.7</td>
</tr>
<tr>
<td>Expected Average Pond Removal (%)</td>
<td>38</td>
<td>63</td>
<td>79</td>
</tr>
<tr>
<td>Average Pond + Filter Removal (%)</td>
<td>70</td>
<td>72</td>
<td>91</td>
</tr>
<tr>
<td>Average Annual System Performance</td>
<td>67</td>
<td>70</td>
<td>89</td>
</tr>
</tbody>
</table>
FDOT InterState Section 6

Eagle Buffer Zone

Eagle Primary and Secondary Protection Zones

Pond RS8-E-1
• NRFS Control Structure (OCS-402)

Orifice flow passes through BAM
FDOT Nutrient Removal Filtration System (NRFS)

- NRFS Control Structure (OCS-402)

BAM filter size = 20’ x 10’ = 200 sf

BAM filter depth = 30”
The Upflow Filter Design Allows for Easy Inspection and Service of the Media
6.12. LID BMP – Biofiltration using Biosorption Activated Media (BAM)

- Offline BMP with engineered media (BAM) to enhance pollutant removal
- Retention or detention BMPs
- Include rain gardens, planter boxes, tree box filters, up-flow filters
Biofiltration BMP Components

- Pretreatment BMPs
- Ponding area 3-12 inches deep
- Planting media over BAM
- Florida-friendly plants
- Overflow/spillway – divert larger storms
- Control structure to create anoxic layer in bed
- Energy-dissipation mechanism
LID BMP - Biosorption Activated Media (BAM)

- Engineered media tailored for specific WQ enhancements
- Includes a wide range of materials with sorption properties and carbon source ranging from soils to expanded clay to tire crumb to activated carbon
- UCF publication for SWFWMD “Alternative Stormwater Sorption Media for the Control of Nutrients”

<table>
<thead>
<tr>
<th>DESCRIPTION OF MEDIA</th>
<th>MATERIAL</th>
<th>TSS REMOVAL EFFICIENCY</th>
<th>TN REMOVAL EFFICIENCY</th>
<th>TP REMOVAL EFFICIENCY</th>
<th>TYPICAL OPERATING LIMITING FILTRATION RATE (in/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&amp;G ECT^1 1st</td>
<td>Expanded Clay^1, Tire Chips^1</td>
<td>60%</td>
<td>45%</td>
<td>45%</td>
<td>96 in/hr</td>
</tr>
<tr>
<td>B&amp;G OTE^1 2nd</td>
<td>Organics^1, Tire Chips^1, Expanded Clay^1</td>
<td>60%</td>
<td>45%</td>
<td>45%</td>
<td>96 in/hr</td>
</tr>
<tr>
<td>B&amp;G ECT3* 3rd</td>
<td>Expanded Clay^1, Tire Chips^1</td>
<td>60%</td>
<td>45%</td>
<td>45%</td>
<td>96 in/hr</td>
</tr>
<tr>
<td>SAT* 4th</td>
<td>Sand^2</td>
<td>85%</td>
<td>33%</td>
<td>45%</td>
<td>3 in/hr</td>
</tr>
<tr>
<td>B&amp;G CTS* 5th</td>
<td>Clay^2, Tire Crushed^2</td>
<td>90%</td>
<td>65%</td>
<td>65%</td>
<td>1.0 in/hr</td>
</tr>
<tr>
<td>B&amp;G CTS* 6th</td>
<td>Clay^2, Tire Crushed^2</td>
<td>90%</td>
<td>65%</td>
<td>65%</td>
<td>1.0 in/hr</td>
</tr>
</tbody>
</table>

**NOTES:** Site was not properly operated at this time. Also not used as a demonstration BMP but the removals were measured.
Biofiltration Treatment Effectiveness

- Part of a BMP Treatment Train
- Use graph to determine capture volume (CV)
- Use BAM effectiveness – depends on blend and its thickness
- Efficiency = CV % * BAM % removal
  Efficiency = 53% * 75% TN = 40% removal
LID BMP – Planter Box Biofiltration Systems

Weir
Collection Area
Vault (filter area < vault area)
BAM Media
Planter Box Biofiltration Design Considerations

• Can be either retention or detention BMP
• Setback 10’ from buildings unless lined flow-through
• Contributing DA < 2,500 SF; larger with County OK
• Retention biofiltration RTV per retention BMPs
• Detention biofiltration effectiveness depends on filter media and annual volume of stormwater treated
• Minimum width of 30” with 6 – 12” of storage volume and 2” of freeboard
• Walls of impermeable material but not pressure treated wood
• If used, liner with 30 to 40 mil PVC or HDPE
• Florida-friendly plants may include trees
Tree Box (Well) Filter System Design Considerations

- Pre-cast concrete boxes
- BAM installed below grade at the curb line.
- Sized for specific stormwater treatment volume
- Contributing DA typically < 0.25 acre
- Soil volume is critical – up to 1500 ft³
- Trees per Section 138-3664 of Article X Design Standards
Tree Box (Well) Filter Retention Design
6.15. Rainfall Interceptor Trees

DESCRIPTION:

• Existing or planted trees located adjacent to impervious areas where they can intercept rainfall and reduce stormwater volume and pollutant loading

DESIGN:

• Generally follow tree box filter or biofiltration planter box design criteria
# Rainfall Interceptor Trees Stormwater Treatment Credits

- Calculate load reduction VR * EMC * Conversion Factors

<table>
<thead>
<tr>
<th>TREE TYPES</th>
<th>NEW TREES INTERCEPTION CREDIT</th>
<th>EXISTING TREES INTERCEPTION CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oaks or similar species</td>
<td>13%</td>
<td>18%</td>
</tr>
<tr>
<td>Pines or similar species</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Palms or similar species</td>
<td>8%</td>
<td>13%–15%</td>
</tr>
</tbody>
</table>

1. Determine impervious surface area tree canopy will cover in 20 years
2. Select percent interception credit by tree type
3. Calculate annual rainfall volume reduction VR (ac ft) = A * R * % interception * Conversion Factors
   Where A = canopied impervious area in acres, R = annual rainfall in inches, % interception decimal, Conversion factor = 1 ft/12 inches
Rainfall Interceptor Trees Stormwater Treatment Credits

• Not approved by SWFWMD – Can only be used to meet County requirements

• County allows no more than 10% of impervious area to be mitigated through the use of trees.
Pinellas County Stormwater Management Manual Workshop

Questions, Remarks And Discussion