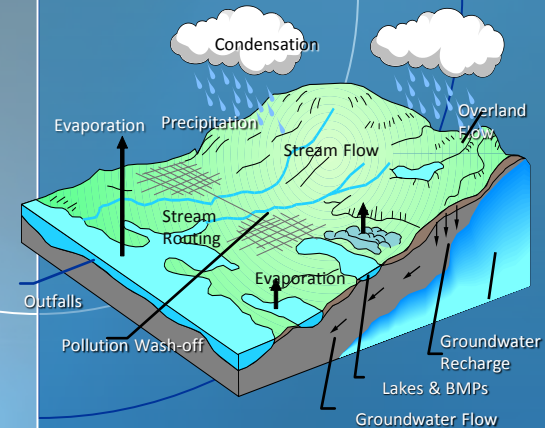


# Florida Chamber of Commerce 28<sup>th</sup> Annual Environmental Permitting Summer School



## Session VV Numerical Nutrient Criteria for Stormwater Emerging Issues July 24, 2014



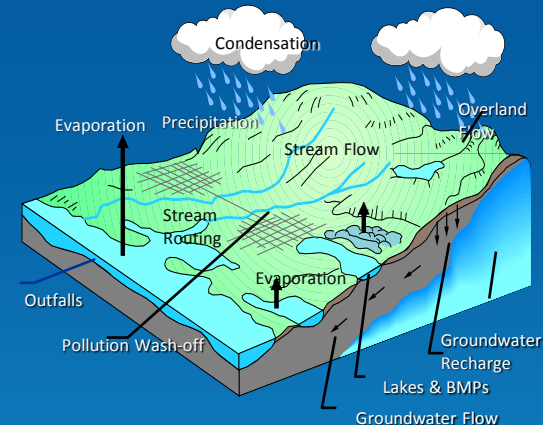
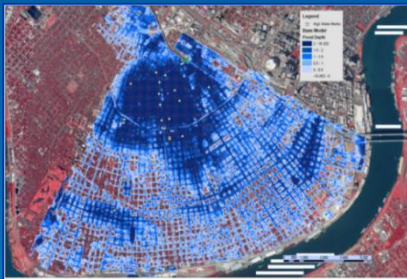
# Presentations

1. Numeric Nutrient Limits and Stormwater – FDEP Perspective -Tom Frick, Director Division of Environmental Assessment and Restoration, FDEP
2. NNC for Stormwater Ditches - Scott McClelland, CDM Smith
3. Stormwater Drivers and Opportunities - Michael Schmidt, P.E. BCEE, CDM Smith
4. Biological Treatment and Volume Reduction Options - Gary Serviss, LEED AP, VHB
5. Use of Environmental Markers to Discern Stormwater Nutrient Impacts from Reclaimed Water - Phil Waller, P.E., MWH Global

# Stormwater Drivers and Opportunities

Michael F. Schmidt, P.E., BCEE  
Senior Vice President  
Water Resources Engineer

July 2014

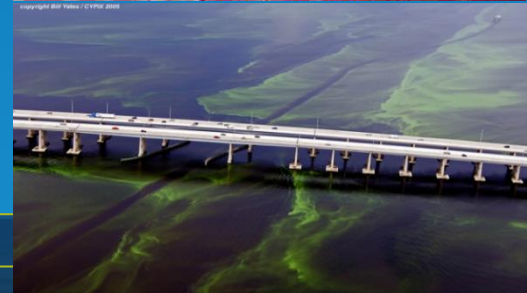


# NNC Issues

- Consideration of the Full Range of Florida Hydrologic, Water Quality, and Biological Diversity
- Cost vs. Benefit
  - Consideration of Limiting Nutrients
  - Limiting Concentrations
- Practicable Retrofits
- Magnitude of Implementation Costs
- Consistent with TMDLs and BMAPs

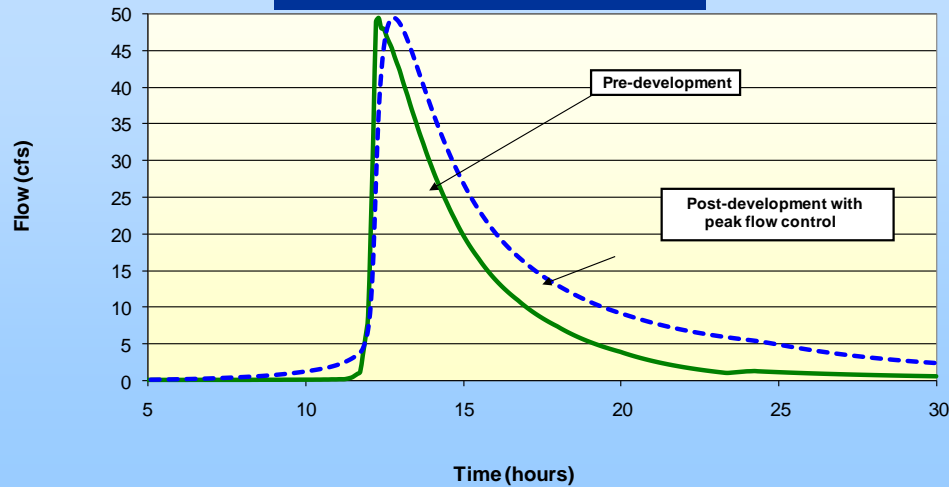
# Issues

- Impaired and Declining Water Quality in Many Areas
- Current BMPs Do Not Fully Control Water Quantity or Water Quality
- Cumulative Impacts Degrade Water Quality and Contribute to Flooding
- Nearly 50% of Potable Water Consumed in Florida is for Irrigation
- More is Needed

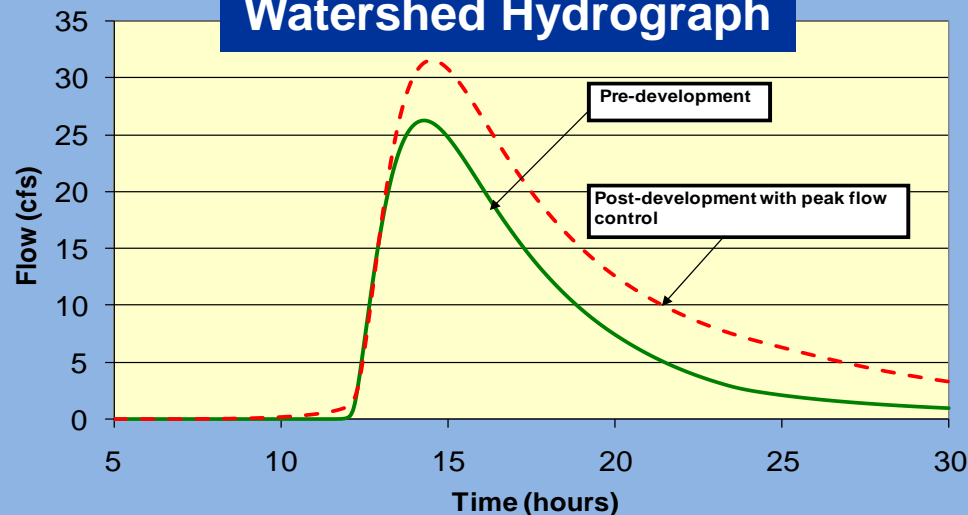


# Runoff Rates, Frequencies, Durations, Volumes, and Pollutant Loads Increase With Development

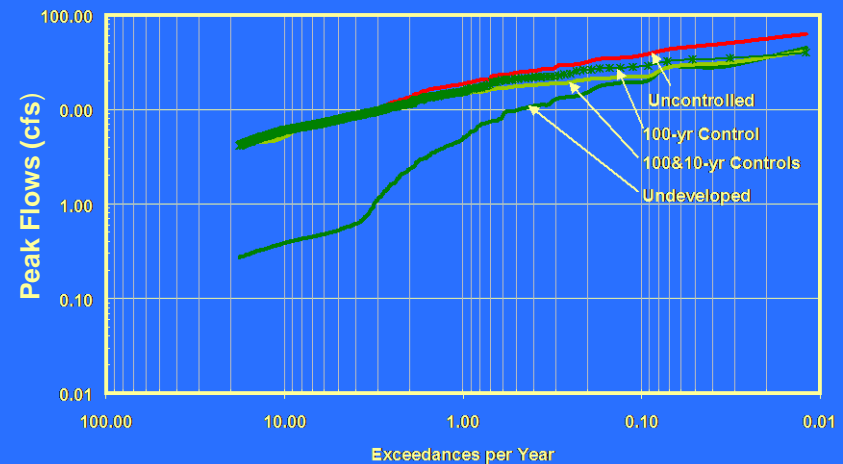
## Site Hydrograph



## Watershed Hydrograph

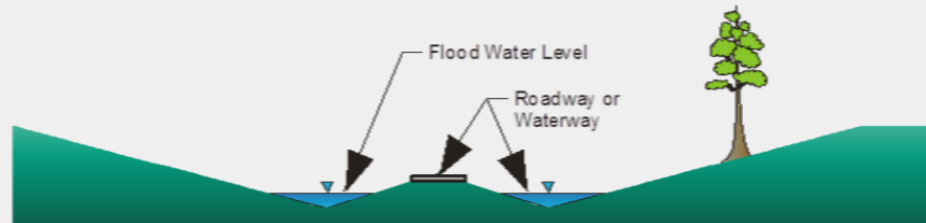


## Number of Flow Exceedances Per Year

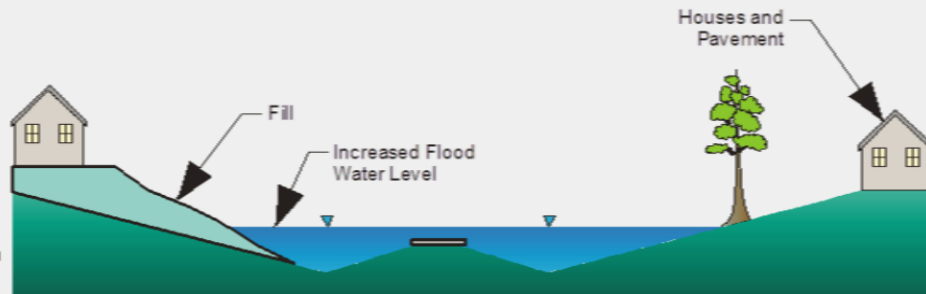


# Cumulative Impacts on Floodplains

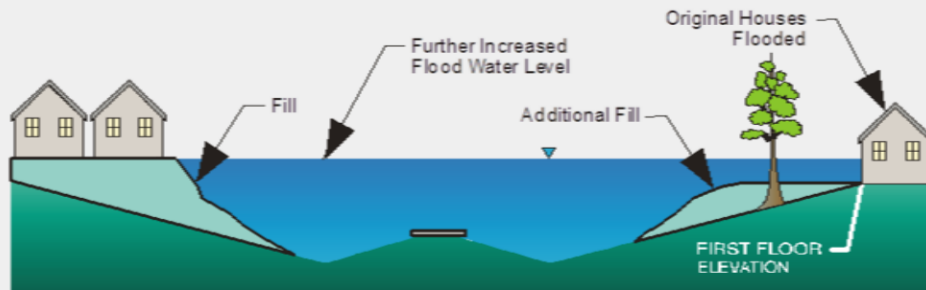
CASE 1:  
Base Conditions



CASE 2:  
Runoff Increased  
Due to Pavement  
and Lost Floodplain  
Storage Due to Fill

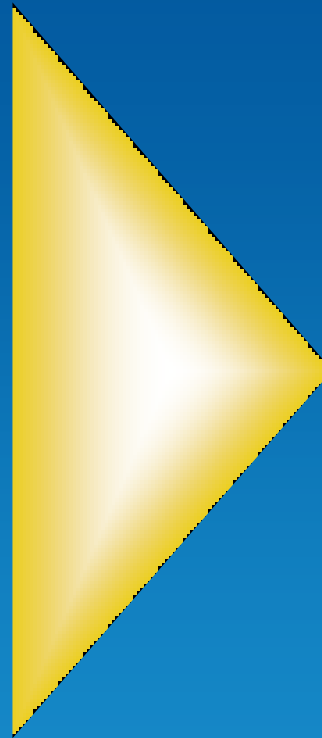


CASE 3:  
Further Increases  
in Runoff Due to  
Pavement and Lost  
Floodplain Storage  
Due to Fill



# Stormwater Management Goals

- Flood Control
- Water Quality Protection
- Wetlands Management
- Water Supply and Aquifer Recharge
- Conservation and Reuse
- Operation and Maintenance
- Community Acceptance



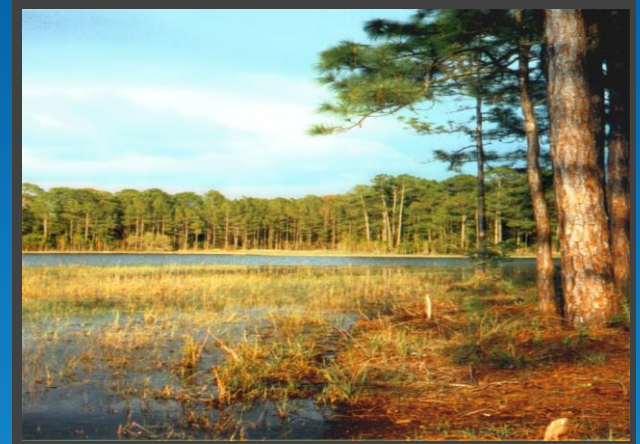
Adaptability

Levels  
of  
Service

Sustainability

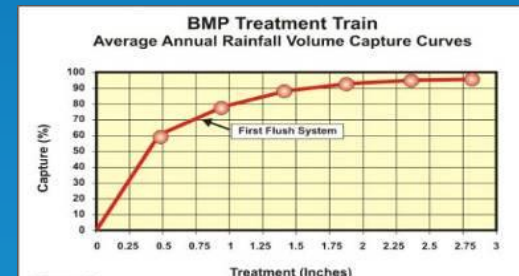
# Opportunities for Sustainable Stormwater Resources to Achieve NNC

- Maintain natural hydrology
  - Volume, frequency, and rate of discharge
- Maintain floodplain storage
- Stream and wetland buffers
- Harvest/recycle stormwater for irrigation



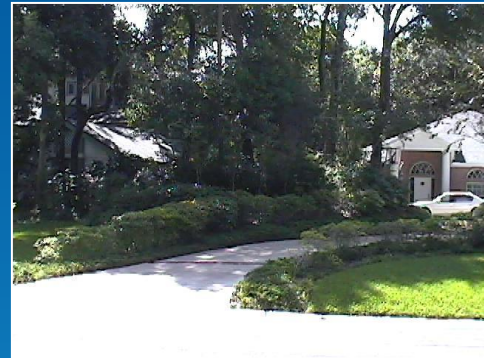
# Approaches

- Low Impact, Green Development, Redevelopment, and Retrofit
- Enhanced BMPs
  - Quantify Sizing and Benefits
- BMP Treatment Train
  - Retention-detention to mimic the full range of hydrology
  - Treat first flush runoff (offline where possible)
  - Volume-time discharge control
- Stormwater Harvesting and Recycling

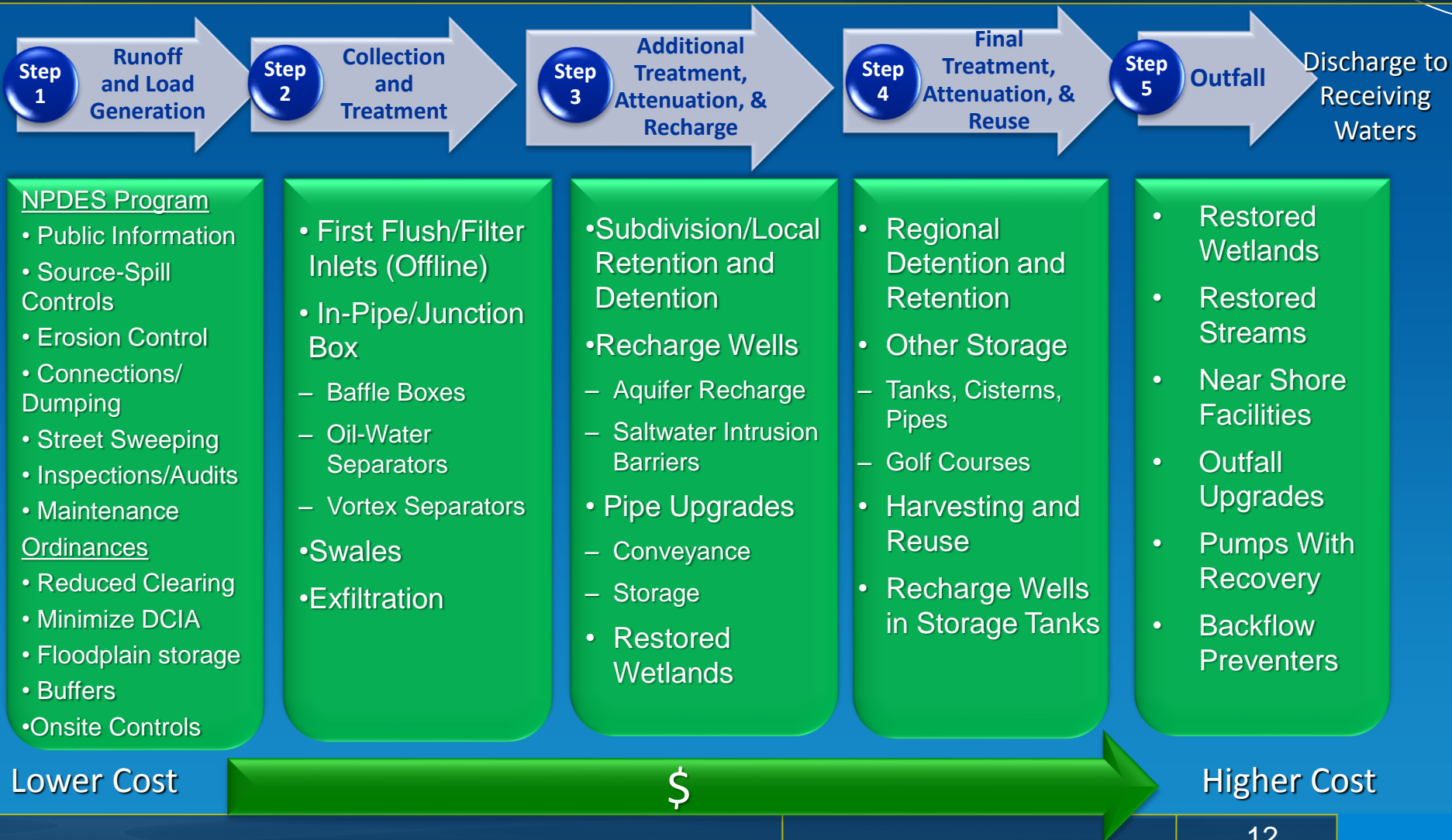


# Potential Low Impact Components

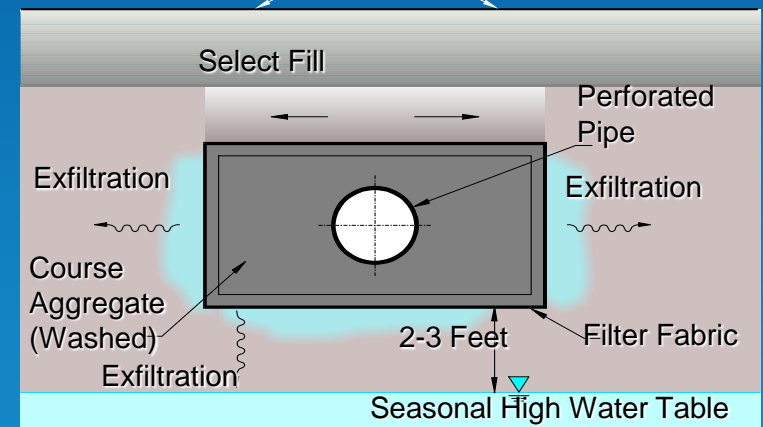
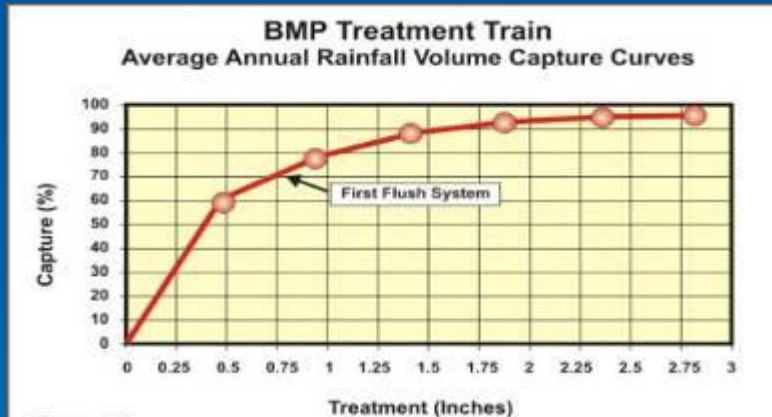
- Minimize clearing (especially along site perimeters) and Less Turf
- Stream buffers = 100-yr floodplain (structures out of 100-yr footprint)
- Maintain 100-Year floodplain storage
  - No net loss in concert with floodway protection
- Promote infiltration where possible (Water Your Plants)
  - 0.25 to 0.5 inches in landscape areas/swales, rain gardens, cisterns



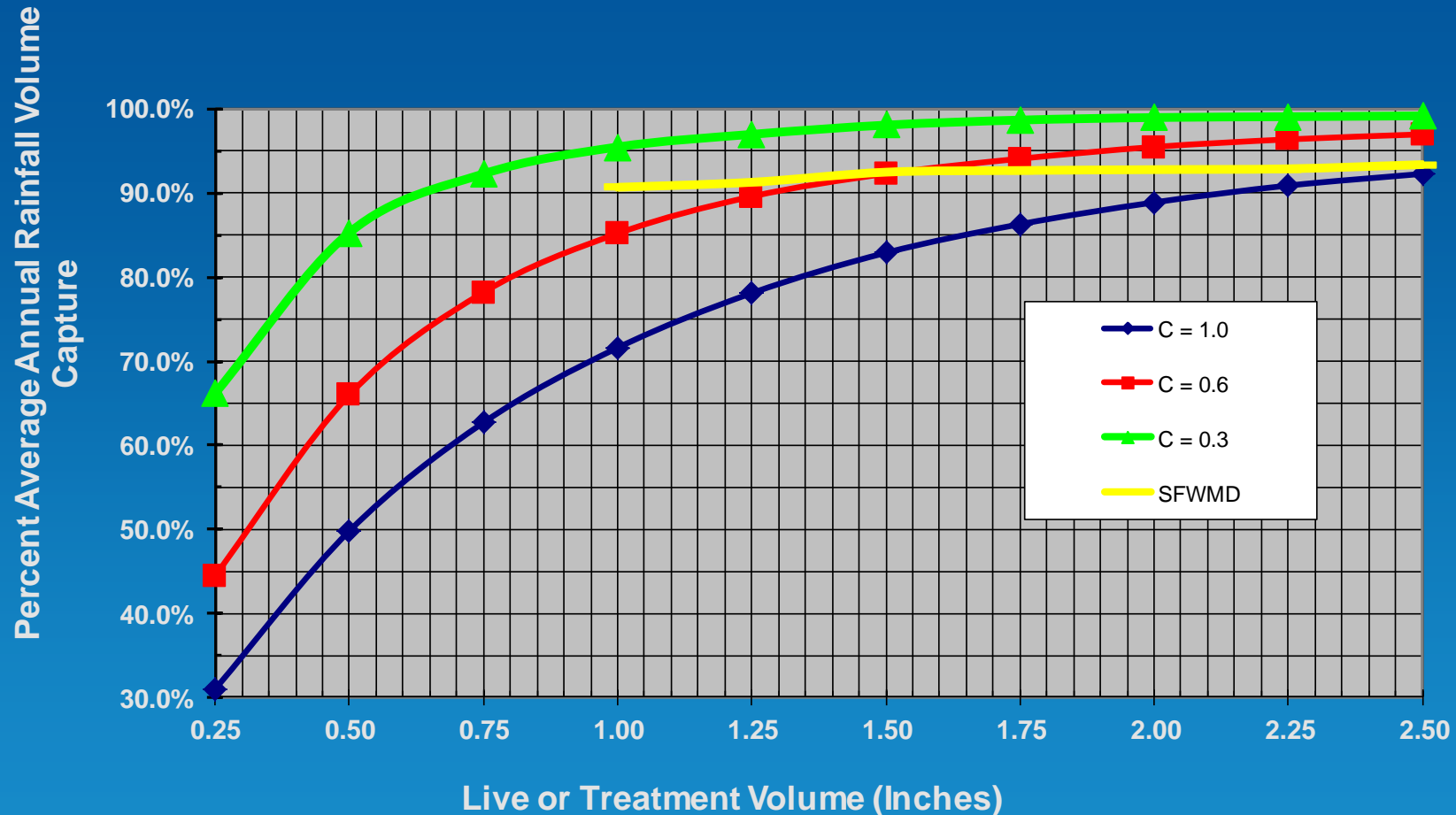
# A BMP Treatment Train Approach Provides Multiple Benefits, Cost Savings, and Adaptability



# BMP Treatment Train Components



# Average Annual Rainfall Volume Capture Is a Good Measure of Hydrologic and Water Quality Control



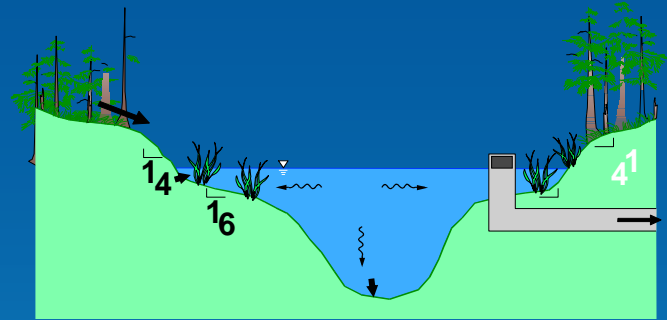
# Potential LID Components

- Minimize directly connected impervious area (DCIA) and send flow to pervious and landscape areas
  - Courtyard driveways
  - Center-crowned driveways
  - Rooftops and roof gutters
  - Pervious Pavement
- Sheet flow spreaders from paved areas
- Cisterns, swales, and ponds for runoff harvesting



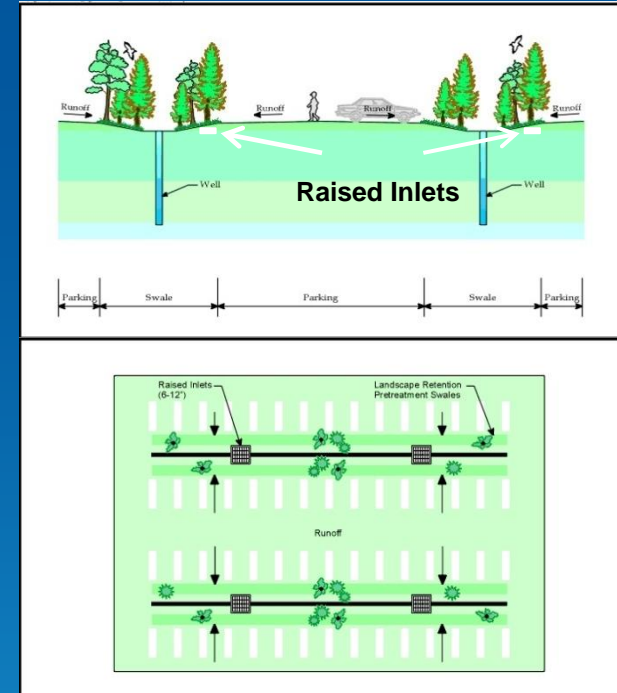
# Enhanced BMP Examples

- Longer residence times for wet detention (4 – 8 weeks)
- Offline systems for first flush
- Greater retention volumes
- Combination of retention (pre-treatment) and wet detention
- Chemical treatment systems

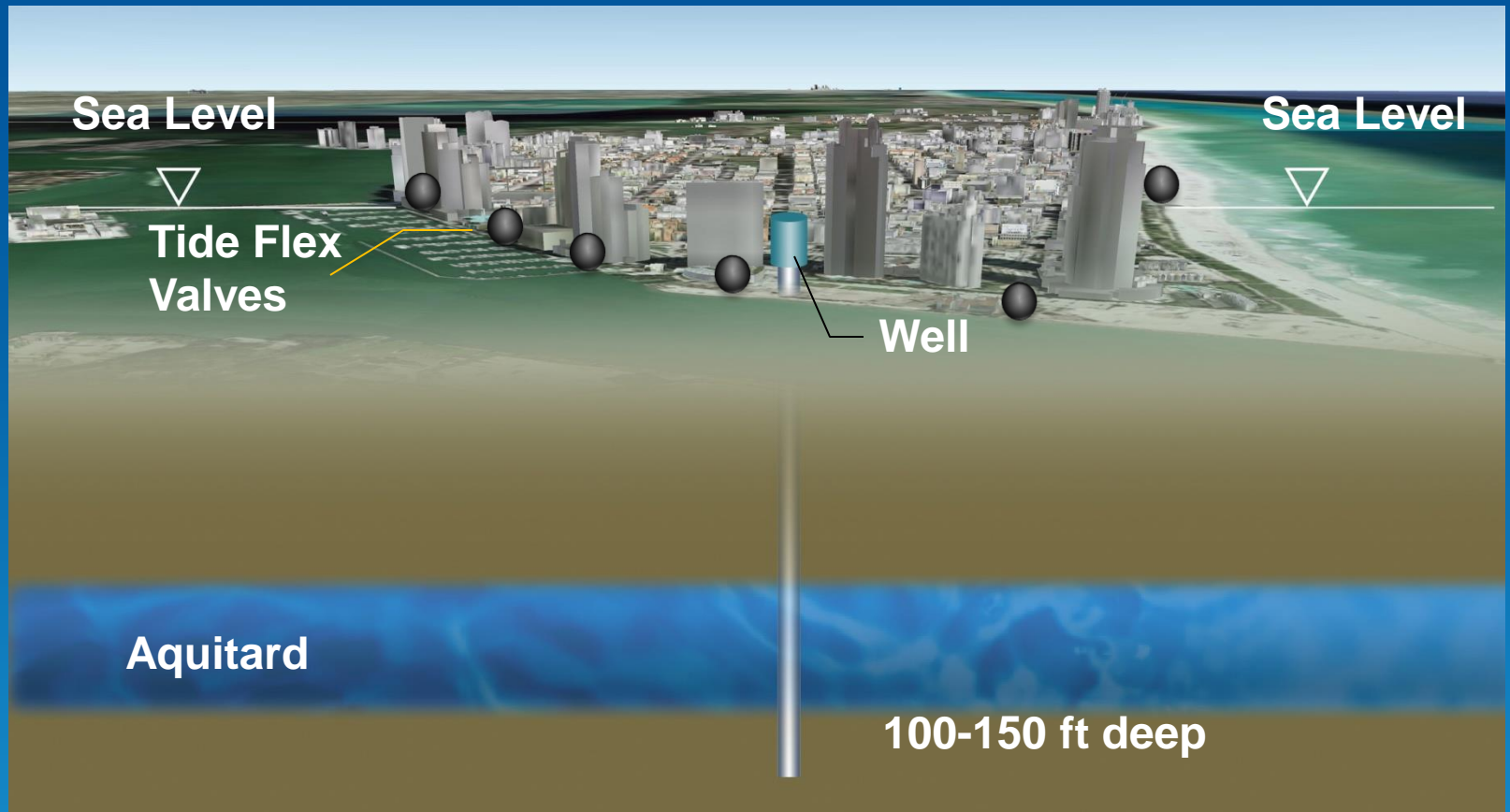


# Stormwater Harvesting and Recycling

- Landscape swales and rain gardens
- Cisterns
- Wet detention systems and horizontal wells as irrigation sources
- Connections to reclaimed water reuse systems
- Alternative Water Supply
  - Drink up



# Coastal Zone Wells Offer Flood Reduction, Aquifer Recharge, and Water Quality Benefits



- Backflow preventers (flex valves)
- Recharge wells and pump stations
- Protection for sea level rise
- Potential water for harvesting

# Alternative Water Supply

We Can Drink Our Way Out of This



# LID Examples - Landscape Designs Minimize Clearing With Shrub Berms and Buffers



# The LID Approach Minimizes DCIA



# Rear and Side Lot Swales



# Courtyard Driveways Provide Play Areas and Collection/Detention of Runoff



# Courtyard Driveways Provide a Source of Water for Landscape



# Rear Yard Buffers Provide Stream Protection, Storage, Wildlife Habitat, and Privacy



# What We Can Do to Meet NNC

- Reduced Clearing and More Low Impact Development – Less DCIA
- More innovative designs of parallel and series BMPs
- Stormwater harvesting and recycling directly in landscaping and from stormwater facilities
- Increased groundwater recharge
- More routine maintenance