



Project #P-14 Basin Retrofits and Channel Improvements in Highlands Subdivision

City of St. Peters, MO

Preliminary Plans

October 8, 2013

St. Peters, MO



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Special Thanks for Attending!

Presentation Agenda

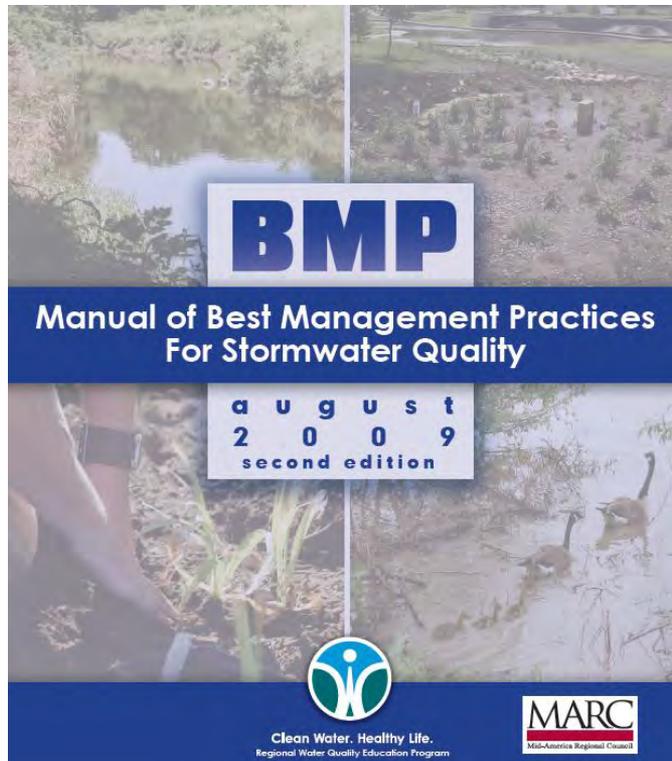
- ✓ Intro to Design Team
- Project Goals & Decision Factors
- Project Location Map
- Urban Stream Improvements Overview
- Detention Basin Retrofits Overview
- Breakout Groups



Project Goals & Decision Factors

PROJECT GOALS:

- Stream corridor stabilization
- Detention basin retrofits



DECISION FACTORS:

- Evolution of regulations
- Urban stream geomorphology
- Stormwater Best Management Practices (BMPs)
- **Public input and preferences**
- Volume and rate of water
- Soil infiltration capacity
- Maintenance evaluation
- Physical constraints of streams, basins, and pipes

Our goal is to blend ecologically sensitive solutions with the preferred aesthetic of the residents.

Project Location Map



Urban Stream Improvements Overview



URBAN GEOMORPHOLOGY

Urban Streams have experienced a variety of complex impacts compared to their rural counterparts

*Straightened/Channelized (Bank Protection
Vegetation Removal*

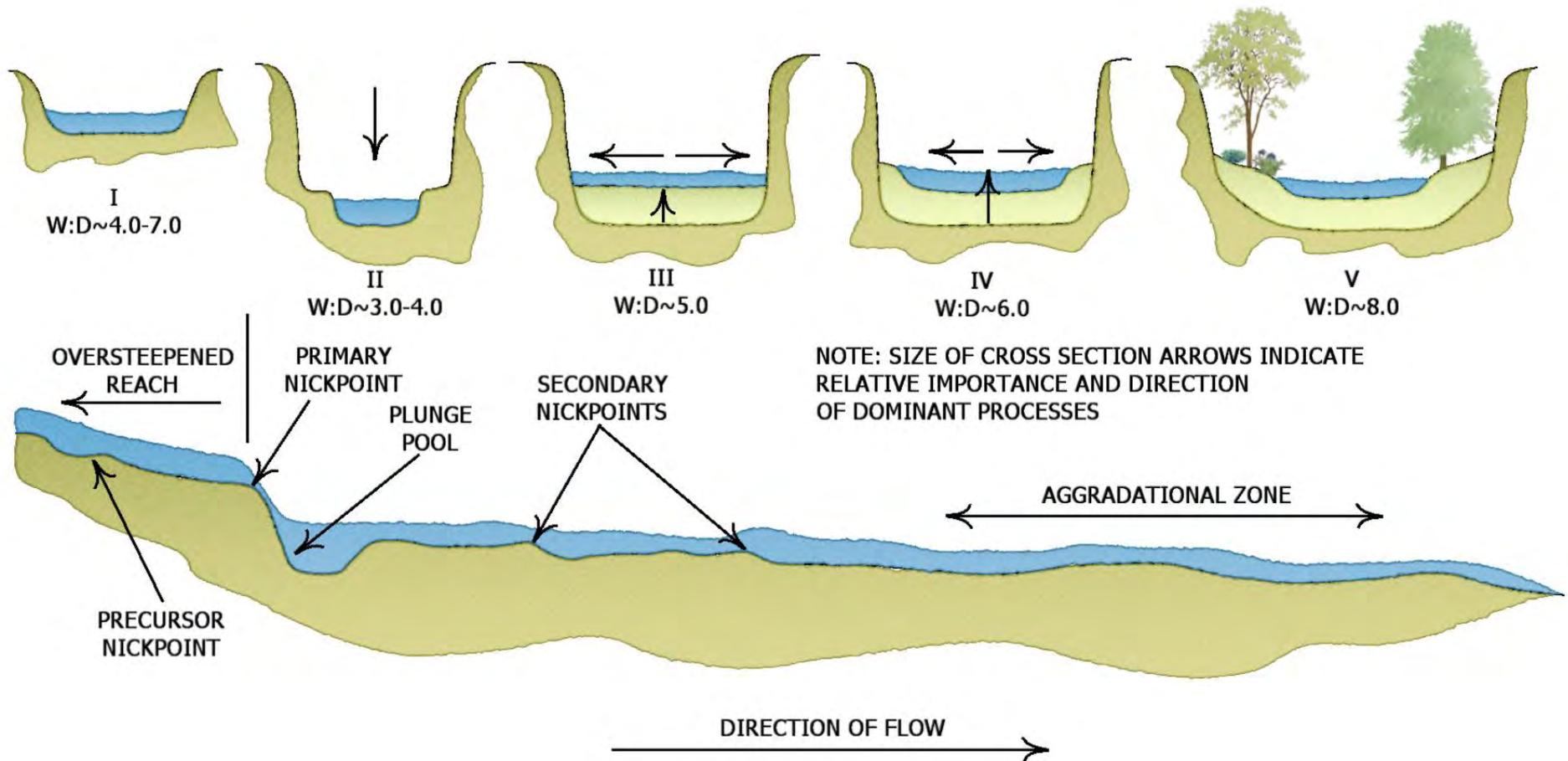
Increased Channel Density (pipes/ditches)

Floodplain Encroachment (retaining walls)

INCREASED IMPERVIOUS SURFACE (PAVED WATERSHED)

CHANNEL EVOLUTION

- Schumm (1977)
- Simon (1986)



COMMON STREAM PROBLEMS

Channel incision (Stage II)

- Channelization is usually what initiates incision (Δ slope)
- Changes in rate and volume result in additional sediment movement and further incision (Lane's balance)
- Bank erosion ensues when the stream reaches a control elevation yet still has energy to do work (Stage III)

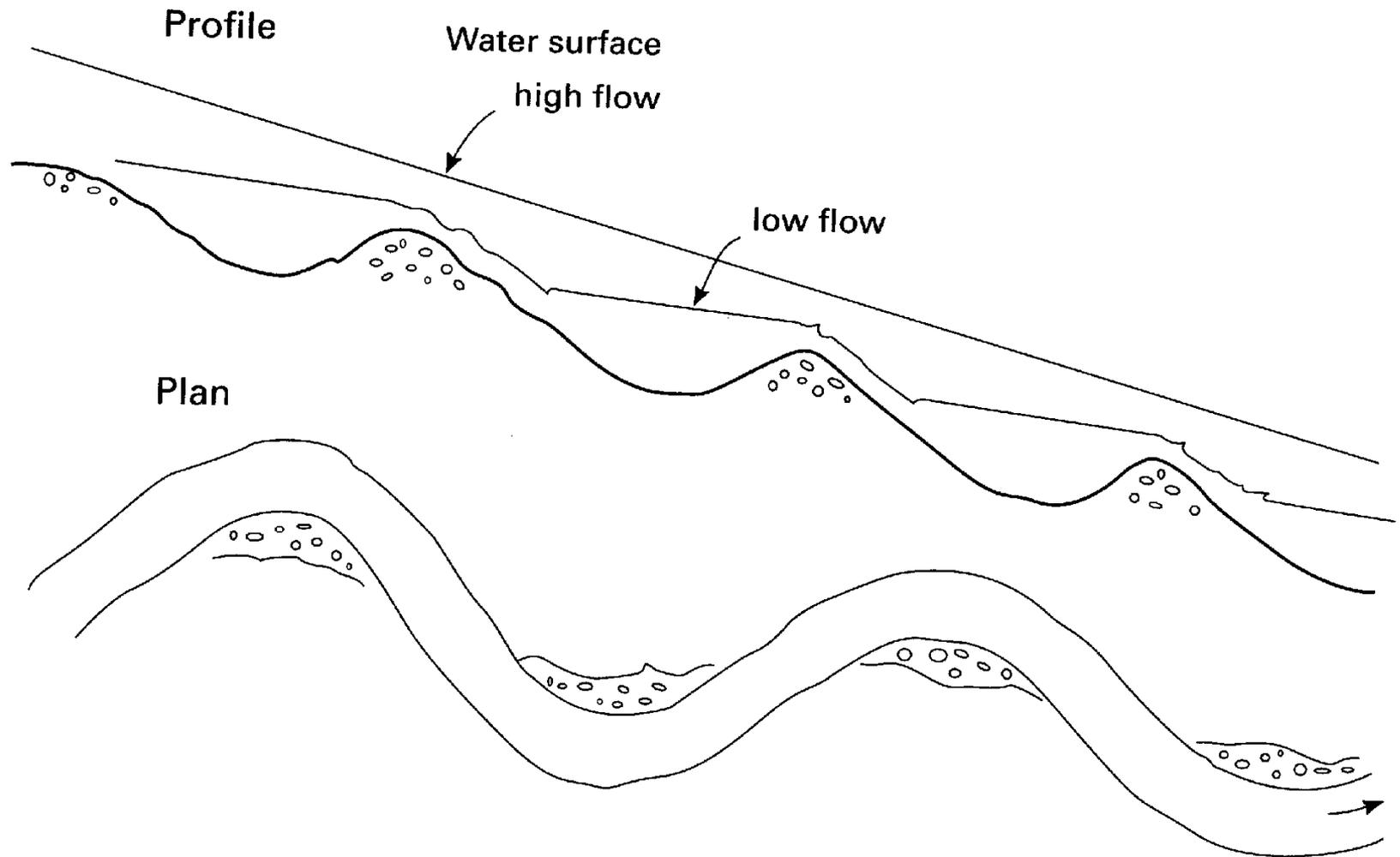


COMMON URBAN STREAM PROBLEMS

Bank erosion

- *Streams erode their banks on the outside of meanders and deposit on the inside of meanders or on the floodplain*
- *Good erosion*
 - *Equilibrium geomorphic process*
 - *Not all erosion is bad*
- *Bad or excessive erosion*
 - *Indicative of a hydrologic or sediment problem –*
 - *Infrastructure impacts*
 - *Sediment pollution*

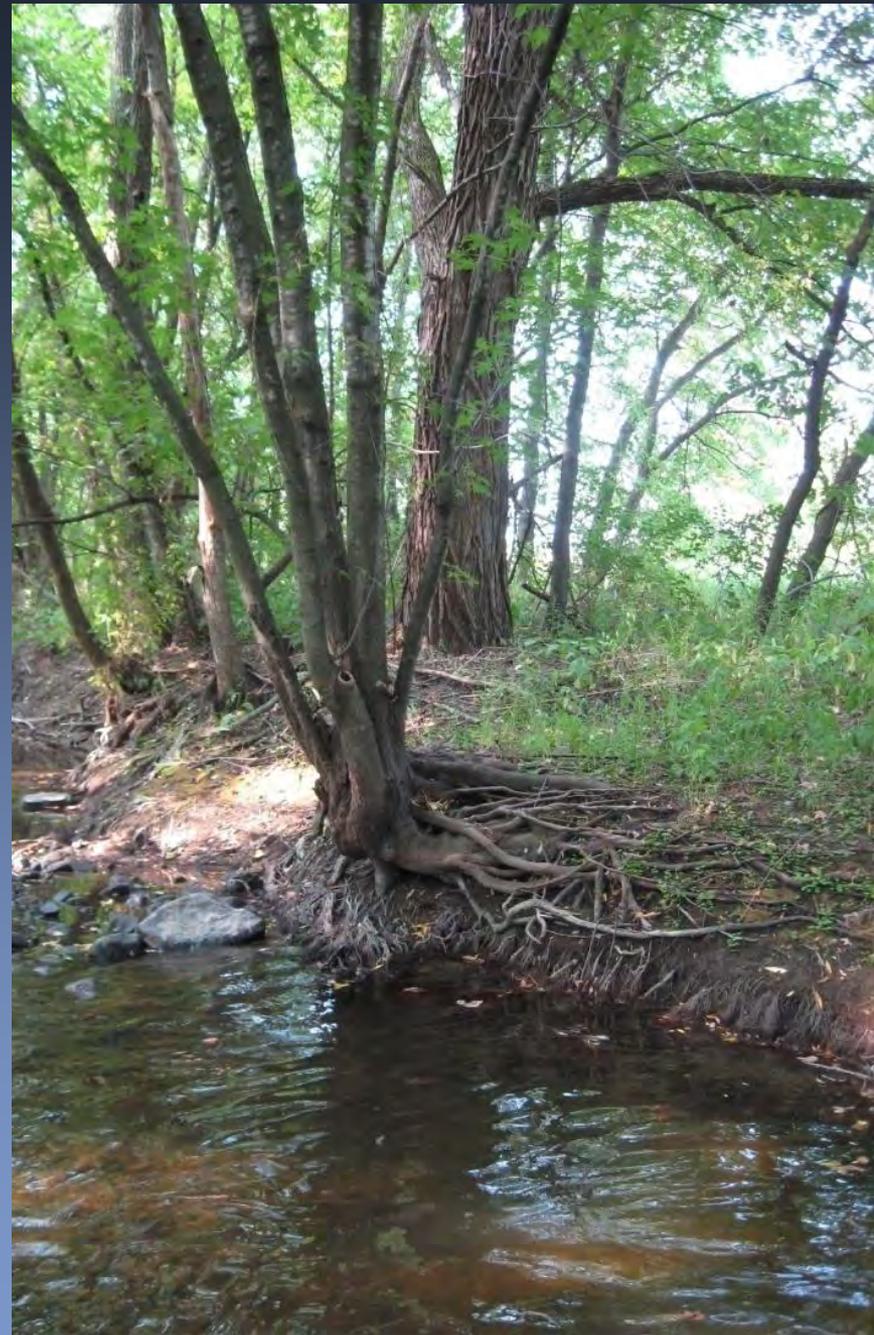
- Riffles and pools also dissipate energy



EROSION RESISTANCE

Tree roots

- Generally good to 4 ft bank height
- Evolved for river life
 - Flood tolerant
 - Plastic root systems
 - Fibrous roots
 - Vegetative reproduction



BANK EROSION

- Not all bank erosion is bad
- Erosion is a normal process
- Streams evolve their XS to fit their flow regime



SPECIFIC SITE

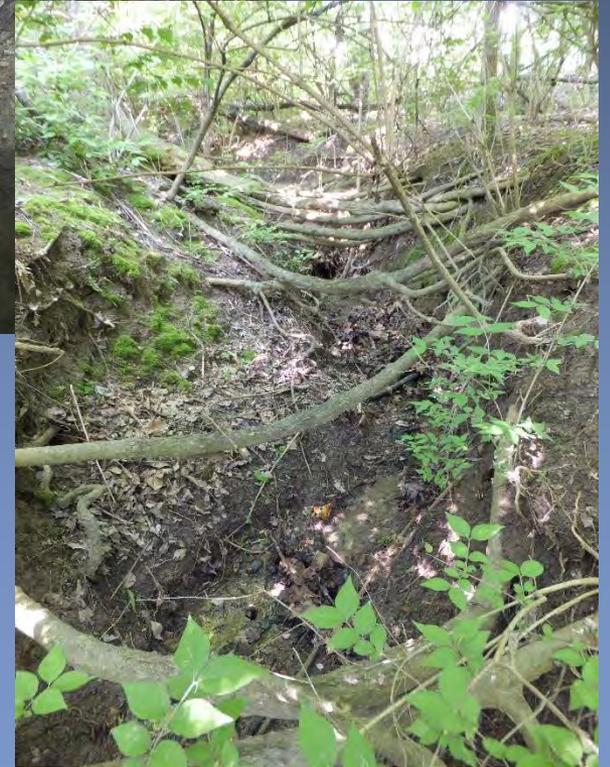
LOWER CHANNEL

- Relatively stable
- Step/Pool
- Log Steps



UPPER CHANNEL

- Eroding Banks
- Incision
- Piping



REMOVAL

- Vertical Pipes
- Grouted rock
- Culvert



SOLUTIONS



- Fortunately, regulations have evolved so that these types of practices are no longer allowed

Step pool channel stabilization & bluff protection



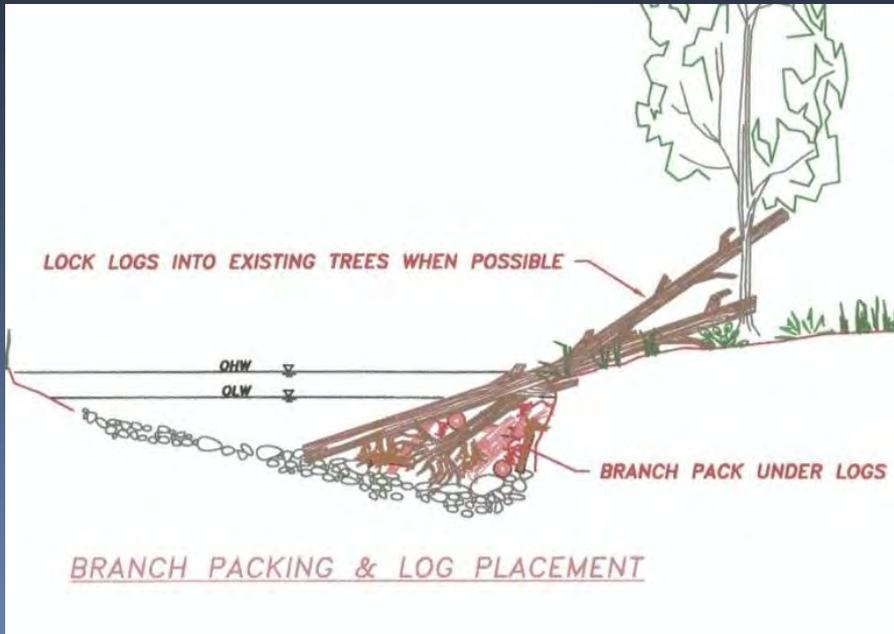


During construction



**Large Woody
Debris**

Bank stabilization



Considerations:

- Approach
- Shadow
- Throughflow
- Erodibility and scour



Incised channel elevation



Incised channel elevation

- 1 year post construction

Steep channel elevation/stabilization

- Natural step pool/cascade



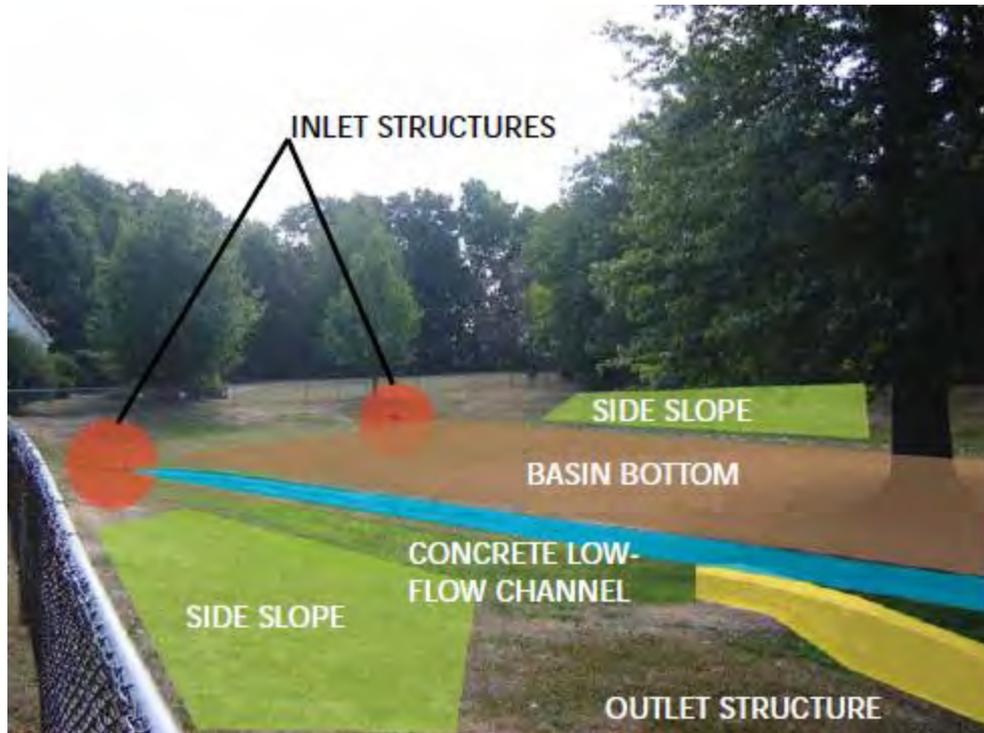
Detention Basin Retrofits Overview

Agenda:

- Common Concerns with Traditional Detention Basins
- Benefits of Retrofitting a Detention Basin
- The Retrofit Concept
- Specifics to Your Basins



Traditional Detention Basins



Common Concerns:

- Focused on rate control
- Largely ignore quantity and quality of stormwater runoff
- Side slope stabilization
- Outlet blockages
- Clogged low-flow channels
- Standing water
- Floatables and debris
- Mowing costs



Benefits of Retrofitting a Detention Basin



Benefits:

- Enhance & naturalize the landscape
- Alleviate stream degradation
- More effectively control runoff from small more frequent storms
- Protect streams from polluted runoff – capture and treat “first flush”
- Reduce maintenance

The Retrofit Concept

Basic Steps:

- Remove concrete low-flow channel
- Excavate basin bottom
- Install infiltration and filtration practices, if applicable
- Grade to increase flow path and prevent “short-circuiting”
- Modify the outlet control structure
- Install sediment forebay(s) and safety benches around permanent pools
- Replace grass with native species



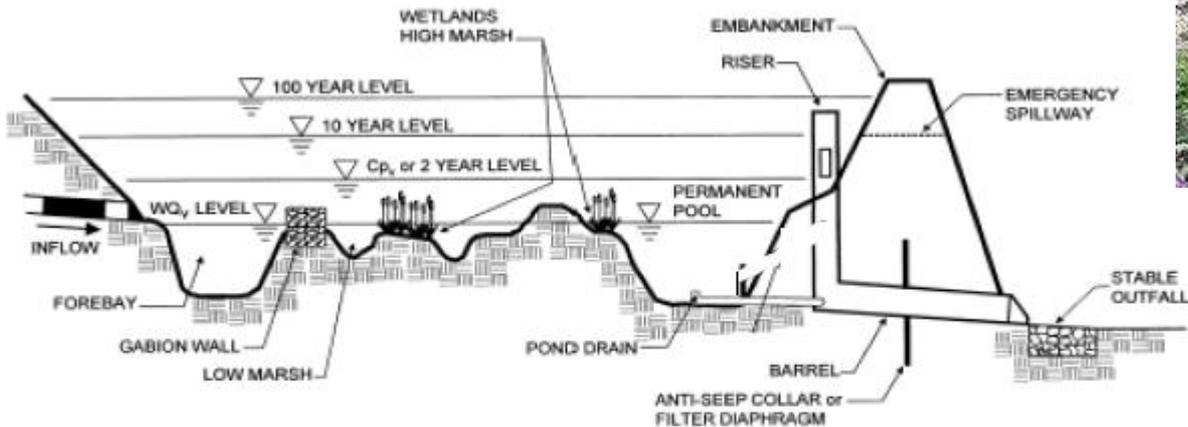
Extended Detention Wetland

Considerations:

- Hydrology
- Underlying Soils
- Planting Soils
- Size & Volume
- Vegetation

Advantages:

- Significant pollutant removal
- Protects downstream water bodies
- Ecological & aesthetic benefits



PROFILE

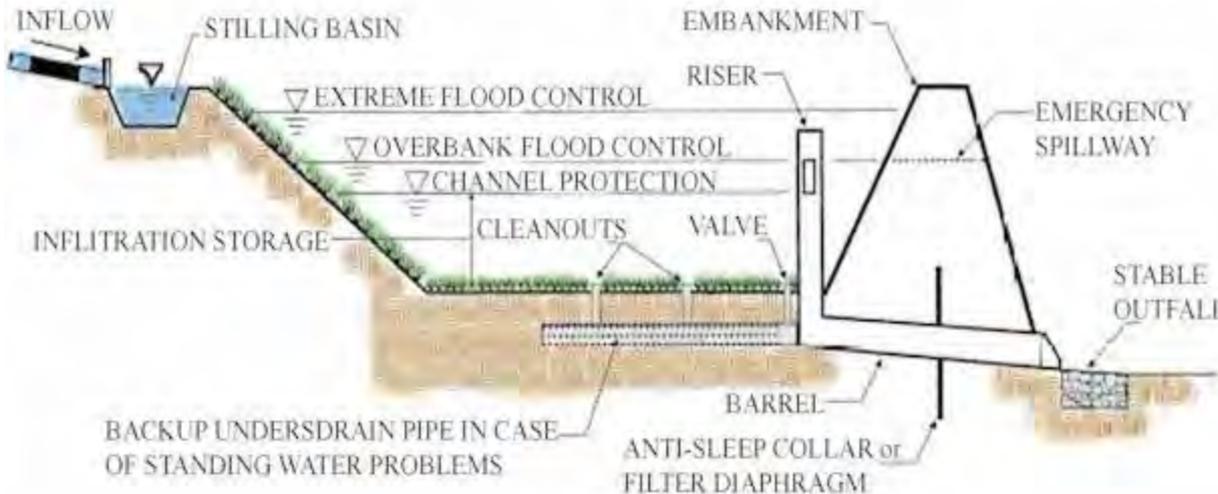
Infiltration & Enhanced Filtration

Considerations:

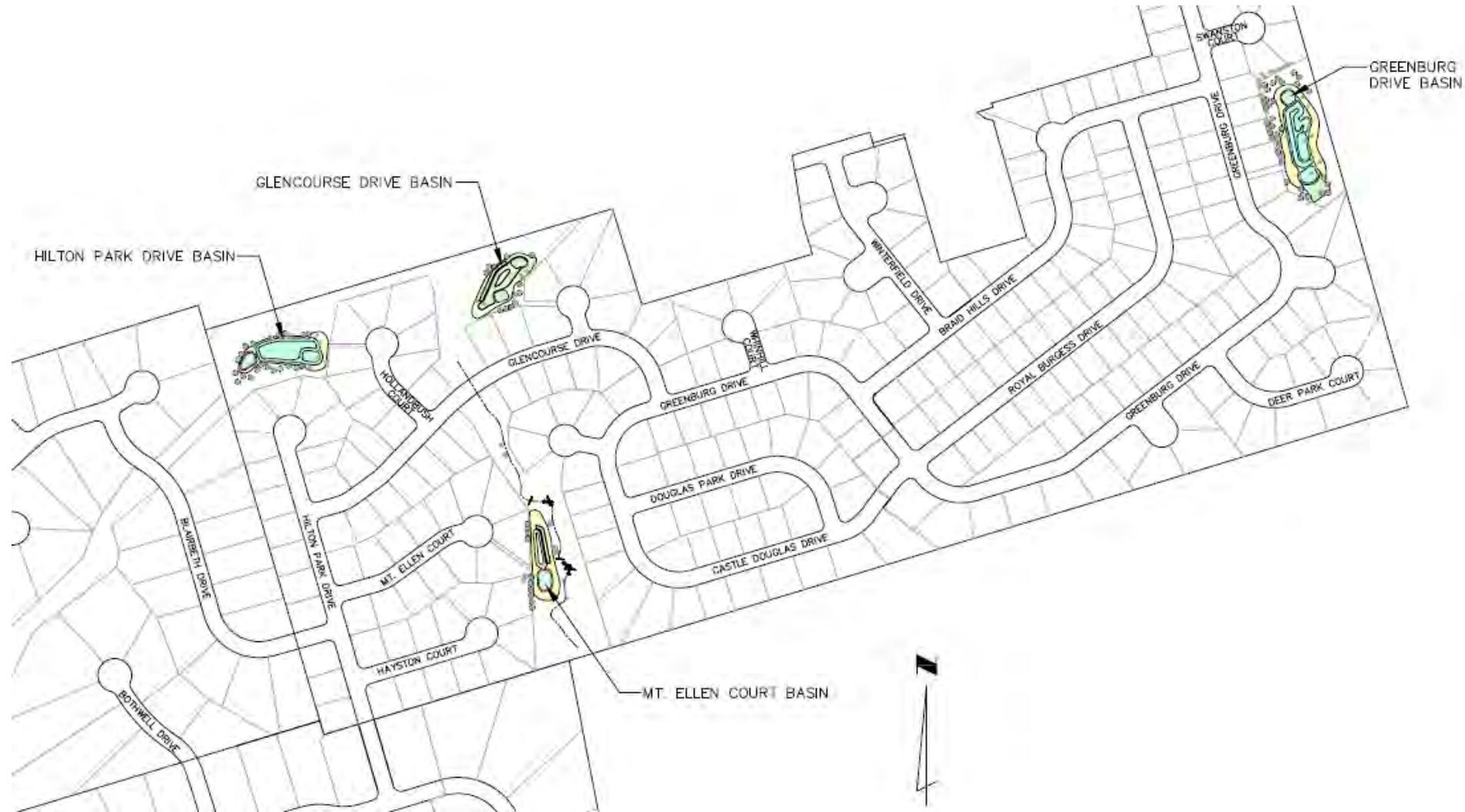
- Hydrology
- Underlying Soils
- Planting Soils
- Size & Volume
- Vegetation

Advantages:

- Significant pollutant removal
- Protects downstream water bodies
- Ecological & aesthetic benefits
- Volume reduction

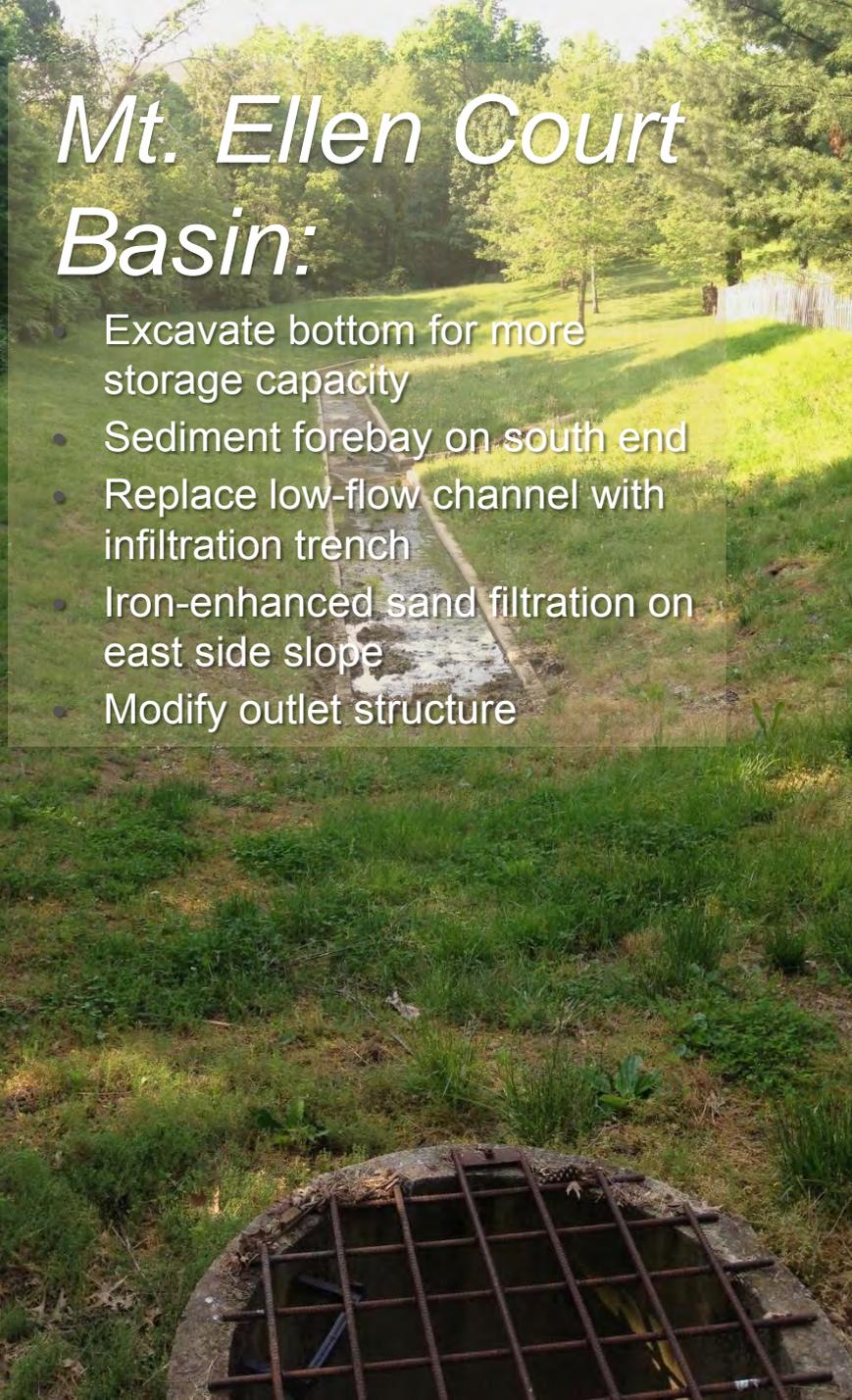


Specifics to Your Detention Basins



Mt. Ellen Court Basin:

- Excavate bottom for more storage capacity
- Sediment forebay on south end
- Replace low-flow channel with infiltration trench
- Iron-enhanced sand filtration on east side slope
- Modify outlet structure



Hilton Park Drive Basin:

- Excavate bottom for more storage capacity
- Sediment forebays on east and west end
- Remove low-flow channel
- Extended detention wetland concept
- Submergent and emergent vegetation; micropool
- Modify outlet structure



Glencourse Drive Basin:

- Excavate bottom for more storage capacity
- Sediment forebays on north and south end
- Replace concrete low-flow channel with infiltration trench
- Iron-enhanced sand filter on west side slope
- Modify outlet structure

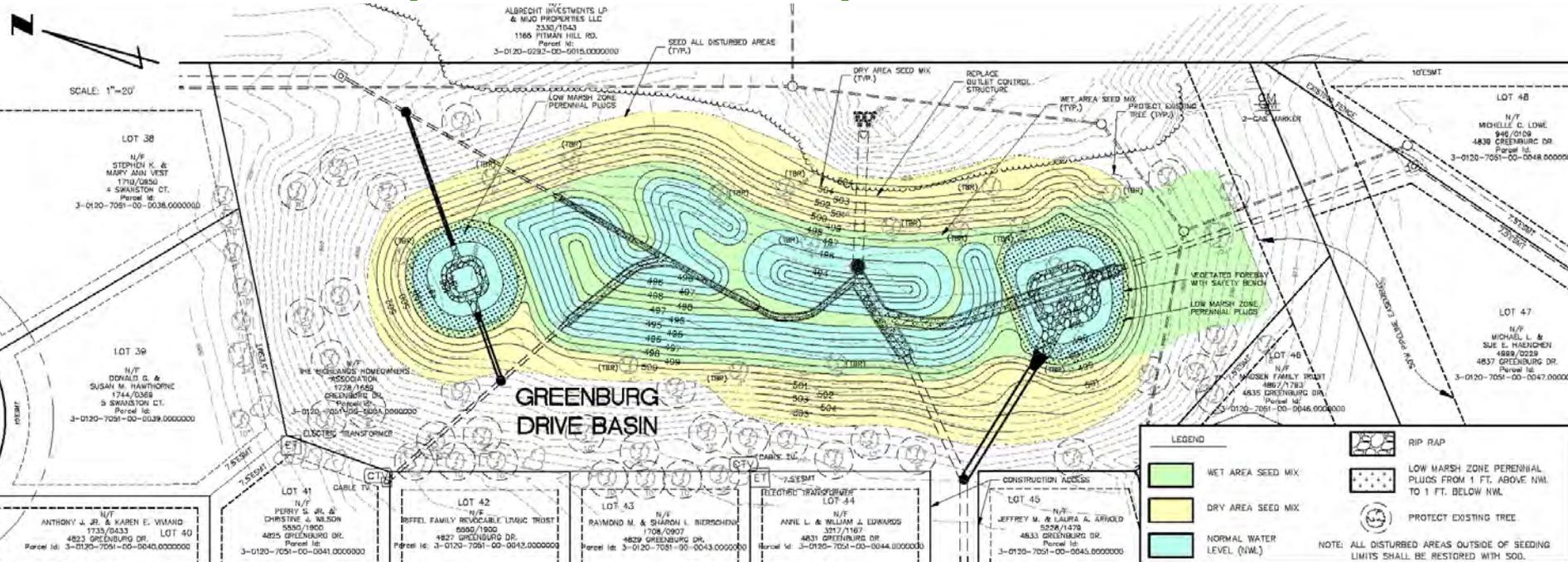




Greenburg Drive Basin:

- Excavate bottom for more storage capacity
- Sediment forebays on north and south end
- Remove low-flow channel
- Extended detention wetland concept
- Submergent and emergent vegetation; micropool
- Modify outlet structure

Example Landscape Plan



LEGEND

- WET AREA SEED MIX
- DRY AREA SEED MIX
- NORMAL WATER LEVEL (NWL)
- RIP RAP
- LOW MARSH ZONE PERENNIAL PLUGS FROM 1 FT. ABOVE NWL TO 1 FT. BELOW NWL
- PROTECT EXISTING TREE

NOTE: ALL DISTURBED AREAS OUTSIDE OF SEEDING LIMITS SHALL BE RESTORED WITH SOO.

LOW MARSH ZONE PERENNIALS PLUGS
(OTHER SOO IS SHOWN BY PLANT HEIGHT FROM LOWEST TO HIGHEST)

GRASSES/SEDGES



FORBS



DRY AREA SEED MIX
(OTHER SOO IS SHOWN BY PLANT HEIGHT FROM LOWEST TO HIGHEST)

GRASSES/SEDGES



FORBS



WET AREA SEED MIX
(OTHER SOO IS SHOWN BY PLANT HEIGHT FROM LOWEST TO HIGHEST)

GRASSES/SEDGES



FORBS



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	CITY OF ST. PETERS ONE ST. PETERS CENTRE BOULEVARD ST. PETERS, MO 63376, 836-477-8600					
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Drawn	LRB	DATE	OCTOBER, 2013			
Checked	JC	DATE	OCTOBER, 2013			



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Breakout Groups – Thank You!

