

Applied Ecological Services, Inc.



Sustainable Solutions for Over 30 Years

Introduction to Ecosystem Services
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The Illinois River

Now in 3-D

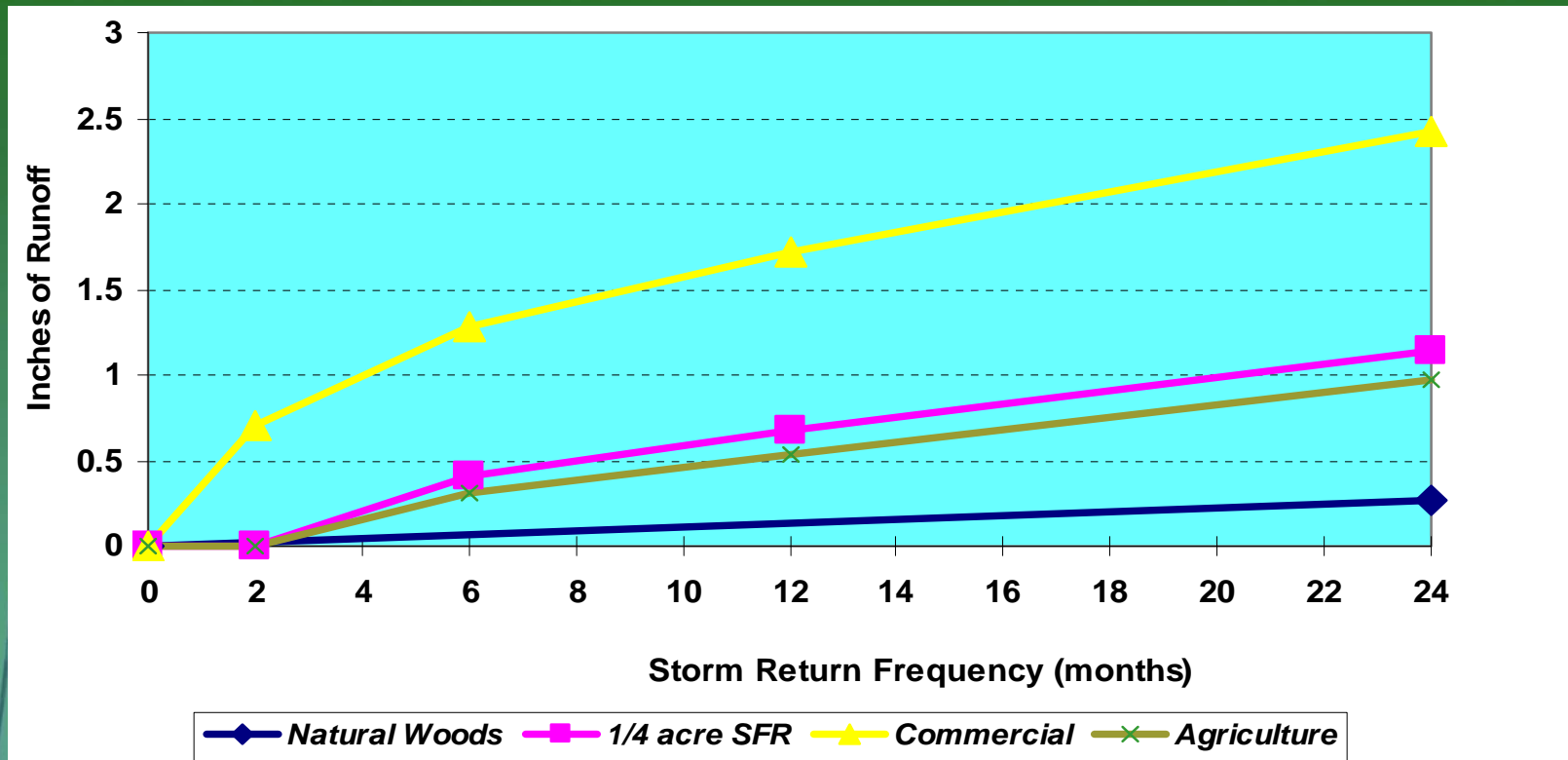
The Illinois River in 3-D

- Dammed
- Diked
- Damaged

Natural vs. Developed Runoff

Surface Water Runoff Amounts

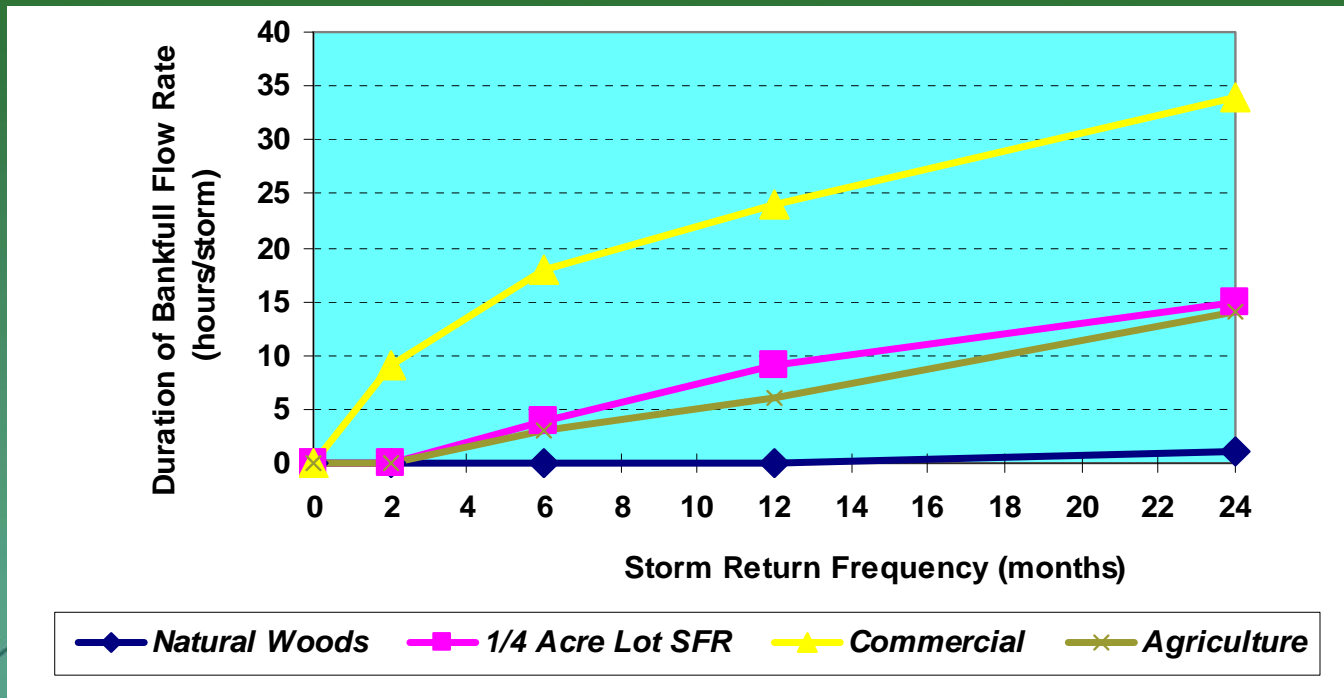
Comparison of Runoff Amounts for Hypothetical Development Scenarios in Liberty, MO



Natural vs. Developed Runoff

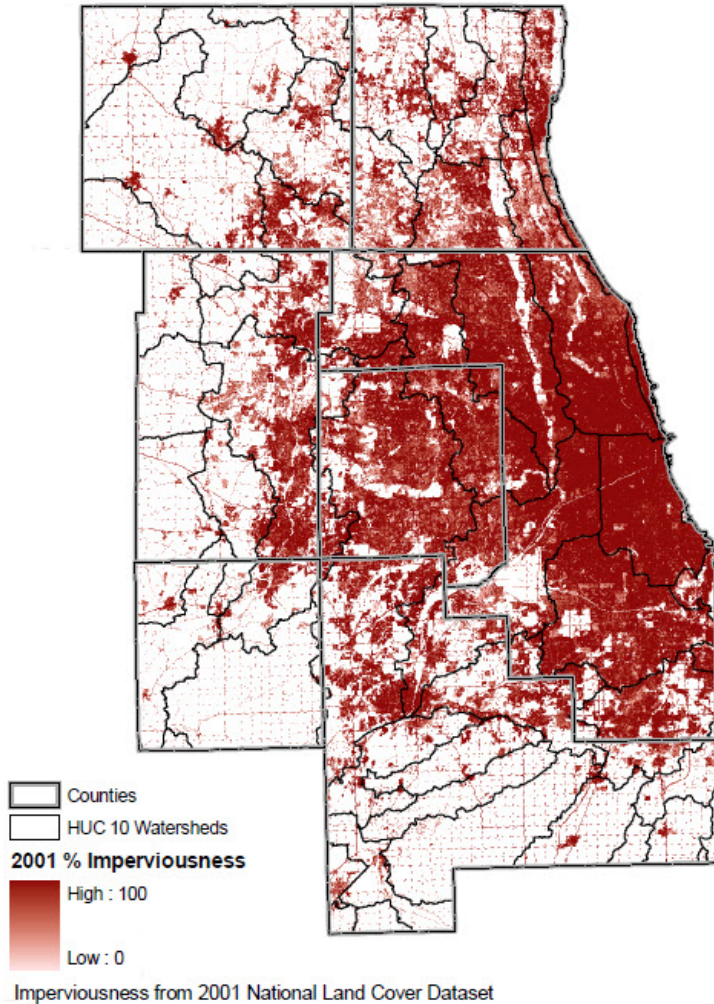
Bankfull Duration

For 24-hour duration, 2-year recurrence interval storm in Liberty, MO
(Assuming adequate stormwater detention to not exceed 2-year release rate for natural conditions)



2001

- Impervious surfaces
 - 505,000 acres
 - 19.3% of total area



Development impacts water volume, rate & quality...



Stormwater Management Objectives

- Flood Control
 - Surface Discharge Rate/Volume Control
 - Conveyance
- Base Flow Augmentation
- Water Quality Improvement

Water Quality Considerations

- Design for frequent storm events since all rain events wash contaminants away from source
- Need to remove contaminants from stormwater runoff
- System design is a function of both contaminant mass and contaminant concentration
- 90% of surface runoff volume occurs with storms having recurrence interval of 2-years or less

Negative impacts of a traditional stormwater approach...

- Quantity: Increase stormwater runoff volumes into downstream water resources
- Timing: Rapid and unnatural swings in water levels
- Quality: Inputs that degrade water quality in our rivers, lakes and wetlands
 - Nutrients
 - Contaminants
 - Sediments

Ecological Stormwater Management Principles

- Manage stormwater where it hits the ground.
- Manage stormwater throughout the watershed.
- Give stormwater an opportunity to infiltrate and evaporate.
- Manage volume, rate, and water quality of stormwater.
- Integrate stormwater management to contribute to the community aesthetic and sense of place.

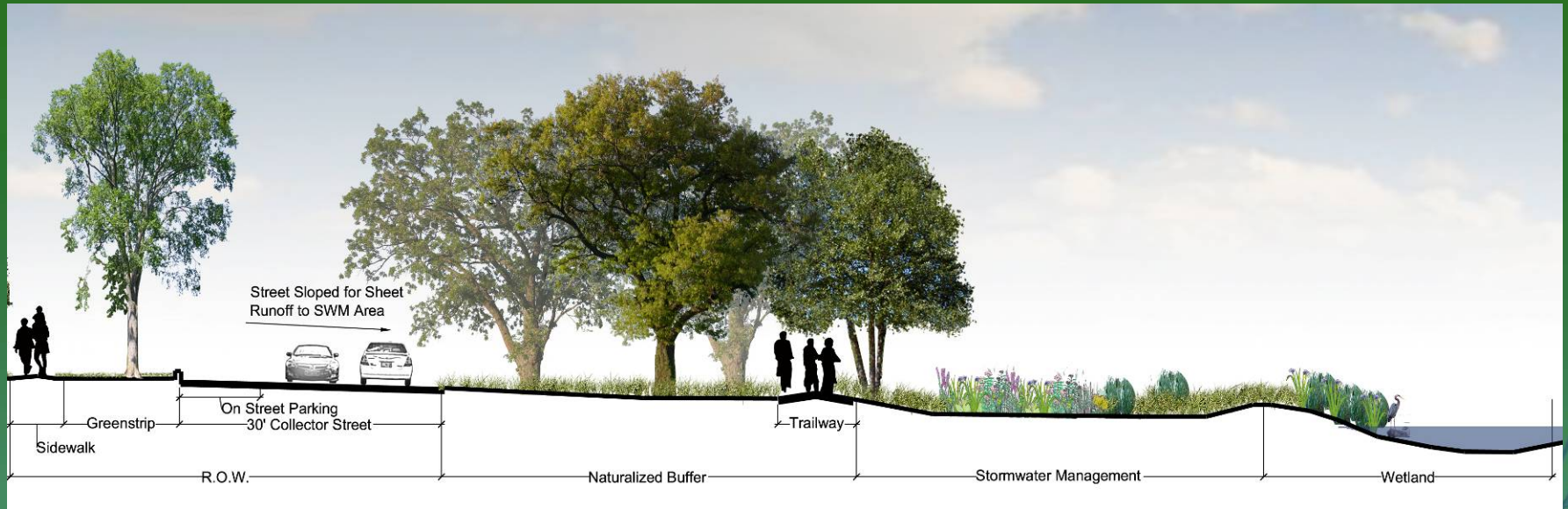
Ecological Stormwater Management Principles

- Provide stormwater management projects that work at all scales from regional to backyard.
- Reduce project short and long-term costs by reducing engineering infrastructure and use “nature” where possible to manage water.
- Retrofit stormwater management opportunities in the community.

Sustainable Stormwater Management

- Duplicate Natural Runoff Volume and Rates
 - Surface Runoff
 - Infiltration
 - Evapotranspiration
- Manage the Precipitation Where it Hits the Ground
- Management Options
 - Retention and Extended Detention
 - Infrastructure Design
 - Land Use Changes

Best Management Practices: The Stormwater Treatment Train



Precipitation



Rain Garden



Bio-Swale



Cleansing Meadow Buffer

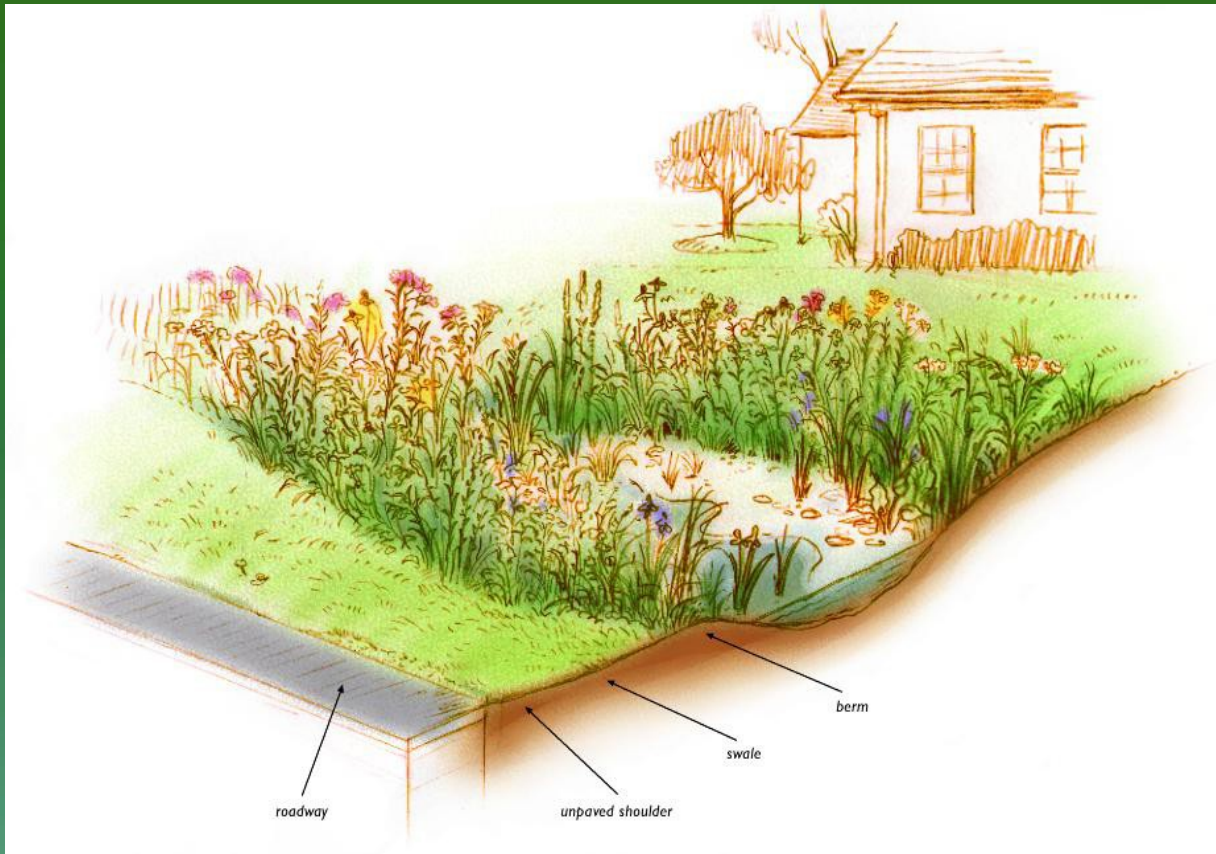


Naturalized Detention Basin



Treatment Wetland

Rain Gardens



Benefits:

- Source management of first flush of precipitation
- Deep rooted native plantings enhance infiltration
- First stage of filtering process

Rain Garden Example

After...

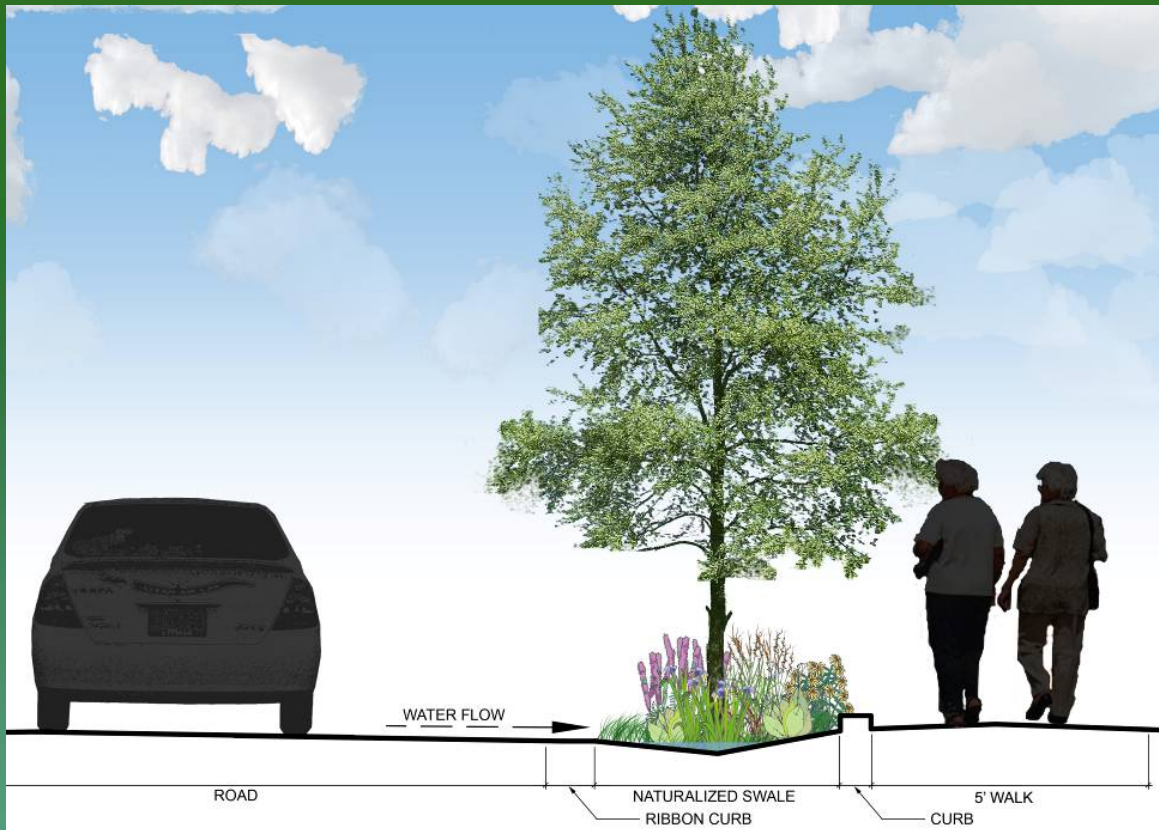
Before...



Rain Garden Example



Bio-Swales



Benefits:

- Collects water from hard surfaces such as roads and driveways
- Filters and moves water to ponds and treatment wetlands

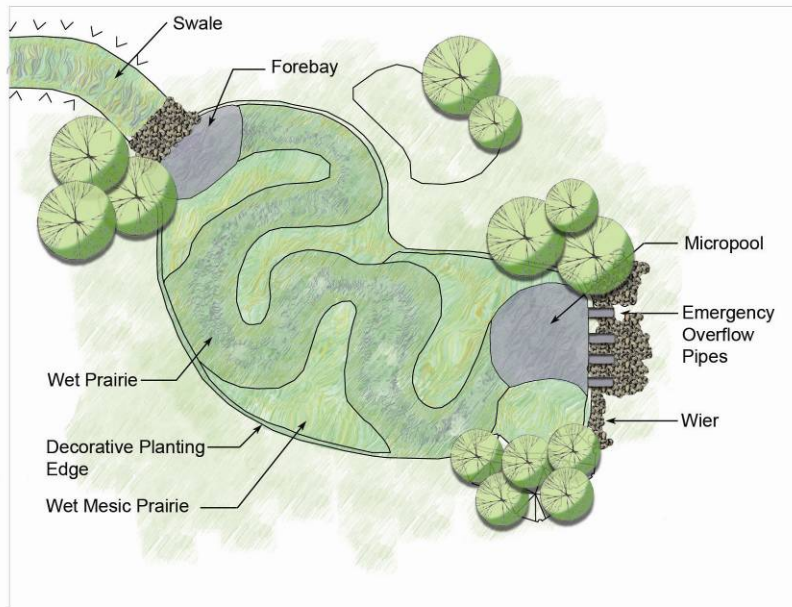
Meadow Buffers



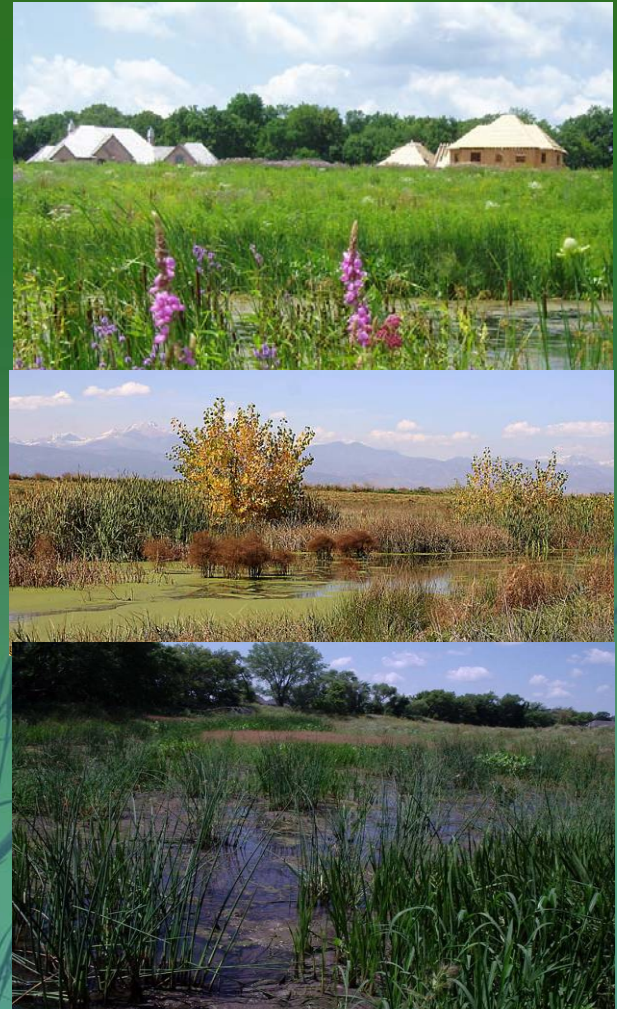
Benefits:

- Deep rooted grasses and forbs absorb and infiltrate water
- Slows and filters water

Treatment Wetlands



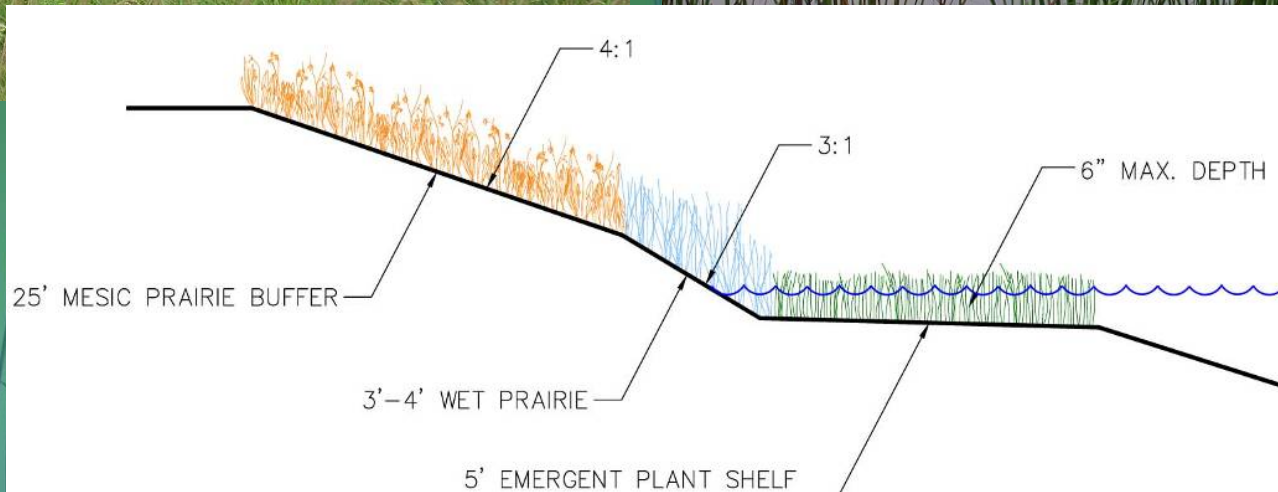
Constructed Wetland Detail

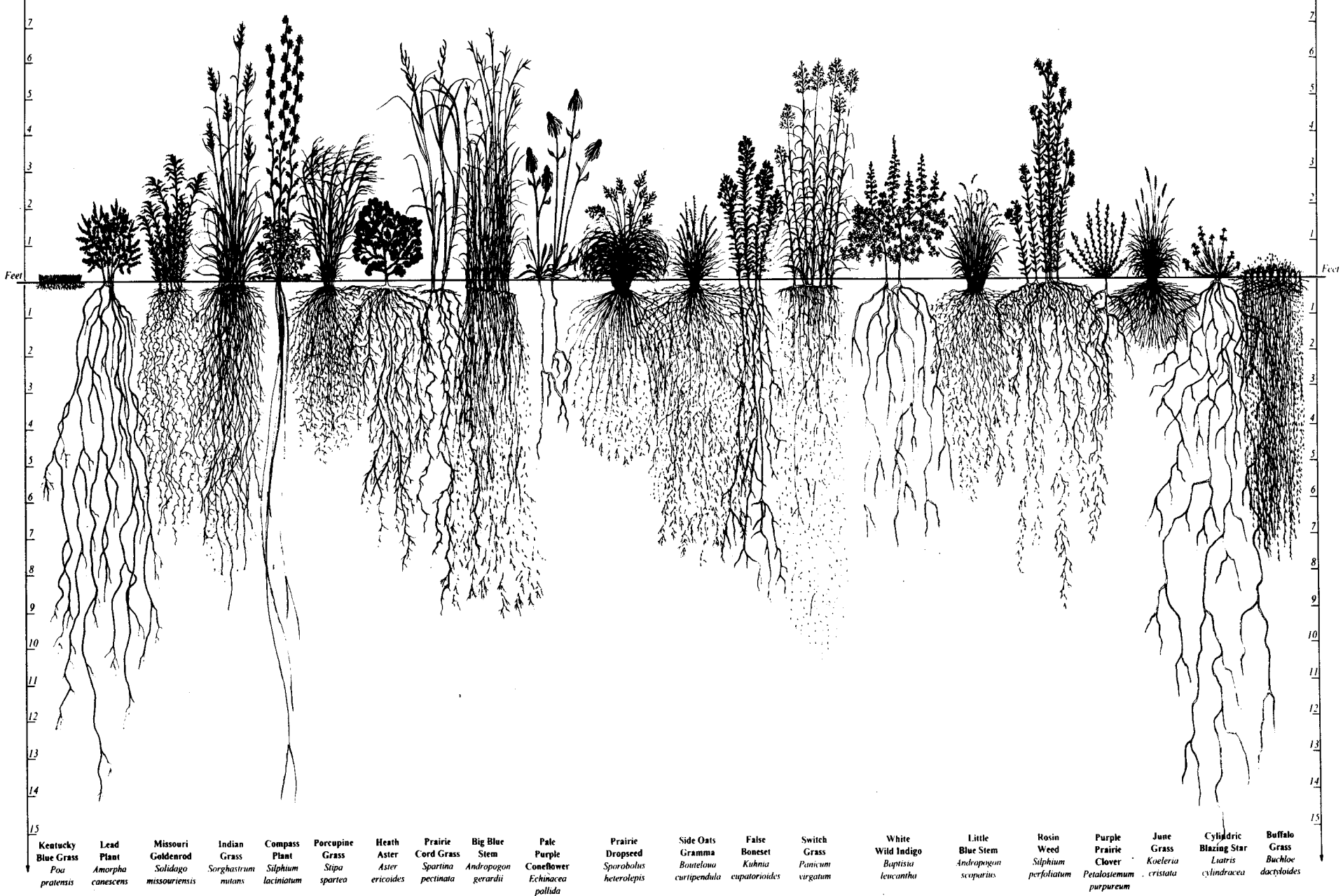


Benefits:

- Provide aerobic and anaerobic conditions for the breakdown of nutrients and pollutants in the water
- Removes nitrates and hydrocarbons
- Creates habitat

Wetland Biofiltration/Detention

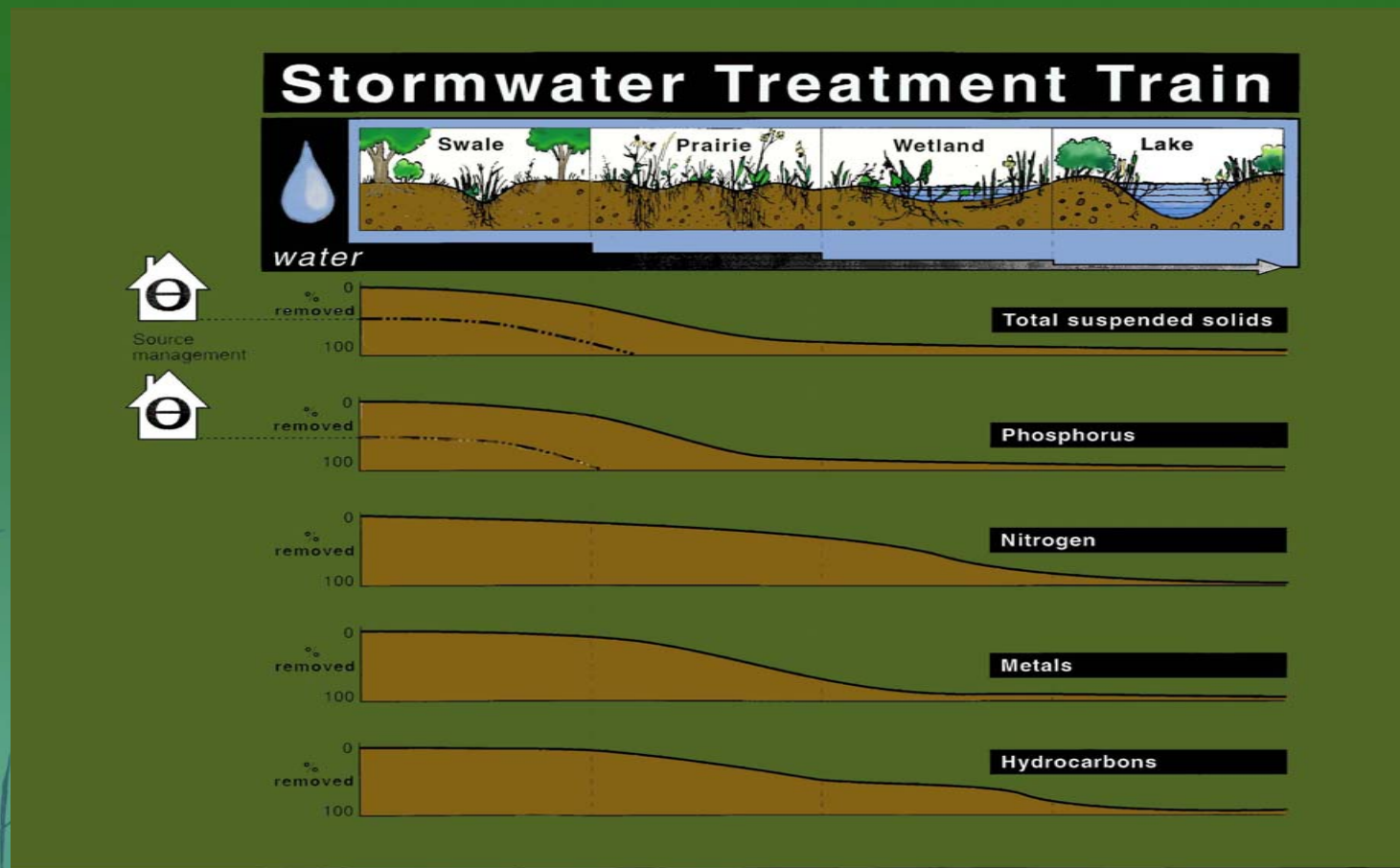




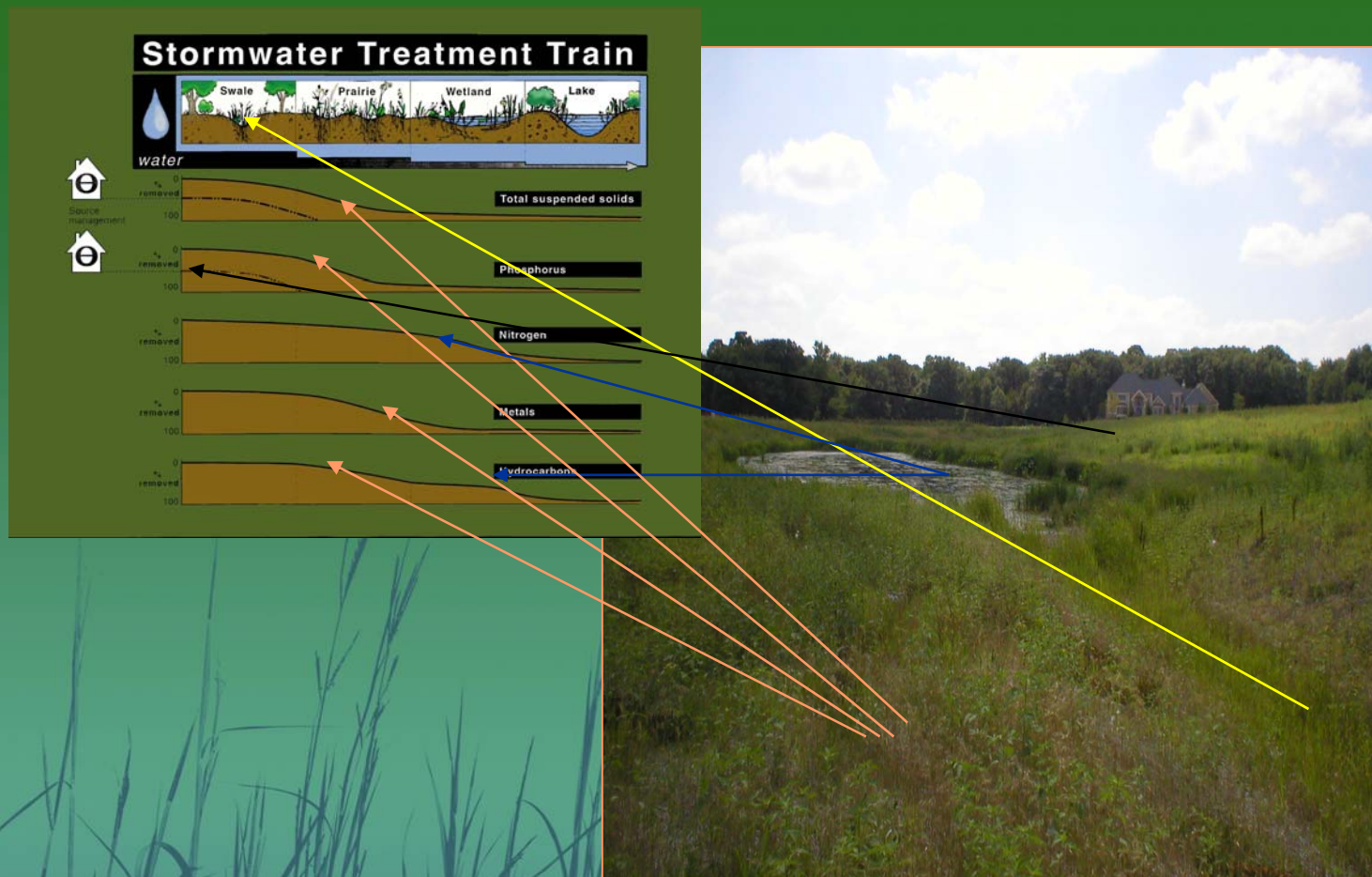
Root Systems of Prairie Plants

Conservation Design Forum, Inc.

Use Of Restored Prairies And Wetlands (Not Storm Sewers)—SAVES \$\$\$.



Stormwater Treatment Train (STT) Elements Integration



Results of the Stormwater Treatment Train . . .

- Improved water quality.
- Reduced run off rate and volume.
- Increased infiltration and groundwater recharge.
- Natural discharge and maintenance of base flow.
- Improved habitat.
- Reduced erosion and sedimentation.

Provides the backbone of your green infrastructure for wildlife, trails, and parks.



Aesthetic and Functioning Stormwater Management Systems



Vegetated Biofilter Wetland

Traditional Detention Pond



NATURE is beautiful, provides multiple-
benefits, free services and functions that
we cannot replace.

Commitment...
Commitment...
COMMITMENT!!

A VISION!!!

PARTNERSHIPS!!!

A VISIONARY TEAM

TEAM MEMBER

ROLE

Local Government Member	Provides Community Vision, Applies conservation principles, Approves the project
Owner/Developer	Initiator, Overseer & Financial Purveyor
Ecologist Specialist	Natural Systems Analyst & Restoration Specialist Geotechnical, Arborist, Farmer, Other
Landscape Architect/Planner Engineer	Spatial & Aesthetic Analyst & Designer, “Arranger of Space” Civil: Hard Systems Specialist & Designer Hydrologist: Water Quality & Management Specialist
Architect	Architectural Solutions (Structural & Thematic/Ornamental)
Attorney	Codifier, Covenants & Restrictions Writer
Construction Manager	Builds it
Realtor	Sells it
Land Steward	Monitors & Maintains it
Homeowner	Buys it, Lives it, Enjoys it!

Applied Ecological Services, Inc.

“Our vision and ethic is to bring the science of ecology to all land-use decisions.”

- Practice sound ecosystem science
- Work at all spatial scales
- Strive for ecosystem health



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Thank You!



Applied Ecological Services, Inc.™

