
# Going Blue at Brownfields:

## Use of Green Infrastructure for Storm Water Management


## Margaret Renas, P.E., LEED AP

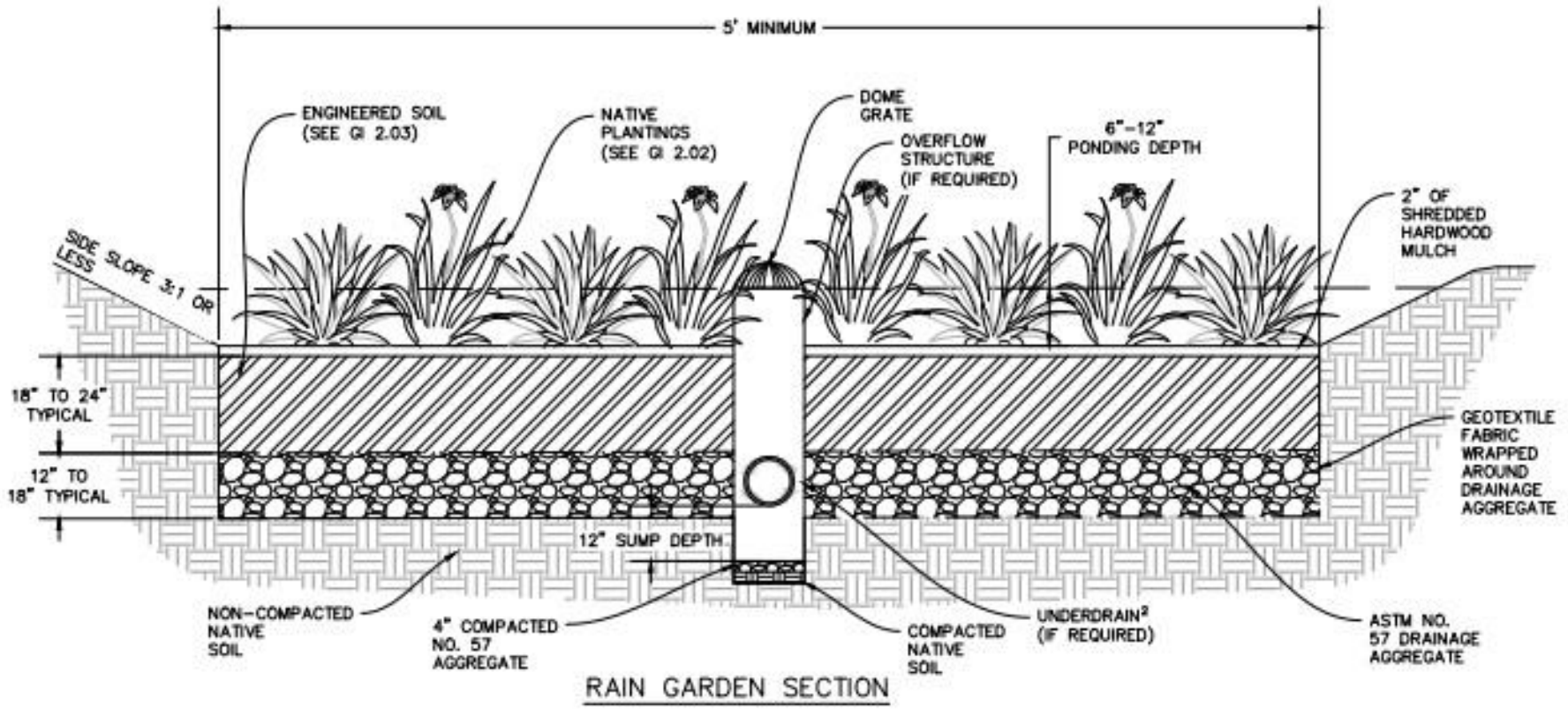
**Senior Manager, Delta Institute**

# Today's Presentation

- What is Green Infrastructure (GI)?
  - Types and Low Impact Design (LID) vs. Non-LID
  - Co-Benefits of LID
- Why Do We Need GI?
- GI and Brownfields in Wisconsin
  - Restrictions and Permitting
- GI Maintenance Issues & Tips
- Tools for GI and Brownfields

delta institute


What is Green Infrastructure?
Types of GI




# Cross Section of Rain Garden

**Bioswale**

**Rain Garden**

**Stormwater Planters**

**Permeable Pavers and Pervious Pavement**

**Underground Storage**

Green Roof

## Cistern

# Is a Detention – (Wet) Basin Green Infrastructure?

# Low Impact Design (LID)

**Manages rainfall at the source using uniformly distributed decentralized micro-scale controls.**

**Goal – Mimic a site's predevelopment hydrology by using techniques that infiltrate, filter, store, evaporate and detain runoff close to its source.**

delta institute

# LID Co-Benefits

- **Localized storm water mgmt.**
- **Space saving (small footprint)**
- **Blight reduction/Additional green space**
- **Potential increase in property value of site and neighboring sites (halo effect)**

delta institute

# LID Co-Benefits

- **Improved water quality *& air quality***
- **Urban heat island reduction**
- **Energy savings**
- **Jobs – installation & maintenance!!**

delta institute

# Co-Benefit: Community Engagement

# Co-Benefit: Place Making

# Co-Benefit: Habitat Restoration

# WI Examples:
# 1000 Friends of Wisconsin
# MMSD

http://www.1kfriends.org/watershed-protection/

http://www.mmsd.com/gi/green-infrastructure

# WI Example:
# Reed Street Yards, Milwaukee, WI

## INFRASTRUCTURE

With water as the priority, Reed Street Yards is an evolving eco-industrial zone balancing natural resources and economic development. Sustainability starts with the underlying infrastructure: a system of urban bio swales and rain gardens, a "purple pipe" for grey water recapture, demonstration and educational projects - all integrated with the Menomonee River and historic brownfield reclamation. Reed Street Yards has adopted green building guidelines to promote sustainable development and ensure building performance. In collaboration with the Water Council and Milwaukee Metropolitan Sewerage District (MMSD), Reed Street Yards is promoting an industrial symbiosis around the water business. Cooperation and collaboration among stakeholders may include: sharing logistics, research, purchasing green power and integrating industrial processes that require water.

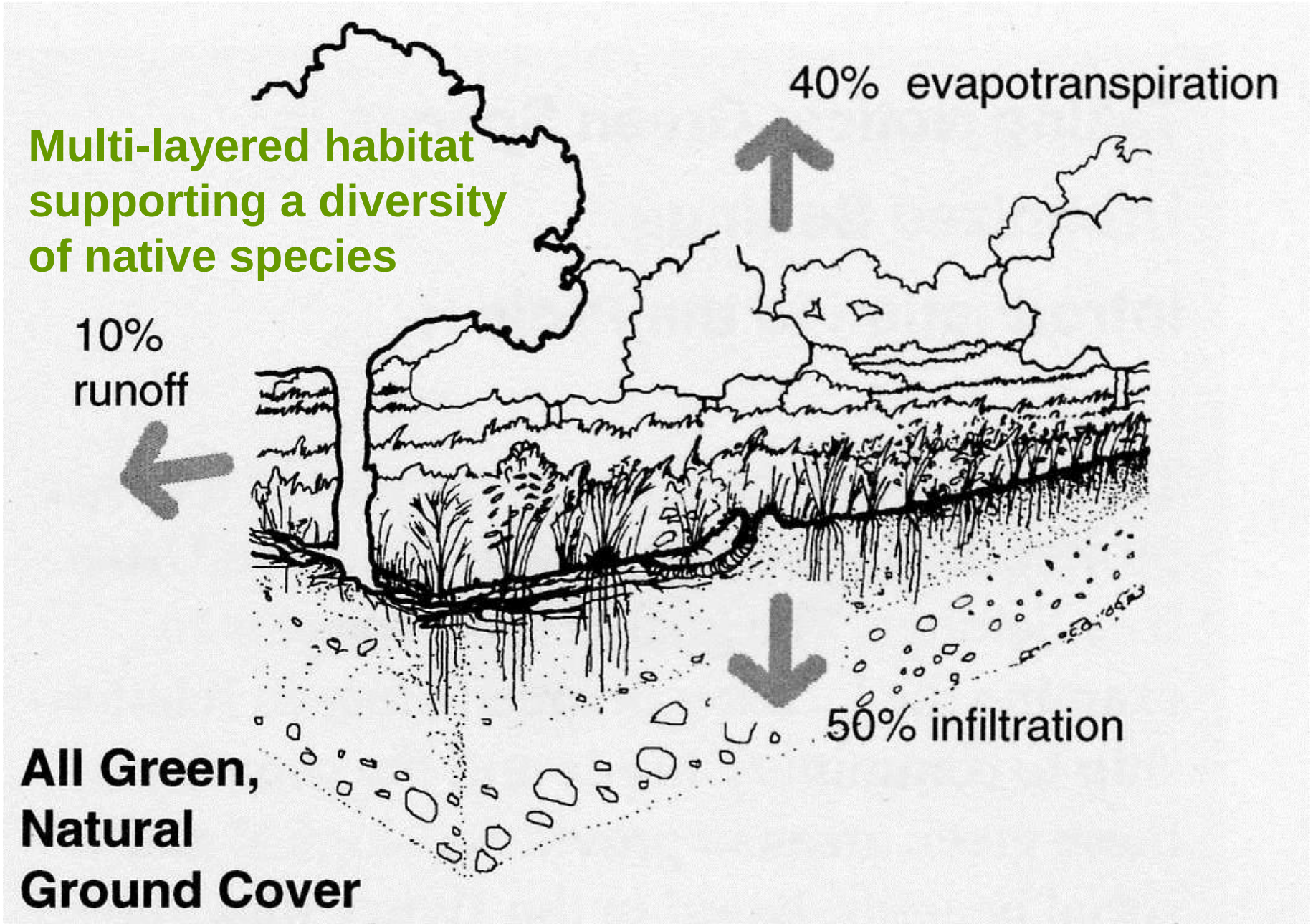
BIOSWALES

RAIN GARDENS

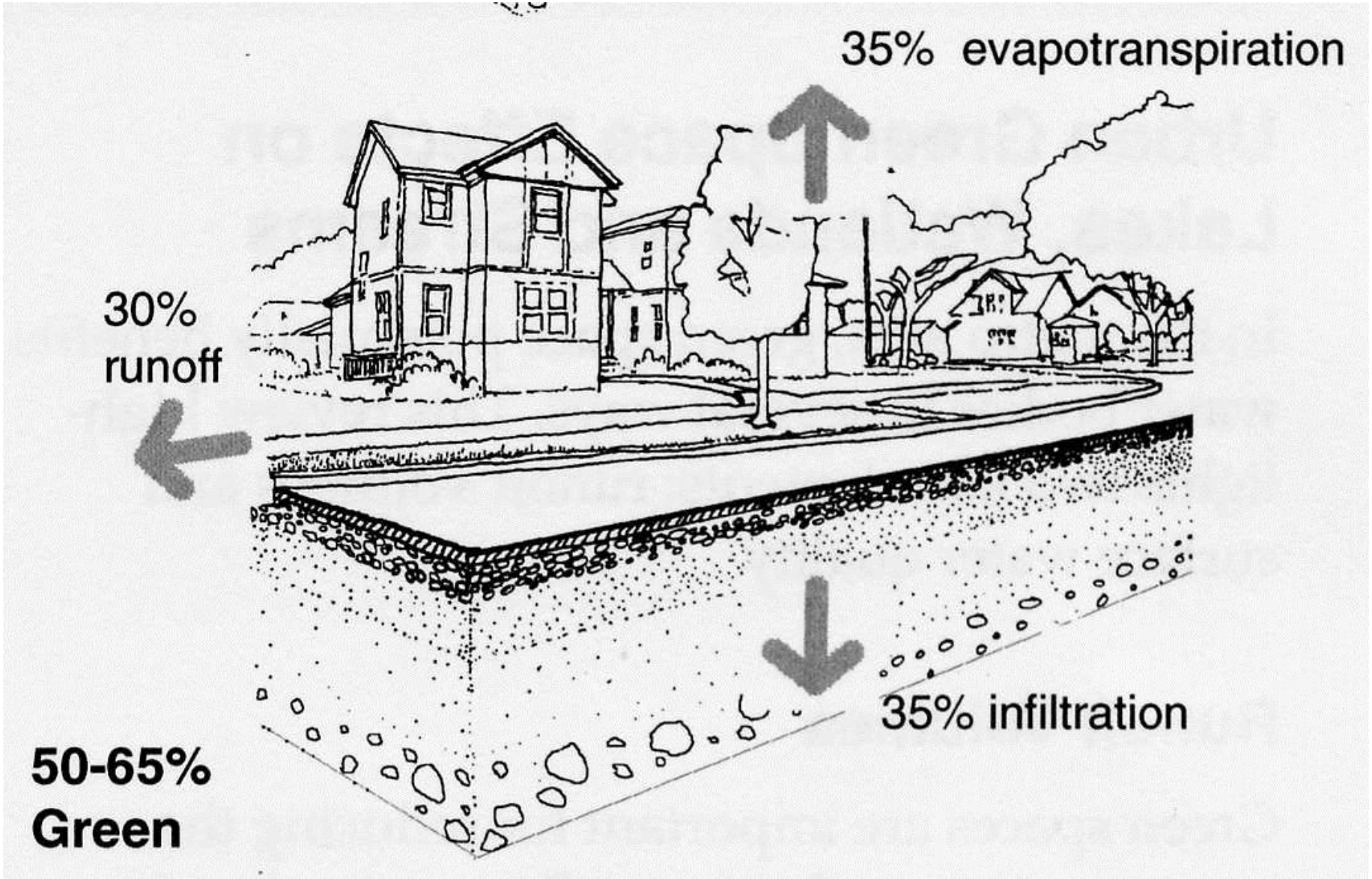
# WI Example:
# Menomonee Valley SW Park


Why Do We Need GI?

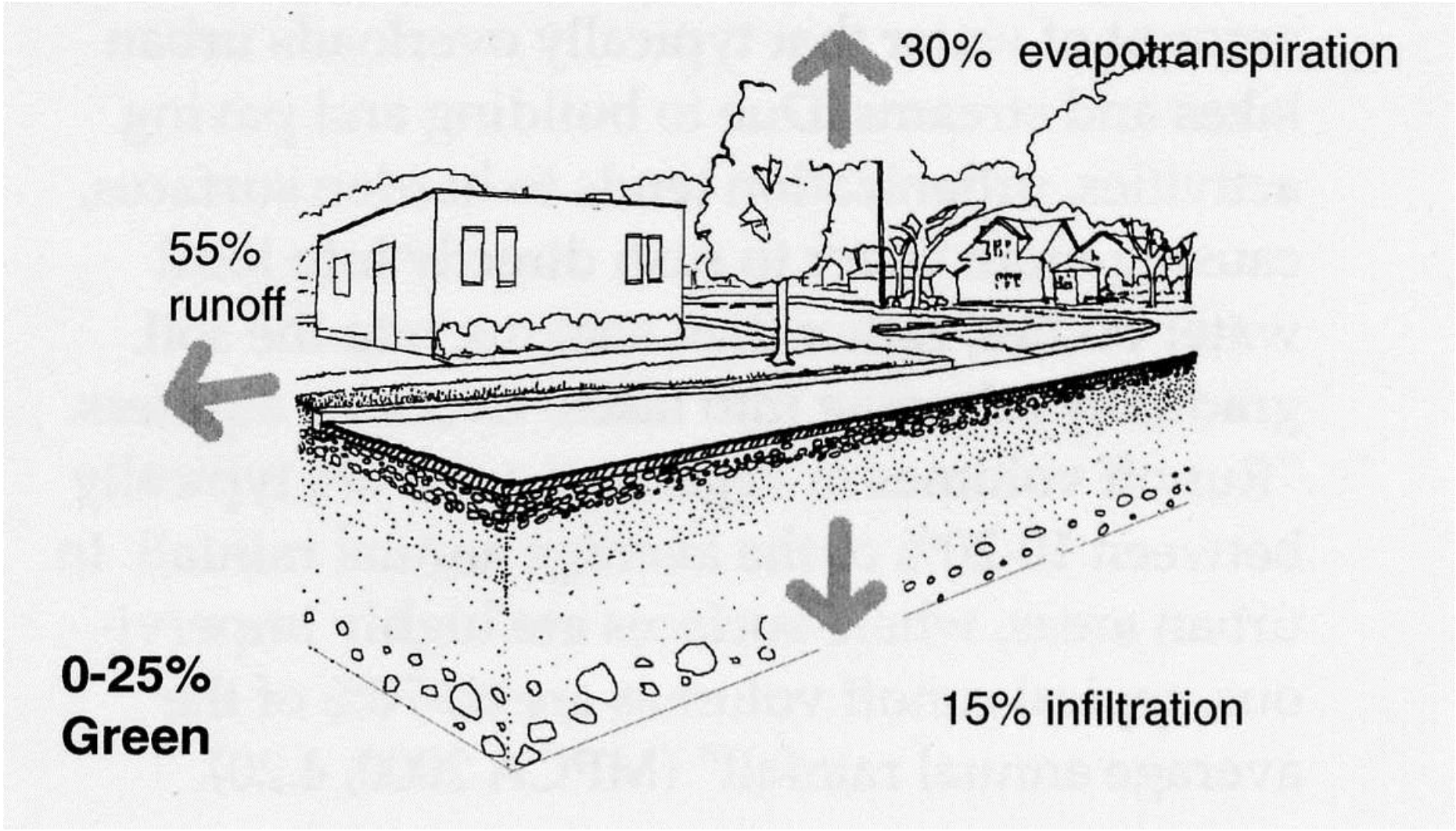
# Past: Primarily Natural Habitats



**More diverse plants introduced that are pleasing to people, but plants become less native/replaced with hardscape**



# A habitat is created that is predominantly hardscape.



# Healthy Stream

# Stream Channel Erosion

# Effects of Stormwater and CSOs in Urban Environments

Per FEMA, “About 20-25% of all economic losses resulting from flooding occur in areas not designated as being in a ‘floodplain’, but as a consequence of urban drainage.”

# Role of Green Infrastructure in Stormwater Management

- **Community Level: *Supplement or complement* grey infrastructure (sewers) and wet detention basins.**
- **Development Level: *Replace* grey infrastructure or detention basis.**
- **Filtration and Biodegradation of Pollutants**
- **Evapotranspiration of Stormwater**
- **Recharging of Groundwater through infiltration***


GI and Brownfields

# GI and Brownfields in Wisconsin

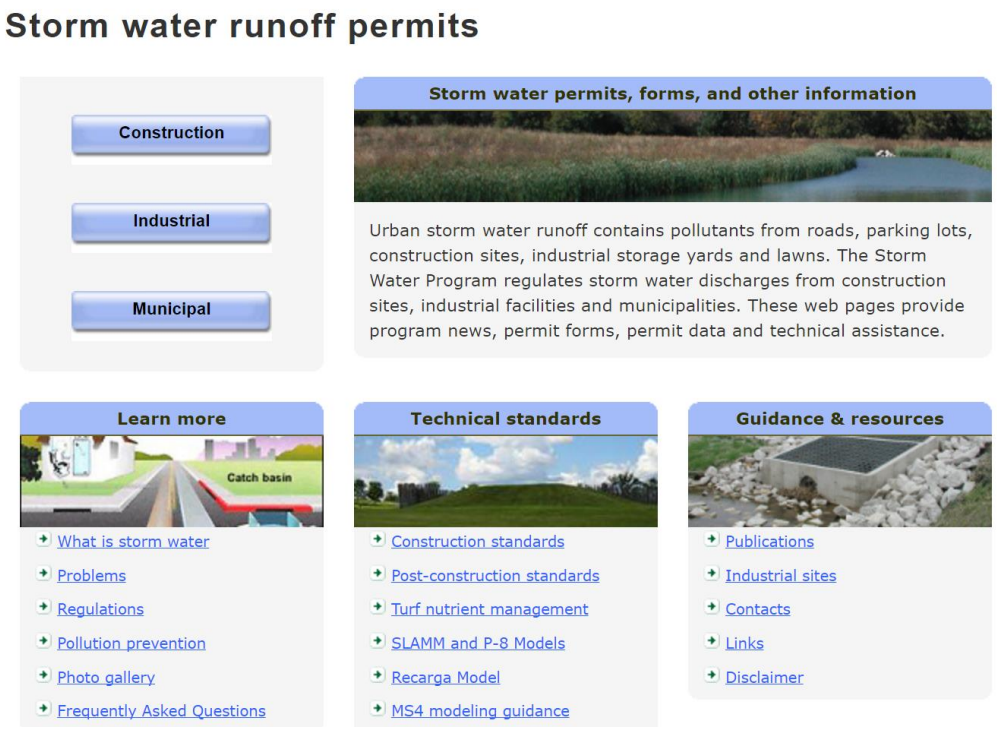
**Sites that receive case closure with contamination managed in place *may* be required to use an underground liner**

- **Work with:**
  - **WDNR Remediation & Redevelopment Program *and***
  - **WDNR Storm Water Division.**

# GI and Brownfields in Wisconsin

## Planning/Permitting Process:

- **Statewide – WDNR Guidelines**
  **dnr.wi.gov/topic/stormwater/**



# GI and Brownfields in Wisconsin

## Planning/Permitting Process:

- **Local Municipalities- Will also need to be permitted by your local municipality and agree on a maintenance contract for the GI**

**www.1kfriends.org/watershed-protection/**


Maintenance of LID GI

# Comparison of LID GI to Grey and to Wet Detention

# Maintenance Strategies

- **To Protect GI Create *Intentionality:***
  - Hardscape around GI
  - Make GI a “feature” in your design using water features, geometry and art components.
  - Curb markers if GI in parkways
  - Weed torch on permeable pavers instead of pulling weeds.
  - Avoid planting near utilities that require maintenance

# Increasing Acceptance of GI

- Include some trial garden plants i.e 25% garden (tulips) 75% native for greater acceptance.
- Solicit community feedback during install.
- Show renderings of newly planted *in addition to* growth at 3 years for realistic impressions.


Tools for GI and Brownfields

# WI DNR Post-Construction Tech Standards

dnr.wi.gov/topic/stormwater/standards/postconst_standards.html

# TAB Resources

Projector | Timesheet | (471 unread) - margaret | Online Training Details -

https://www.ksutab.org/education/training/details?id=201

TAB TECHNICAL ASSISTANCE TO BROWNFIELDS

Home About Education Online Tools Resources Services Contact

> Help > Sign in

Not a member? Get a free account.

## Online Training: Infrastructure for Green Redevelopment of Brownfields

TAB Program > Education > Online Training > Training Details

**Review Questions:** 22

Welcome to the Infrastructure for Green Redevelopment of Brownfields training course.

The purpose of this course is to help participants 1) explain the basic concepts behind green infrastructure and why it is significant to brownfield redevelopment,2) distinguish the different types of green infrastructure relevant to water management and transportation, 3) describe the economic benefits of installing green infrastructure on brownfields, 4) describe the basic planning process for implementing green infrastructure with brownfield redevelopments, 5) recognize municipal green infrastructure templates, and 6) identify sources for GI financing.

The course is a series of short lectures accompanied by supplemental materials. The supplemental materials are .pdf versions of the slides from the lectures including the transcript, provided as a reference for further study. The lectures and supplemental materials are accessible from the Associated Learning section at the bottom of this page. They are listed in order of recommended viewing.

**Scroll down to begin.** Once you have viewed the materials, please select the Launch Review button at the bottom of the screen. This will take you to a short test to help you review the course content. After taking the test and achieving a score of at least 80%, a certificate of participation will be available for printing.

**PRESENTERS:**

**Eugene Goldfarb** was the Midwest Environmental Officer for the U.S. Department of Housing and Urban Development for approximately 15 years and retired in 2004. Eugene was a certified planner (AICP) from 1981 through 2012 and is still a licensed attorney in Illinois.

2016-ATC-Registra....pdf 2016-ATC-Registra....pdf 2016-ATC-Registra....pdf 2016-ATC-Registra....pdf Show all

Search the web and Windows 4:02 PM 9/23/2016

# TAB GI Online Training Modules

- **Module 1: Introduction to GI**
- **Module 2: Types & Uses of GI – Water Management & Transportation**
- **Module 3: Economic Development & Broader Benefits of GI**
- **Module 4: Planning Process for GI**
- **Module 5: Tools for GI Decision Making**
- **Module 6: Funding for GI**

https://www.ksutab.org/education/resources

TAB
TECHNICAL ASSISTANCE TO BROWNFIELDS

Home About Education Online Tools Resources Se

# Resources

TAB Program > Education > Resources

**Category**

**Topic**

**Related Material**

Resources (14)

**Keyword Search**

green infrastructure

## Title

- GI for Stormwater – Design Considerations
- GI Green River Pattern Book
- GI Retrofitting Large Landscape for Sustainability – Morton Arboretum

# Delta Guidance


http://delta-institute.org/delta/wp-content/uploads/Green-Infrastructure-Designs-July-2015.pdf

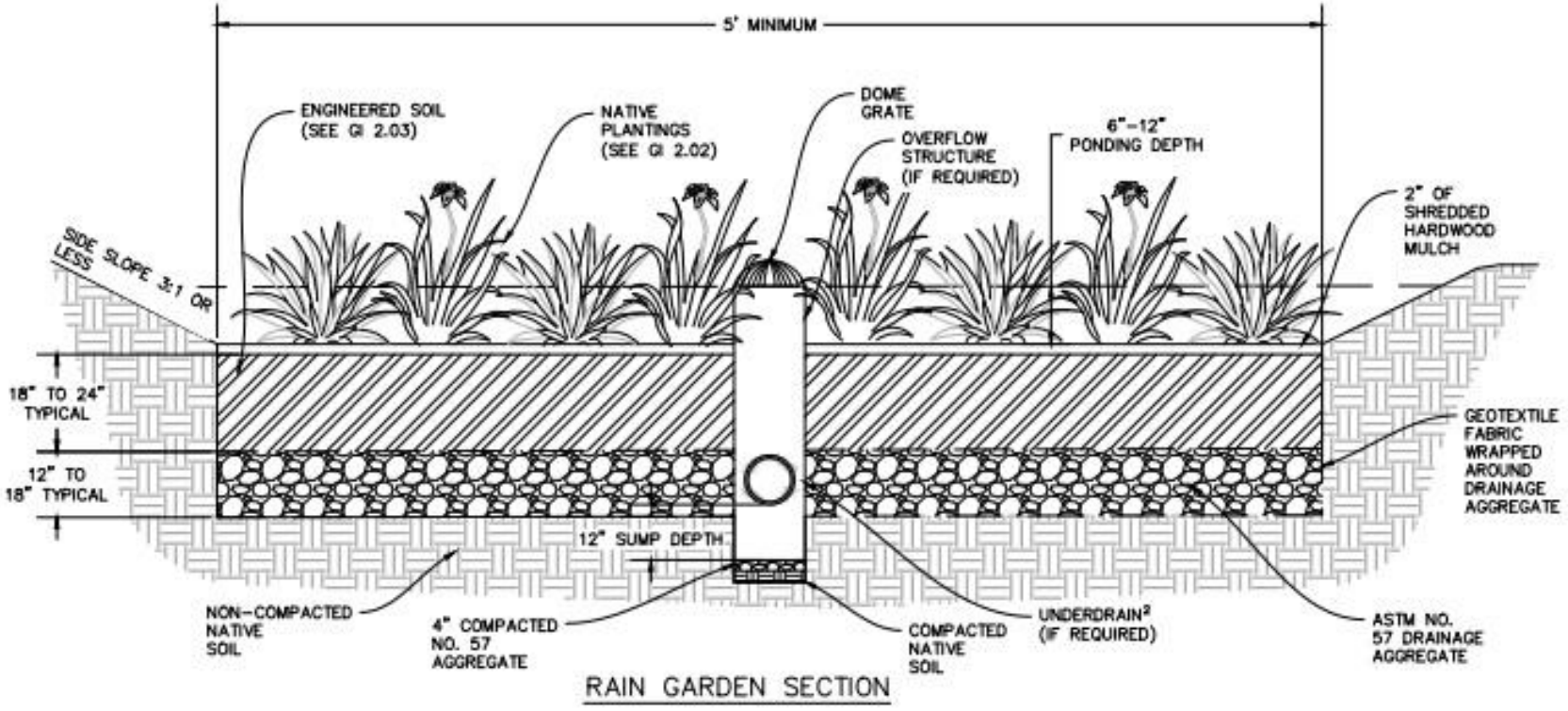
# Toolkit Features

1. Decision support trees, basic information on green infrastructure

2. Templates, plan sets, cross sections, and material specifications – *Generic so always follow WDNR technical standards.*

3. Estimation tools for installation and maintenance costs

# For Engineers




Cross Section from Rain Garden Section

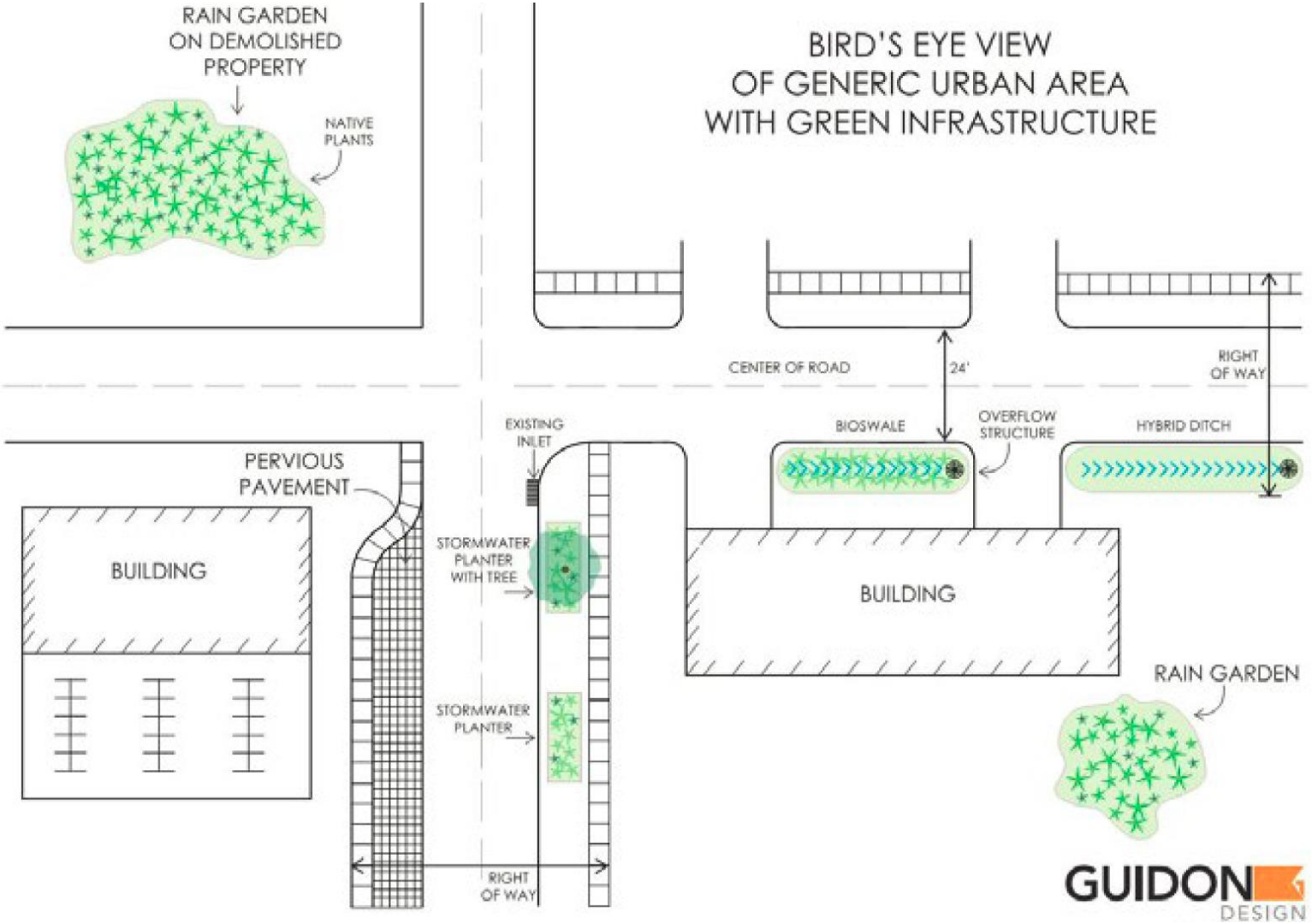
# Download The Toolkit & Open Source CAD Files:

www.bit.ly/greeninfrastructuretools

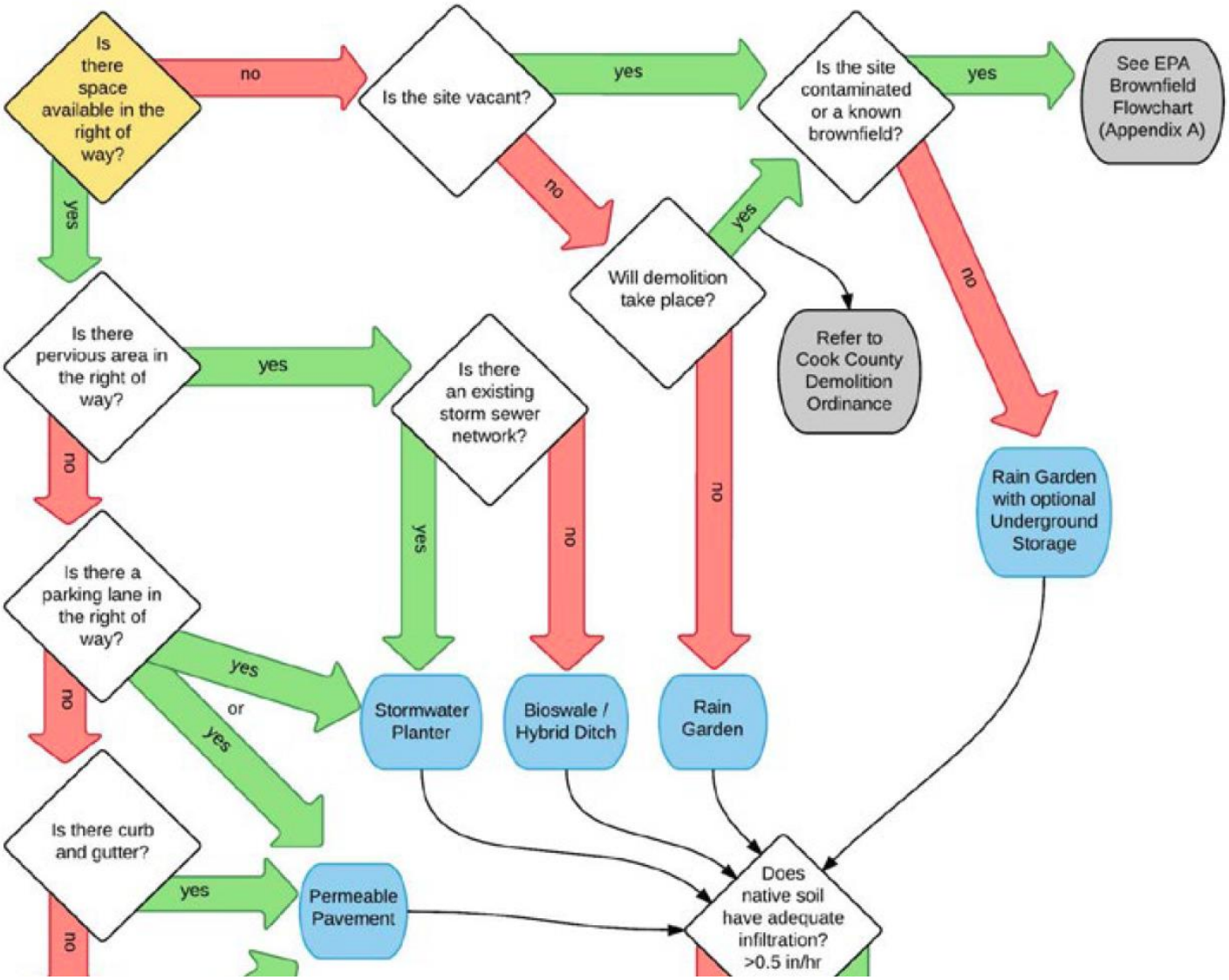
# For Municipal Managers

| | Item | Description | Installed Cost[1] | Unit |
|---|---|---|---|---|
| *GI Technique* | *Permeable pavement* | *Pavers, stone layers (bedding, base, and subbase), geotextile and excavation* | *$ 15.00* | *SF[2]* |
| *Required component* | *Bedding layer* | *2" ASTM No. 8 Stone* | *$ 45.00* | *TON* |
| | *Base layer* | *4" ASTM No. 57 Stone* | *$ 30.00* | *TON* |
| | *Subbase layer[3]* | *6" ASTM No. 2 Stone* | *$ 35.00* | *TON* |
| | *Geotextile* | *Non-woven geotextile fabric* | *$ 5.00* | *SY* |
| | *Curb* | *Containment curb* | *$ 35.00* | *LF[4]* |
| *Custom options* | *Underdrain* | *12" HDPE perforated storm pipe* | *$ 32.00* | *LF* |
| | *Connect to existing storm structure* | *Core drill existing structure, connect overflow pipe* | *$ 1,500* | *EA* |

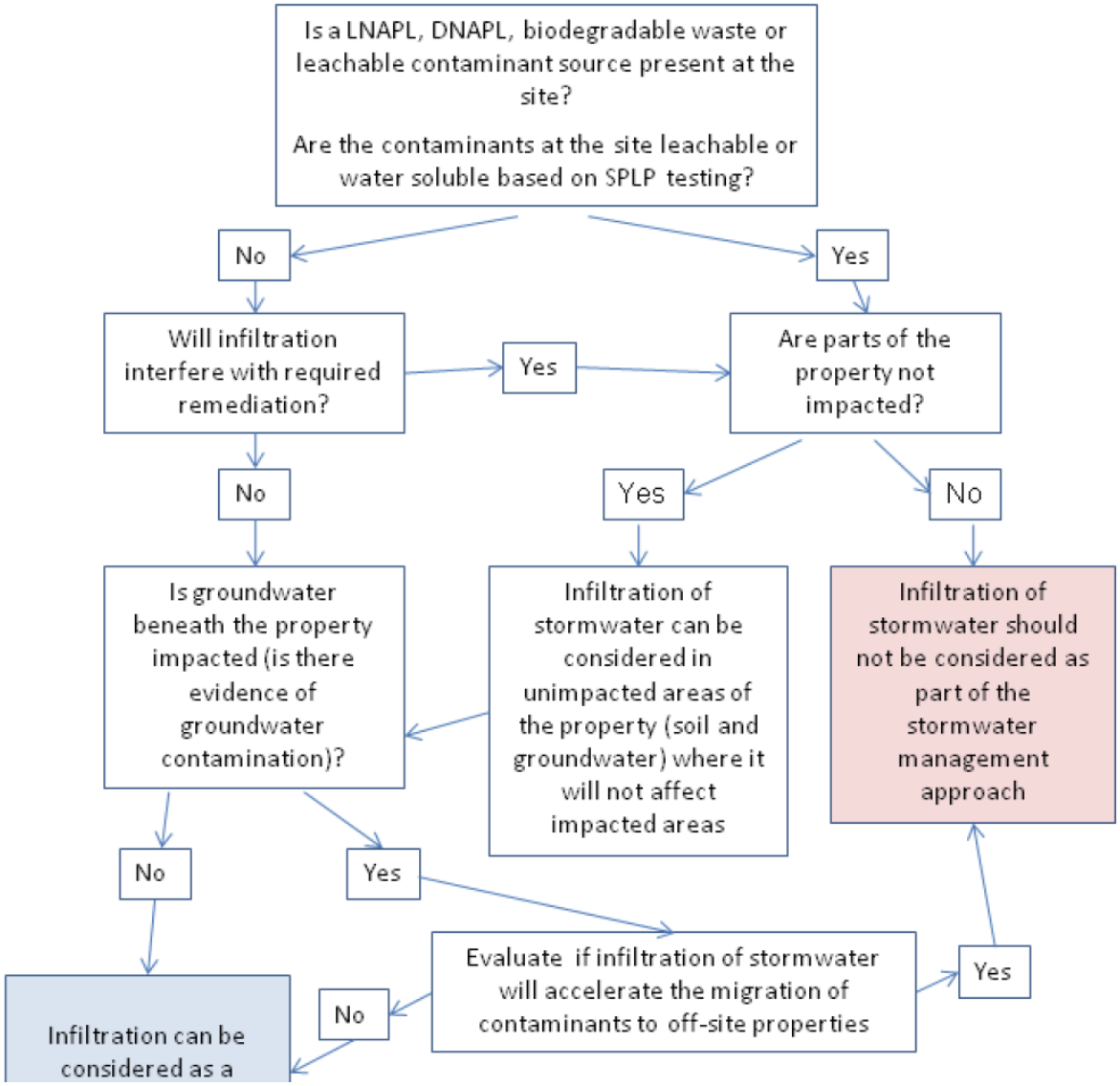
# For Planners



# Green Infrastructure Flow Chart



## Decision Flowchart for the Use of Stormwater Infiltration at Brownfield Sites



# NGIT – Decision Tool

Green Storm Water Infrastructure Decision Tree for Brownfield Sites

**http://www5.njit.edu/tab/tools-1/**

# Ongoing Efforts: Piloting

# TAB Contact

Blase Leven (TAB Program Coordinator)
785-532-0780 baleven@ksu.edu

Margaret Renas (TAB Point of Contact for WI)
312 651-4335 mrenas@delta-institute.org

Web site: http://www.ksutab.org

** TAB acknowledges TAB Partner Eugene Goldfarb and Great Lakes Environmental Planning as contributor to these slides.*

KANSAS STATE UNIVERSITY

TAB TECHNICAL ASSISTANCE TO BROWNFIELDS

delta institute