



Green Infrastructure Opportunities for Municipalities

**Northern Michigan Green
Infrastructure
Conference**

June 4, 2015

Scott Dierks, PE

Overview

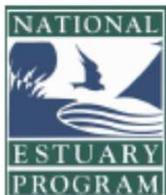
- Present GI practices that can be integrated into current day to day municipal operations
- Provide ideas that span the spectrum of “low-hanging fruit” to more involved projects
- Present concepts for integrating GI into existing municipal operations
- Provide Michigan & Ohio project examples
- Provide design, funding and maintenance guidance resources

Green Infrastructure Opportunities that Arise During Municipal Operations



EPA 842-R-15-002

January 2015



Office of Wetlands, Oceans and Watersheds
National Estuary Program



Intended Audience



.....and, in particular, communities with NPDES stormwater permits, TMDLs, impaired waters (303D list) and CSOs

Improved Air Quality/Climate Change



Urban Heat Island

Green infrastructure practices that include trees and other vegetation can reduce the urban heat island effect, which reduces energy use and the incidence and severity of heat-related illnesses.

Air Quality

Green infrastructure improves air quality by increasing vegetation, specifically trees, that absorb air pollutants, including CO₂, NO₂, O₃, SO₂, and PM₁₀.

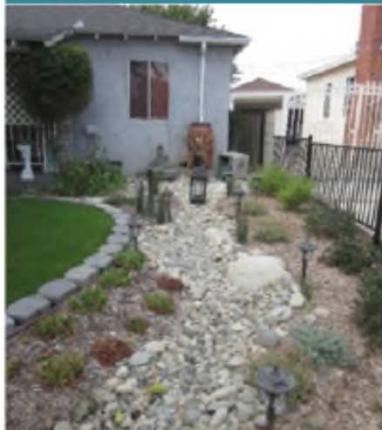
Greenhouse Gases

Green infrastructure's ability to sequester carbon in vegetation can help to meet greenhouse gas emission goals by contributing to a carbon sink.

Water Quality and Quantity

Water Conservation

Green infrastructure that incorporates locally adapted or native plants reduce the need for irrigation, which reduces demand for potable and recycled water. Rain barrels and cisterns that capture rainwater also reduce water use.



Water Quality and Flood Mitigation

Green infrastructure can decrease the frequency and severity of local flooding by reducing stormwater discharge volumes and rates.

Habitat

Vegetated green infrastructure can provide habitat for wildlife, particularly birds and insects, even at small scales of implementation.

Quality of Life

Public Health

Residents have more recreational opportunities in the presence of large-scale green space in their community, which can improve public health and well-being.

Public Safety

Green streets that include curb bump-outs at pedestrian crossings improve pedestrian safety by slowing traffic and decreasing the distance that pedestrians must travel in the roadway.

Recreational Opportunities

Larger-scale green infrastructure facilities that include public access, such as constructed wetlands, offer recreational opportunities.



Property Aesthetics

Green infrastructure that includes attractive vegetation can improve property aesthetics, which can translate into increased property values.

Educational Opportunities

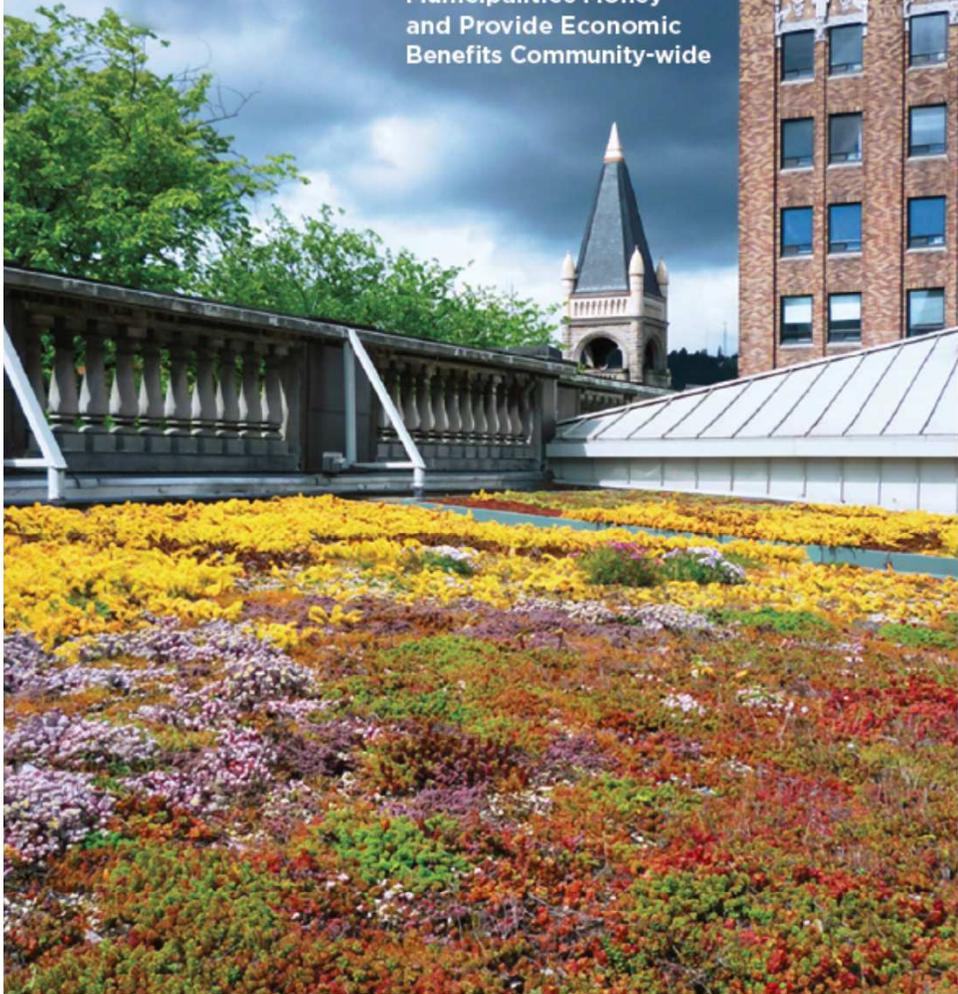
Public Education

The visible nature of green infrastructure offers enhanced public education opportunities to teach the community about mitigating the adverse environmental impacts of our built environment. Signage is used to inform viewers of the features and functions of the various types of facilities.



BANKING ON GREEN:

A Look at How Green Infrastructure Can Save Municipalities Money and Provide Economic Benefits Community-wide

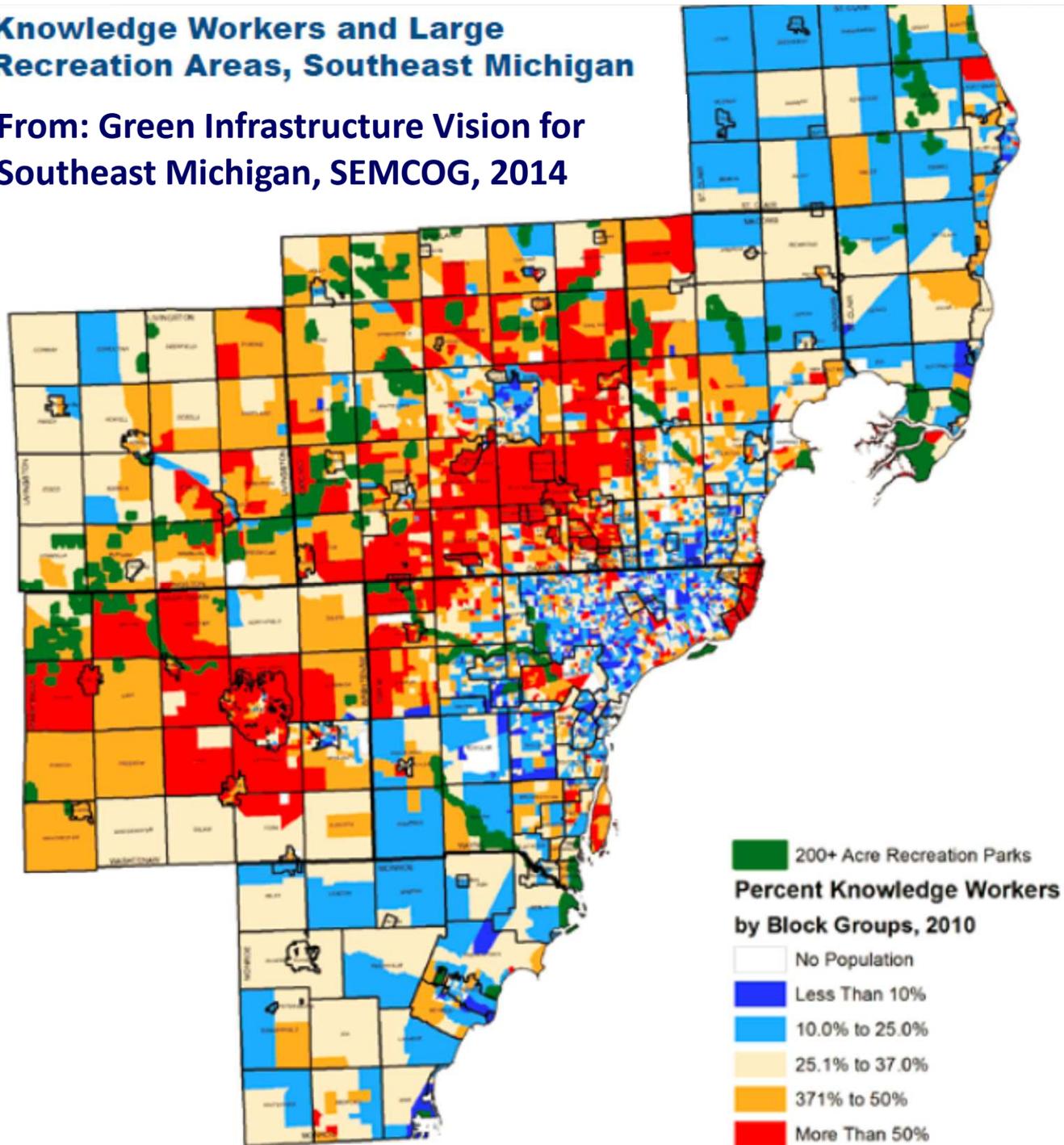


Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices



Knowledge Workers and Large Recreation Areas, Southeast Michigan

From: Green Infrastructure Vision for Southeast Michigan, SEMCOG, 2014



consultants

Incorporating GI

First/Second Generation
Michigan GI Projects

Add GI
Opportunistically

Starting Line:
Grey
Infrastructure

Third Generation
Michigan GI Projects

Plan for GI
Systematically

Add GI
Opportunistically

Fact Sheet 5:
Create
stormwater
microparks



Fact Sheet 1:
Build in green features
during routine right-of-
way maintenance and
operations

Fact Sheet 4:
Design traffic
safety features
to manage
stormwater
and improve
aesthetics



Green Infrastructure Opportunities



Fact Sheet
Build or
retrofit par
facilities to
greener

Fact Sheet 3:
Build rain gardens
at public facilities



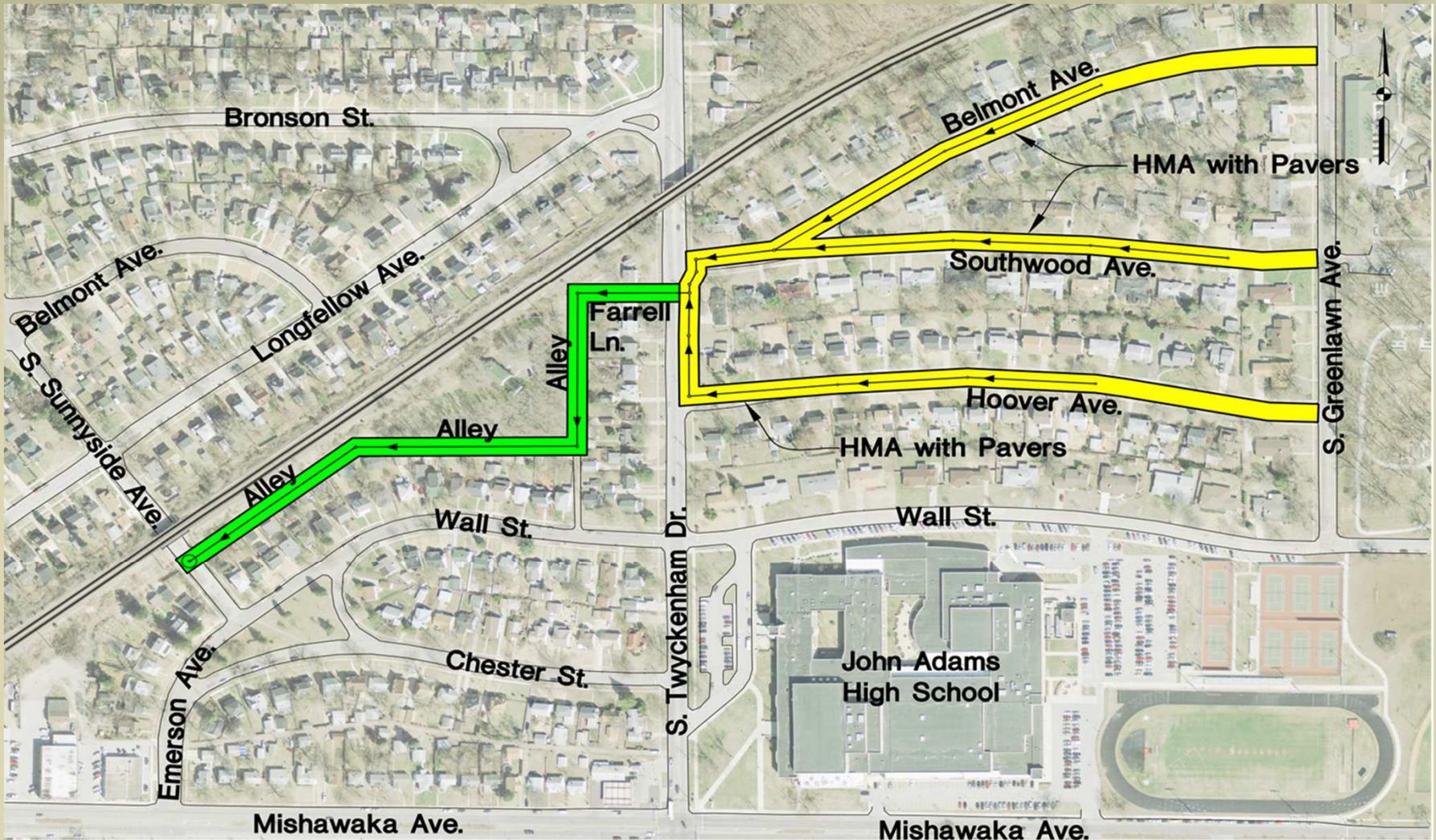
Stormwater “Micro-park”: Briarcliff in Ann Arbor



GI built into Road/Infrastructure + Traffic Calming: Easy Street, Ann Arbor



Southwood CSO Sewer Separation – South Bend



Parking Lot Retrofits:



Traverse City

& Cincinnati



Rain Gardens in Public Places: Zone Recreation, Cleveland



Incorporating GI

First/Second Generation
Michigan GI Projects

Starting Line:
Grey
Infrastructure

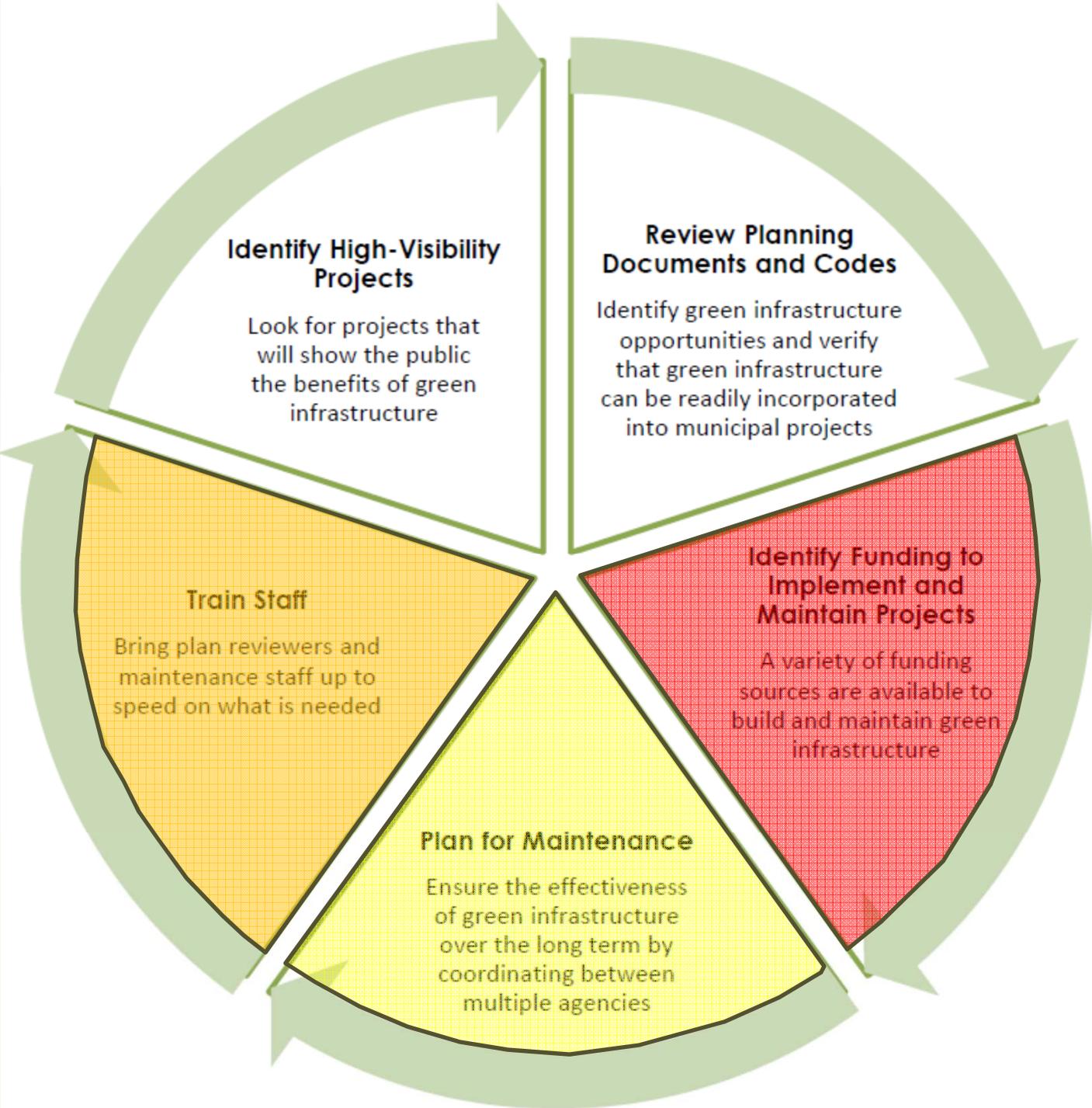
Add GI
Opportunistically

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STEPS TO IMPLEMENTING

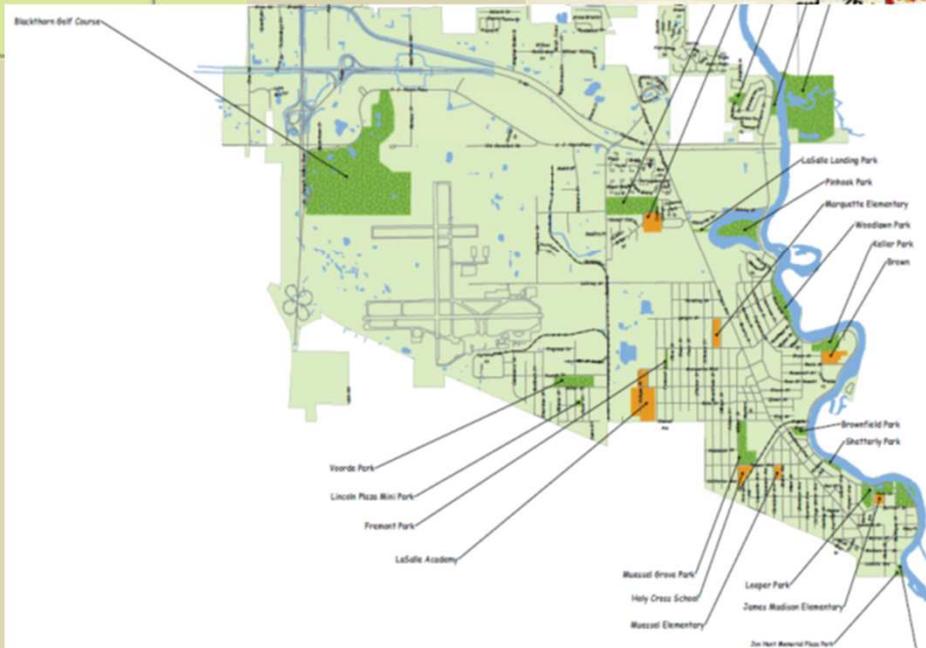
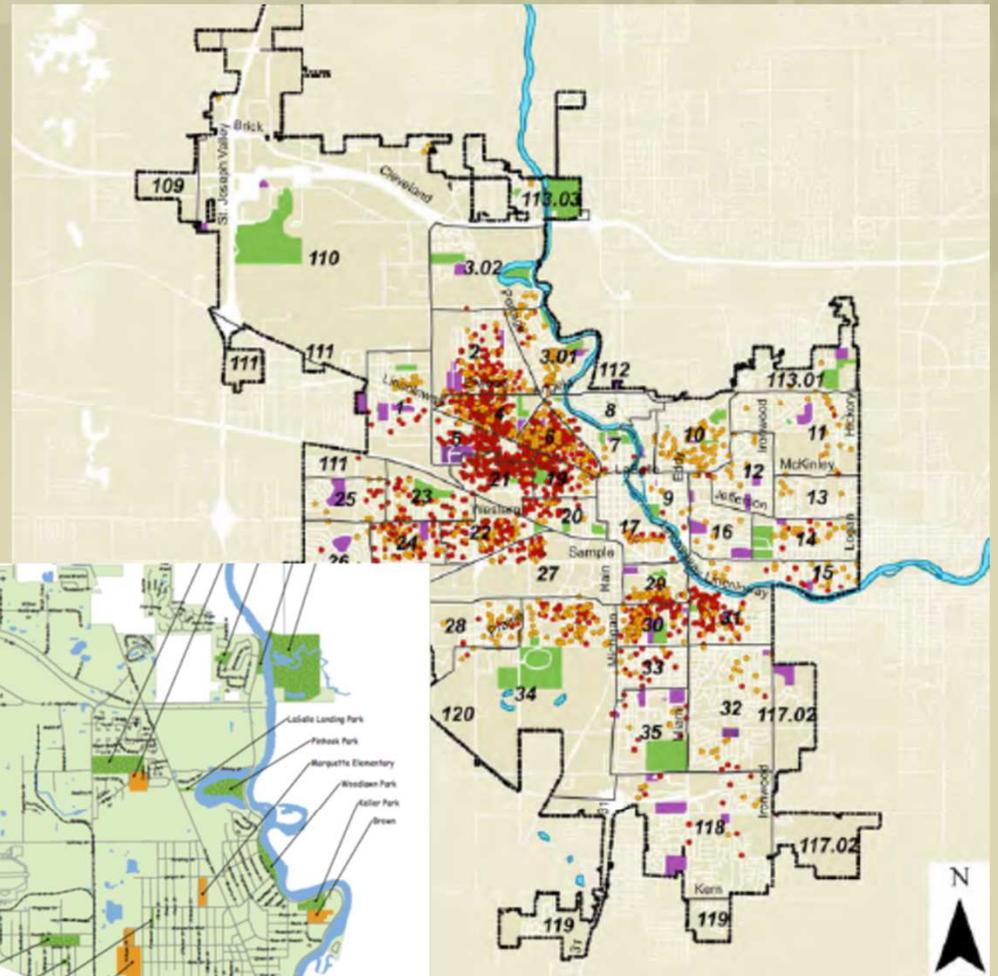
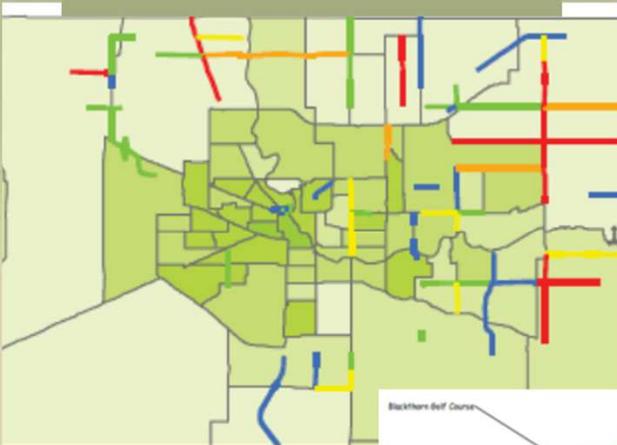


IN REVERSE ORDER: BARRIERS TO IMPLEMENTATION

In other words...

- Consider GI in your planning
- Make sure your rules and codes allow it
- Design it right
- Fund it adequately, and last but not least it....
- **MAINTAIN** it!

Your CIP: Mix Low-Hanging Fruit & Planning





Permitting Green Infrastructure:

A Guide to Improving Municipal Stormwater Permits and Protecting Water Quality



Written by Jeffrey Odefey
January 2013



Upgrade Your Infrastructure

Green Infrastructure Portfolio Standard
A Guide to the Green Infrastructure Portfolio Standard
And Building Stormwater Retrofits

A JOINT EFFORT BY

American Rivers
The Center for Neighborhood Technology
The Great Lakes and St. Lawrence Cities Initiative



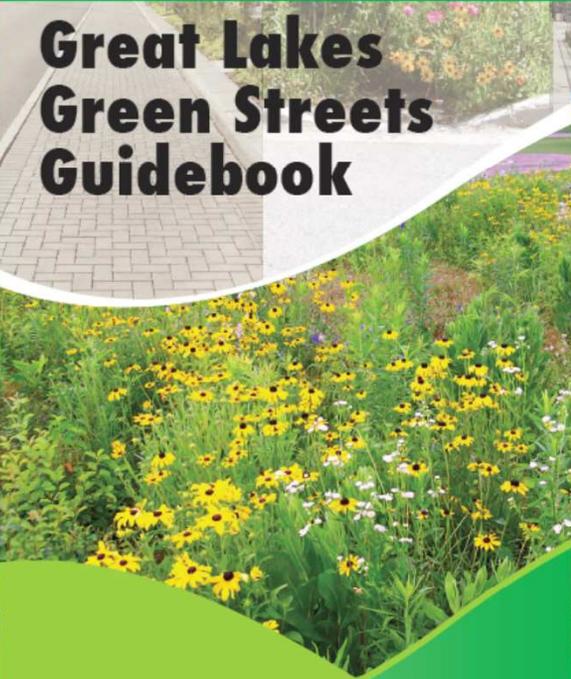
A Design Guide for Implementers and Review

Low Impact Development Manual for Michigan



A Compilation of Road Projects Using Green Inf

Great Lakes Green Streets Guidebook



SEMCOG . . . *Shaping the future of Southeast Michigan*
Southeast Michigan Council of Governments



Green Infrastructure Vision for Southeast Michigan



SEMCOG . . . *Shaping the future of Southeast Michigan*
Southeast Michigan Council of Governments



What We Do

Customer Services

Programs

Library

Library > Manuals and CADD Support > 2014 Stormwater Management Manual (SWMM)

2014 Stormwater Management Manual

Appendix A

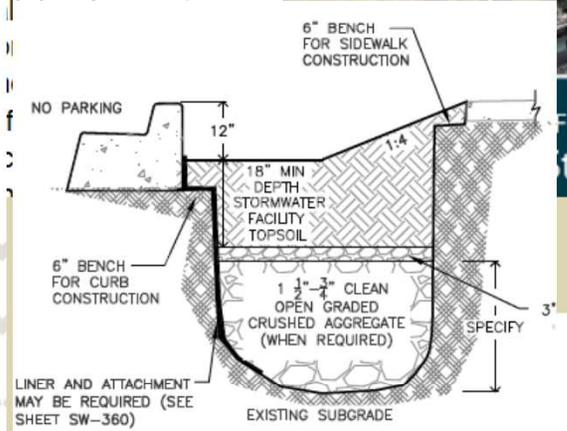
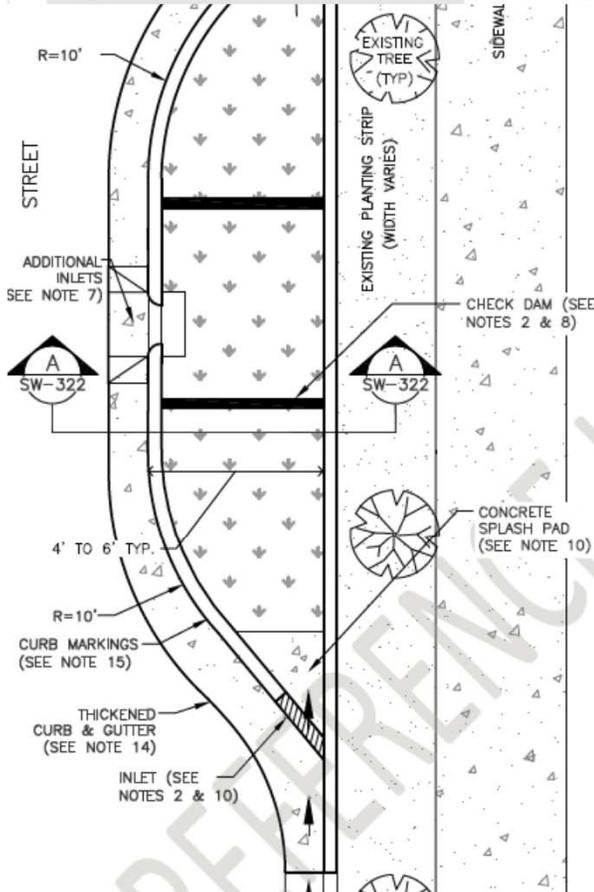
Appendix B

2014 Stormwater Management Manual (SWMM)

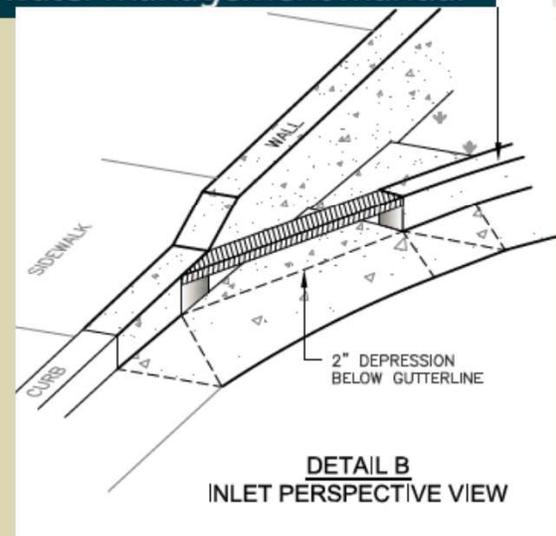
The Stormwater Management Manual (SWMM) provides policy and design



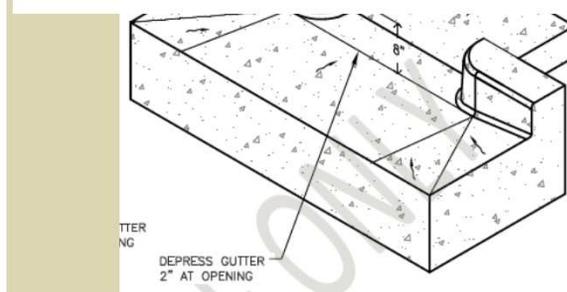
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ents in the manual



PORTLAND Stormwater Management Manual



DETAIL B
INLET PERSPECTIVE VIEW



Borrowing

Bonds

Bonds are not a true revenue source but are a means of borrowing money. Green bonds are a new source of funding dedicated to environmentally-friendly projects, including clean water projects

Loans

Low interest loans may be secured but are generally used for planning and capital projects



Local Revenue

Fees

Funds raised through charges for services such as inspections and permits. Funds raised through developer impact fees are one-time charges linked with new development

Stormwater Utility

Generates revenue through user fees, which go into a separate fund that only can be used for stormwater services

Taxes/General Funds

Funds raised through property, income, or sales taxes that are paid into a general fund

Grants

State and Federal Grants

State and federal grants provide additional funding for water quality improvements

Private Sector

Public-Private Partnerships

Contractual agreements between public agencies and private sector entities that allow for private sector participation in stormwater facility financing, planning, design, construction, and maintenance

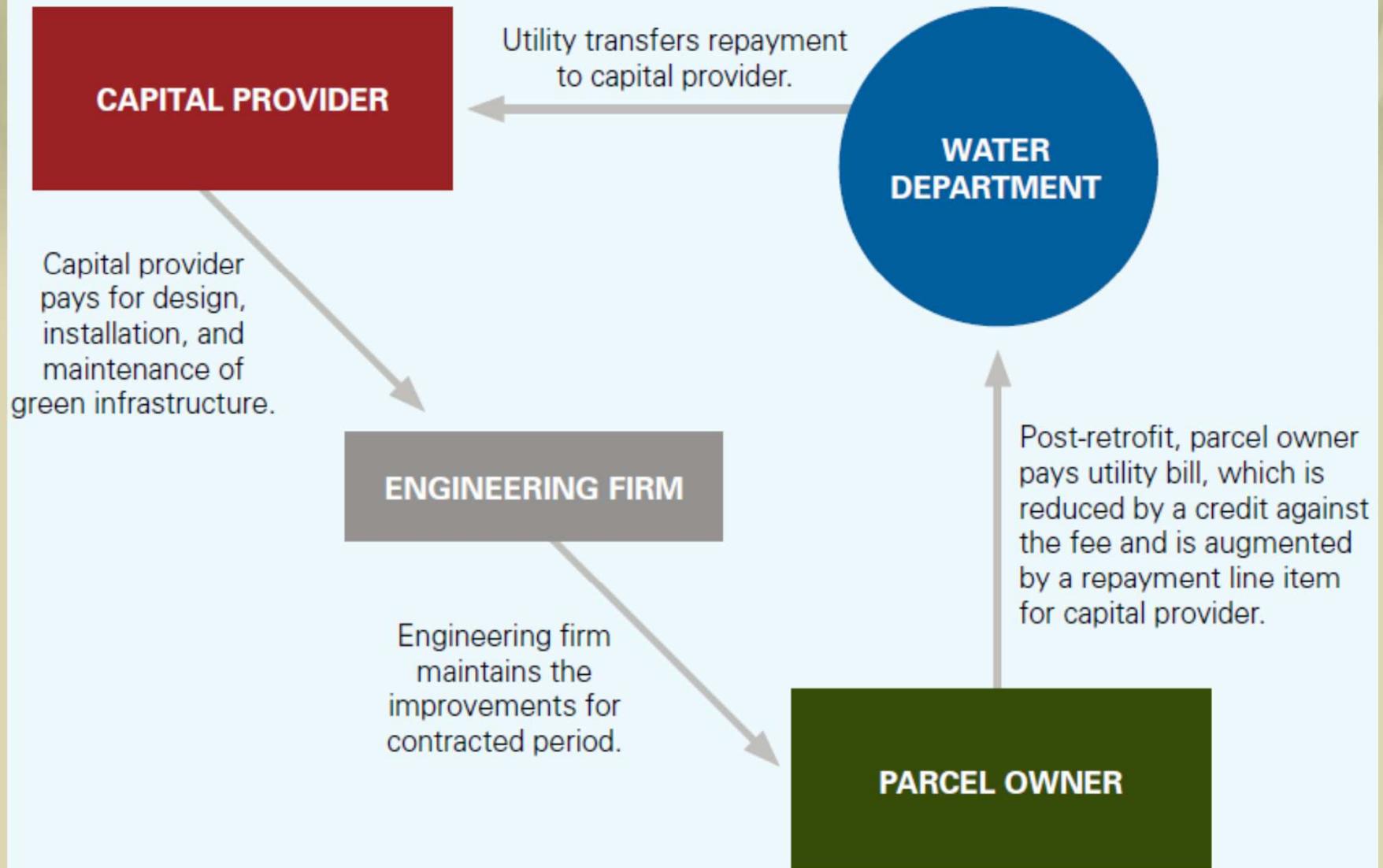


National Association of Clean Water Agencies Report



Navigating Litigation Floodwaters:
*Legal Considerations for Funding
Municipal Stormwater Programs*

Naturevest: Another Future Funding Model



Maintenance, Maintenance, Maintenance



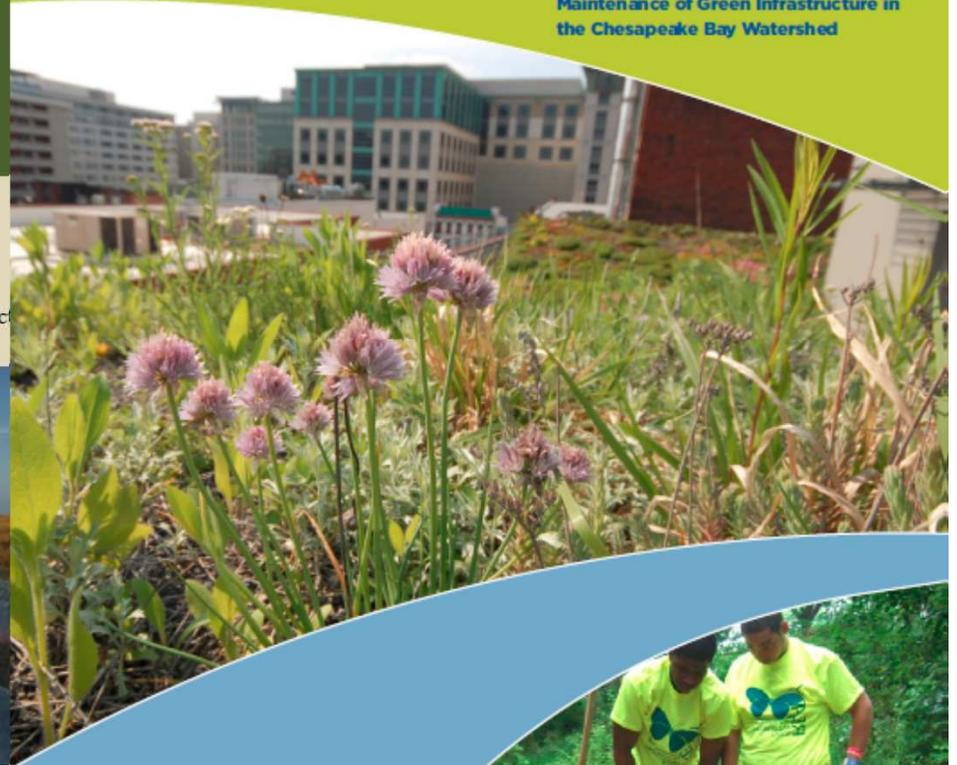
The Importance of Operation and Maintenance for the Long-Term Success of Green Infrastructure

A Review of Green Infrastructure O&M Practices in ARRA Clean Water State Revolving Fund Projects



STAYING GREEN:

Strategies to Improve Operations and Maintenance of Green Infrastructure in the Chesapeake Bay Watershed



 American Rivers
Rivers Connect Us*

In partnership with

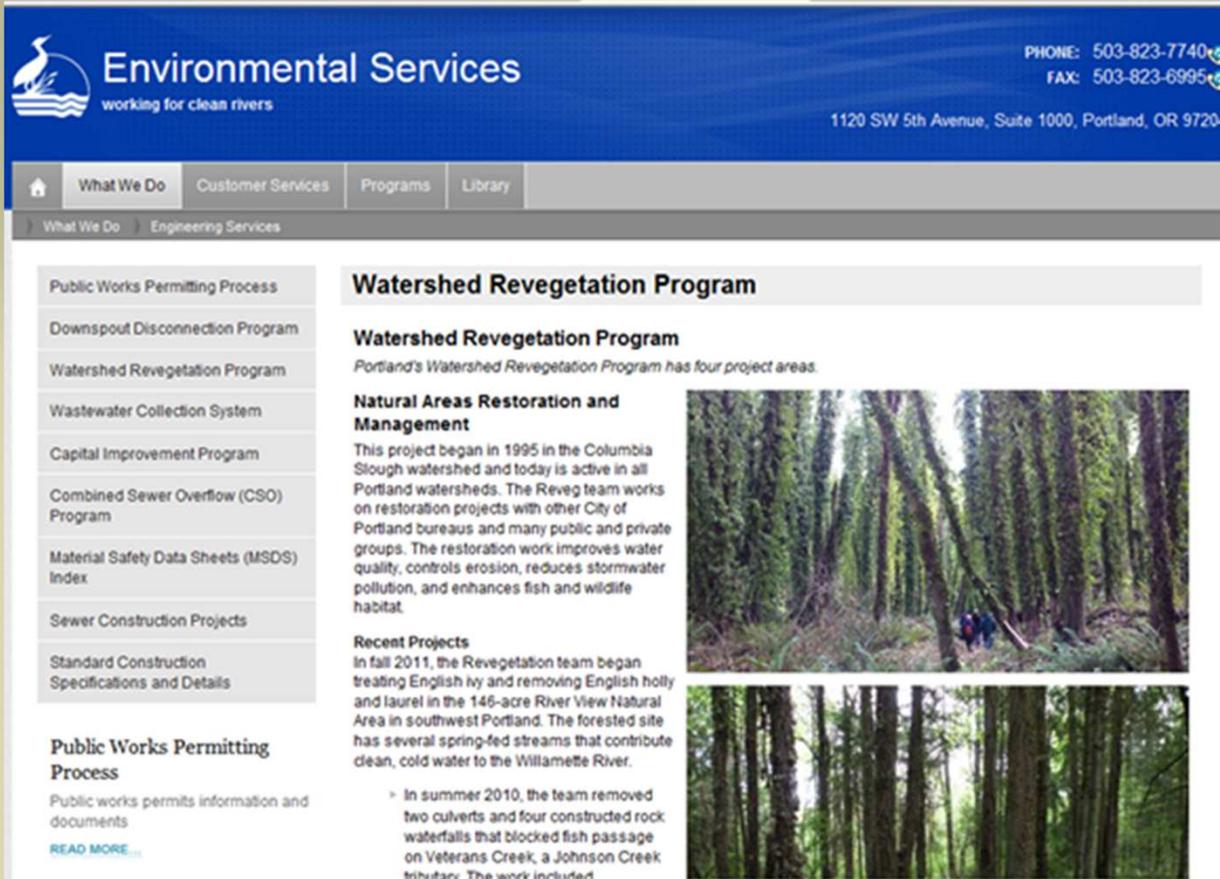
 GREEN



Level of Service Model: Seattle

Service Category	Service Level A (Excellent Effort)	Service Level B (Good Effort)	Service Level C (Moderate Effort)	Service Level D (Poor Effort)
	<ul style="list-style-type: none"> No erosion, channelization or scouring Water drains within 24 hours Minimal bare spots Acceptable level of sediment or debris accumulation 	<ul style="list-style-type: none"> Some erosion, channelization or scouring Most water drains within 24 hours, minimal long-term ponding A few bare spots Acceptable level of sediment or debris accumulation 	<ul style="list-style-type: none"> The presence of long-term ponding (> 72 hours) Many bare spots Significant build up of sediment or debris 	<ul style="list-style-type: none"> scouring The presence of long-term ponding (> 72 hours) Many bare spots or noxious weeds/grass Significant build up of sediment or debris
Swale bottom vegetation				
Sediment or debris accumulation				
Conveyance	<ul style="list-style-type: none"> Healthy vegetation 	<ul style="list-style-type: none"> Mostly healthy vegetation 	<ul style="list-style-type: none"> Some vegetation 	<ul style="list-style-type: none"> Poor or no vegetation

Integrated GI & Natural Area Maintenance: Portland, OR



Environmental Services
working for clean rivers

PHONE: 503-823-7740
FAX: 503-823-6995

1120 SW 5th Avenue, Suite 1000, Portland, OR 97204

What We Do Customer Services Programs Library

What We Do Engineering Services

- Public Works Permitting Process
- Downspout Disconnection Program
- Watershed Revegetation Program
- Wastewater Collection System
- Capital Improvement Program
- Combined Sewer Overflow (CSO) Program
- Material Safety Data Sheets (MSDS) Index
- Sewer Construction Projects
- Standard Construction Specifications and Details

Watershed Revegetation Program

Watershed Revegetation Program
Portland's Watershed Revegetation Program has four project areas.

Natural Areas Restoration and Management

This project began in 1995 in the Columbia Slough watershed and today is active in all Portland watersheds. The Reveg team works on restoration projects with other City of Portland bureaus and many public and private groups. The restoration work improves water quality, controls erosion, reduces stormwater pollution, and enhances fish and wildlife habitat.

Recent Projects

In fall 2011, the Revegetation team began treating English ivy and removing English holly and laurel in the 146-acre River View Natural Area in southwest Portland. The forested site has several spring-fed streams that contribute clean, cold water to the Willamette River.

- In summer 2010, the team removed two culverts and four constructed rock waterfalls that blocked fish passage on Veterans Creek, a Johnson Creek tributary. The work included:



The Green Street Steward's Maintenance Guide

Green Streets

are landscaped spaces that transform street surfaces into living stormwater management facilities. Green streets capture stormwater runoff and let water soak into the ground as plants and soil filter pollutants. Green Streets convert stormwater from a waste directed into a pipe, to a resource that replenishes groundwater supplies and protects urban watershed health. They also create attractive streetscapes and urban green spaces, provide natural habitat, and enhance pedestrian and bicycle safety.



Case Study: City of Ann Arbor

- Stormwater fee based on impervious area
 - With credits available for roof drain disocnnect and rain gardens, etc.
- Green Street Policy (25% of A2 imp area)
 - Within the floodplain, slopes >20%, $k \leq 0.6$ in/hr, must infiltrate first 1" of PPT
 - Outside floodplain, slopes <20%,
– $0.6 < k < 2.0$ in/hr, must infiltrate 2-yr event – 2.35-in
 - >2.0 in/hr must infiltrate 10-yr event 3.26-in
- Maintenance responsibility
 - Natural areas & high visibility natural areas performed by Natural Area Preservation Group
 - Parks maintained by Parks & Rec Staff
 - Low visibility, low use area maintained by Public Works

Single-Family and Two-Family Residential

Measured impervious area	Quarterly charge*
Up to 2,187 square feet	\$15.40
> 2,187 to 4,175 square feet	\$26.32
> 4,175 to 7,110 square feet	\$45.12
> 7,110 square feet	\$78.96

QUESTIONS?

For more detailed information please contact:

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