


Green Streets in the Federal Government and Around the Nation: Valuable to the Nation's Environment and Economy



Dominique Lueckenhoff, Acting Deputy Director
Water Protection Division, USEPA Region 3

Green Streets Workshop
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Overview

- EPA's Focus on Green Streets - a GI-Driven Approach
- Green Infrastructure (GI) –Definition & Rationale
- Definition & Importance of Green Streets
- Benefits of Green Streets
- US EPA Green Street Support & Initiatives –
  - Green Streets Green Jobs Green Towns
- Re-Street – Where Green Streets Meet Complete Streets

What is Green Infrastructure?

Green infrastructure is an approach that communities can choose to:

- **Maintain healthy waters,**
- **Provide multiple environmental benefits, and**
- **Support sustainable communities**

Unlike single purpose gray stormwater infrastructure, which uses pipes to dispose of rainwater, green infrastructure uses vegetation and soil to manage rainwater where it falls.

How is EPA Defining Green Infrastructure?

"Green infrastructure refers to an array of technologies, approaches, and practices that protect and use natural systems or systems engineered to mimic natural processes, to manage rain water as a resource, to solve combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs), enhance environmental quality and achieve other economic and community benefits."

Green

Vs

Gray

Failing Gray Infrastructure

The Traditional Storm Water Approach

- Brick and mortar solutions
- Slow pace of permit renewals and retrofit due to "sticker shock"
- Highly engineered solutions – Detention Vs. Retention
- Storm Water as pollution –
  not an asset

Green Infrastructure is a Paradigm Shift: Rain as a Resource, rather than a Waste

- Ground water recharge
- Enhance stream base flow
- Stormwater capture and use
- Augment water supplies

Why Green Infrastructure?

Urban Stormwater is a Leading Source of Water Quality Impairment

Urban stormwater identified as source of impairment (2004 WQ Report)

- **22,559 miles of impaired rivers and streams**
- **701,024 acres of impaired lakes**
- **867 square miles of impaired estuaries**

Stormwater pollutants

Sediments, nutrients, metals, temperature, trash, bacteria

Cause beach closures and swimming illnesses

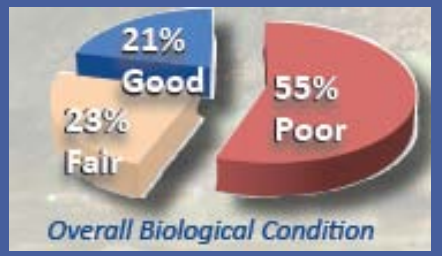
Impact fisheries and shellfish harvesting

Increase the costs of treating drinking water supplies

Hydrologic impacts

- **Increased stormwater volume can cause**
  - **flooding, scouring and sewer overflows**
- **Reduce groundwater recharge**

EPA Survey: Over Half of American Rivers and Streams Are in Poor Condition



- **55% of the nation's river and stream miles do not support healthy populations of aquatic life, with phosphorus and nitrogen pollution and poor habitat the most widespread problems.**

- **23% of river and stream miles are in fair condition. 21% are in good condition and support healthy biological communities.**

Why Use A GI Approach?

There are further complications resulting from climate change.

Warmer waters foster pathogen growth - increased demands for drinking water disinfection.

Increased wet weather and big storms will demand more treatment and threaten our water supplies.

Significant water shortages in the coming five years.

Annual flood damages in the U.S. - increased from $1 billion in the 1940’s to $5 billion in the 1990’s.

Summary State Stormwater Regulations – per Chesapeake Bay TMDL

	MD	PA	VA	DE	DC	WV
New Development	**1"- 2.6" OSR depending on soils and imperviousness; 5,000 sq ft (state-wide reg)**	New development woods in good condition for 2 year-24 hour storm, which varies, but approx 1.5" OSR; 1 acre generally, but 5,000 sq ft for discharges to high quality waters (state-wide reg)	OSR not required. New rules (in full effect in 2014) include std extended detention & phosphorus limits; OSR is optional for meeting phosphorus limits. (state-wide reg)	Predevelopment hydrology (OSR) in draft (state-wide reg)	1.2" OSR; 5,000 square feet (District-wide reg, driven by the permit)	1" OSR (in MS4s, per permit)
Redevelopment	**Same as above (state-wide reg)**	Similar approach, but less stringent (state-wide reg)	Similar approach, but less stringent (state-wide reg)	Similar (state-wide reg)	Same as above (District-wide reg)	1" OSR, reductions for certain development (permit)
Retrofit	**20% drainage area within Phase I MS4s; performance target is forest pollutant loads. (permit)**	PAG-13 does have a TMDL planning requirement that could drive retrofits; no target/performance has been stipulated (permit)	Not yet, though there's a WIP commitment to include specific requirements in reissued MS4 permits this year and next year with specific performance objectives (permit)	No	Over 5 yrs: 350,000 ft^2 green roofs; net increase of 4,150 trees annually; addn'l 18 million sq ft drainage retrofit to meet the 1.2" std (permit)	No

OSR: on-site retention

GI Solutions Address Multiple Benefits

- Impacts to human health and the environment
- Regulation
- Flooding
- Cost / Benefit: Cities are interested in the multiple benefits of green
  - Multiple Benefits / Triple Bottom Line
  - “Livability”
  - Becoming green leaders
  - Cities want to be seen as green

GI Cost Savings

Table 2. Summary of Cost Comparisons Between Conventional and LID Approaches

Project	Conventional Development Cost	LID Cost	Cost Difference	Percent Difference
2nd Avenue SEA Street	$868,803	$651,548	$217,255	25%
Auburn Hills	$2,360,385	$1,598,989	$761,396	32%
Bellingham City Hall	$27,600	$5,600	$22,000	80%
Bellingham Bloedel Dono	$52,800	$12,800	$40,000	76%
Gap Creek	$4,620,600	$3,942,100	$678,500	15%
Garden Valley	$324,400	$260,700	$63,700	20%
Kensington Estates	$765,700	$1,502,900	–$737,200	-96%
Laurel Springs	$1,654,021	$1,149,552	$504,469	30%
Mill Creek	$12,510	$9,099	$3,411	27%
Prairie Glen	$1,004,848	$599,536	$405,312	40%
Somerset	$2,456,843	$1,671,461	$785,382	32%
Tellabs Corporate Campus	$3,162,160	$2,700,650	$461,510	15%

15-96% Cost Savings

[a] The Central Park Commercial Redesigns, Crown Street, Poplar Street Apartments, Prairie Crossing, Portland Downspout Disconnection, and Toronto Green Roofs study results do not lend themselves to display in the format of this table.

[b] Negative values denote increased cost for the LID design over conventional development costs.

[c] Mill Creek costs are reported on a per-lot basis.

Reducing Stormwater Costs through LID Strategies and Practices, EPA 2007

Green Streets: Where Green Meets Gray

Why Use A Green Streets Approach?

US communities are facing a total of $106 billion in needed stormwater management and combined sewer correction upgrades or improvements.

Federal Highway Administration estimates that $170 billion in capital investment would be needed on an annual basis to significantly improve conditions and performance of roads.

Cities and counties operate and finance almost all of the country's water and roadway infrastructure, with help from the federal and state governments.

Need to focus on multi-purpose outcomes through integrated approaches that better leverage public dollars.

The 21st Century Vision for America's Infrastructure

ASCE 2013 Report Card

In the 21st century, we see an America that thrives because of **high quality infrastructure**.

Leadership at the federal, state, and local levels of government, by businesses and individuals, will:

- *Communicate importance of our nation's infrastructure, to craft **innovative solutions** that reflect the **diverse needs** of the nation, and to make the investments the system needs.*
- *Employ strategies to **use every dollar more efficiently and deploy creative solutions to infrastructure…***

Why Green Infrastructure on the Street

Green infrastructure provides one of the greatest opportunities for streets and cities to achieve the goal of sustainability.

Introducing natural processes for handling water and waste as well as capturing and reusing energy from the sun and wind has a number of advantages and benefits in a streetscape.

GI Solutions Have a Growing Business Case – 10's of $$$$ Billions

CSO LTCPs with Green Elements

- Portland, Or
- Seattle, WA
- Cincinnati OH
- Kansas City MO
- Lansing MI
- Louisville KY
- Milwaukee, WS
- New York City
- Philadelphia PA
- Washington, DC

All are making "Green Streets" a major component of GI Plans!

Why Green Streets & Roads?

Traditionally, road building practices focus on ways to move stormwater away from the road as quickly as possible - channeling water down the street to a receiving storm sewer, where it is rapidly moved to a stream or river.

Though intended for storm water relocation, conventional “curb and gutter” designs are also by nature street litter and pollution drains.

Litter and other pollutants that collect on our roads and other pavements are simply washed away into the storm drain system, eventually dumping out into nearby streams or other bodies of water.

Why Green Streets & Roads?

More than 20% of U.S. roads are in urban areas (FHWA) .

Urban roads, along with sidewalks and parking lots, are estimated to constitute almost **two-thirds** of the total impervious cover and contribute a similar ratio of runoff.

Roads are also a part of the infrastructure system, conveying stormwater along gutters to inlets and the buried pipe network.

Effective road drainage, translated as moving stormwater into the conveyance system quickly, has been a design priority while opportunities for enhanced environmental management have been overlooked especially in the urban environment.

Green Street - Definition

Urban transportation right-of-ways integrated with green techniques, such as the use of porous pavement to allow water to percolate to the soils, designing a network of rain gardens to slow down and treat stormwater, and planting and/or preserving street trees.

Green streets mimic local hydrology prior to development and provide a source control for a main contributor of stormwater runoff and pollutant load.

Green infrastructure approaches complement street facility upgrades, street aesthetic improvements, and urban tree canopy efforts that also make use of the right-of-way and allow it to achieve multiple goals and benefits.

Using the right-of-way for treatment also links green with gray infrastructure by making use of the engineered conveyance of roads and providing connections to conveyance systems when needed.

Green Street - Benefits

Integrated system of stormwater management within the right of way

Volume reductions in stormwater which reduce the volume of water discharged via pipe into receiving streams, rivers and larger bodies of water

Key linking component in community efforts to develop local green infrastructure networks

Aesthetic enhancement of the transit right of way

Improves local air quality by providing interception of airborne particulates and shade for cooling

Enhanced economic development along the transit corridor

Improved pedestrian experience along the street right of way."
(WERF Livable Communities website: http://www.werf.org/livablecommunities/)

Cost Effectiveness of Green Streets

The economics are simple: green storm water infrastructure provides more green in our communities, costs less, works better, is easily scalable, and is more resilient and adaptable than standard pipe systems.

This transfer of investment from single-purpose gray infrastructure such as cartridge storm filters to multi-purpose green infrastructure investment allows for greater benefit to communities—both financially and environmentally—making every dollar invested pay back abundantly.

Major Elements of a "Green Street"

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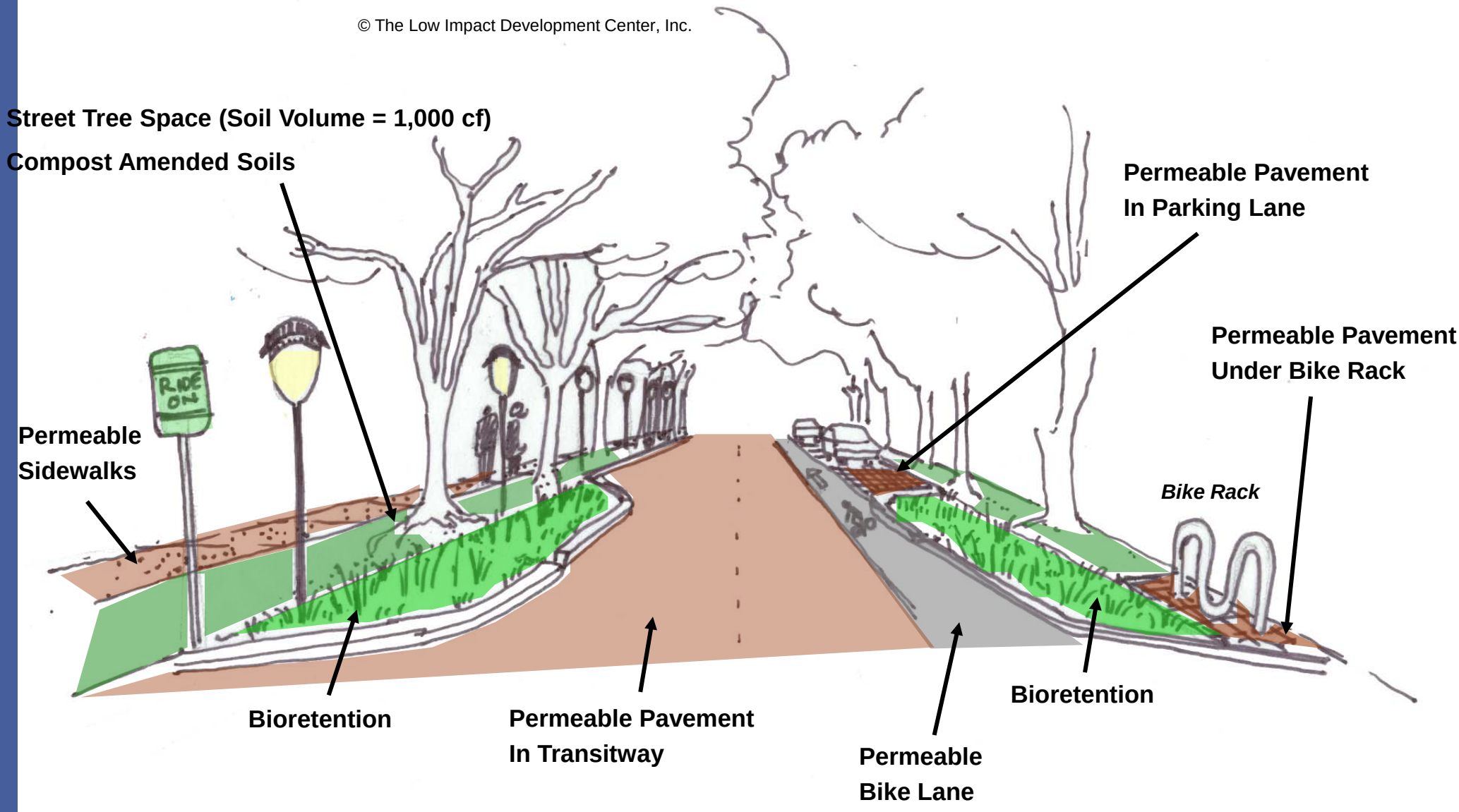
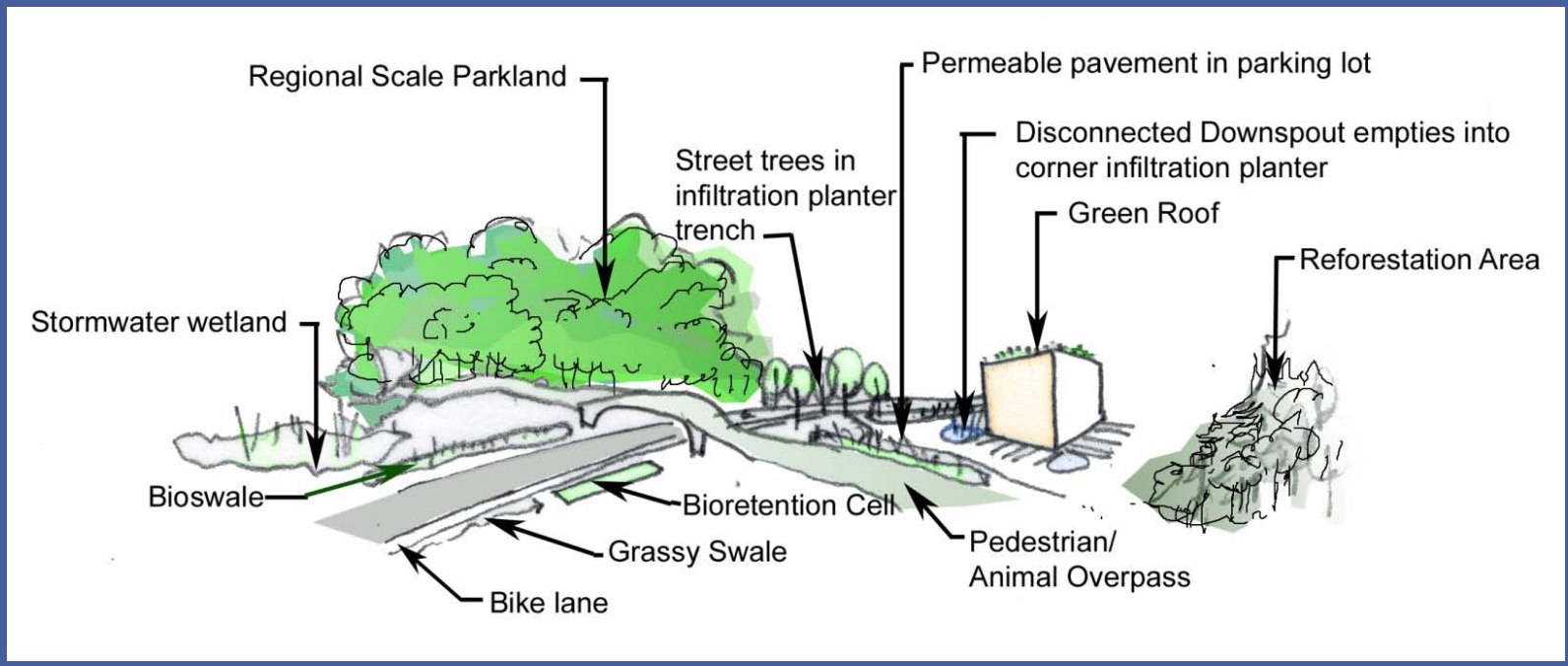




Here are some of the physical green infrastructure elements that can be found in and adjacent to the Right-of-Way

How USEPA Supports Green Streets

- CWA Section 319 Program
- CWA SRF Program
- National Estuary Program (NEP) Grants
- **Green Highways Partnership**
- **Green Streets, Green Jobs, Green Towns (G3) Academy & Grants**
- Chesapeake Bay/NFWS Community Grants
- Green Infrastructure Technical Assistance
- HUD/DOT/EPA Sustainable Communities Grants

CHESAPEAKE BAY
ANACOSTIA

GREEN STREETS, GREEN JOBS, GREEN TOWNS

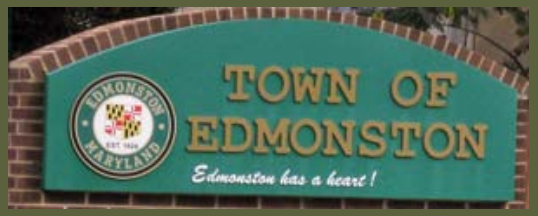
ACADEMY

Jobs
Livability
Environment!

Greening Towns by Greening Infrastructure & the Economy

Green Streets, Green Jobs, Green Towns

- Developed under the President's May 2009 Chesapeake Bay Executive Order Strategy
- To provide technical and financial assistance to communities in urbanized watersheds
- To reduce stormwater runoff, improve energy conservation, promote livable communities, and create Green jobs through…
- Creation of green streets.



Green Streets

by the Green Highways Partnership

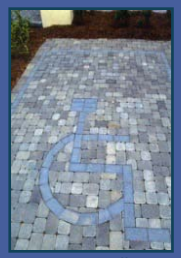
Low Impact Development Center, Inc
www.lowimpactdevelopment.org

Green Highways Partnership
www.greenhighways.org

Chesapeake Bay Trust
www.cbtrust.org

Greening Tools…

Solar trash compactor; Program information on trash can
Source: LID Center



ADA-compliant PICP
Source: ICPI

Energy-efficient light fixtures; Banner standards on light poles
Source: Cannell Graphics

Rain garden, Maplewood, MN
Source: City of Maplewood, MN

Recreation, alternative transportation support
Source: Damien Newton, Streetsblog.org

Educational sign explaining greening practices
Source: Chuck Taylor, Advanced Pavement Technology

Benches for local recycling and art opportunities
Source: LID Center

Bioretention next to pervious concrete with recycled materials for edges
Source: LID Center

Source: LID Center

Source: LID Center

What could be…

Bioretention on family-friendly street edge
Source: Portland Bureau of Environmental Services

Traffic calming and signature green space at street entry
Source: Portland Bureau of Environmental Services

Rain gardens for viewing; pedestrian-friendly permeable concrete walks
Source: LID Center

Permeable interlocking concrete pavement (PICP) in parking lanes
Source: Portland Bureau of Environmental Services

Streets constructed of pervious concrete pavement or other permeable surfaces
Source: City of Bellingham, WA

Curb bump outs/extensions provide bioretention areas; traffic calming measures improve safety
Source: LID Center

Planning for environmentally sustainable growth in the Anacostia Watershed

Stormwater Standards for Redevelopment

- Maryland Standard
  - Capture **1 inch** of rainfall on **50%** of impervious surfaces
- Edmonston Green Street
  - Captures **1.33 inches** of rainfall on **90%** of impervious surfaces.

Major Elements of a "Green Street"

- Minimizes impact on the surroundings through a natural systems approach.
- Integrated system of stormwater management to increase infiltration or filtration of runoff, reduce flows, reduce urban heat island effects, and enhance watershed health;
- Makes the best use of the street tree canopy for stormwater interception and air quality improvement

Major Elements of a "Green Street"

- Uses clean, renewable energy (e.g. wind, solar) for street lighting
- Uses recycled materials – in "green construction"
- Encourages pedestrian and/or bicycle access; and
- Provides an aesthetic advantage to a community and improves economic viability

Chesapeake Bay Trust, State of Maryland, and US EPA 2013 Chesapeake Bay Green Streets-Green Jobs-Green Towns (G3) Grant Program Application Package

www.epa.gov/reg3wapd/pdf/

Bladensburg
Green Streets Charrette and Street Design

green streets,
green jobs initiative

G3 Digest

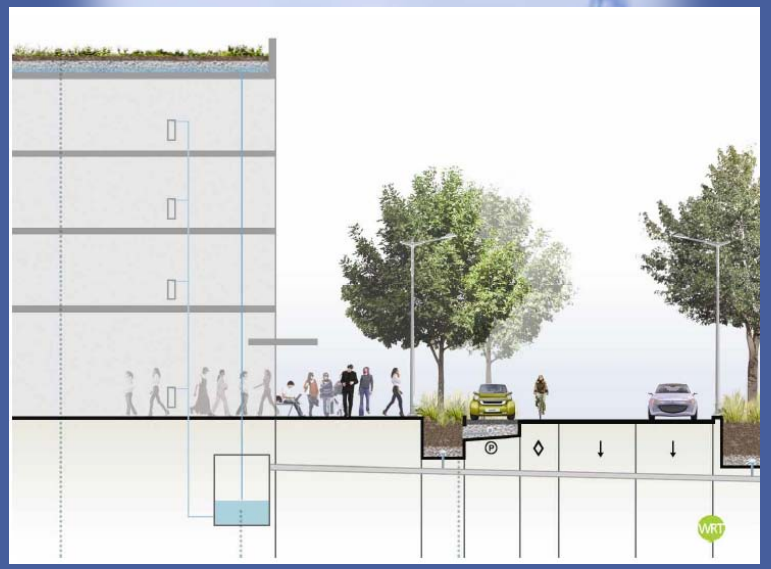
As a major component of the G3 Academy and drawing upon the major success of the GHP Digest, the G3 Digest was launched as an electronic clearinghouse and resource tool.

The G3 Digest is a bi-monthly weekly virtual tour of events, activities, best practices, and news from across the nation related to green streets, jobs and towns. Its readership is over 3,500 and growing.

The G3 Digest provides a
Due to its success, the G3 Digest, spearheaded by EPA R3 received additional funding support from the Federal Highway Administrations Office of Planning, Reality and Environment.

What's Next ?

Next Generation High Performance (Cost Effective) Green Infrastructure



- Maintenance friendly designs
- Smaller footprint
- High flow media and storage
- Using modular designs that can still respond to variations in site conditions

Conventional Bioretention vs. Next Generation

Conventional Bioretention surface area = 5%
Next Gen Bioretention = .4%
Factor of 100 improvement
Benefits - less excavation, disturbance, maintenance area and space used.

Conventional Bioretention void space storage = 30%
Next Gen Bioretention Storage = 95%
Factor of 3 improvement
Benefits – less excavation, disturbance, easier to maintain and replace.

FINANCING

Basic Finding - No shortage of money

- NYC, Philadelphia, Chicago, DC, and hundreds of other municipalities pursuing GI as an alternate to constrained gray infrastructure
- Investment banks, financiers see innovation in stormwater as an emerging market
- Stormwater credit and contract trading markets being established (GLPF, Ches Bay, DC)
- Alternative funding models through Public-Private Partnerships being developed

Definition PPP

Innovative involvement of the private sector through a "*contractual agreement*" between a public agency and a private sector entity that allows for the private sector participation in the financing, planning, design, construction, operation, maintenance, rehabilitation and replacement of urban retrofit facilities.

Can reduce costs to government from 20-50+ %

Benefits

"Mutual Rewards"

Local Government

- No capital outlay.
- No increase in staff.
- Reduced risks.
- Reduced Cost up to 50%.
- No bond or debt service.
- Phase in fees.
- Control performance.
- Demand added values.
- Quicker completion.

Private Entity

- Low risk source of income.
- Hire local vendors.
- Performance rewards.
- Reduced Admin costs.
- Taxes, finance cost, banking trading
- ROI long-term.
- Technology innovations.
- Experience is more competitive.
- Private sector efficiencies.

What's Next?

Re-Thinking Streets----Re-Streets

Where Green Streets Meets Complete Streets and Beyond

re:Streets is a multi-disciplinary collaboration focused on the planning, design and construction of streets as a method for **improving our built environment**. It pushes beyond the current standards to **explore the future of streets** and what America's roadways would be like if they were **designed for living**, instead of just driving.

Building on the **Complete Streets movement**, **re:Streets** has developed a comprehensive design manual for creating streets that promote the expanded functions of the street and turn new design ideas into a series of best practices that can be applied to any community.

restreets.org




The End.

Thank You!



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