



# Nature-based Solutions

Exploring nature-based mitigation, including post-disaster solutions and their impact.



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June 28, 2018

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partners

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# Agenda

- Introduction to nature-based solutions
- Case studies
- Nature-based solutions in a post-disaster environment
- Barriers to implementation
- Potential and innovative funding sources



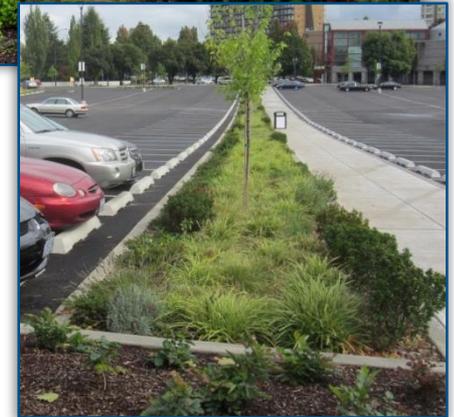
# What are Nature-Based Solutions?



←  
**Landscape**



↗  
**Community  
and Site**



↙  
**Shoreline**



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# Landscape Approaches

**Better**

**Worse**

**Area**



**Proximity**



**Connectivity**



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# Community and Site Approaches

## Low-Impact Development Practices



### Bioretention (Infiltration and Filtering)

- Rain gardens
- Bioswales
- Stormwater planters



### Green Roofs (Storage and Evapotranspiration)

- Blue roofs
- Cisterns



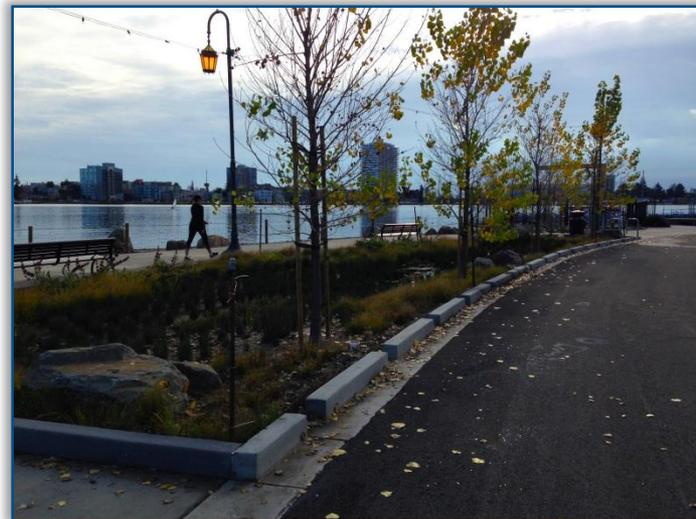
### Permeable Pavements (Infiltration)

- Porous asphalt or concrete
- Grass or gravel pavers
- Pavers

# Community and Site Approaches

## Green Streets

- Key linking component in green infrastructure network
- Design dependent on local conditions, but generally includes:
  - Alternative street widths
  - Swales
  - Bioretention
  - Permeable pavements
- Provides multiple benefits



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# Shoreline Approaches



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# Natural Infrastructure is a multi-benefit solution

- Buffer wave action and storm surge
- Store floodwaters, recharge aquifers
- Reduce runoff, improve water quality and clarity
- Stabilize shorelines
- Provide habitat
- Offer recreational job opportunities
- Protect property and improve property value (aesthetics)
- Many more!

QUICK REFERENCE



**Put Green Infrastructure between Your Community and the Next Coastal Storm.**  
There are many benefits.

<b>Tidal and Forested Wetlands</b> <ul style="list-style-type: none"><li>• Slow waves</li><li>• Filter and clean floodwaters</li><li>• Provide food and jobs</li></ul>	<b>Sand Dunes</b> <ul style="list-style-type: none"><li>• Buffer waves as a first line of defense</li><li>• Build economy through tourism</li></ul>
<b>Green Streets</b> <ul style="list-style-type: none"><li>• Capture and clean stormwater</li><li>• Beautify streets and encourage economic development</li><li>• Provide pedestrian-friendly walkways</li></ul>	<b>Open Space and Parks</b> <ul style="list-style-type: none"><li>• Store floodwaters and recharge aquifers</li><li>• Increase property values</li></ul>
<b>Oyster and Coral Reefs</b> <ul style="list-style-type: none"><li>• Slow storm surge</li><li>• Provide food</li><li>• Clean water</li></ul>	<b>Urban Trees</b> <ul style="list-style-type: none"><li>• Reduce runoff and absorb floodwaters</li><li>• Shade and cool homes and businesses</li><li>• Provide clean air and water</li></ul>
	<b>Living Shorelines</b> <ul style="list-style-type: none"><li>• Slow waves and reduce erosion</li><li>• Protect property</li></ul>

 Office for Coastal Management  
Digital Coast

03/2017

*See the reverse of this page to learn more.*



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# Using Nature-Based Solutions to Reduce Hazard Impacts



**Harvey (Texas)**



**Maria (Puerto Rico)**



**St. Louis County, Missouri (2017)**



**Ellicott City, Maryland (2018)**



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# Polling Question #1

**What natural infrastructure techniques are being implemented in your local community?**

- A. Green streets
- B. Rain gardens and bioswales
- C. LID permeable pavements
- D. Rain barrel programs
- E. More than one of the above
- F. Other
- G. None

# Case Study: Fourth Ward Park, Atlanta, GA

## Urban revitalization through water quality and flood control

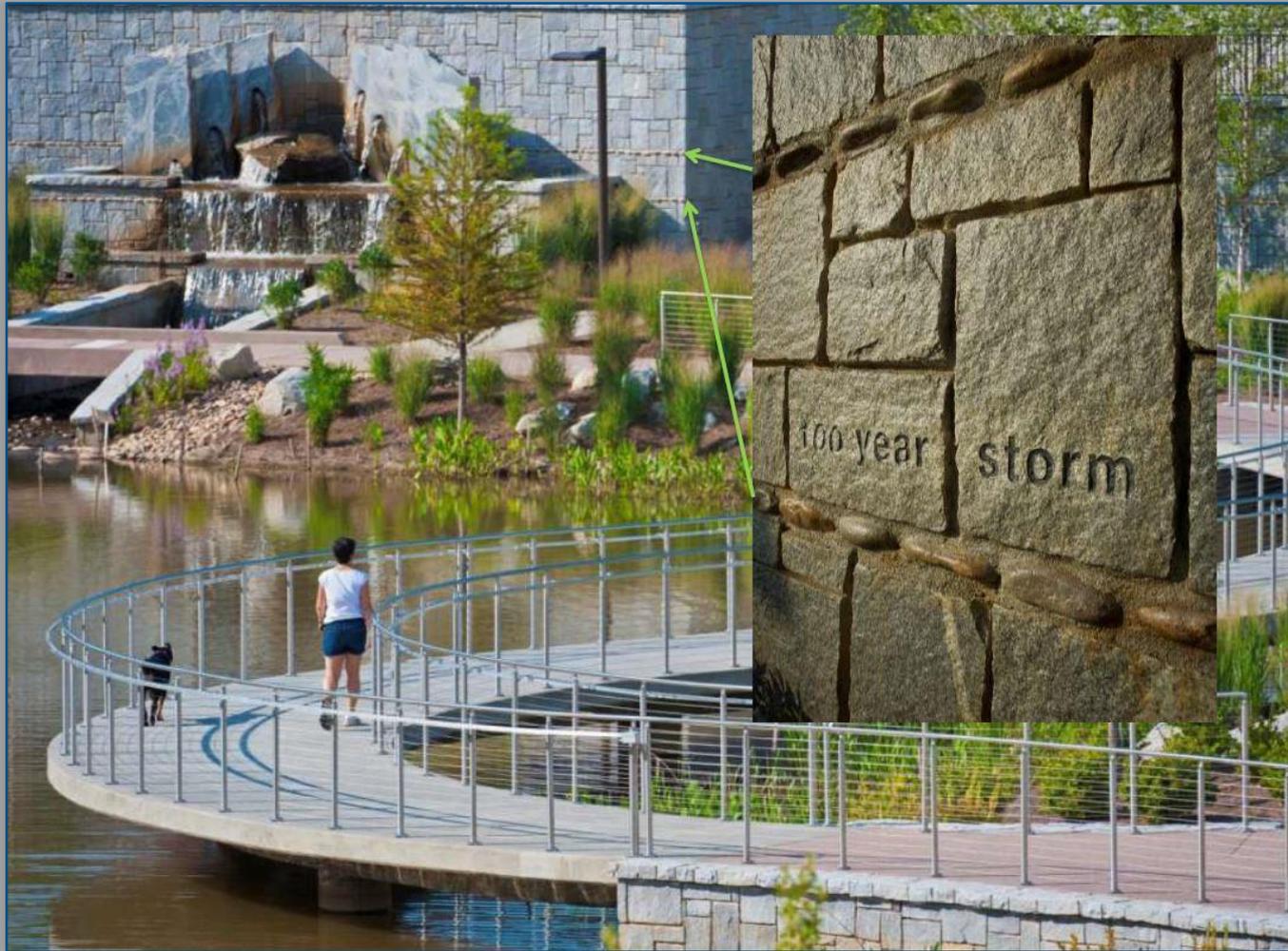


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<https://beltline.org/parks/historic-fourth-ward-park/>

# Case Study: Fourth Ward Park, Atlanta, GA

## Urban revitalization through water quality and flood control

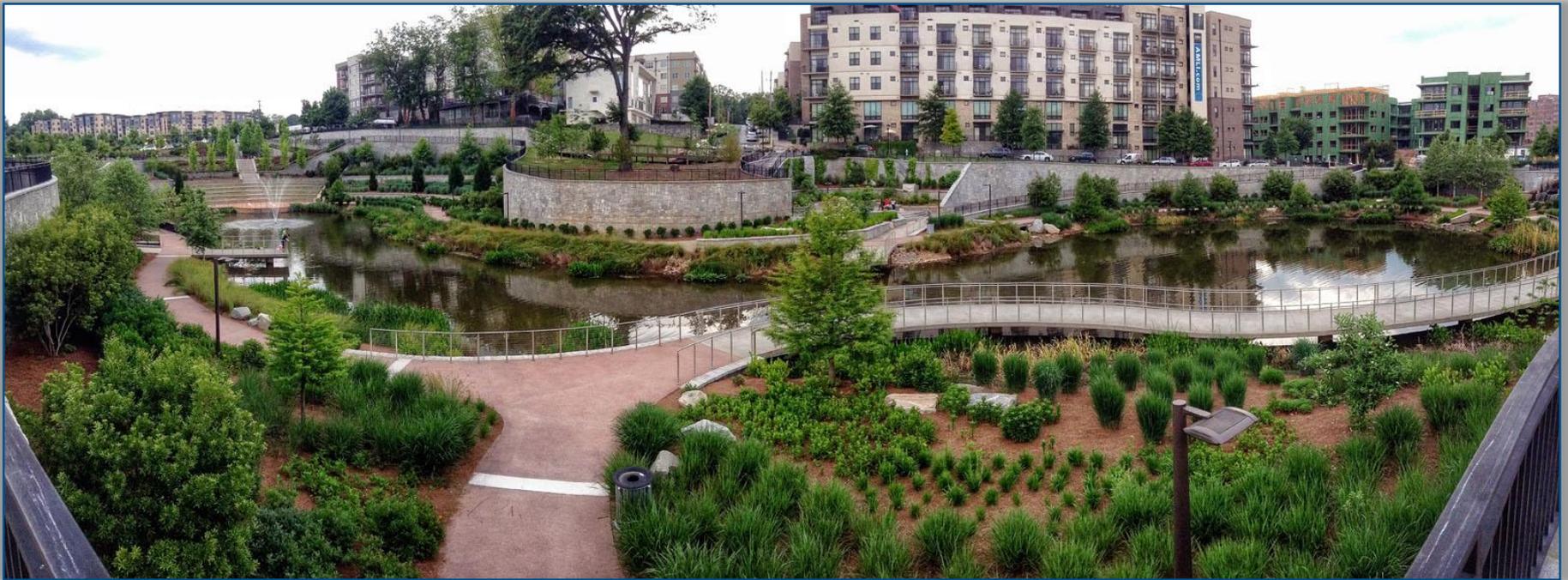


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<https://www.seswa.org/assets/Services/Annual-Conference/2017/17%20-%20rayburn.pdf>

# Case Study: Fourth Ward Park, Atlanta, GA

## Urban revitalization through water quality and flood control



[https://www.reddit.com/r/Atlanta/comments/278z4e/old\\_4th\\_ward\\_park\\_bam/?st=jj37tm36&sh=c204e45d](https://www.reddit.com/r/Atlanta/comments/278z4e/old_4th_ward_park_bam/?st=jj37tm36&sh=c204e45d)



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# Case Study: Fourth Ward Park, Atlanta, GA

## Urban revitalization through water quality and flood control

### Green Infrastructure Task Force

#### City staff plus partners

- Watershed, Public Works, Parks & Recreation, Mayor's Office of Resilience, Planning and Community Development, Aviation
- Atlanta Beltline, The Conservation Fund, American Rivers, Invest Atlanta, Chattahoochee Riverkeeper, etc.

#### Task Force Origins and Goals

- Began through a Peer Exchange trip (2012) to Philadelphia
- Create 'Best-in-Class' program
- Focus on CIPs and processes
- Recently published Strategic Action Plan



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# Case Study: Living Seawall (Seattle, WA)

## Incorporating habitat into traditional grey infrastructure



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# Case Study: Living Seawall (Seattle, WA)

## Incorporating habitat into traditional grey infrastructure



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<http://www.washington.edu/news/2017/05/18/seattle-seawalls-novel-fish-features-are-a-potential-model-for-the-world/>

# Post-Disaster Lessons Learned

## Open Space Preservation and Wetlands are Valuable

### Coastal Wetlands Prevented \$625M in Property Damage During Hurricane Sandy

BY SIDDHARTH NARAYAN, MIKE BECK

AUGUST 31, 2017 | Follow



Nov 11, 2012 aerials of coastal destruction caused by Hurricane Sandy storm surge along the New Jersey Shore. © Bridget Besaw



Engineers, Ecologists and Risk Modelers Team Up to Measure the Value of Coastal Wetlands for Reducing Hurricane Risk

A new paper, [The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA](#),

Smart nature straight to your inbox every week

[Sign up for the newsletter](#)



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# Post-Disaster Lessons Learned

Opportunity to engage, educate, and empower



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# Post-Disaster Lessons Learned

## Learn from others (Middlebury, VT)

- ❑ **Study shows Middlebury, VT, wetlands reduced damages from Tropical Storm Irene by 84% –95%.**
- ❑ **Estimates for annual value of flood mitigation services provided by the wetlands to Middlebury exceed \$125,000 and may be as high as \$450,000.**



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# Post-Disaster Lessons Learned

## Capitalize on attention and momentum

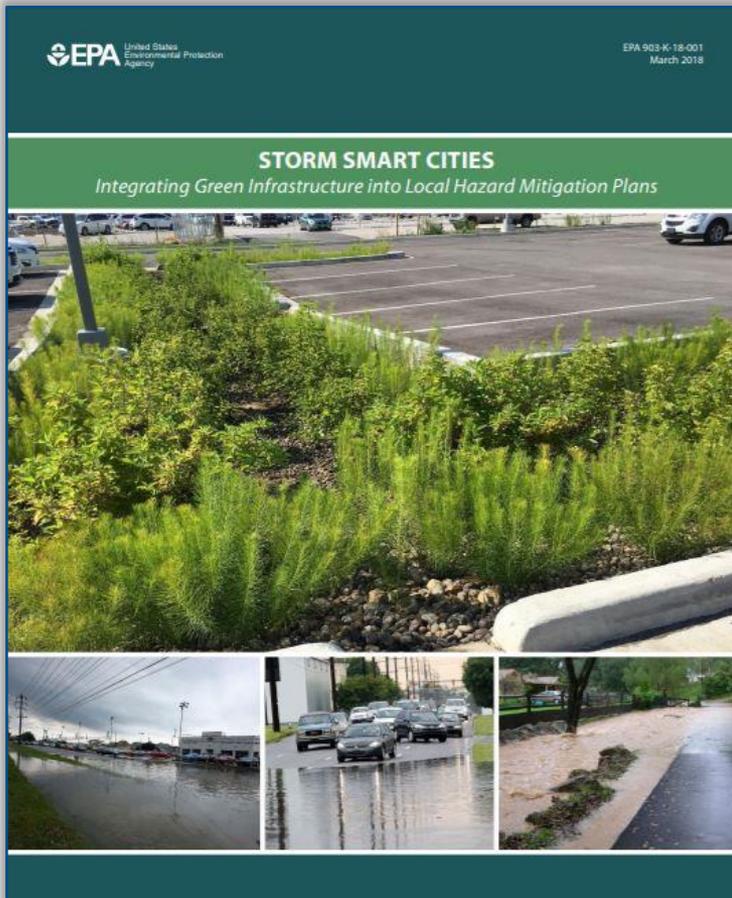
### Houston's Hurricane Recovery through Smart Green Infrastructure Investments



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# Post-Disaster Lessons Learned

## BE PREPARED, BE ORGANIZED, BE READY TO ACT



[https://www.epa.gov/sites/production/files/2018-04/documents/storm\\_smart\\_cities\\_508\\_final\\_document\\_3\\_26\\_18.pdf](https://www.epa.gov/sites/production/files/2018-04/documents/storm_smart_cities_508_final_document_3_26_18.pdf)

## Building Resilient Communities with Green Infrastructure and Hazard Mitigation Planning

Presenters will focus on two proof of concept projects co-sponsored by the U.S. Environmental Protection Agency (EPA) and the Federal Emergency Management Agency (FEMA), in which two communities enhanced their resiliency by integrating green infrastructure elements of their stormwater and watershed plans into their hazard mitigation plans to achieve co-benefits such as improving water quality and preserving resources.



<https://www.epa.gov/green-infrastructure/building-resilient-communities-green-infrastructure-and-hazard-mitigation>



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## Polling Question #2 **\*REQUIRED FOR ASFPM CEC\***

**Are communities in your Region incorporating natural infrastructure projects, goals, or strategies into their hazard mitigation plans?**

- A. Yes**
- B. No**
- C. Unsure**

# Potential Barriers to Implementation

## Public Perception

### Montgomery residents are fighting plans to build rain gardens

SUSTAINABILITY By Dan Reed (Editorial Board) April 12, 2018 49



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<https://ggwash.org/view/67222/montgomery-residents-are-fighting-plans-to-build-rain-gardens>

# Potential Barriers to Implementation

## Local Politics

- ❓ **“The problem with rain gardens in many cases is that they are on private land, people do not know how to maintain them, so they will not be worth the money we pay for them.”**
- ❓ **“These rain gardens only exist on public property in which people have confused the property as their own, but it is actually county property... this work is based on a sound environmental policy.”**
- ❓ **“Rain gardens are pits of death.”**
- ❓ **“I am also sorry that some of the candidates here have exacerbated the anxiety.”**



[https://www.youtube.com/watch?v=hUI5cz4\\_O0M&feature=youtu.be&t=53s](https://www.youtube.com/watch?v=hUI5cz4_O0M&feature=youtu.be&t=53s)



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# Potential Barriers to Implementation

## Maintenance and Staff Resources



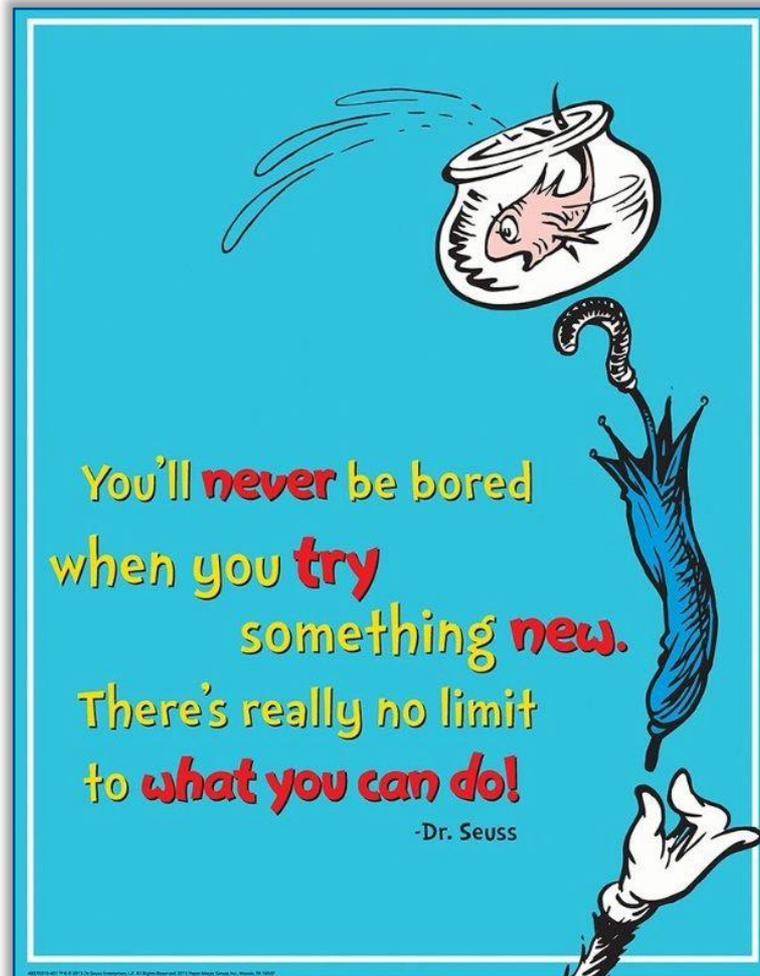
<https://www.portlandoregon.gov/bes/article/552115>



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# Potential Barriers to Implementation

## Inexperience / Unfamiliarity



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# Potential Barriers to Implementation

## Gentrification and Social Equity - Displacement



<https://www.thrillist.com/lifestyle/new-york/things-to-do-near-the-high-line-nyc>



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# Communicating Natural Infrastructure Priority - Tailor your language

green infrastructure

permeable pavement

infrastructure

health streets green

green roof green streets public

ecosystem services natural solutions

public health flood risk

living shoreline ecology

nature

natural infrastructure

flooding low impact development water

nature based solutions

stormwater quality

heat island



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# Communicating Natural Infrastructure

## Getting the conversation started – Focus on VALUE

### ☐ **Focus on benefits to public health**

- Improved air quality
- Green streets are safer

### ☐ **Improves water quality**

- Water recreation and public health

### ☐ **Aesthetics**

- EASY SELL!!! Natural Infrastructure is just prettier!

### ☐ **Economics**

- Cost effective, reduction in load and maintenance on stormwater systems
- Increases property values



# Communicating Natural Infrastructure

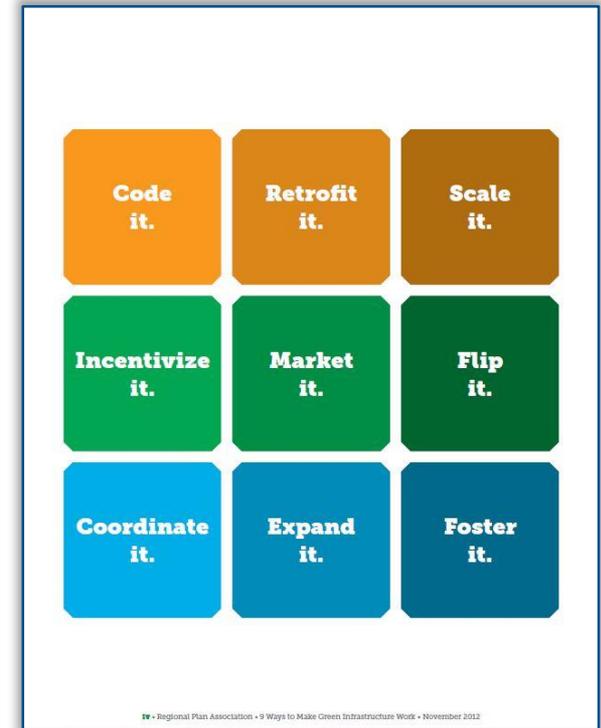
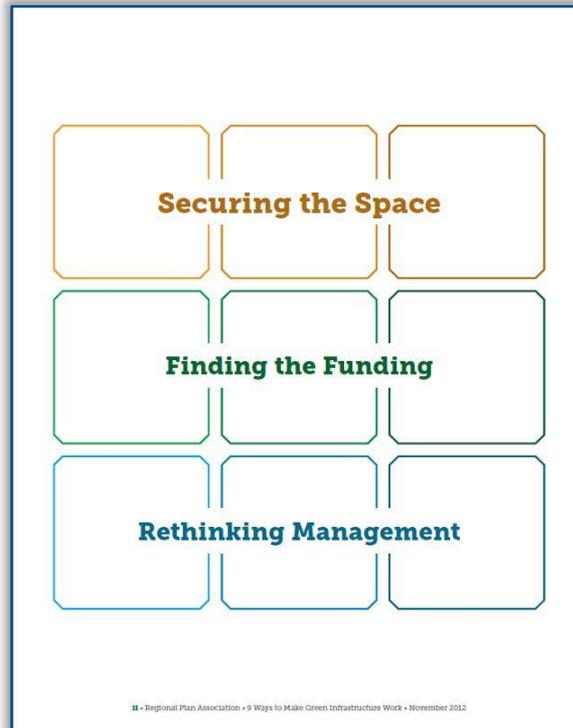
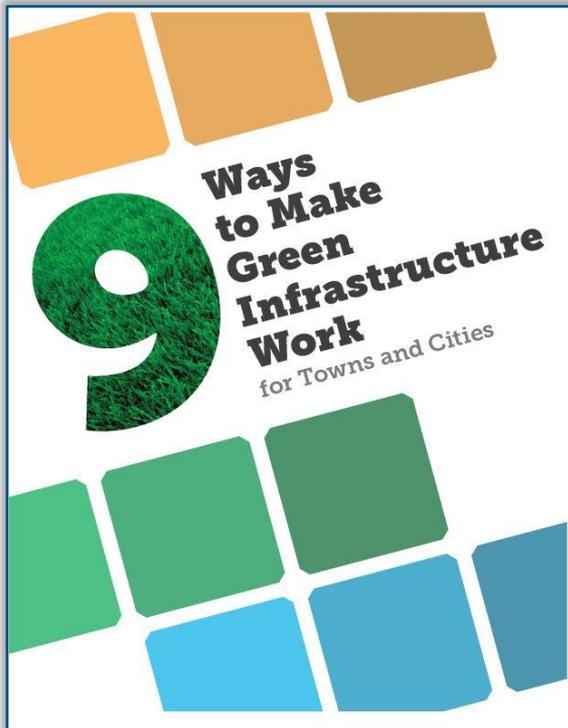
## Flip the Script – Focus on cost savings to grey solutions



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# Communicating Natural Infrastructure

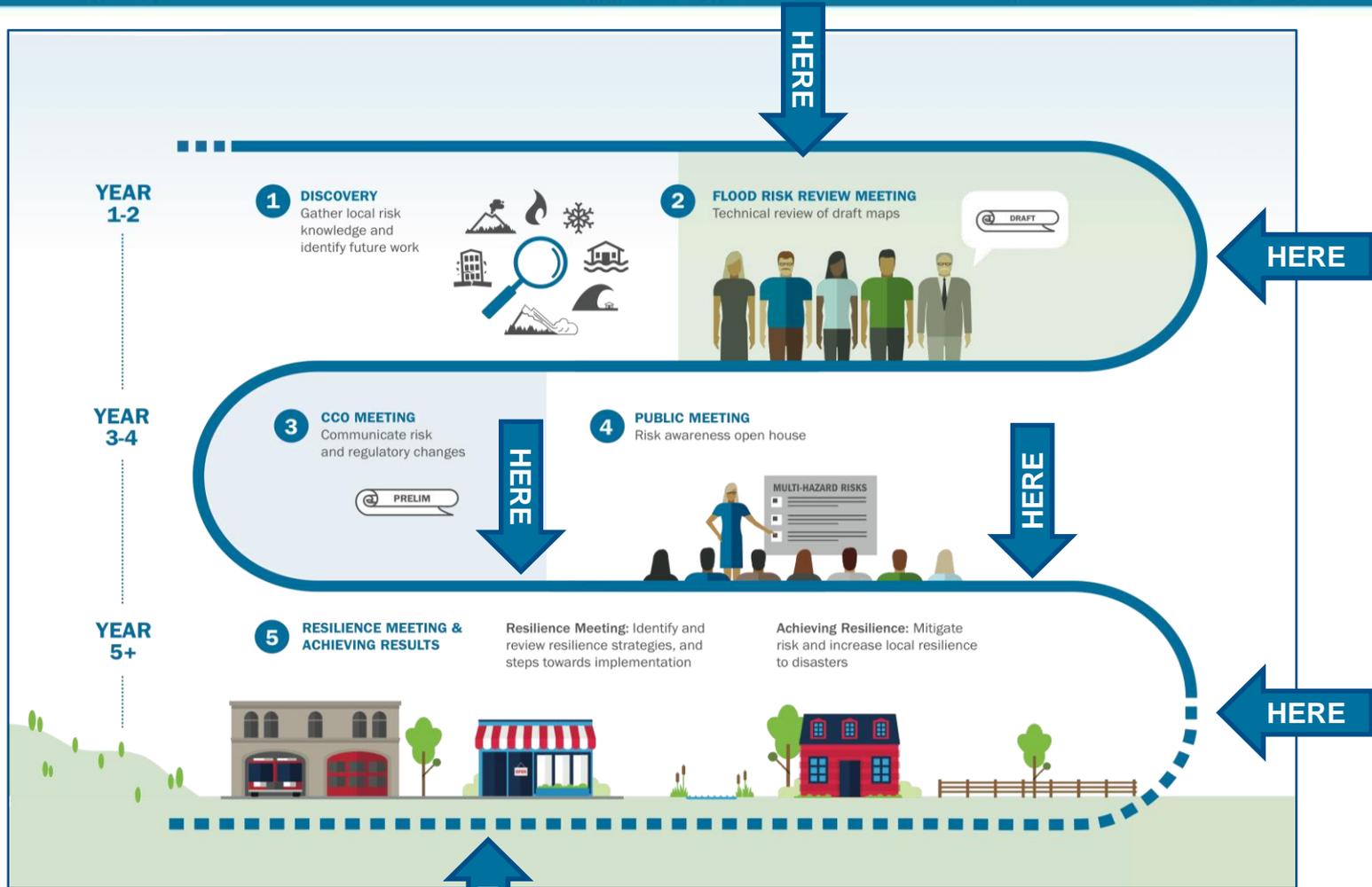
Share relevant examples and learn from others



<http://library.rpa.org/pdf/RPA-9-Ways-to-Make-Green-Infrastructure-Work.pdf>

# Communicating Natural Infrastructure

## Communicate at EVERY stage of the Risk MAP Process!



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# How do Nature-Based Solutions Fit into FEMA Programs?

## Resource: EPA Fact Sheet

### Smart Growth

CONTACT US SHARE    

## Healthy Places for Healthy People

We have selected six partner communities to receive Healthy Places for Healthy People assistance in 2018. [Learn more about the projects these communities will undertake.](#)



1 2 3 4

Smart growth strategies help communities grow in ways that expand economic opportunity while protecting human health and the environment.

#### What Is Smart Growth?

- [About smart growth](#)
- [Examples of smart growth](#)
- [National Award for Smart Growth Achievement](#)

#### Resources

- [Grants and funding](#)
- [Map of smart growth projects](#)
- [Newsroom](#)
- [Publications](#)
- [Technical assistance](#)
- [Tools](#)

#### What's New

- [Healthy Places for Healthy People 2018 partner communities announced](#)
- [Local Foods, Local Places 2018 partner communities announced](#)
- [Summary of 2017 Local Foods, Local Places Summit](#)
- [Local Foods, Local Places case study of Passaic, NJ](#)
- ["Community Stories" story map](#) (link will open in a new window or tab)

#### Tweets by @EPAcommunities

 **US EPA Office of Communities** @EPAcommunities

We just announced assistance for 6 communities that want to revitalize their communities and create a healthier future: [epa.gov/newsreleases/t...](#)

 **Trump Administration** EPA News ... epa.gov

Jun 14, 2018

 **US EPA Office of Communities** @EPAcommunities

Plans to create new recreational opportunities and grow the local

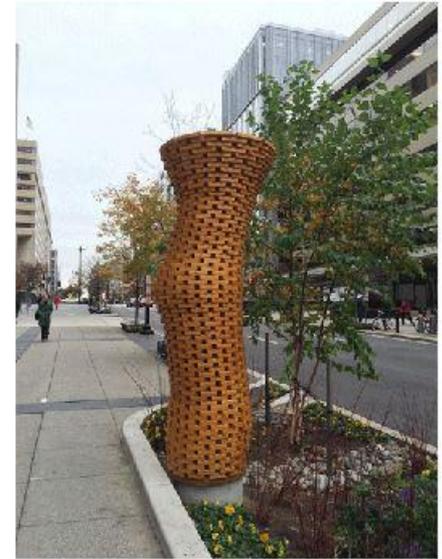


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<https://www.epa.gov/smartgrowth>

# Innovative Funding Sources and Opportunities

## Business Districts and Art Programs



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# Innovative Funding Sources and Opportunities

## Green Infrastructure to Green Jobs Initiative (Savannah, GA)



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# Innovative Funding Sources and Opportunities

## DOTs Promoting the Arts and Sense of Place

“8-acre Underground at Ink Block, which formally opened in the fall of 2017, is part park, part water garden/filtration system, part art project, part paid parking lot, part-secured bike storage, and part dog park – all nestled under I-93 in between the South End and South Boston, owned by MassDOT, and operated by a local property owner, National Development.” *CityParksBlog.org*

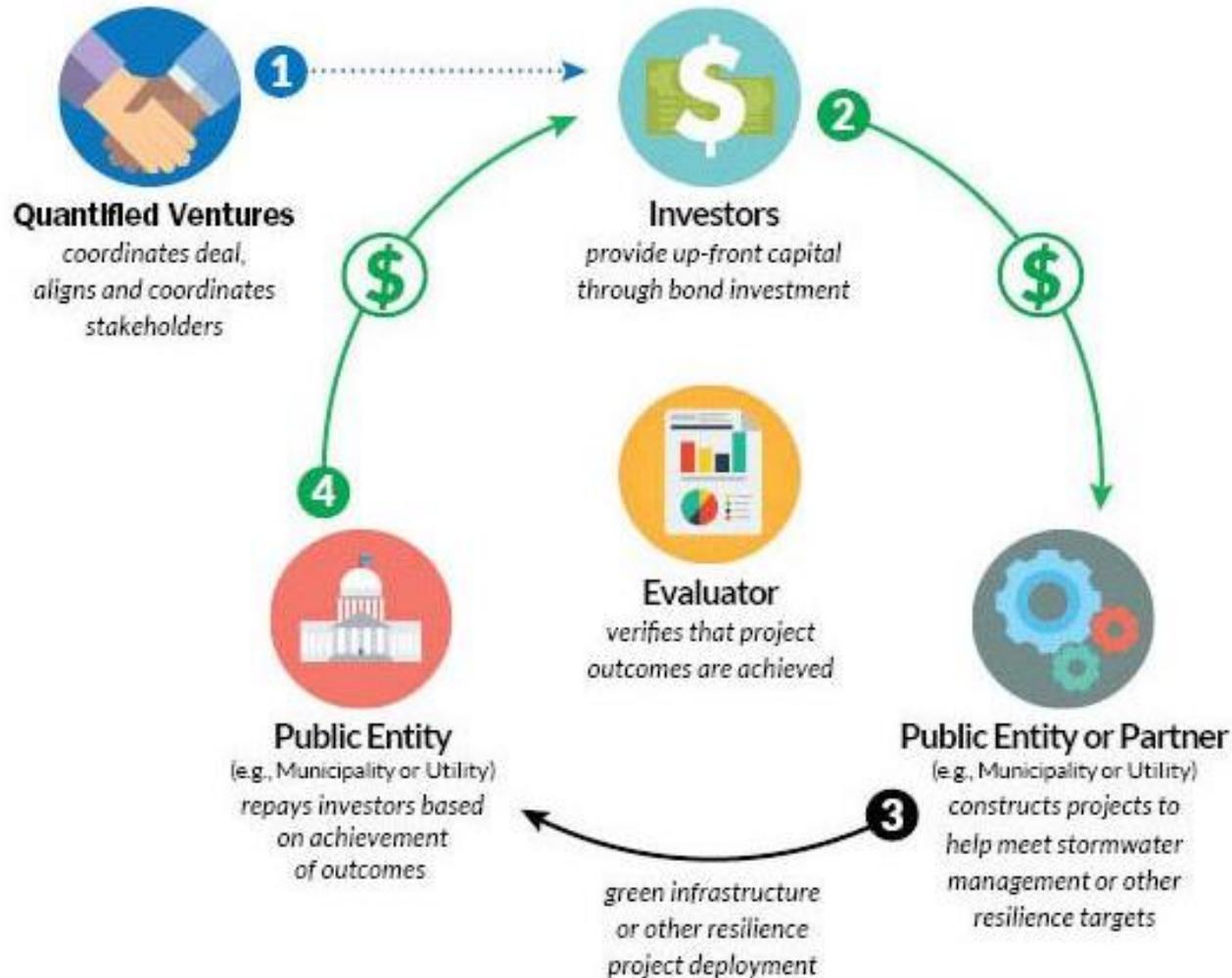


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<https://cityparksblog.org/2017/12/12/park-profile-underground-at-ink-block/>

# Innovative Funding Sources and Opportunities

## Environmental Impact Bonds



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# What You Can Do Next

- ❑ **Determine if natural infrastructure projects have already been implemented in your community, state, or region.**
- ❑ **Identify local champions and work with your local stormwater utility.**
- ❑ **Research and identify how natural infrastructure project implementation may provide multiple benefits.**
- ❑ **Communicate and engage local residents and stakeholders to promote buy in.**

## **Polling Question #3**

**Is there momentum in your FEMA Region to pursue additional training or communications for Nature-based Solutions?**

- A. Yes, conversation is starting but needs time (future need)**
- B. Yes, this is an identified priority (current need)**
- C. Maybe, but we have not initiated the conversation (unknown)**
- D. No, but would appreciate or look forward to more from FEMA on integrating these approaches (additional resources)**
- E. No, this is not being discussed in my Region**

# Key Takeaways

- **Be aware of the specific hazard of concern, the benefits different natural infrastructure techniques can provide, and the surrounding land use that will impact the technique implemented.**
- **Engage key stakeholders throughout the entire Risk MAP and mitigation processes so you are implementing natural-based solutions that provide multiple benefits that stakeholders value and are socially equitable.**
- **Post-disaster environments prioritize recovery. After critical recovery efforts begin to slow, momentum, funding availability, and political interest can lead to implementation opportunities. Nature-based solutions provide an opportunity to build back better and smarter.**

# Questions?



**Bradley.Dean@MBakerintl.com**

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**RiskMAP**  
Increasing Resilience Together



## Q&A and Discussion

*Please use the chat box and send your questions to Victoria*



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**\*REQUIRED FOR ASFPM CEC\***

**In the chat box, send the following information to “Taylor Kennedy:”**

**Name, email address, and state**

**Ex: Jane Doe, [jdoe@gmail.com](mailto:jdoe@gmail.com), Georgia**



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