Green Infrastructure and Hazard Mitigation

Workshops to Address Water Quality and Water Quantity

8 January 2021

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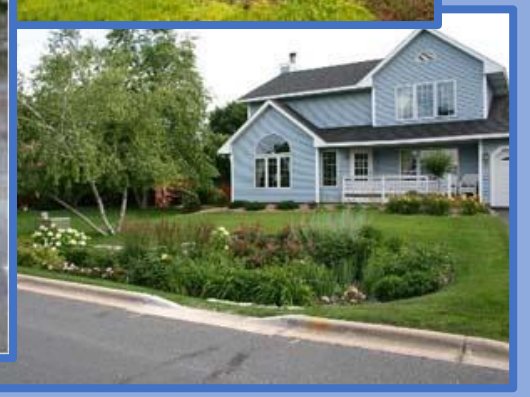
Mari Radford, FEMA Region 3

Presentation Outline

1. Green Infrastructure Statutes
2. Green Infrastructure Co-Benefits
3. Hazard Mitigation Modules
4. Hazard Mitigation Workshops
5. MS4 Case Studies



Green Infrastructure in the Clean Water Act

Section 5 of the 2019 Water Infrastructure Improvement Act amends the Clean Water Act to include green infrastructure.

- Section 502 is amended to include a definition of green infrastructure.

(27) Green infrastructure

The term green infrastructure means the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate stormwater and ***reduce flows to sewer systems or to surface waters****.*

Green Infrastructure in the Clean Water Act

Section 5 of the 2019 Water Infrastructure Improvement Act amends the Clean Water Act to include green infrastructure.

- Section 519 is added to promote the practice at the national and regional levels.

(c) Regional green infrastructure promotion

The Administrator shall direct each regional office of the Environmental Protection Agency, as appropriate based on local factors, and consistent with the requirements of this Act, to promote and integrate the use of green infrastructure within the region, including through—

*(1) **outreach and training regarding green infrastructure** implementation for State, tribal, and local governments, tribal communities, and the private sector; and*

*(2) the **incorporation of green infrastructure into permitting and other regulatory programs**, codes, and ordinance development, including the requirements under consent decrees and settlement agreements in enforcement actions*

Green Infrastructure in the Clean Water Act

Sections 3 and 4 of the 2019 Water Infrastructure Improvement Act define and promote integrated planning and provides technical assistance to communities seeking to develop an integrated plan.

- 402 (s) (1) "integrated plan" means a plan developed in accordance with the Integrated Municipal Stormwater and Wastewater Planning Approach Framework, issued by the EPA and dated June 5, 2012.
- 402 (s) (2) The Administrator (or a State, in the case of a permit program approved by the Administrator) shall inform municipalities of the opportunity to develop an integrated plan…
- The duties of the Municipal Ombudsman shall include the provision of technical assistance to municipalities seeking to comply with the Federal Water Pollution Control Act;

Integrated Municipal Stormwater and Wastewater Planning Approach Framework (2012)

Integrated plans should: Evaluate and incorporate, where appropriate, effective sustainable technologies, approaches and practices, particularly including green infrastructure measures, in integrated plans where they provide more sustainable solutions for municipal wet weather control.

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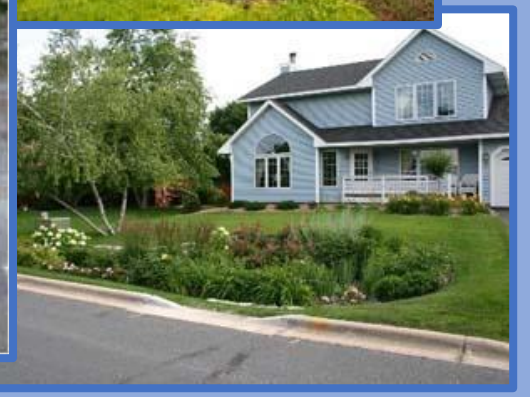


Benefits of Green Infrastructure

Air Quality

- *Ground-Level Ozone*
- *Particulate Pollution*
- *Health Effects*

Benefits of Green Infrastructure

Communities

- *Green Jobs*
- *Health Benefits*
- *Recreation Space*
- *Property Values*

Benefits of Green Infrastructure

Habitat and Wildlife

- *Habitat Improvement*
- *Habitat Connectivity*

Benefits of Green Infrastructure





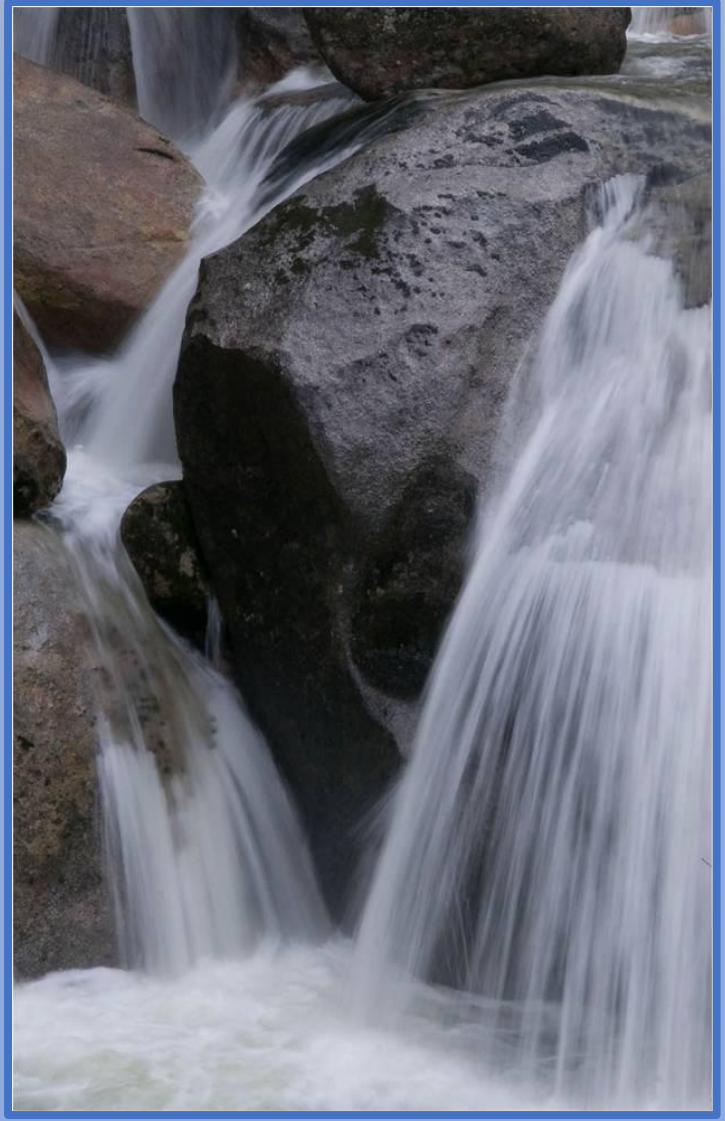

Climate Resiliency

- *Manage flooding*
- *Prepare for drought*
- *Reduce urban heat island*
- *Lower building energy demands*
- *Spend less energy managing water*
- *Protect coastal areas*

Benefits of Green Infrastructure

Water Quality and Quantity

- *Water Quality*
- *Flooding*
- *Water Supply*
- *Private and Public Cost Savings*



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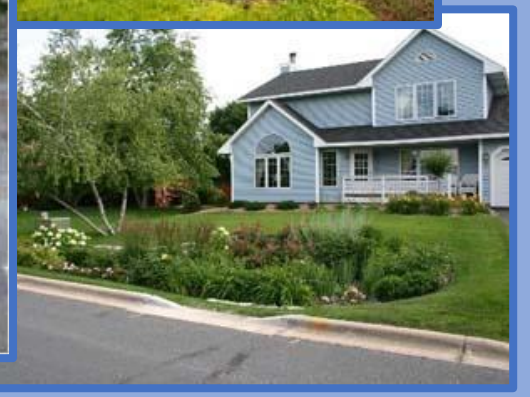


Project Background

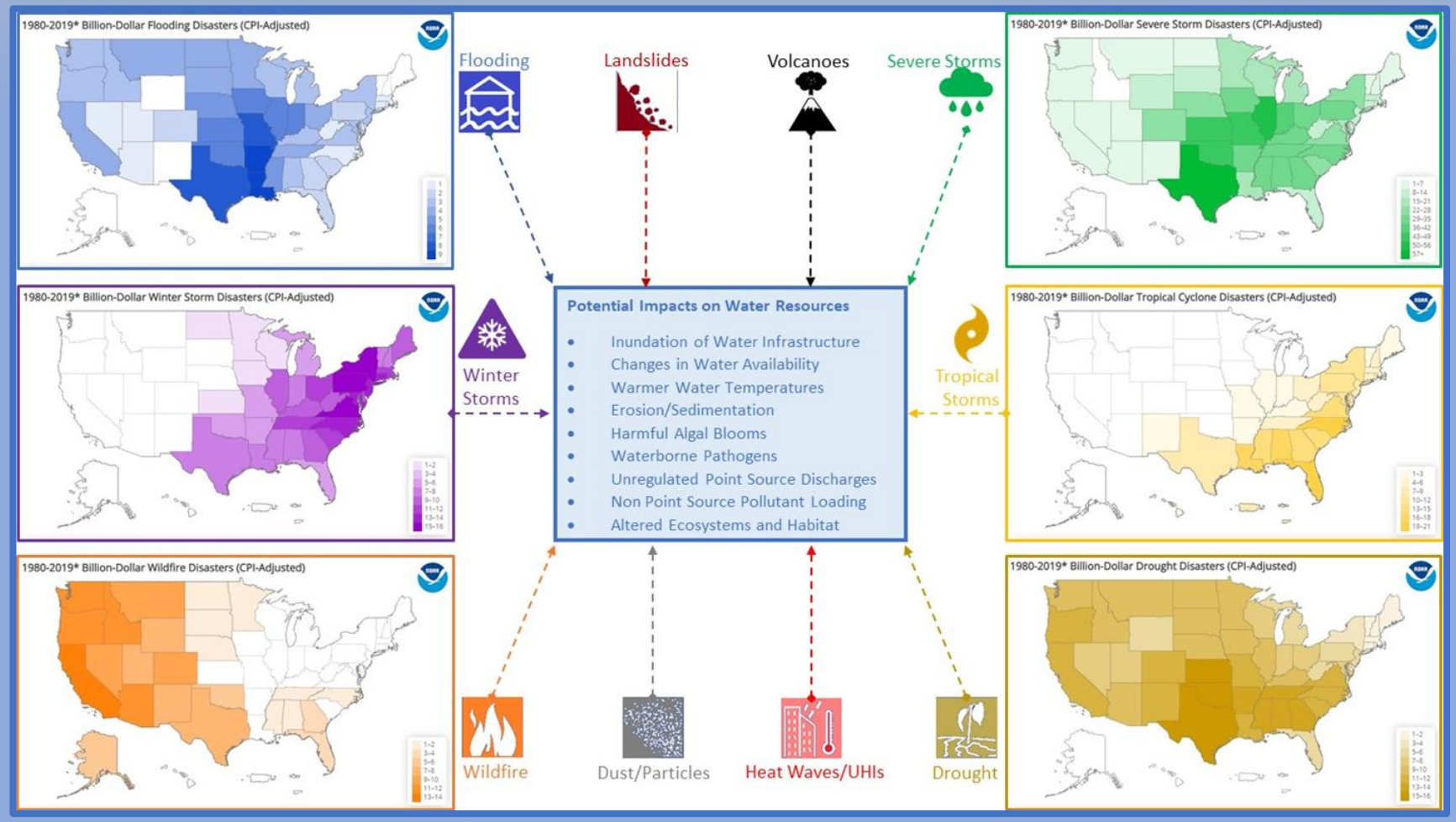
- Phase I: series of modules describing water quality/hazard mitigation plan integration
  - Lisa Hair (OW/OWOW) and Tetra Tech; University of Maryland, EFC
- Phase II: training materials to present modules in workshops
  - EPA Region 3/PG Environmental with federal and state partners
- Currently finalizing training materials wth plans to post them on the EPA website

Module 1

Introduction to GI/LID and Hazard Mitigation

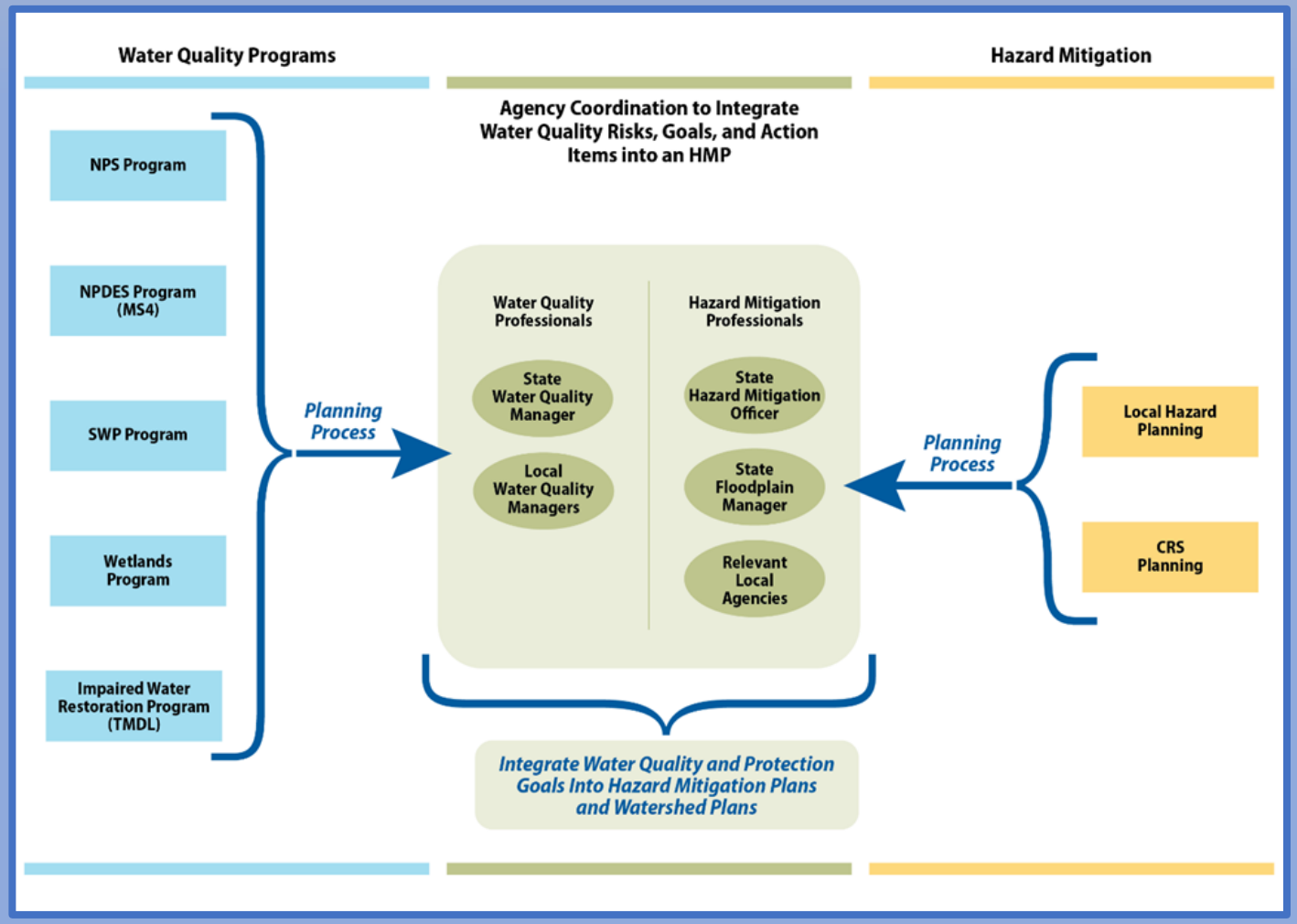
Module Steps:

1. Learn about the purpose of the series and the modules included.
2. Review natural hazards affecting water resources.
3. Learn about nature-based solutions and their role in Federal (EPA and FEMA), state, local, tribal, and territory (SLTT) programs.
4. Learn about the benefits of incorporating nature-based solutions into hazard mitigation planning.
5. Assess goals, vulnerabilities, strategies, and actions to mitigate natural hazards.



Module 2

How Water Quality Protection Programs Fit Within and Enhance Hazard Mitigation Strategies



Module Steps:

1. Review key concepts of water quality, source water protection and hazard mitigation planning.
2. Assess how water quality planning processes can align with hazard mitigation plans.
3. Consider your approach to including water quality risks, goals, strategies, and action items in your state or local HMP. Understand who should be involved in a coordinated planning approach.
4. Become familiar with elements of key water quality and source water protection related programs.
5. Understand how integrating planning processes can leverage additional funding and increase the efficiency and effectiveness of plan integration.
6. Review local and state examples to translate what you learned into integrated HMPs.

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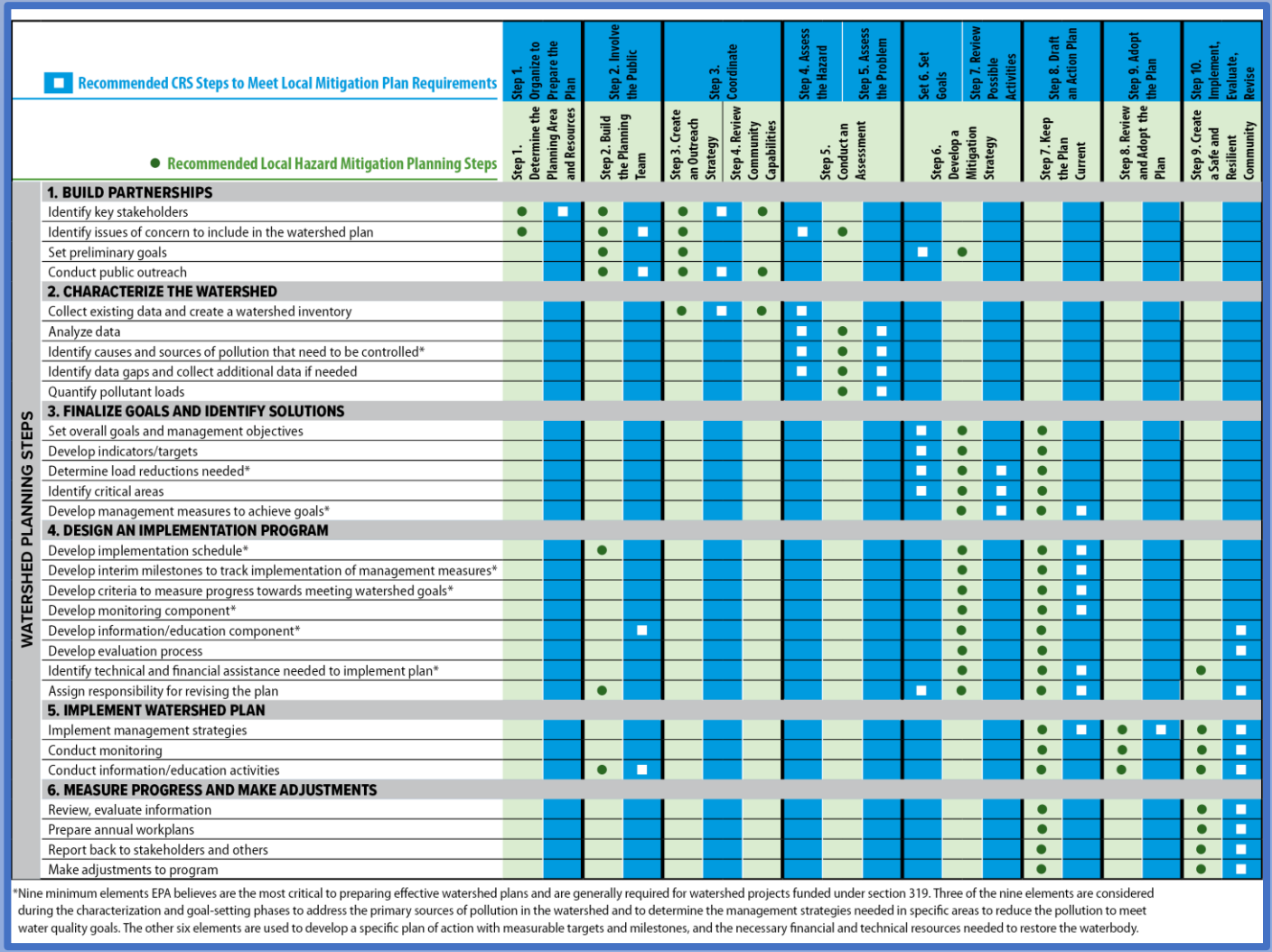

■ Recommended CRS Steps to Meet Local Mitigation Plan Requirements

● Recommended Local Hazard Mitigation Planning Steps

WATERSHED PLANNING STEPS	Step 1. Organize to Prepare the Plan		Step 2. Involve the Public		Step 3. Coordinate			Step 4. Assess the Hazard	Step 5. Assess the Problem		Set 6. Set Goals	Step 7. Review Possible Activities		Step 8. Draft an Action Plan		Step 9. Adopt the Plan		Step 10. Implement, Evaluate, Revise	
	Step 1. Determine the Planning Area and Resources		Step 2. Build the Planning Team		Step 3. Create an Outreach Strategy	Step 4. Review Community Capabilities		Step 5. Conduct an Assessment			Step 6. Develop a Mitigation Strategy			Step 7. Keep the Plan Current		Step 8. Review and Adopt the Plan		Step 9. Create a Safe and Resilient Community	
1. BUILD PARTNERSHIPS																			
Identify key stakeholders	●	■	●		●	■	●												
Identify issues of concern to include in the watershed plan	●		●	■	●			■	●										
Set preliminary goals			●		●						■	●							
Conduct public outreach			●	■	●	■	●												
2. CHARACTERIZE THE WATERSHED																			
Collect existing data and create a watershed inventory					●	■	●	■											
Analyze data								■	●	■									
Identify causes and sources of pollution that need to be controlled*								■	●	■									
Identify data gaps and collect additional data if needed								■	●	■									
Quantify pollutant loads									●	■									
3. FINALIZE GOALS AND IDENTIFY SOLUTIONS																			
Set overall goals and management objectives											■	●		●					
Develop indicators/targets											■	●		●					
Determine load reductions needed*											■	●	■	●					
Identify critical areas											■	●	■	●					
Develop management measures to achieve goals*												●	■	●	■				
4. DESIGN AN IMPLEMENTATION PROGRAM																			
Develop implementation schedule*			●									●		●	■				
Develop interim milestones to track implementation of management measures*												●		●	■				
Develop criteria to measure progress towards meeting watershed goals*												●		●	■				
Develop monitoring component*												●		●	■				
Develop information/education component*				■								●		●				■	
Develop evaluation process												●		●				■	
Identify technical and financial assistance needed to implement plan*												●		●	■			●	
Assign responsibility for revising the plan			●								■	●		●	■			■	
5. IMPLEMENT WATERSHED PLAN																			
Implement management strategies														●	■	●	■	●	■
Conduct monitoring														●		●		●	■
Conduct information/education activities			●	■										●		●		●	■
6. MEASURE PROGRESS AND MAKE ADJUSTMENTS																			
Review, evaluate information														●				●	■
Prepare annual workplans														●				●	■
Report back to stakeholders and others														●				●	■
Make adjustments to program														●				●	■

*Nine minimum elements EPA believes are the most critical to preparing effective watershed plans and are generally required for watershed projects funded under section 319. Three of the nine elements are considered during the characterization and goal-setting phases to address the primary sources of pollution in the watershed and to determine the management strategies needed in specific areas to reduce the pollution to meet water quality goals. The other six elements are used to develop a specific plan of action with measurable targets and milestones, and the necessary financial and technical resources needed to restore the waterbody.

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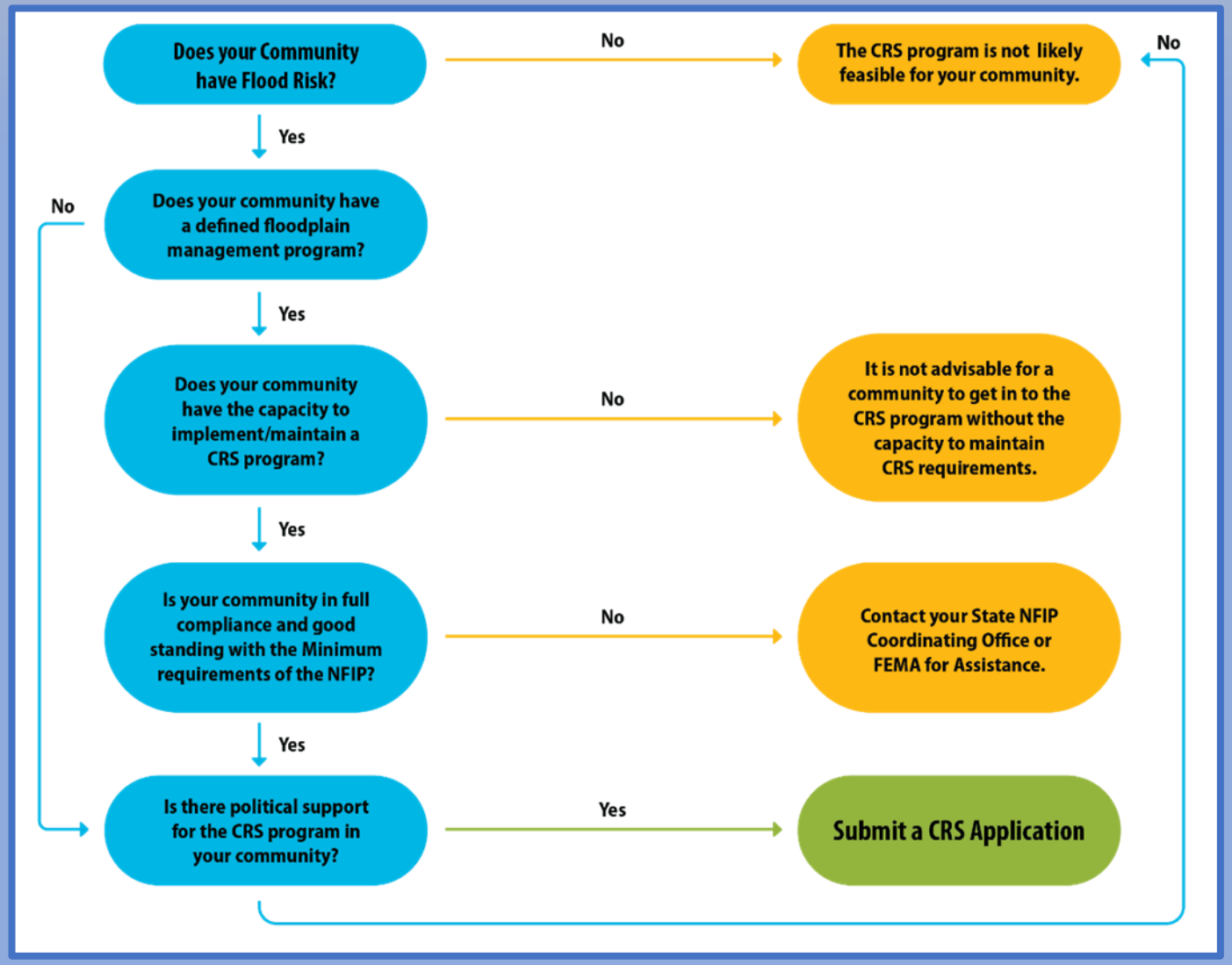
Module 3

How to Build Support for Local Water Resource Management Through the FEMA National Flood Insurance Program's Community Rating System

Module Steps:

1. Understand the NFIP and its environmentally-related CRS activities.
2. Learn how to determine if CRS participation is relevant for your community.
3. Understand how to obtain multiple benefits—CRS activities can support, strengthen, or incentivize the implementation of water quality planning; and can help obtain more flood insurance discounts.
4. Learn how to integrate CRS activities, water quality planning, and hazard mitigation planning to strengthen the success of both program types and ensure the most benefits for your community.



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Series	Category	Activity	
300 Series Overview: This series credits programs that advise people about the flood hazard, encourage the purchase of flood insurance, and provide information about ways to reduce flood damage. These activities also generate data needed by insurance agents for accurate flood insurance rating. They generally serve all members of the community.			
300	Public Information Activities	310	Elevation Certificates
		320	Map Information Service
		330	Outreach Projects
		340	Hazard Disclosure
		350	Flood Protection Information
		360	Flood Protection Assistance
		370	Flood Insurance Promotion
400 Series Overview: This series credits programs that provide increased protection to new development. These activities include mapping areas not shown on the Flood Insurance Rate Map (FIRM), preserving open space, protecting natural floodplain functions, enforcing higher regulatory standards, and managing stormwater. The credit is adjusted to recognize impacts for growing communities.			
400	Mapping and Regulations	410	Flood Hazard Mapping
		420	Open Space Preservation
		430	Higher Regulatory Standards
		440	Flood Data Maintenance
		450	Stormwater Management
500 Series Overview: This series credits programs for areas in which existing development is at risk. Credit is provided for a comprehensive floodplain management plan, relocating or retrofitting flood-prone structures, and maintaining drainage systems.			
500	Flood Damage Reduction Activities	510	Floodplain Management Planning
		520	Acquisition and Relocation
		530	Flood Protection
		540	Drainage System Maintenance
600 Series Overview: This series provides credit for measures that protect life and property during a flood, through flood warning and response programs. There is credit for the maintenance of levees and for state regulatory programs for dams, as well as for programs that prepare for the potential failure of levees and dams.			
600	Warning and Response	610	Flood Warning and Response
		620	Levees
		630	Dams

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Activity		Description[1]	Water Quality Planning Programs in Which CRS Activities Might Overlap[2]
300 Public Information Activities			
320	Map Information Service	The OBJECTIVE of this activity is to provide inquirers with information about the local flood hazard and about flood-prone areas that need special protection because of their natural functions.	• Stormwater Management • Watershed Management (Includes Wetlands Protection)
330	Outreach Projects	The OBJECTIVE of this activity is to provide the public with information needed to increase flood hazard awareness and to motivate actions to reduce flood damage, encourage flood insurance coverage, and protect the natural functions of floodplains.	• Source Water Protection • Stormwater Management • Watershed Management
350	Flood Protection Information	The OBJECTIVE of this activity is to provide the public with information about flood protection that is more detailed than that provided through outreach projects.	• Source Water Protection • Stormwater Management • Watershed Management

Module 4

How to Incorporate Funding and Financial Strategies into Integrated Plans

Module Steps:

1. Examine the financial benefits of integrated hazard mitigation and water resource planning.
2. Review basic best practices for incorporating funding and finance into integrated planning.
3. Consider appropriate funding and financing options for implementing integrated hazard mitigation and water resource projects.
4. Become familiar with the benefits, challenges, and ideal uses related to specific funding and financing strategies.
5. Explore community examples on how taking a blended finance approach can leverage public, private and philanthropic dollars to increase the amount of capital directed at hazard mitigation and water resource implementation.

Funding: Providing "one way" financial resources to support a need, program or project (i.e. taxes, fees and grants).

Financing: The "two-way" acquisition of money for a program or project (i.e. loans and bonds).

Financing Mechanisms	
Cost Reducers	Revenue Streams
Comprehensive Planning	Taxes
Capital Improvement Programs	Fees
Cooperative Procurement and Inter-local Resource Sharing	Bonds and Loans
Public Private Partnerships	Grants
Incentives - Rebates and Tax Credits	Crowdfunding
Regulations and Policy	Offsite Crediting Programs

Blended Finance: refers to the idea of combining multiple finance and funding sources. Having a diverse funding portfolio can help ensure the implementation of projects.

Module 5

Overview of EPA/FEMA Pilot Projects and Lessons Learned

Module Steps:

1. Review and understand the best practices developed from lessons learned during the four pilot projects.
2. Incorporate best practices learned from the pilot projects into your planning process.

Lessons Learned

- Conduct a Stakeholder-based Assessment to Define Issues and Affected Stakeholders
- Use a Third Party to Facilitate the Effort
- Identify a Champion
- Form a Core Group of Invested People
- Understand How the Planning Process Works in the Community
- Understand the Funding and Project Management Requirements to Ensure Continuity
- Keep the Focus on Plan Integration and Alignment

Module 6

Three Examples of Hazard Mitigation Plans That Include GI/LID Practices and Water Quality Integration

In 2019 the City of Milwaukee wrote their Hazard Mitigation Plan to include mitigation strategies that reduce hazards associated with flooding and stormwater drainage issues and incorporate Green Infrastructure as a means to achieve those goals.

Existing GI Provisions from City Stormwater Management Ordinances

- Reduce adverse impacts from stormwater runoff
- Attain and maintain water quality standards
- Reduce the effects of development on erosion
- Minimize damage to public and private property
- Minimize impervious cover to reduce nonpoint source pollution
- Promote the co-benefits of GI/LID
- Provide adaptation and resilience to climate change

Stakeholders

- All Hazards Mitigation Plan Local Planning Team
- Southeastern Wisconsin Regional Planning Commission (SEWRPC)
- Milwaukee Metropolitan Sewerage District (MMSD)
- University of Wisconsin-Madison's Nelson Institute for Environmental Studies

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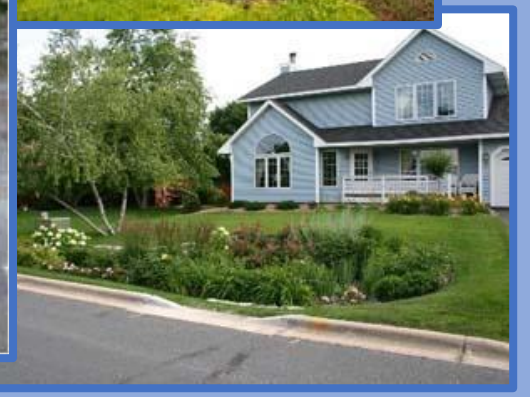

Workshop Goals

- Develop training materials to present the content of the modules
- Target Audience: floodplain managers, state hazard mitigation officers, local officials, water quality planners, etc.
- Present as a new concept
- Partners: federal and state
- Community of Practice
- Interactive sessions
- Come away with an idea of how to get started in their community

Workshop Agenda (Harrisburg, PA)

Topics	Time	Presenters
Introduction	9:00 AM – 9:15 AM	EPA Region 3
Session 1A: Overview	9:15 AM – 10:15 AM	PEMA; Virginia Department of Conservation and Recreation
Session 1B: Mini Exercise and Q&A	**10:15 AM – 10:45 AM**	**PG Environmental**
Morning Break	10:45 AM – 11:00 AM	
Session 2A:Plan Integration	11:00 AM – 12:00 PM	FEMA; PEMA
Lunch	12:00 PM – 1:00 PM	
Session 2B: Mini Exercise and Q&A	**1:00 PM – 1:30 PM**	**PG Environmental**
Session 3: Resources and Tool Demonstration	1:30 PM – 2:00 PM	PEMA; EPA Region 3
Session 4: Funding and Grant Panel Discussion	2:00 PM – 2:45 PM	EPA Region 3; University of Maryland EFC; USACE Silver Jackets; PEMA
Session 5: Facilitated Exercise Discussion	**2:45 PM – 3:45 PM**	**All Participants**
Recap and Closing	3:45 PM – 4:00 PM	EPA Region 3

Pilot Workshop Locations

Pilots to test training materials:

- Harrisburg, PA
  - July 16th
- Charlottesville, VA
  - August 20th
- Western Maryland
  - October 27th

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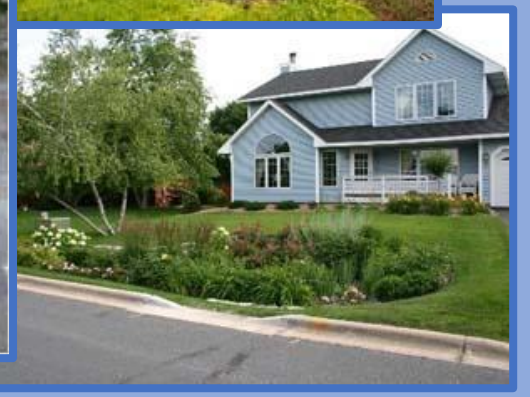

Milwaukee Hazard Mitigation Plan Update

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Existing GI Provisions from City Stormwater Management Ordinances

- Reduce adverse impacts from stormwater runoff
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- Reduce the effects of development on erosion
- Minimize damage to public and private property
- Minimize impervious cover to reduce nonpoint source pollution
- Promote the co-benefits of GI/LID
- Provide adaptation and resilience to climate change

Elements of the Flooding/Stormwater Mitigation Strategy:

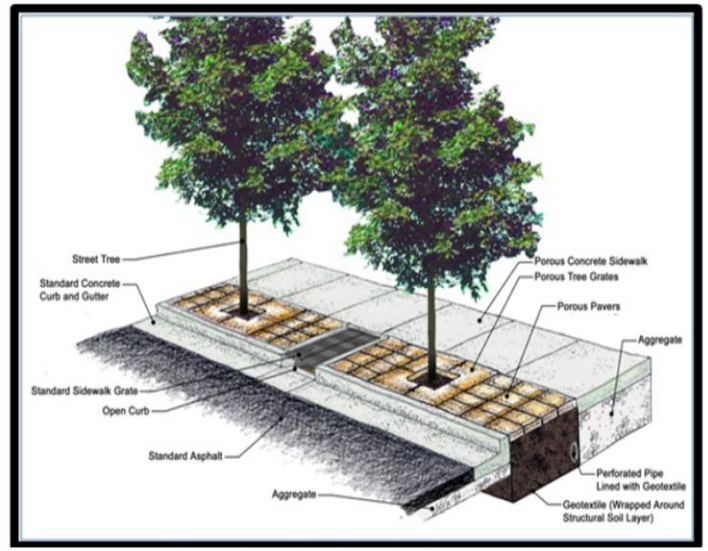
- Floodplain management
- Stormwater management
- Preservation of sensitive land
- Public education/outreach
- Secondary planning

Stakeholders

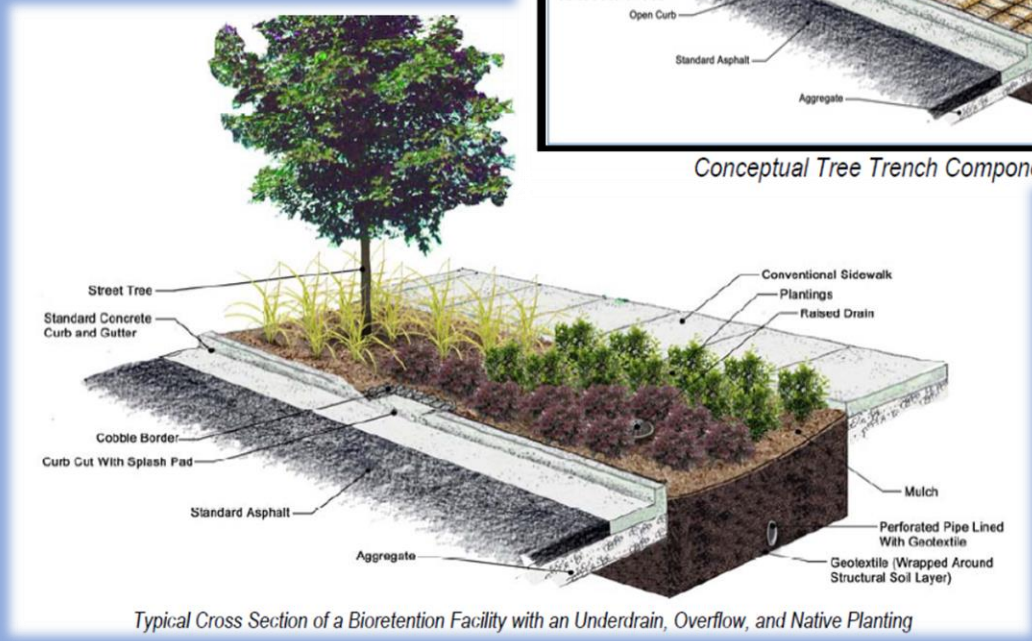
- All Hazards Mitigation Plan Local Planning Team
- Southeastern Wisconsin Regional Planning Commission (SEWRPC)
- Milwaukee Metropolitan Sewerage District (MMSD)
- University of Wisconsin-Madison's Nelson Institute for Environmental Studies

Green Streets Stormwater Management Plan

- Menu of green street stormwater strategies
- Implemented along with street and alley repaving or reconstruction projects
- Includes bioretention, tree trenches, and porous pavements
- Examples of typical installation locations, benefits, and maintenance considerations
- bioretention provides the greatest water quality improvement while all strategies provide water quantity benefits.

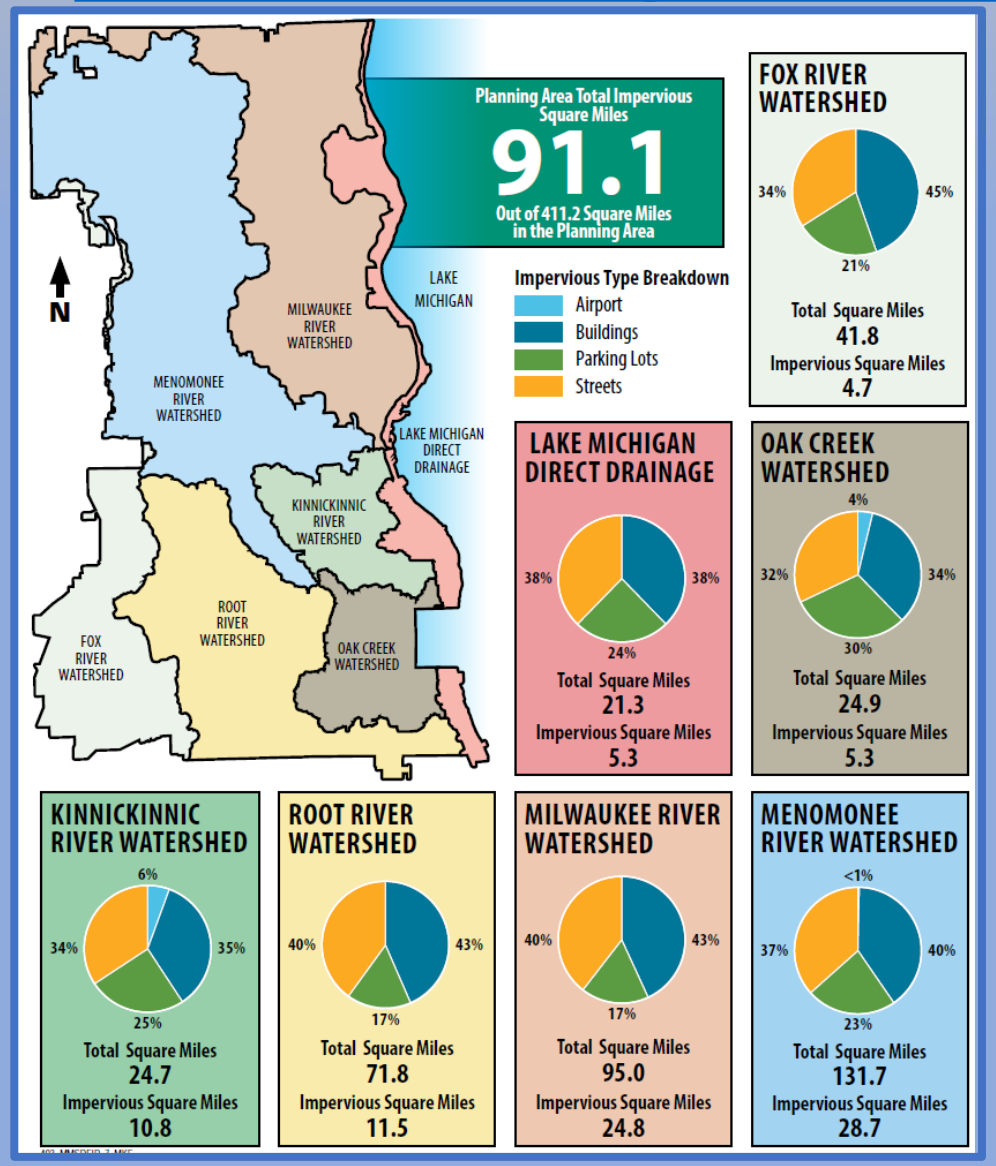


Conceptual Tree Trench Components



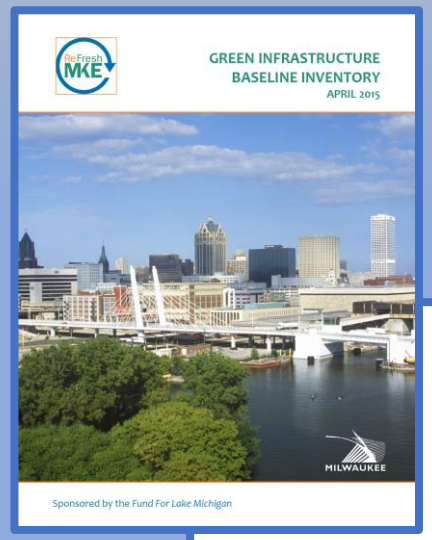
Typical Cross Section of a Bioretention Facility with an Underdrain, Overflow, and Native Planting

MMSD Regional Green Infrastructure Plan

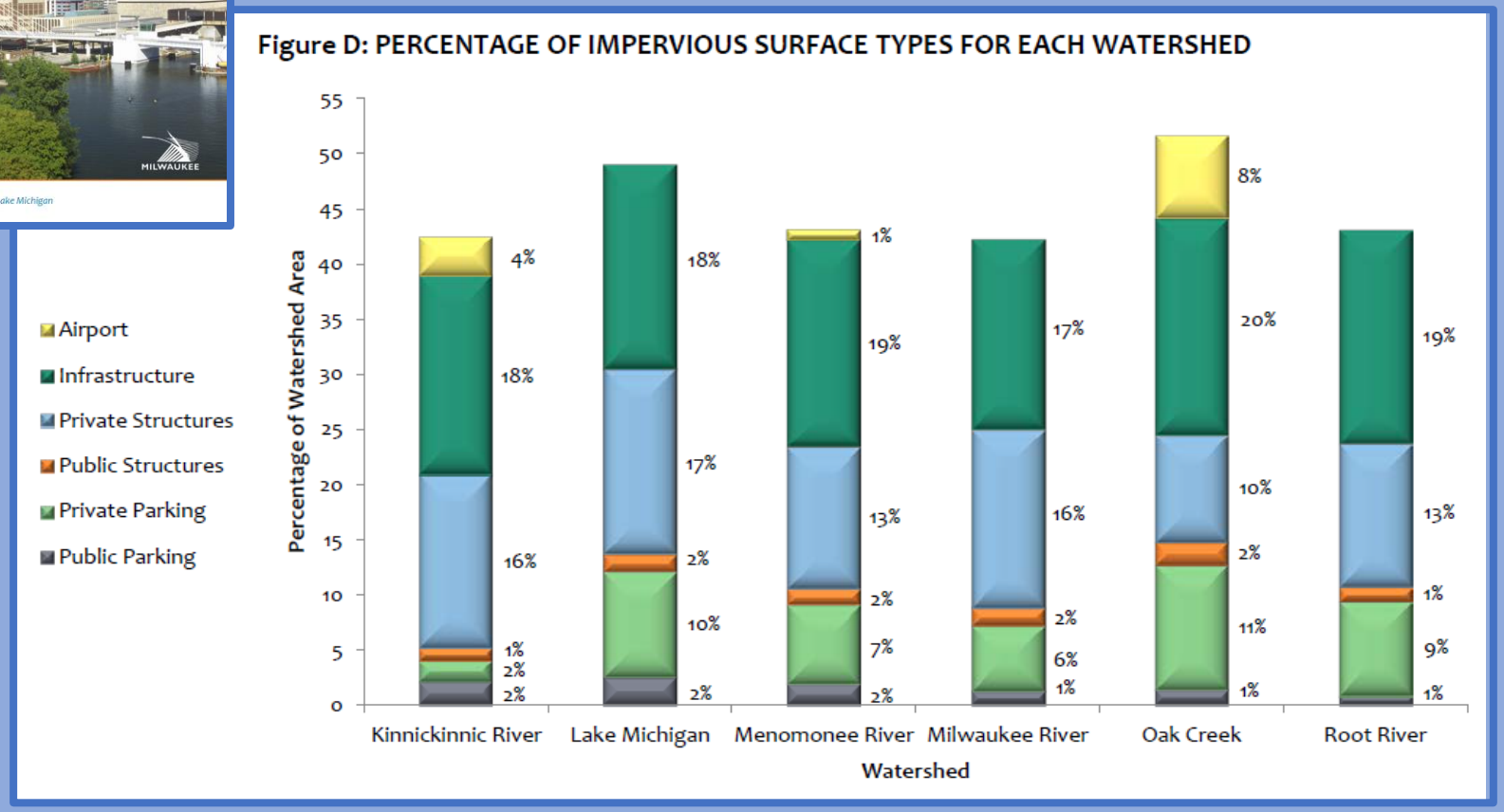


- Key recommendation: "inform municipal leaders of possible credits towards current program requirements… when green infrastructure implementation occurs.“
- "The Plan will help to meet certain regulatory requirements that already exist, such as the municipal separate stormsewer system (MS4) permit (required by WDNR) and future requirements such as TMDL implementation to reduce pollutants from stormwater runoff."

Green Infrastructure Baseline Inventory



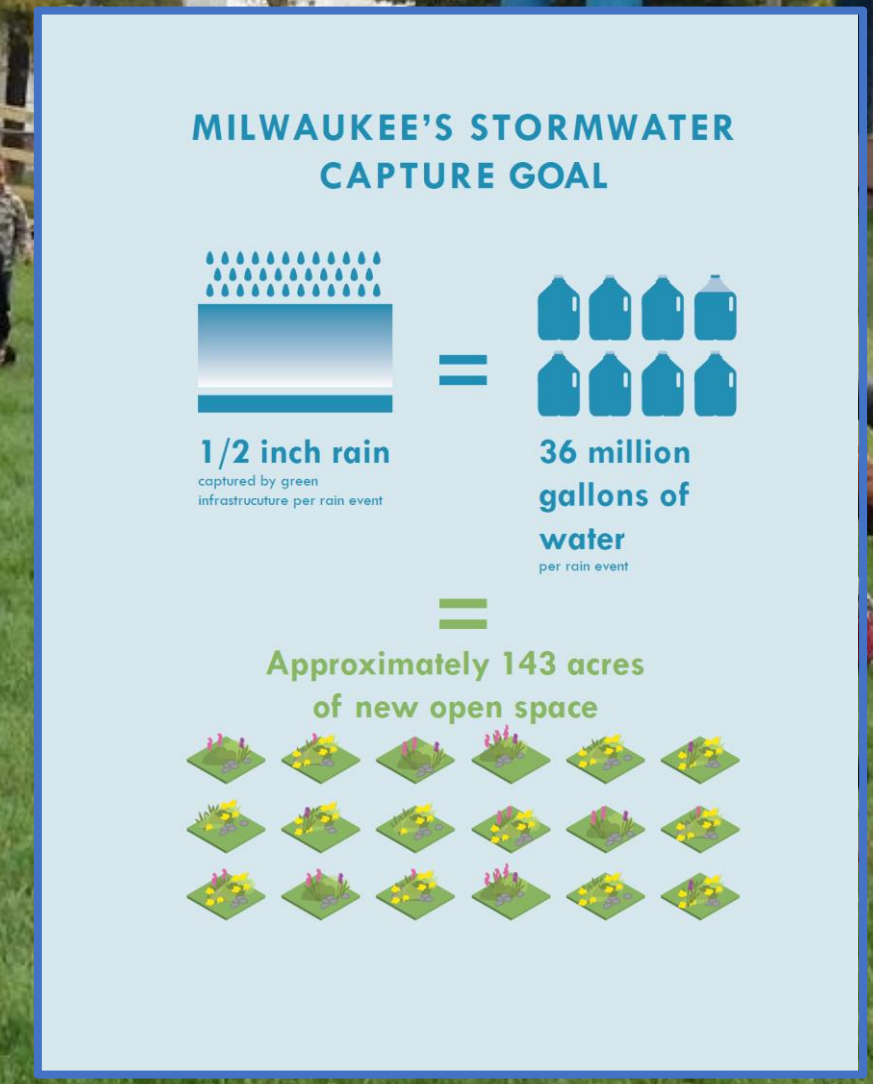
- Establish baseline measures of impervious surfaces and existing green infrastructure within the city limits.



- Lists redevelopment plans that will reduce impervious surfaces and industrial structures.
- Rough estimates of potential stormwater capture.

Milwaukee Green Infrastructure Plan

By 2030, Milwaukee will add approximately 36 million gallons of stormwater storage by implementing green infrastructure. This is the equivalent of adding 143 acres of green space throughout the City. Green infrastructure will be designed, installed, and maintained by an inclusive workforce that is representative of the City's diversity. The Green Infrastructure Plan will help Milwaukee adapt to climate change while creating a healthier and more resilient city.



Other Case Studies

Ashland, OR

Green Infrastructure and Low Impact Development into the Ashland Hazard Mitigation Plan: EPA/FEMA Project Report

Huntington, WV

Storm Smart Cities: Integrating Green Infrastructure into Local Hazard Mitigation Plans

Massachusetts

Using Green Infrastructure to Improve Drought Resilience in the Commonwealth of Massachusetts

Other Stormwater Resources

Fillable Template

NPDES Stormwater Permit Program for Municipal Separate Storm Sewers (MS4s)

Lead	**Internal Partners**	**External Partners**	**Hazards/Goals**	**Funding/Costs**
Insert state agency or local department, territory, or tribe overseeing the program EPA authorizes states to issue permits where applicable.	Insert partner state or local agencies such as public works, storm water maintenance crews, road departments, parks and recreation departments, construction departments, and finance office.	Insert external partners such as permittee associations, state or federal agencies, neighboring MS4s, universities with GIS or other skillsets, citizens advisory groups, watershed groups, state or local construction associations, departments of transportation, major permittees, etc.	Insert the *hazard* identified in the plan that the MS4 program can help mitigate the *goal* identified in the plan that the MS4 Program can help mitigate. Hazard #1 (Example: Recurrent nuisance urban flooding) Hazard #2 (Example: Urban Heat Island) Hazard #4 (Example: Social inequities in parks and open space) Goal #4 (Example: Reduce nuisance flooding in Smith Commons with required implementation of bioretention along Thomas Street.) Goal #1, 2, and 4 (Example: Review the Hick's Creek Watershed Plan as part of area hazard risk reduction planning for joint project implementation.)	Insert how the permittee might fund the program. Ex. Permittee is responsible. Support may be from local stormwater funds, developer contributions, financial planning assistance from EPA's Water Infrastructure and Resiliency Finance Center, and funding resource types identified at https://www.epa.gov/green-infrastructure/green-infrastructure-funding-opportunities.

Objective

Prevent stormwater runoff from washing harmful pollutants into local surface waters.

Description

The National Pollutant Discharge Elimination System (NPDES) stormwater program regulates some stormwater discharges from three potential sources including municipal separate storm sewer systems (MS4s). The term "MS4" does not solely refer to municipally-owned storm sewer systems. It has a much broader application that can include systems owned by public entities such as local jurisdictions, state departments of transportation, universities, local sewer districts, hospitals, military bases, and prisons.

Under an MS4 permit permitted entities develop, implement, and enforce stormwater management plans (SWMP) that describe the stormwater control practices they will implement consistent with permit requirements to reduce the discharge of pollutants from the sewer system. These control measures include requirements generally related to (1) construction site runoff control, (2) post-construction stormwater management in new development and redevelopment, (3) illicit discharge detection and elimination, (4) pollution prevention/good housekeeping for municipal operations, (5) public education and outreach on stormwater impacts, and (6) public involvement/participation. Stormwater discharge requirements for regulated MS4s are included in permits that are effective for five years. Permittees submit an Annual Report providing a status of compliance, results of information collected and analyzed, summary of activities proposed, any changes to their program, and notice if relying on another entity for some activities.

There are two types of MS4s – Phase I and Phase II.

- Phase I MS4s: The 1990 Phase I regulation requires medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. There are approximately 855 Phase I MS4s covered by 250 individual permits.

CRS Crosswalk

Table 6. Crosswalk Between Water Quality Planning and CRS Credits: Stormwater Management Planning for MS4s

Planning Steps/Activities	CRS Number/Credit Category	Specific CRS Credit Activity[1]
Apply for and obtain MS4 NPDES Permit coverage and Develop a Stormwater Management Program (SWMP) that addresses six minimum control measures (shown below):		
○ Public Education and Outreach on Stormwater Impacts	320 Map Information Service	• Provide Flood Insurance Rate Map information to those who inquire, and publicize this service
	330 Outreach Projects	• Distribute outreach projects with messages about flood hazards, flood insurance, flood protection measures, and/or the natural and beneficial functions of floodplains
	350 Flood Protection Information	• The public library and/or community's website maintains references on flood insurance and flood protection
○ Public Involvement/Participation	510 Floodplain Management Planning	• Prepare, adopt, implement, and update a plan to protect natural functions within the community's floodplain • Prepare, adopt, implement, and update a plan to protect natural functions within the community's floodplain
○ Illicit Discharge Detection and Elimination	540 Drainage System Maintenance	• Have a program for and conduct annual inspections of all channels and detention basins; remove debris as needed • Have a program to publicize no dumping regulations • Map and inventory of stormwater conveyance system including natural channels that are not inspected. • Capital improvement program allocated in budget
○ Construction Site Runoff Control	450 Stormwater Management	• Regulate new construction to minimize soil erosion and protect water quality
○ Post-Construction Stormwater Management in New Development and Redevelopment	410 Flood Hazard Mapping	• Develop new flood elevations, floodway delineations, wave heights, or other regulatory flood hazard data for an area not mapped in detail by the flood insurance study • Have a more restrictive mapping standard • While 410 is strictly flood hazard mapping, this is an opportunity to map and assess risks
	420 Open Space Preservation	• Guarantee that currently open public or private floodplain parcels will be kept free from development
	430 Higher Regulatory Standards	• Limit new buildings and/or fill in the floodplain • Require freeboard • Require compensatory storage • Prohibitions or restrictions of outdoor storage of materials in floodplains, including hazardous materials • Have regulations tailored to protect critical facilities or areas subject to special flood hazards (for example, alluvial fans, ice jams, subsidence, or coastal erosion)
	440 Flood Data Maintenance	• Keep flood and property data on computer records • Use better base maps • Maintain elevation reference marks

Green Infrastructure and Hazard Mitigation

Workshops to Address Water Quality and Water Quantity

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