

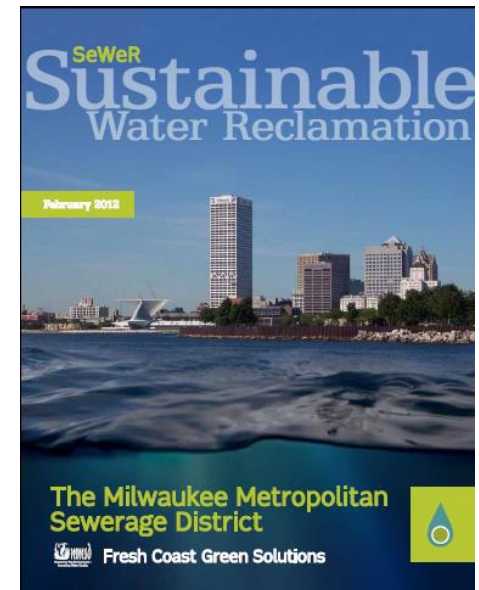
Reducing Flood Impacts Using Green Infrastructure

2015 Rock River Coalition and Environmental Law Institute's Wetlands, Wildlife Habitat and Flood Hazards Webinar

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Senior Project Manager*



Milwaukee Metropolitan Sewerage District



Basic Flood Facts

- Flooding is #1 natural hazard in US and it is increasing
- More than 50% of properties in high-risk areas do not have flood insurance
- 25% flood insurance claims outside SFHA
- 26% chance of flood during 30-year mortgage (compared to 9% chance of fire)
- Studies show \$4 savings on every \$1 of mitigation

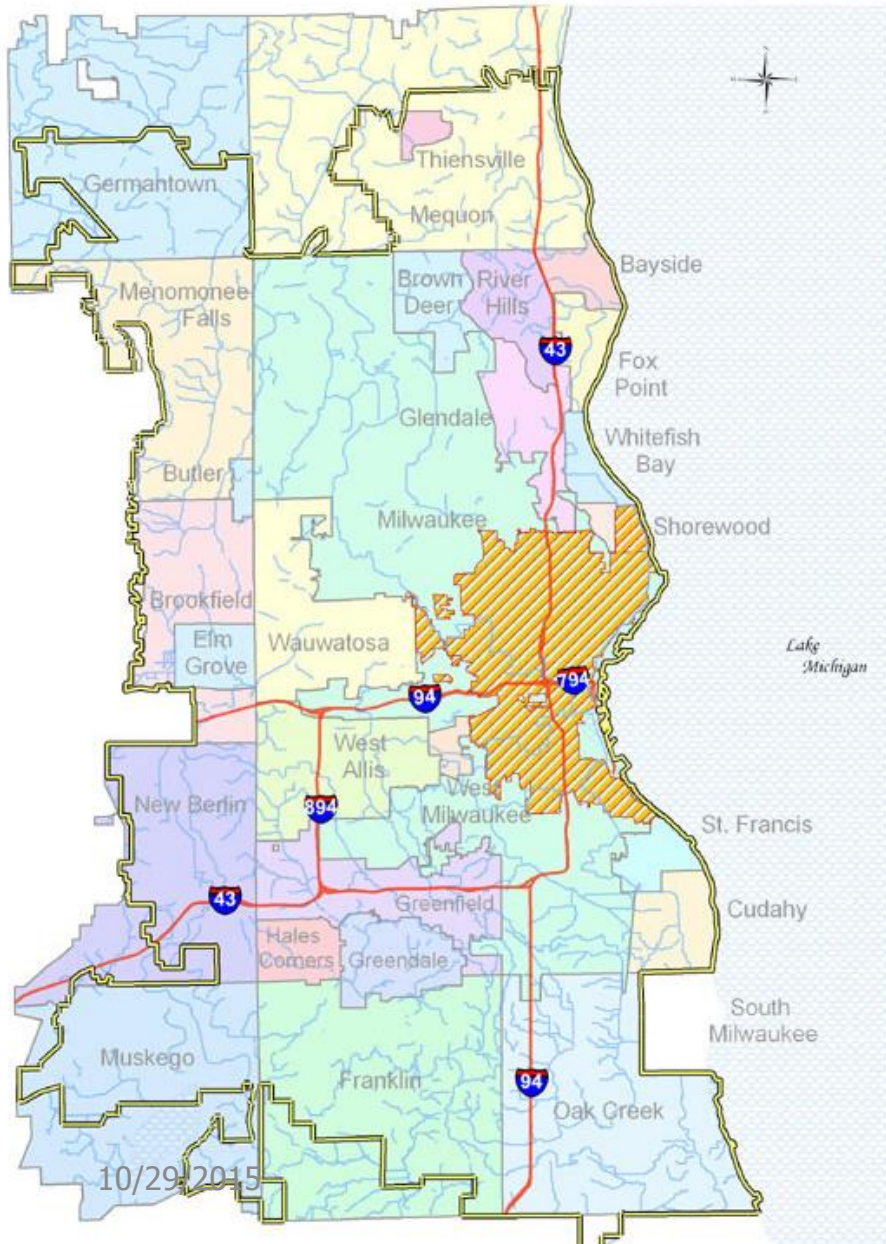
What is Flood Management?

Flooding is a natural process that becomes problematic if property and life are put in the path of disaster!

THEREFORE:

Floodplain management is a decision making process for wise use of the Existing Floodplain based on all costs and benefits

Milwaukee Metropolitan Sewerage District



We Serve:

- 1.1 Million Customers
- 28 Municipalities
- 411 Square Miles

We Protect the Public & Lake Michigan:

- Convey/Store/Reclaim Wastewater
- Manage Flooding

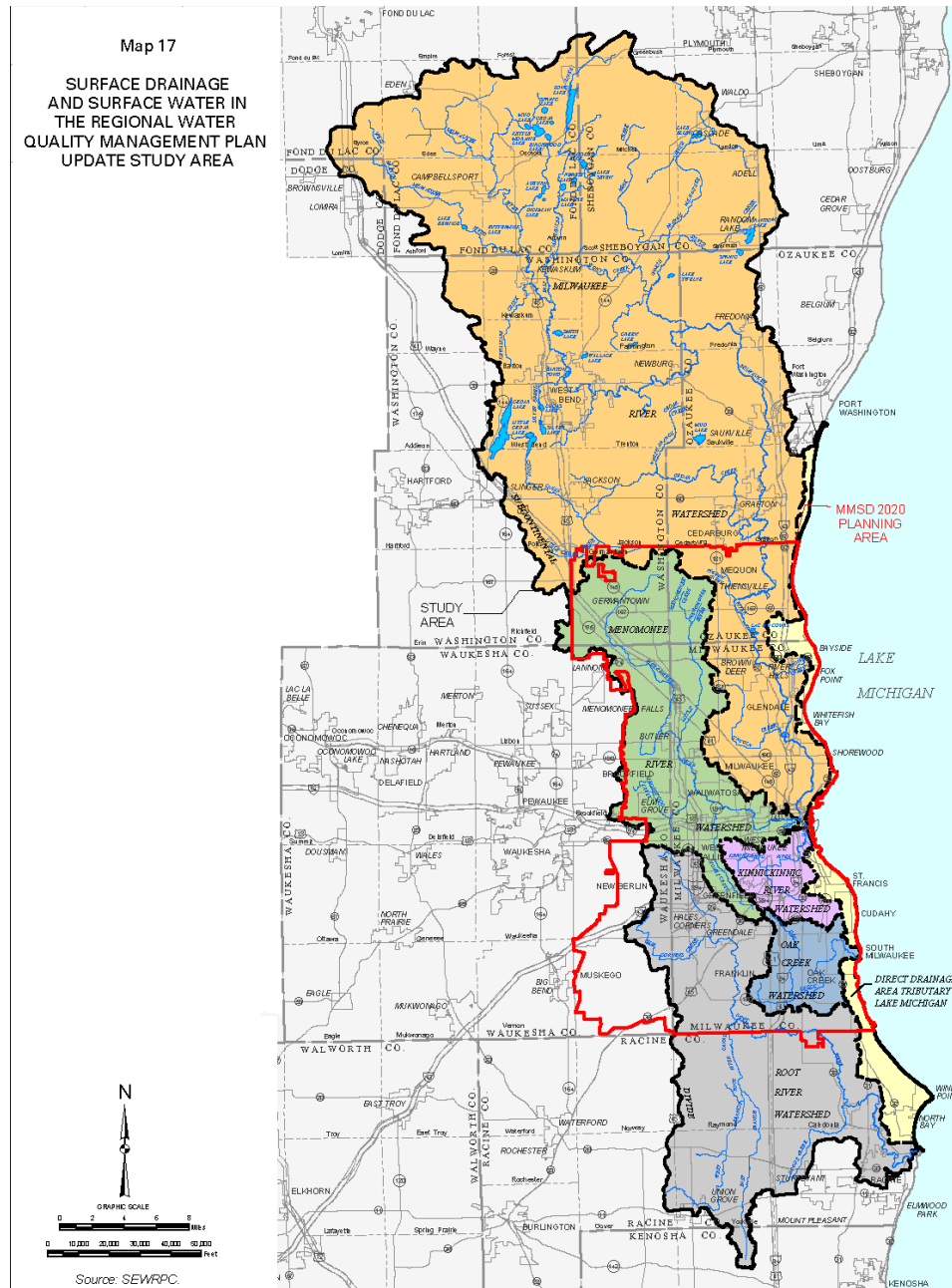
We Have:

- 300 Miles of Sewers (Municipalities and individuals have 6,000 miles!)
- 521 MG Tunnel System
- 2 Water Reclamation Facilities

The Water Quality and Flood Management Initiative

A Watershed Approach

<u>Watershed</u>	<u>Area</u> <u>(square miles)</u>
Kinnickinnic River	24.7
Menomonee River	135.8
Milwaukee River	700.0
Oak Creek	28.2
Root River	197.6
Lake Michigan Direct	40.7
Drainage Area	
Total	1,127.0
Number of Counties	9
Number of Local Municipalities	83



Water Reclamation Facilities



Jones Island



South Shore

Deep Tunnels



300 Feet
Below ground

521 Million
Gallons of Storage

28.5 Miles
Long

17- to 32-feet
In Diameter

Designed to
minimize basement
backups and for 1-2
overflows per year.

% OF VOLUMES CAPTURED & CLEANED

**TOTAL
PERCENT
CAPTURE
98.3%**

1994	99.7%	1999	94.8%	2004	97.9%	2009	98.3%
1995	98.9%	2000	95.6%	2005	99.6%	2010	96.1%
1996	99.0%	2001	99.3%	2006	99.9%	2011	99.7%
1997	97.1%	2002	99.3%	2007	99.2%	2012	99.9%
1998	99.1%	2003	99.9%	2008	95.1%	2013	98.5%

MMSD's 2035 Vision

(<http://v3.mmsd.com/NewsDetails.aspx>)

Integrated Watershed Management Goals:

Zero sanitary sewer overflows

Zero combined sewer overflows

Zero homes in the 100 year floodplain

Acquire an additional 10,000 acres of river buffers through Greenseams®

Use green infrastructure to capture the first 0.5 inch of rainfall

Harvest the first 0.25 gallon per square foot of area of rainfall

Energy Efficiency and Climate Mitigation & Adaptation Goals:

Meet 100% of MMSD's energy needs with renewable energy sources

Meet 80% of MMSD's energy needs with internal, renewable sources

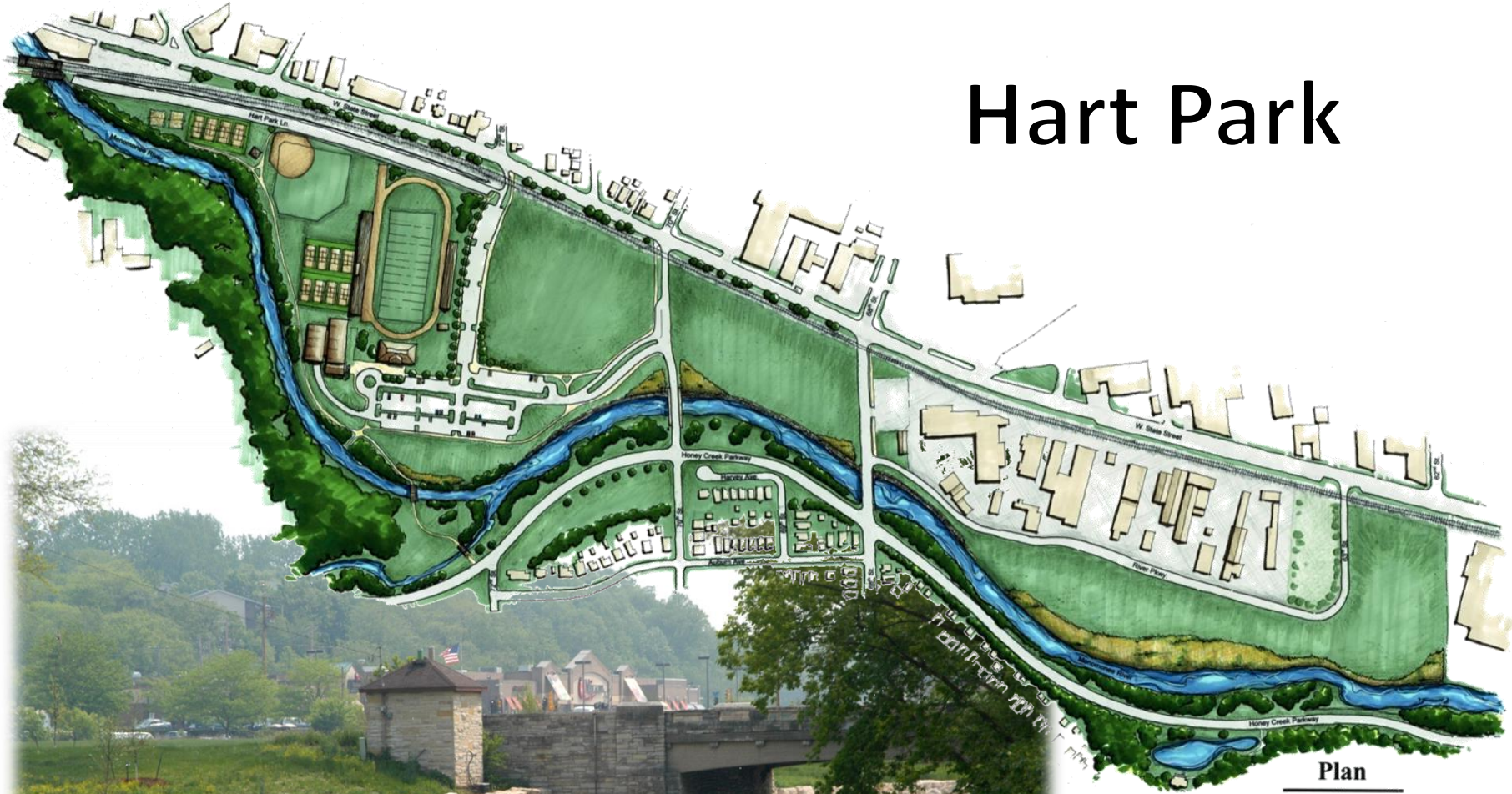
Use the Greenseams® Program to provide for 30% sequestration of MMSD's carbon footprint

Reduce MMSD's carbon footprint by 90% from its 2005 baseline

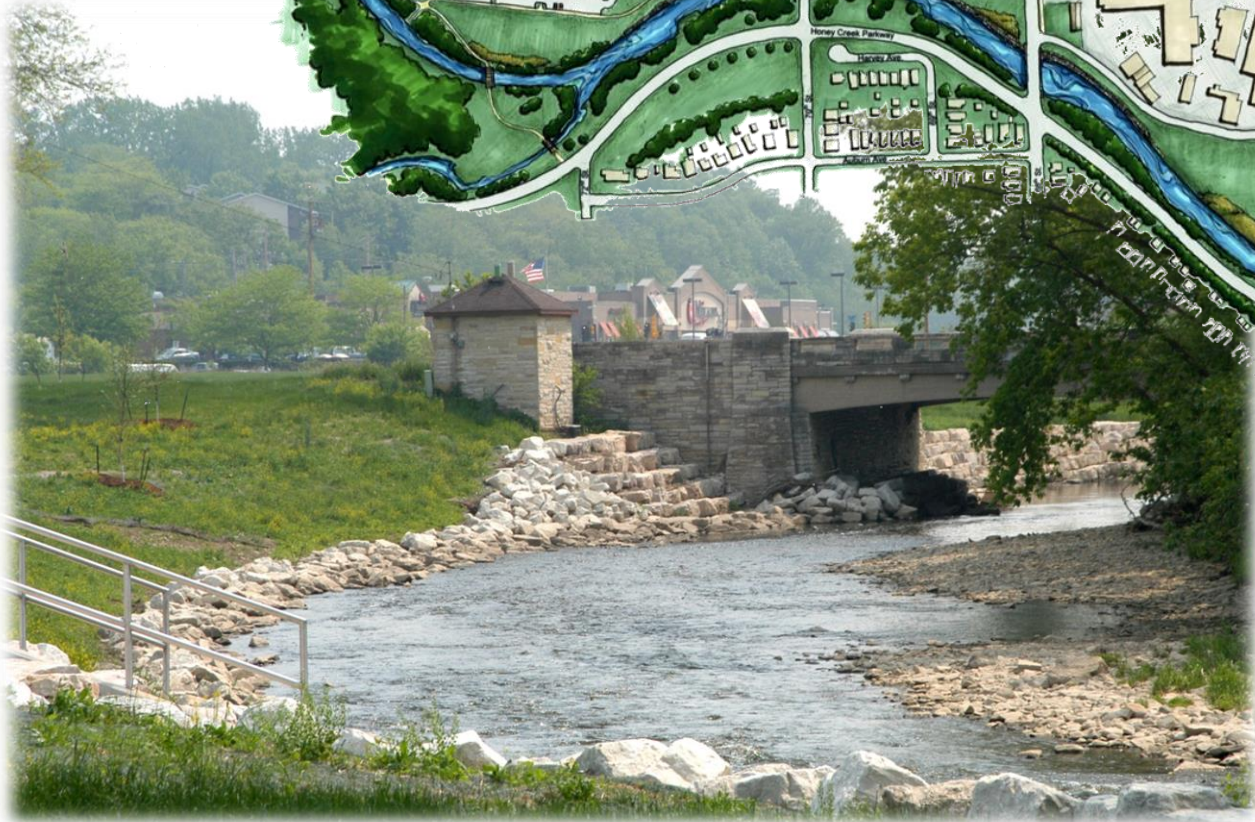
Valley Park Project



Hart Park



Plan



County Grounds



Kinnickinnic Concrete Removal



Menomonee River Concrete Removal



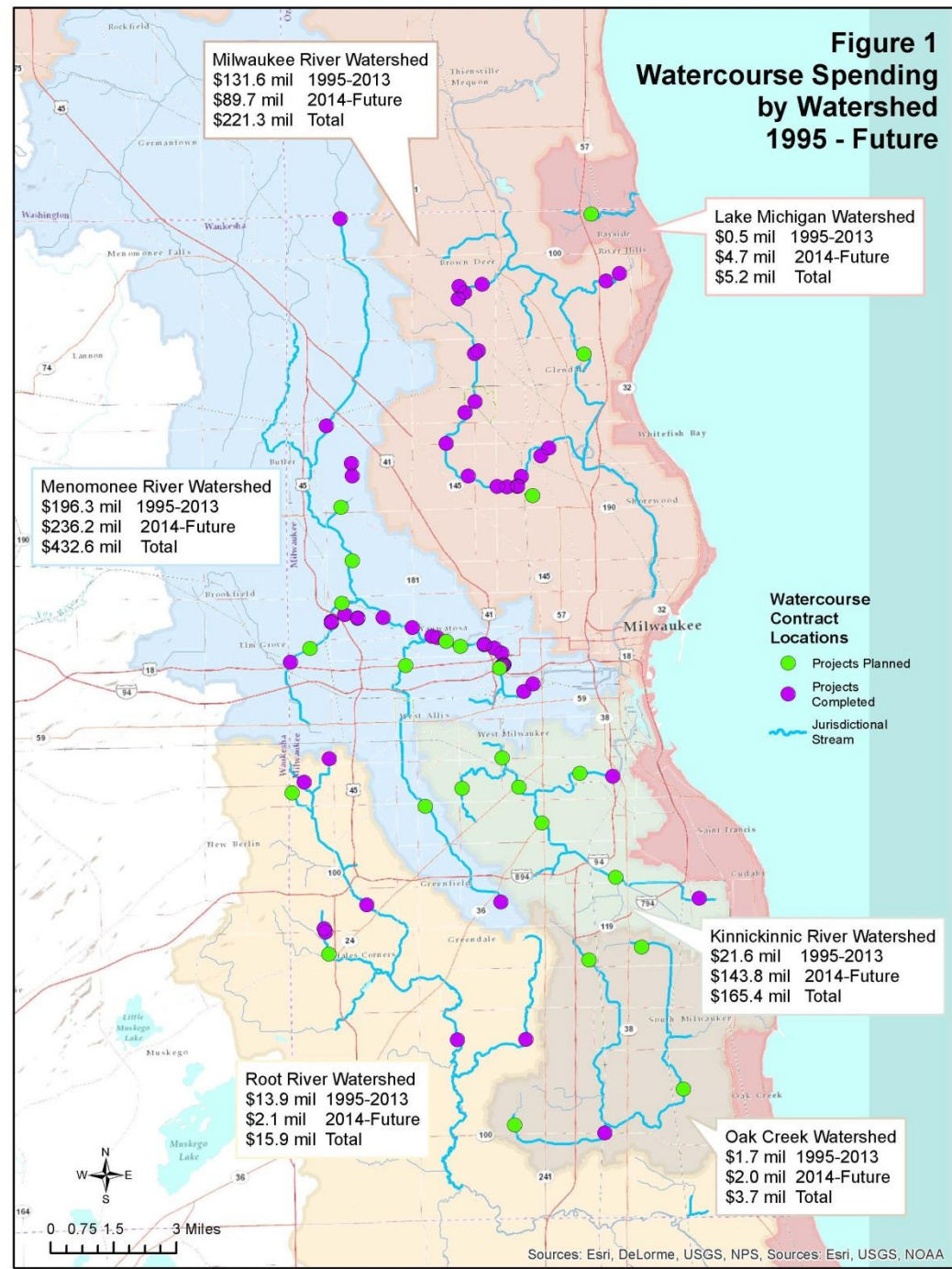


Greenseams®

2,660
Acres

Watercourse Spending

Milwaukee River	\$221.3 M
Lake Michigan	\$ 5.2 M
Menomonee River	\$432.6 M
Root River	\$ 15.9 M
Kinnickinnic River	\$165.4 M
Oak Creek	\$ 3.7 M



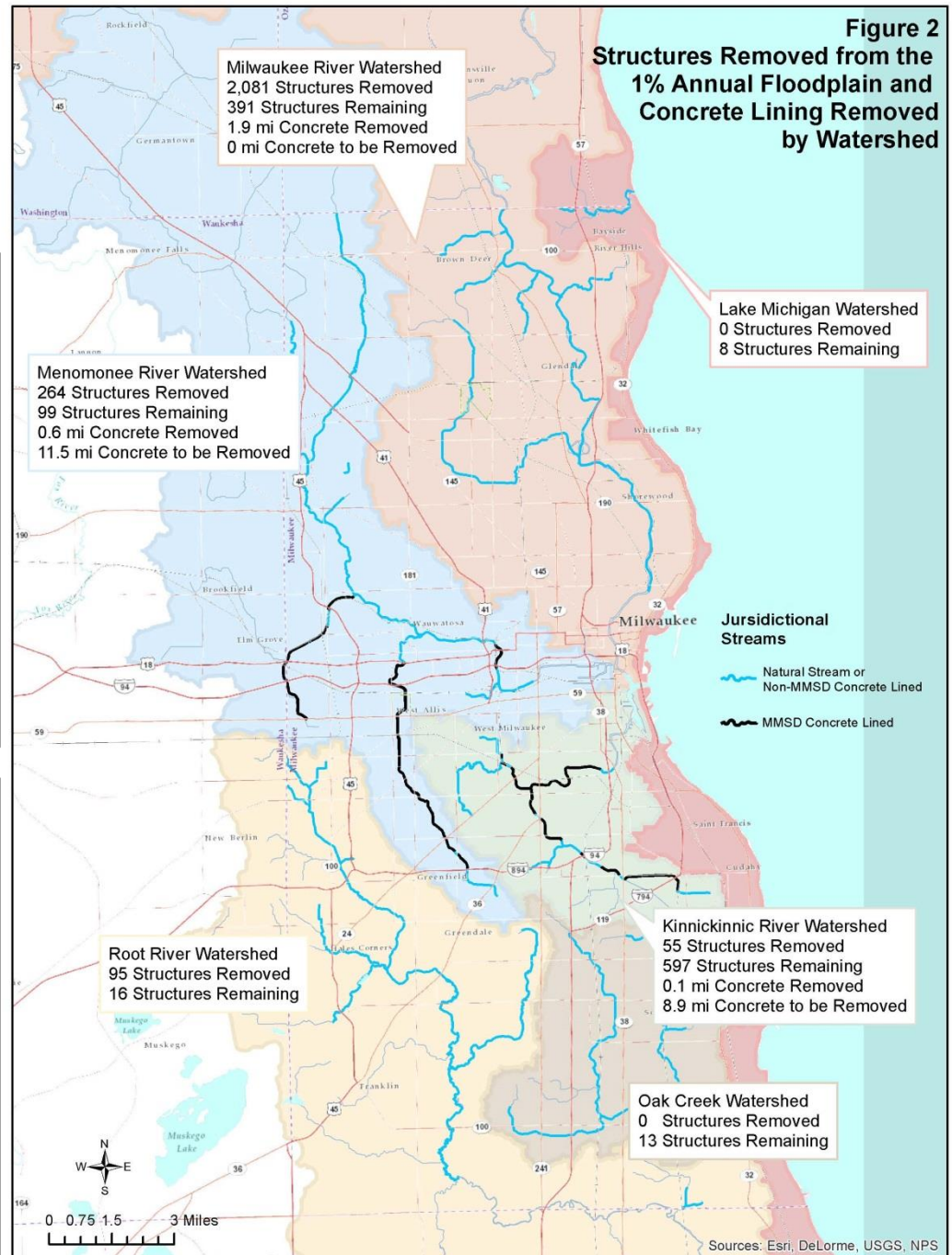
Impacts of our Work

Homes in Floodplain Removed/Remaining

Milwaukee River	2,081/391
Lake Michigan	0/8
Menomonee River	264/99
Root River	95/16
Kinnickinnic River	55/597
Oak Creek	0/13

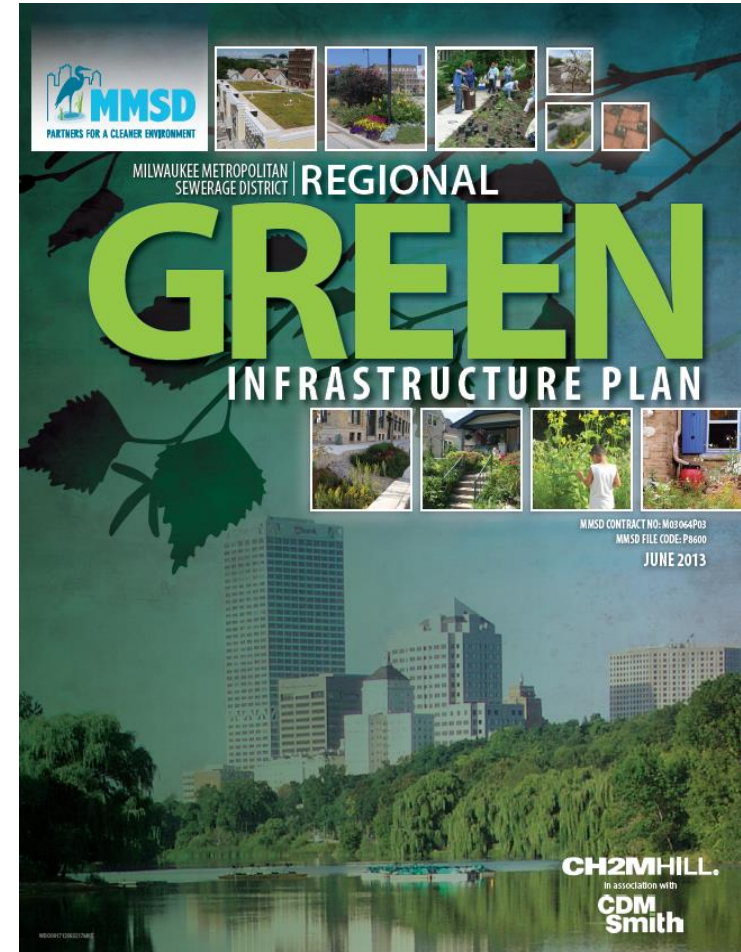
Miles of Concrete Removed/Remaining

Milwaukee River	1.9/0
Lake Michigan	0/0
Menomonee River	0.6/11.5
Root River	0/0
Kinnickinnic River	0.1/8.9
Oak Creek	0/0



MMSD's Regional Green Infrastructure Plan

- Meet new discharge permit requirement
- Capture the first 0.5" that falls on impervious surfaces or an additional 740 MG
- Prioritize green infrastructure projects



Milwaukee Metropolitan Sewerage District

FRESH COAST 740
MILWAUKEE, WISCONSIN



What is Green Infrastructure (GI)?

10 GREEN INFRASTRUCTURE DEFINITIONS

Green infrastructure is an approach to wet weather management that is cost-effective, sustainable, and environmentally friendly. At the largest scale, the preservation and restoration of natural landscape features (such as forests, floodplains and wetlands) are critical components of green stormwater infrastructure. By protecting these ecologically sensitive areas, communities can improve water quality while providing wildlife habitat and opportunities for outdoor recreation. On a smaller scale, green infrastructure practices include strategies such as rain gardens, porous pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater harvesting for non-potable uses such as toilet flushing and landscape irrigation.



GREENWAYS

Greenways



RAIN GARDENS

Rain Gardens



BIO-SWALES

Bioswales



POROUS PAVEMENT

Porous Pavement



WETLANDS

Wetlands



STORMWATER TREES

Stormwater
Trees



NATIVE LANDSCAPING

Native
Landscaping



RAINWATER CATCHMENT

Rainwater
Catchment



GREEN ROOFS

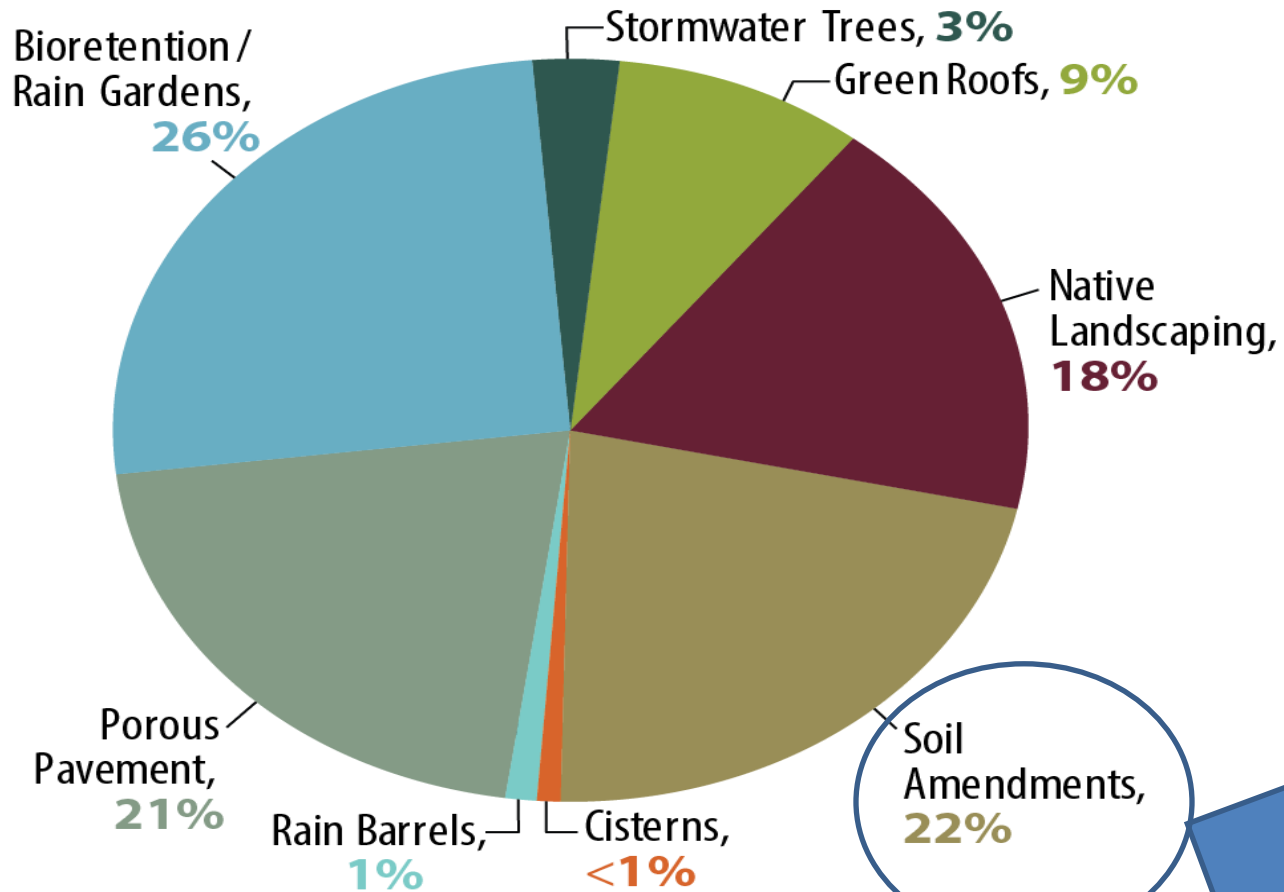
Green Roofs



GREEN ALLEYS, STREETS AND PARKING LOTS

Green Streets,
Alleys, Parking

The Mix of Green





29,300 Plants Sold Since 2006

mmmsd Rain barrels



More than
18,000
SOLD
Since 2002

Green Roofs

+10 acres

since 2003



Benefits at full implementation

Economic	
Green job opportunities	633 O&M; 161 construction jobs
Reduced infrastructure costs in the CSSA	\$221.8 million compared to cost of GI in CSSA of \$179.5 Million
Reduced pumping and treatment costs	Reduction in the need for deep tunnel pumping and associated treatment: \$1.3 million/year
Increased property values	Increase in property values due to aesthetic improvements from GI: Residential: \$447.8 million Commercial: \$238.2 million Industrial: \$ 19.9 million Total: \$705.9 million

Benefits at full implementation

Social	
Improved quality of life and aesthetics	Recreational Area Increase: 275 acres Reduced Crime & Social Program Costs
Improved green space/recreational areas	Native landscaping: 8,600 acres Bio-retention/rain gardens: 670 acres Number of trees: 738,000

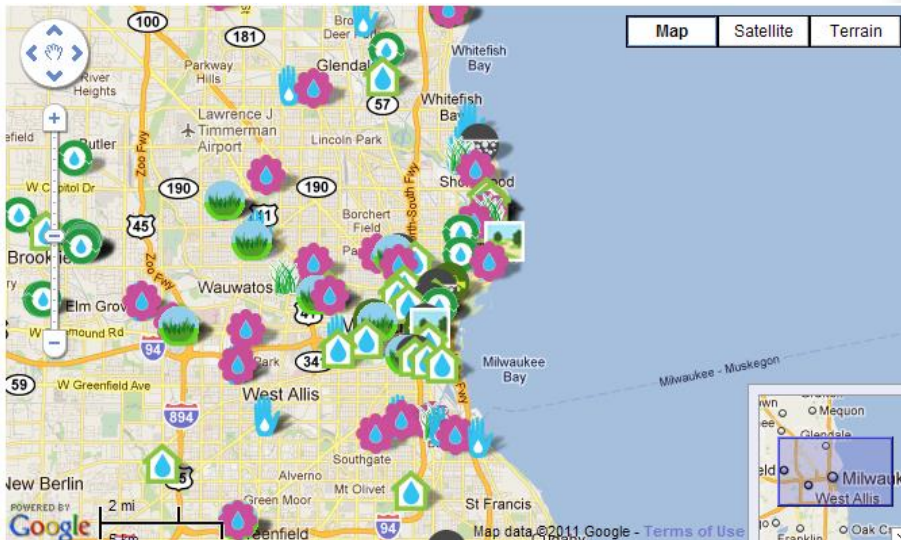
Benefits at full implementation

<u>Environmental</u>	
Captured stormwater runoff	740 MG new GI storage
Reduced pollutant loadings	Total suspended solids: 15.1 million pounds/year Total Phosphorus: 54,400 pounds/year
Carbon reduction	CO ₂ sequestered plus emissions avoided due to GI-related energy savings: 73,000 tons/year Reduction costs due to effects on human health, property damages from increased flood risk, etc. \$1.4 million/year

Benefits at full implementation

<u>Environmental</u>	
Reduced energy use for cooling	Due to the insulating properties of green roofs and tree shading: 16.5 million kWh/year Associated cost savings: \$1.5 to \$2.1 million
Improved air quality	Criteria air pollutants removed by trees plus emissions avoided due to GI-related energy savings: CO: 8 tons/year NO ₂ : 103 tons/year Ozone: 403 tons/year PM ₁₀ : 190 tons/year SO ₂ : 113 tons/year Human health benefit costs from NO ₂ and SO ₂ reductions: \$6.4 million/year

Public Education



www.mmsd.com and
www.freshcoast740.com

10/29/2015

H₂O CAPTURE measuring greater milwaukee's future... one drop at a time.

Learn Calculate Map It Forum News Contact

Soak it up Challenge

Be Part of the Solution

We're striving to protect our rivers and lakes from water pollution by capturing **500 million gallons** of rain with green infrastructure during any given storm in the region. Up for the challenge?

Plant a rain garden. Install a rain barrel. Then, plug your info into our "Soak it Up" Calculator to see how we stack up as a region.

20.43%

START HERE

Goal: **500,000,000** gals
 Current: **147,172,919** gals

FORUM

Recent MMSD Water News

- August 27, 2011 **FREE Rain Barrel Installation Demo with State Senator Lena Taylor** August 27, 2011
- August 06, 2011 **MMSD Treated 99.8% of Stormwater in 2011**
- August 06, 2011 **A Pocket Full of Stormwater**

Learn How To Capture Stormwater

Do you want to reduce stormwater pollution, conserve water and save money? Green infrastructure allows us to collect and infiltrate stormwater by keeping it out of sewers and waterways, reducing flooding and basement back-ups. It can be as simple as connecting a rain barrel to your home or planting native vegetation.

Read more in our **Learn** section about how you can use green infrastructure to capture stormwater.

The Brewery - MMSD Signature Projects
 The Brewery, a redevelopment project at the old Pabst Brewery site in Milwaukee, has taken sustainable stormwater management to the next level by holding, capturing and expensing stormwater runoff.

Milwaukee Co. Zoo - MMSD Signature Projects
 The Milwaukee County Zoo added a green roof with special monitoring features on its conservation education building to its list of fantastic attractions. It was one of the first green roofs in Milwaukee.

Walnut Way Neighborhood MMSD Signature Projects
 The Walnut Way Conservation Corps has implemented rain barrels, cisterns, and rain gardens to capture rain water. They've also worked on an education and outreach program to promote sustainable living within the neighborhood.

H2O News:

- Green Streets Go Mainstream in Portland**
 Green Streets has become a community affair in Portland, Ore., where citizens can "adopt" a Green Street stormwater management facility in their neighborhood. The city sponsors Green Street maintenance training, which includes picking up trash, removing leaves and debris, and occasional weeding and watering.
- Asian carp; Battle lines are drawn at Chicago ship canal**
 The most contentious issue in the debate over Asian Carp is whether to barricade the superhighway for the fish -- and future invasive species -- created by the Chicago Sanitary and Ship Canal.
- Area Sewerage District Produces Helpful, Informative Video**
 After 3 years of massive storms the MMSD established a program to help reduce the risk of basement backups by reducing volumes of excess water entering into sanitary sewers from homes and businesses. MMSD also released an informative video to explain how this happens and what can be done.

Our Partners

- Fund for Lake Michigan
- sweet water
- CES MILWAUKEE
- Urban Water Sustainability Council

H2O News:

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Southeastern WI Watersheds Trust

Success = A Regional Partnership





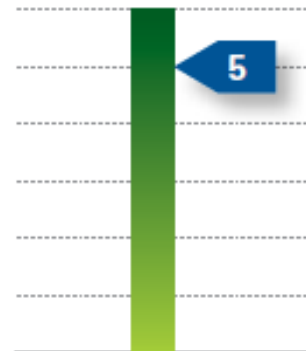
NATURAL RESOURCES DEFENSE COUNCIL

THE EARTH'S BEST DEFENSE

Rooftops to Rivers II

Green Strategies for Controlling Storm water and Combined Sewer Overflows

MILWAUKEE, WISCONSIN



Total Criteria Score
Out of a possible 6

EMERALD CITY CRITERIA*

- Long-term Green Infrastructure (GI) Plan?
- Existing requirement to use GI to reduce some portion of the existing impervious surfaces?
- Incentives for private-party actions?
- Retention Standard?
- Guidance or other affirmative assistance to accomplish GI within City?
- Dedicated funding source for GI?



One step at a time...

Planning Area Rainfall Capture Volume
(Million Gallons)

