

CITY OF MILWAUKEE GREEN INFRASTRUCTURE PLAN



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milwaukee.gov/eco



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ENVIRONMENTAL
COLLABORATION
OFFICE



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GREEN INFRASTRUCTURE TYPES



BIOSWALES

Landscape features that capture and infiltrate runoff and can also remove pollutants.



GREEN ROOFS

Partially or completely planted roofs with vegetation growing in soil or other growing media to hold rainwater.



GREENWAYS

Riparian buffer zones that store stormwater runoff into the ground naturally.



NATIVE LANDSCAPING

The use of native plants that can tolerate drought and flooding cycles because of deep roots and climate-specific adaptations.



POROUS PAVEMENT

Pavement that can reduce and infiltrate surface runoff through its permeable surface into a stone or filter media below.



RAIN GARDENS

Gardens collect stormwater runoff, slowly infiltrating it into the ground



CISTERNS WITH PUMPS FOR RE-USE

The capture and storage of water, potentially for reuse later.



DEPAVING

Removal of structures or paving in order to allow infiltration.



SOIL AMENDMENTS

Materials worked into the soil to enhance its ability to infiltrate or absorb water.



TREES

Trees that can hold rainwater on their leaves and branches



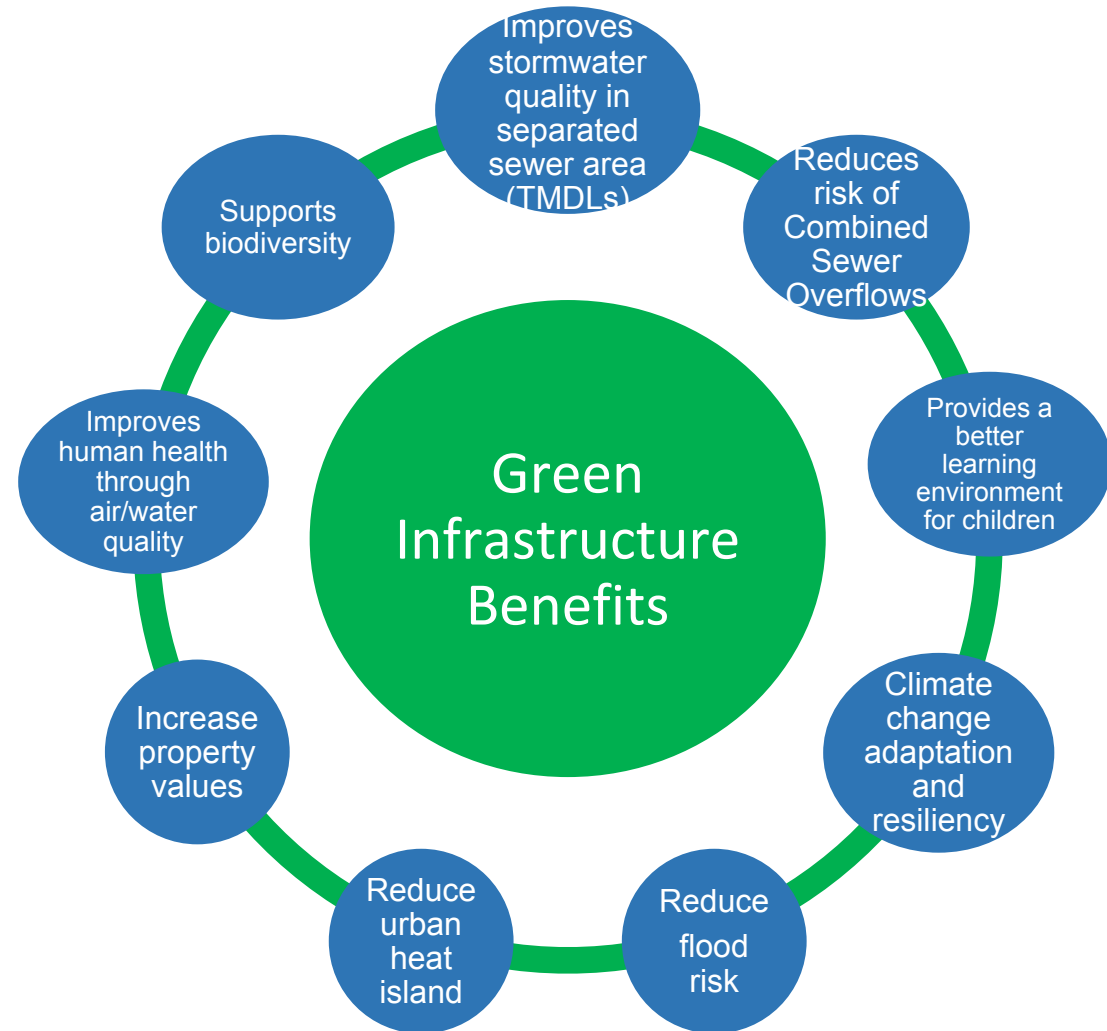
WETLANDS

Areas that have soils that are inundated or saturated for part of the year or the entire year.



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CO-BENEFITS OF GREEN INFRASTRUCTURE





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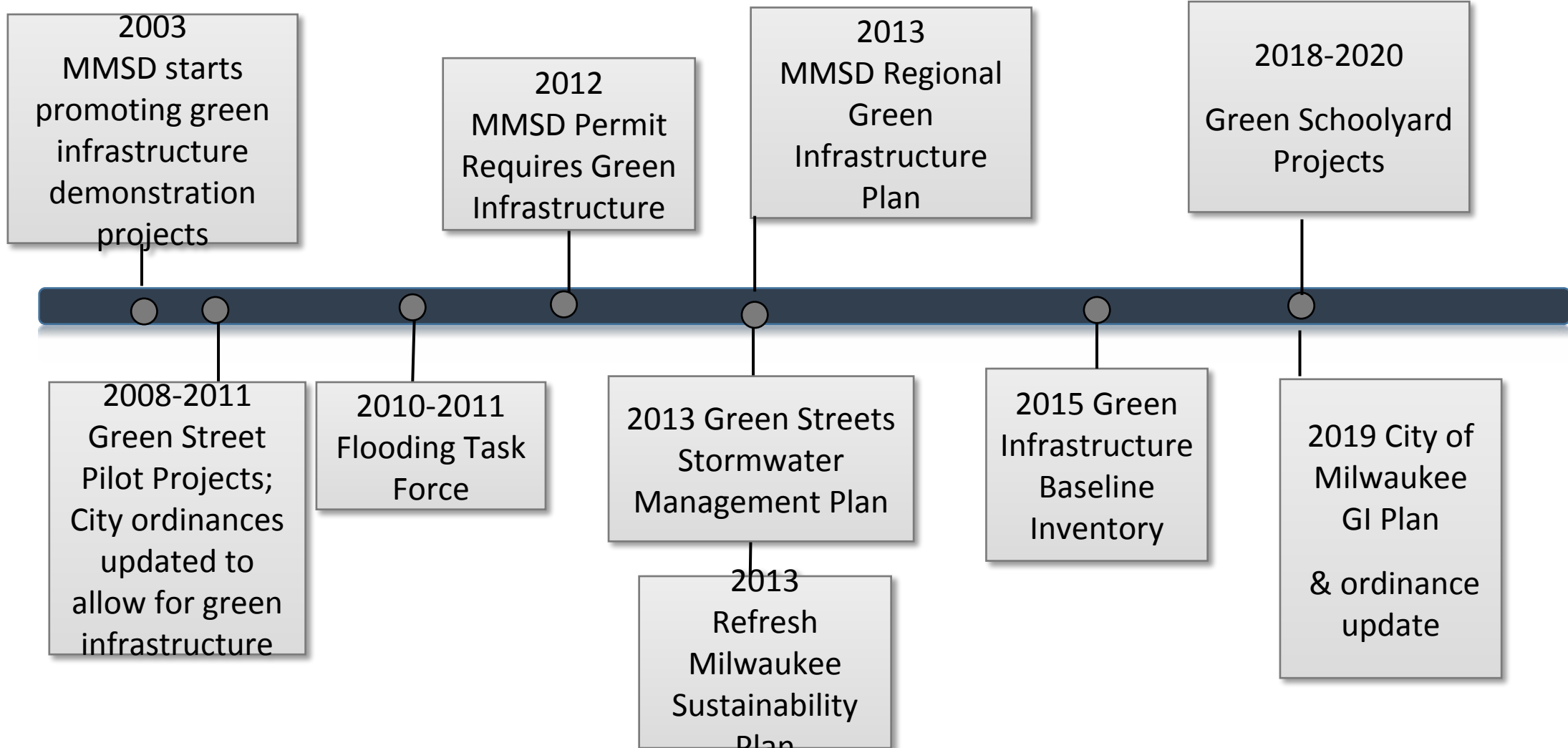
Collaboration is Key

Metro Wastewater/ Stormwater Utility	City Government	Funders and Community Partners	
	  	 	



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Green Infrastructure History in Milwaukee





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TOO MUCH PAVEMENT + INCREASING RISK OF EXTREME STORMS = FLOOD RISK

- Flooding in 2010 cost the Milwaukee County and developers at least \$37 million dollars in damage
- Climate change increases the risk of extreme storms.



Bob Dobrogowski and his daughter Rosie look at the collapsed basement of his parents' home during July 2010 flooding in Milwaukee.

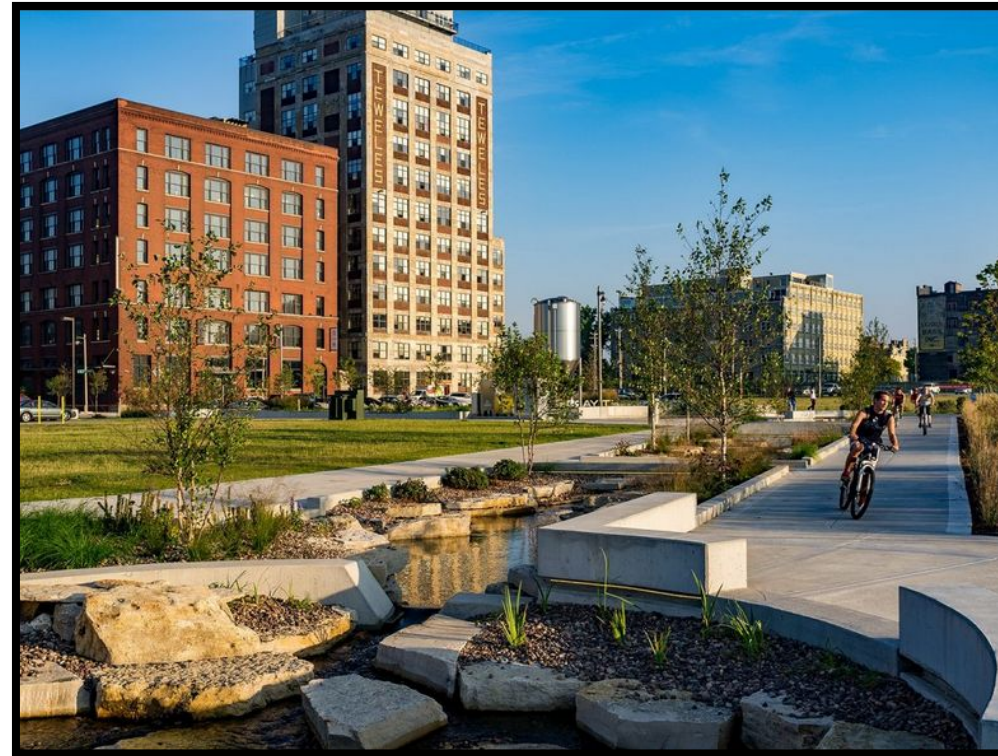
Michael Sears/MCT/Landov





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GREY TO GREEN: CITY IS LEADING BY EXAMPLE ON GREEN INFRASTRUCTURE IN OUR REDEVELOPMENT PROJECTS



GREEN LUMINARIES IN PRIVATE DEVELOPMENT



December 2017 - Freshwater Plaza



June 2017 - Urban Ecology Luminary

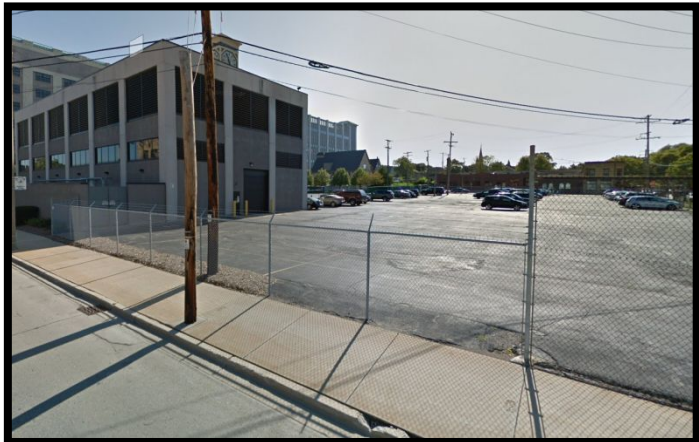
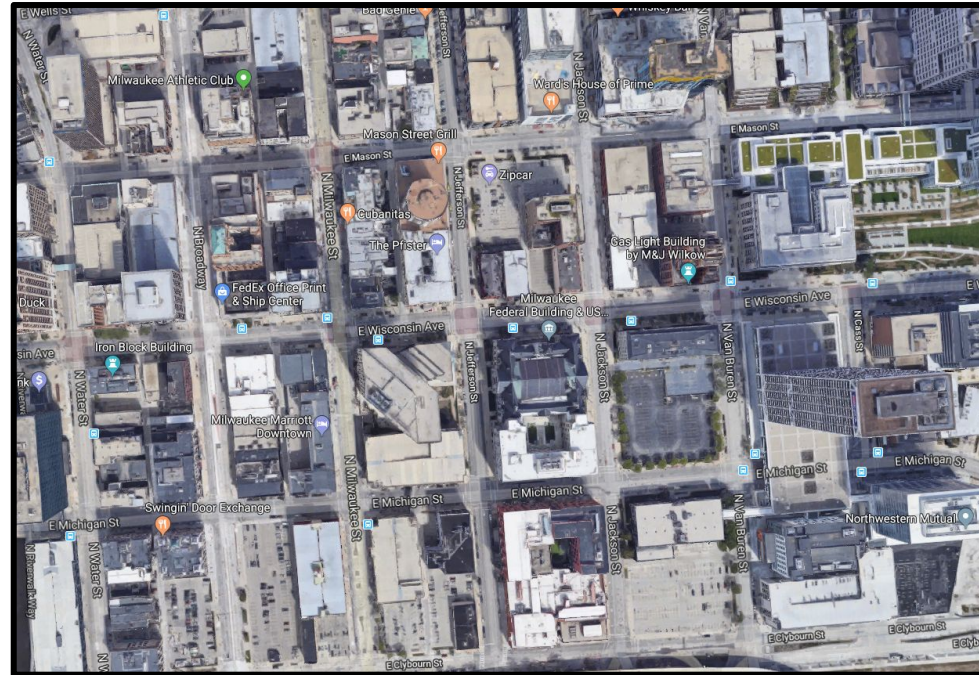


November 2017 - Ascension Columbia St. Mary's



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GREY TO GREEN: BUT OPPORTUNITY REMAINS IN OUR PARKING LOTS, ROOFS AND SCHOOL YARDS





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Setting Goals

- City's 2013 ReFresh Milwaukee Plan set goal of increasing Green Infrastructure 10% per year
- MMSD Goal of 740 million gallons
- What's the baseline?
- How much is needed?
- How much is affordable?





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Green Infrastructure Baseline Inventory

- Need to quantify existing green infrastructure for setting future goals
- Review and quantify existing MMSD and City funded projects
- Estimate gallons captured of known projects



GREEN INFRASTRUCTURE
BASELINE INVENTORY
APRIL 2015



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Green Infrastructure Baseline Inventory-Key Findings

- 45.5% of Milwaukee's land area is impervious
- Green Infrastructure as of 2015 was enough to capture 14m gallons
- Following the 10% annual increase goal would yield 36 million gallons by 2023



GREEN INFRASTRUCTURE
BASELINE INVENTORY
APRIL 2015



Sponsored by the Fund For Lake Michigan

Standard Green Infrastructure Specs

www.freshcoastguardians.com

TABLE 3
 Assumed Stormwater Performance Capacities
 by Green Infrastructure Strategy¹

Green Infrastructure Strategy	Unit of Measure	Potential Storage Capacity (gallon) ²	Expected Impervious Area Managed Per Unit (SF)	Equivalent Capacity (inches from contributing area) ³
Green roofs	SF	1.1	1	1.70
Rain gardens	SF	4.4	12	0.58
Stormwater trees	Each	25	157	0.26
Bioretention/Bioswales/ Greenways	SF	7.5	12	1.00
Native landscaping ⁴	SF	0.4	N/A	0.58
Porous pavement	SF	3.0	4	1.20
Rain barrels	Each	55	350	0.25
Cisterns	Each	1,000	6,500	0.25
Soil amendments ⁴	SF	0.2	N/A	0.39

¹The green infrastructure strategies green alleys, streets, and parking lots are made up of other strategies. The wetlands green infrastructure strategy is encouraged but not quantified in the Plan.

²This is the physical storage capacity per storm.

³Annual capture is determined using equivalent capacity with Figure 12.

⁴Capacities for native landscaping and soil amendments are estimated based on Natural Resources Conservation Service runoff curve number changes during a 2-inch rainfall.



Baseline Inventory- Behind the Scenes Footage

**Exact number unknown; data est from MMSD and H2O Capture; see GIBI Goals.xls

ADDED 10/6/2014 FROM:

"COPY OF CITY OF MILWAUKEE GI_MMSD FUNDED" EXCEL SPREADSHEET

	NUMBER	TOTAL SF	GAL/SF	TOTAL GAL ADDED	ACRES	
BIOSWALE	9	103033	7.5	772748	2.36531221	
GREEN ROOFS	7	53893	1	53893	1.23721304	
NATIVE LANDSCAPING	6	187958	0.4	75183	1.72596419	
POROUS PAVEMENT	6*	65165	3	195495	4.48794766	*ADDED 7; REMOVED 1
RAIN GARDEN	1*	4974	4.4	21886	0.50243343	*ADDED 6, REMOVED 5
RAINWATER CATCHMENT**	10		1	129485		** BASED ON CAPACITY: 1 GAL CAPACITY EQUALS 1 GAL CAPTURE
STORMWATER TREES***	234		25	5850		***25 GAL CAPTURE PER TREE

TOTALS 415023 1254540 10.31887053

DOES NOT INLCUDE GREENWAYS/GREENSEAMS!!

TOTAL FOR ALL GI: 2364761 14005782 55.07869606



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Green Infrastructure Map Tool

Milwaukee.gov/GIS

Map Milwaukee: GREEN INFRASTRUCTURE

City of Milwaukee, WI

Search...



Sign in

Layers



I want to...



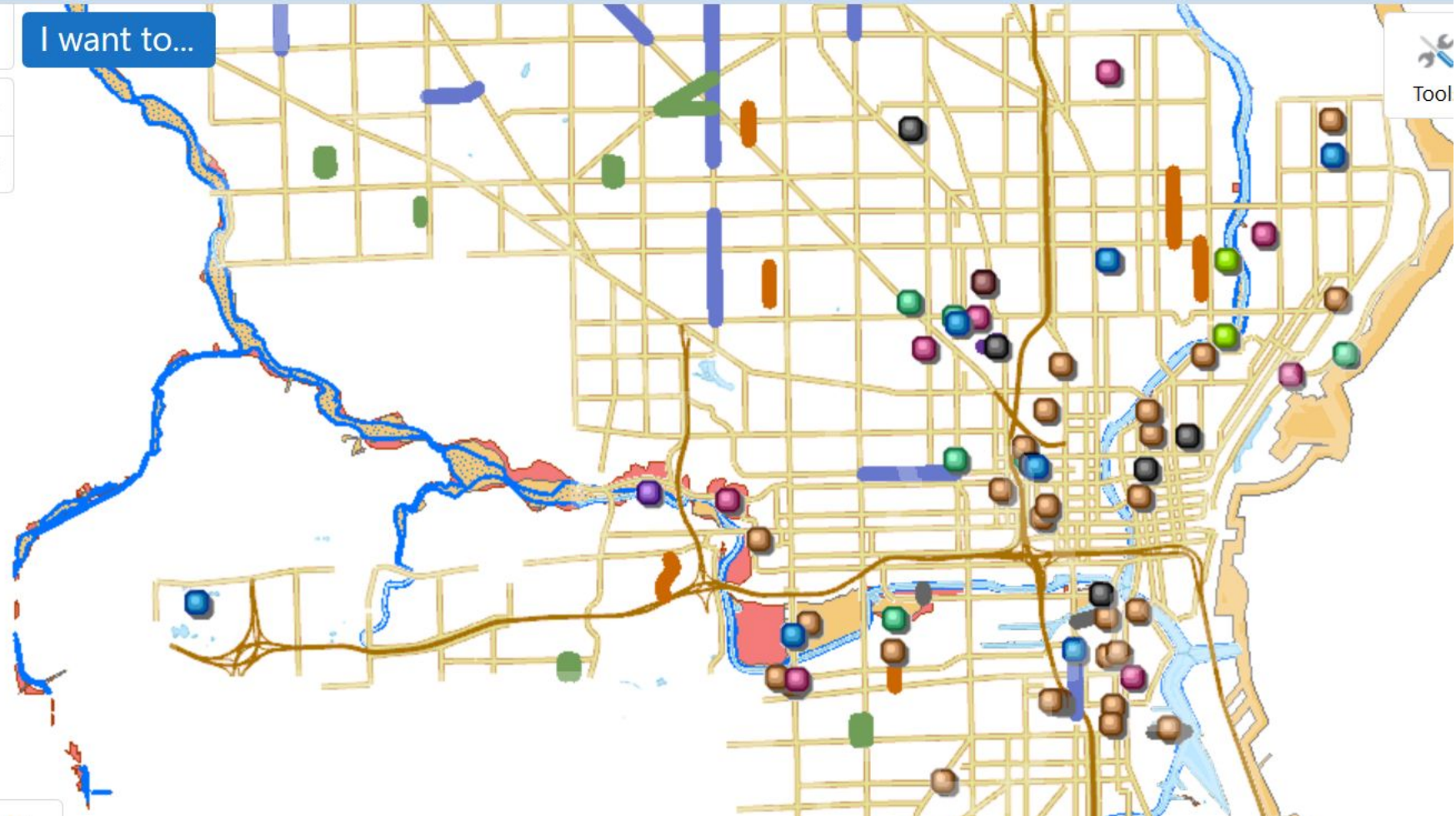
Tool

Filter Layers...



Filter

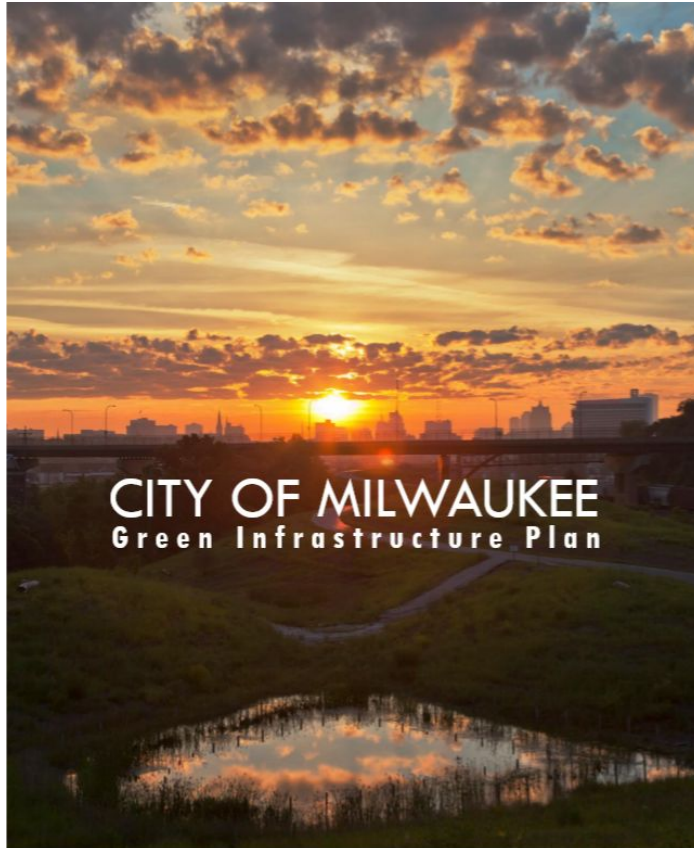
- ECO GI planning
- Green Infrastructure
 - Green infrastructure - point features
 - Green infrastructure - line features
- Basement backups by year
- DPW basement connection areas
- MMSD GI planning
- Total impervious area
- Constraints





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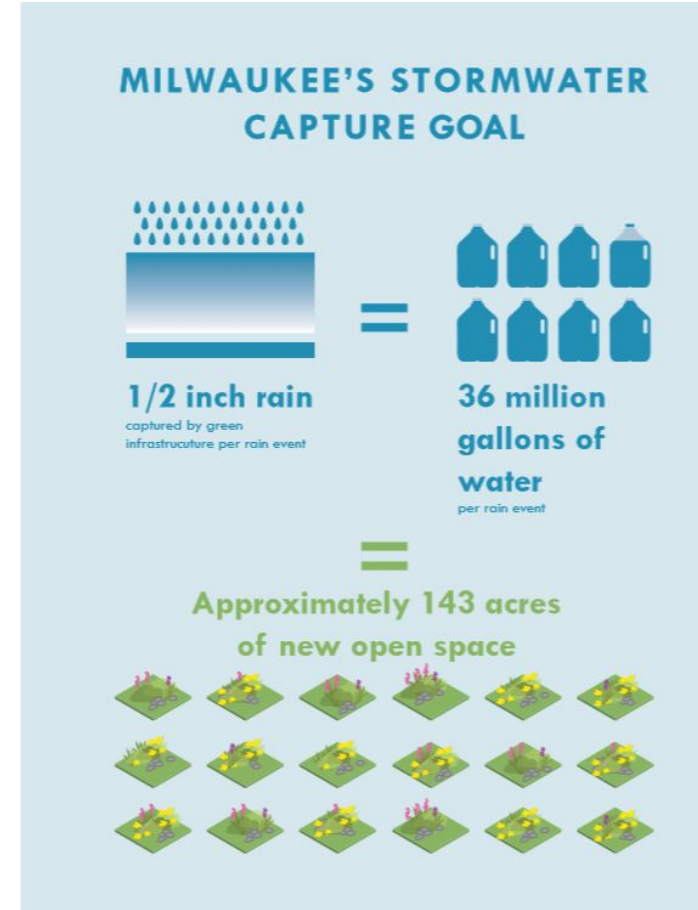
Green Infrastructure Plan 2019



CITY OF MILWAUKEE
Green Infrastructure Plan



JUNE 2019

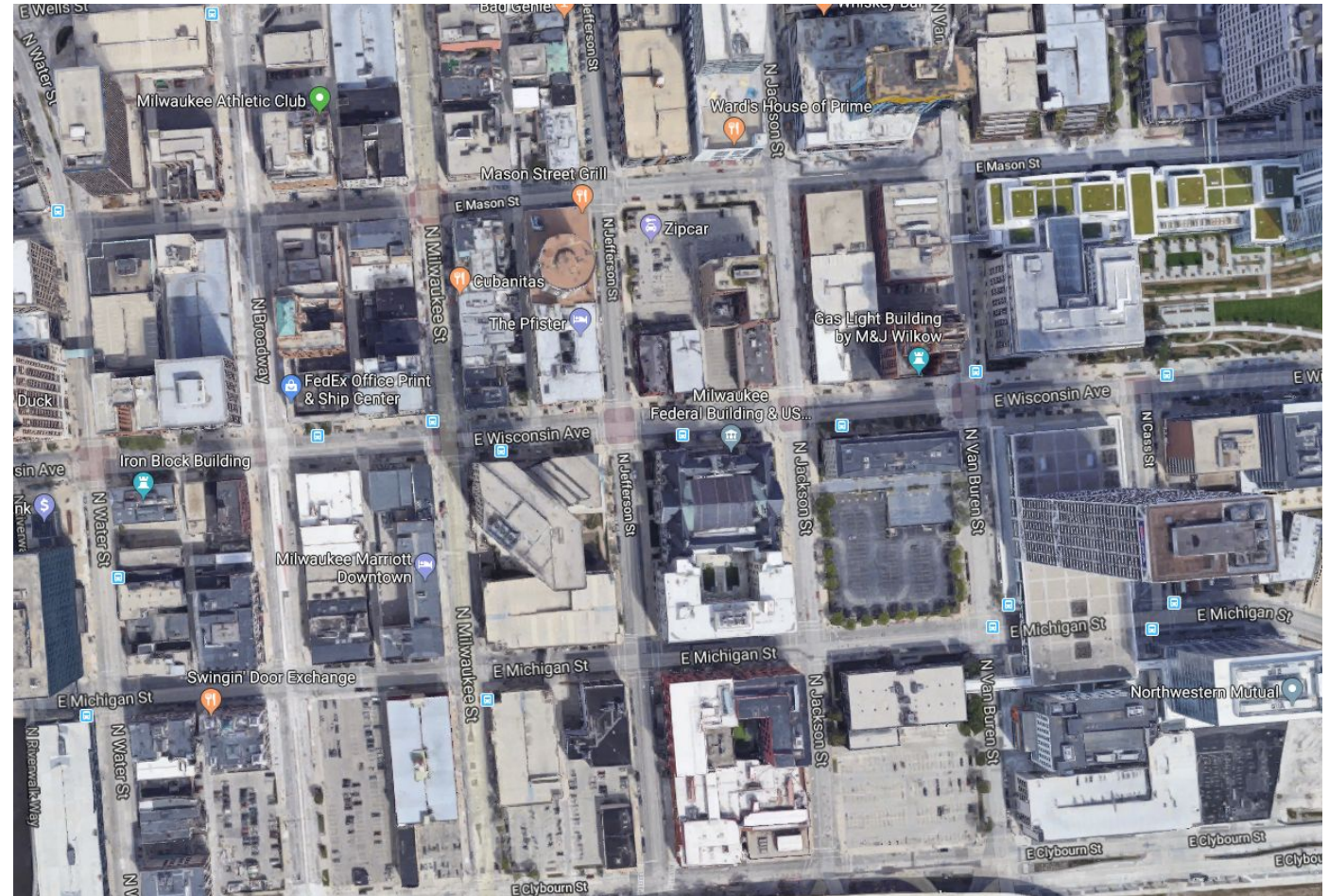




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CONSIDERATIONS FOR GREEN INFRASTRUCTURE PLAN

- Develop policies that substantially add to the amount of visible installed green infrastructure
- Encourage development and investment in the City
- Maneuver within City's tight financial constraints





RECOMMENDATIONS OVERVIEW

Regulatory

Require developments to capture the first half inch of runoff when a stormwater management plan is required

Add climate adaptation and co-benefits of green infrastructure to “Purpose” section of our stormwater management code

Publicly support MMSD’s regional new thresholds for green infrastructure

Economic

One-time grants to property owners to implement their green infrastructure

Partnership with Milwaukee Public Schools to green schoolyards and create new sustainability manager position

Education and Outreach

Outreach to Business Improvement Districts and Real Estate Groups

Provide developer education through the Fresh Coast Guardians’ Resource Center

Review and possibly revise parking lot landscape standards



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GREENING STORMWATER MANAGEMENT PLANS

We revised City Ordinance Chapter 120 governs actions that obligate developers to create a stormwater management plans

1. Add "Climate Adaption" and "Co-benefits of Green Infrastructure" to "Purpose Section."
2. Define Green Infrastructure practices; prioritize those with co-benefits
3. Require that the Stormwater Management Plans use Green Infrastructure to capture at least 1/2" of stormwater using GI
4. If GI is not feasible on site, City Engineer may consider negotiated solution.



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ECONOMIC INCENTIVE:

FUNDING PRIORITIES FOR GREEN INFRASTRUCTURE

- Green Streets & Alleys
- Schoolyards
- Libraries
- Parking Lots





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Green Streets

- 2013 Green Streets Plan
- Bioswales in medians
- Permeable pavement in alleys or parking lanes





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Green School Yard

BEFORE



AFTER



H.W. LONGFELLOW SCHOOL 1021 S. 21ST ST., MILWAUKEE



Green Schools
Consortium of Milwaukee

A Green & Healthy Schools Wisconsin Regional Network



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Green Schools 2

BEFORE



STARMS EARLY CHILDHOOD CENTER 2616 W. GARFIELD AVE., MILWAUKEE

AFTER





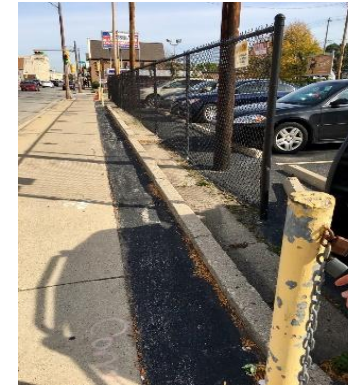
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ECONOMIC:

COMMERCIAL AND NON-PROFIT PROPERTY GRANTS

- Green Solutions could provide grants up to \$25,000 to commercial and non-profit parking lot owners
- Could be used for any implementation of Green Infrastructure including static projects that do not require a stormwater management plan.
- Requires conservation easement

Milwaukee.gov/GreenLots



SDC lot on 17th
North before Green
Infrastructure

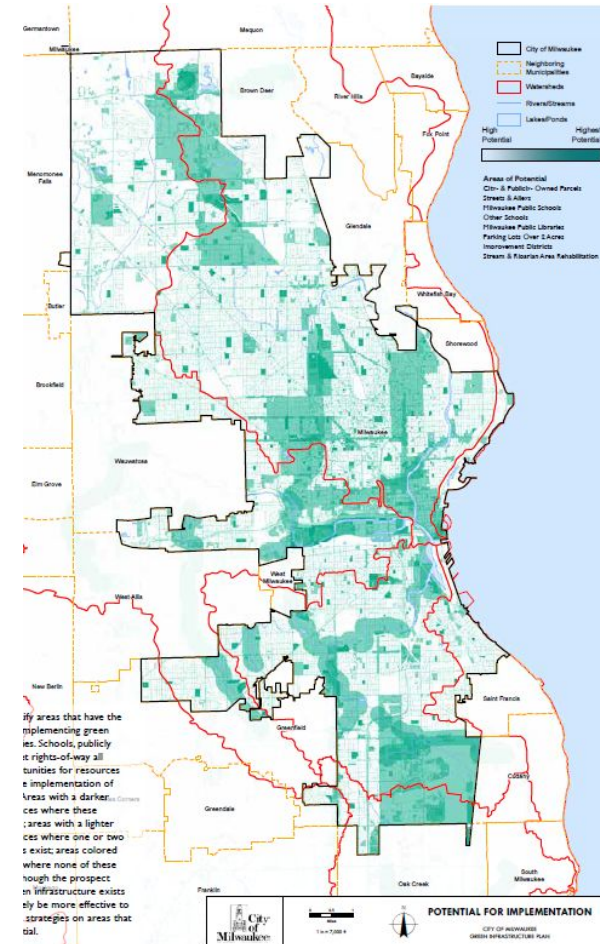




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GEOGRAPHIC PRIORITIZATION

GRAEF Engineering developed weighted scale for siting GI for the greatest impact and is generating maps for priority areas



Highly areas that have the potential for implementing green infrastructure. Schools, publicly owned, and rights-of-way all have high potential for implementation of green infrastructure. Areas with a darker green color indicate areas where these factors exist. Areas with a lighter green color indicate areas where one or two factors exist. Areas colored in light green indicate areas where none of these factors exist. Although the prospect of green infrastructure is high, it may be more effective to focus on areas that have the greatest potential.

Thanks to our Partners!



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Erick Shambarger, Environmental Sustainability Director
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[ECO](#) | [ReFresh MKE](#) | [Water Centric City](#)