



Using GeoDesign to Promote Green Infrastructure for Stormwater Management in Green Bay, Wisconsin

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University of Wisconsin Sea Grant Institute
February 13, 2021

Wisconsin Sea Grant – Who we are

- Sea Grant is a network of universities in coastal states that conduct research and provide outreach on a range of ocean, coastal and Great Lakes issues.
- It is a partnership between NOAA and coastal states that has been in place for 50+ years.
- Wisconsin Sea Grant was the first program established in the Great Lakes region in 1968.
- <https://www.seagrants.wisc.edu/>



Contents

Context within The City of Green Bay, WI

Project purpose and objectives

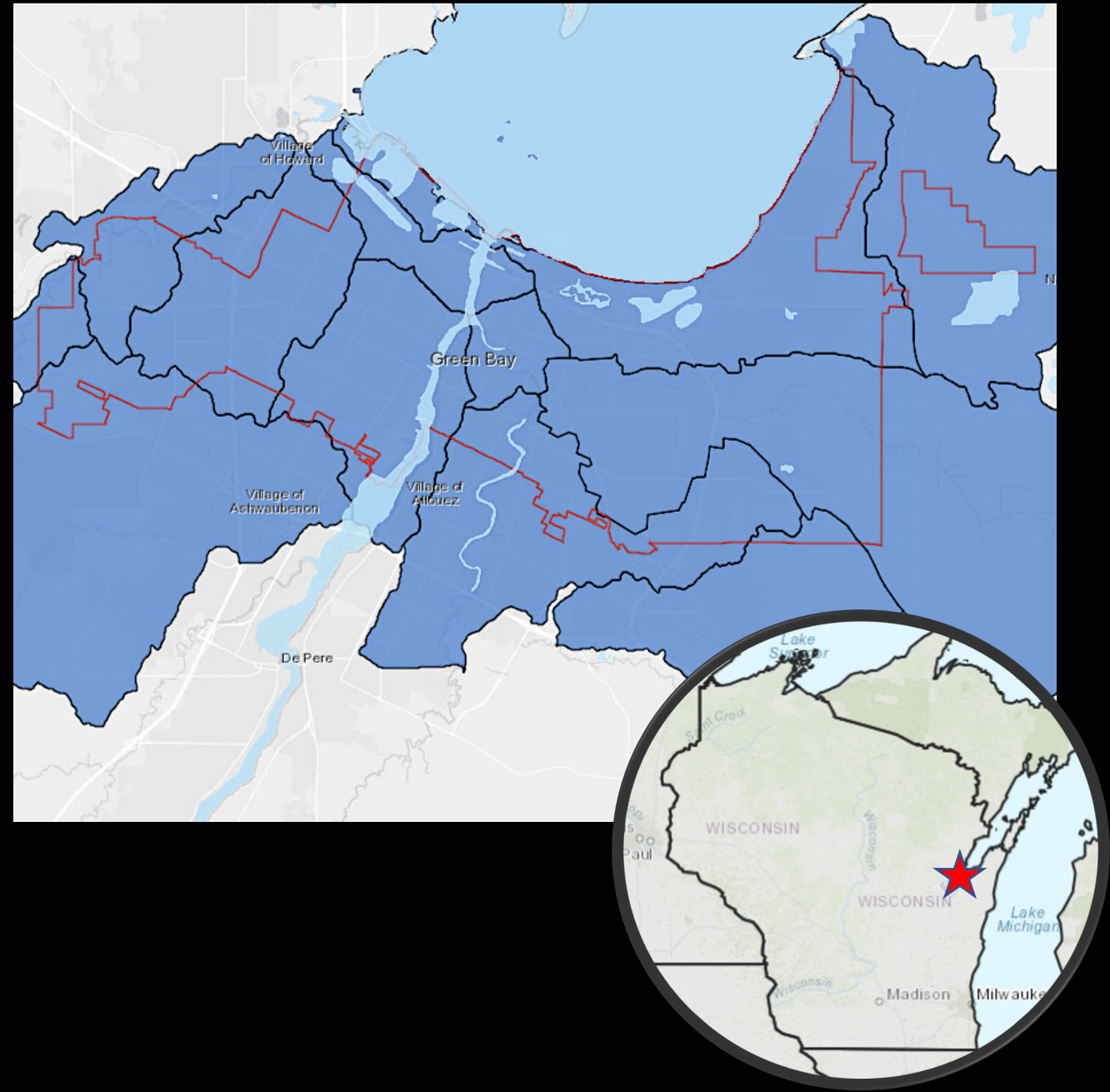
Using GeoPlanner for a planning approach across multiple scales

Examining the study area: Fisk Neighborhood

Challenges we have faced and next steps


Green Bay: Context

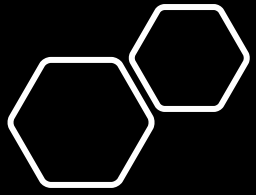
- Regional Scope
 - Green Bay located at the outflow of Fox River to Lake Michigan
 - Within 9 different watersheds
 - Majority ag. land which may contribute to pollution
- Green Bay
 - Population of 105,000
 - 35.4% impervious surfaces
 - All waterways considered impaired by the Clean Water Act





Green Bay: Context

- The problem with flooding in Green Bay
 - Climate change is causing increased precipitation
 - Multiple facets of flooding
 - Increased development & impervious surfaces = more runoff
- 



Project purpose and objectives

01

Assist the City of Green Bay with flooding issues through green infrastructure (GI) planning across multiple scales

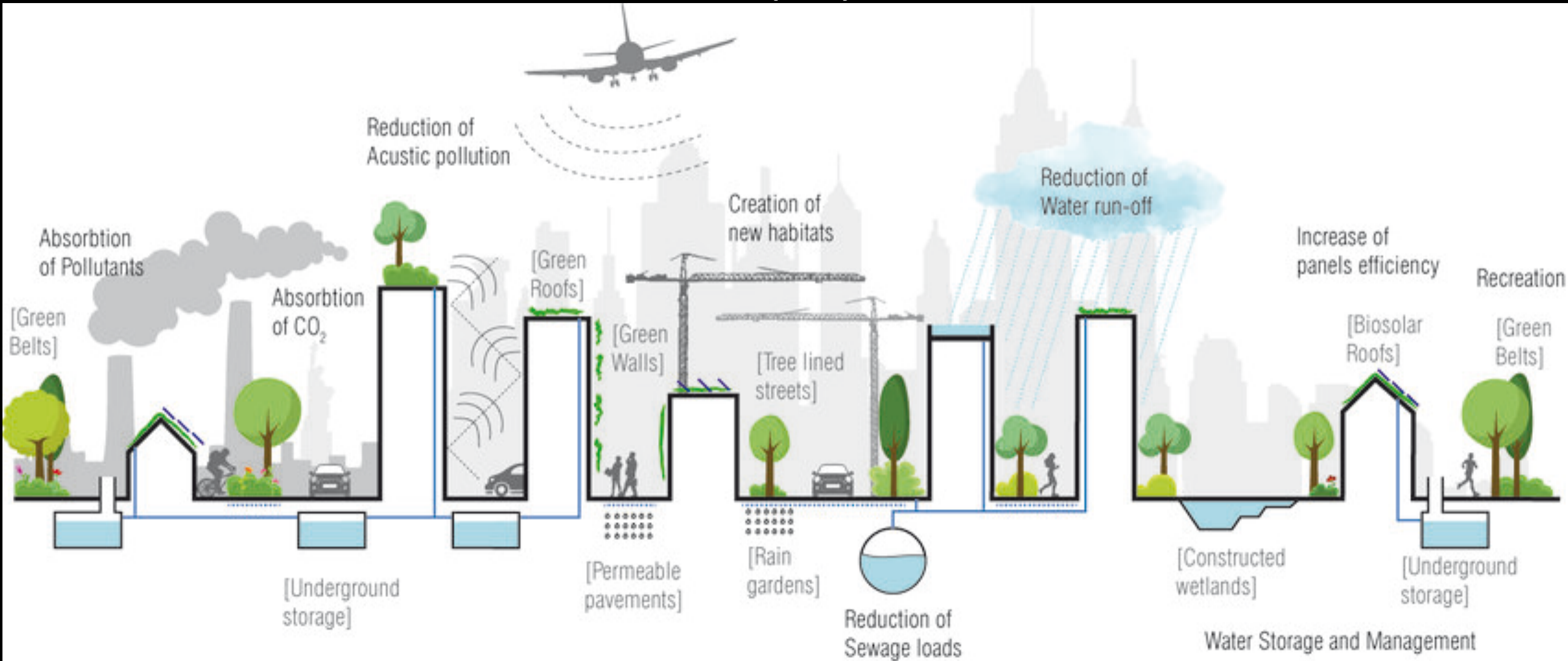
02

Create a GeoPlanner template to address green infrastructure and stormwater management at the local level

03

Encourage inter-agency collaboration and support community outreach and public engagement

Green Infrastructure (GI) for Stormwater




Using GeoPlanner for ArcGIS

- GeoPlanner for ArcGIS
 - Identified as the best tool for our project
 - Many templates available for use, but none that specifically match our purpose
 - Developed a green infrastructure template to match our scale and need

My Content My Organization **Curated** All

GeoPlanner Basic Template




GeoPlannerAdmin
August 16, 2016

Basic Template

SELECT PREVIEW DETAILS

GeoPlanner Template for Green Infrastructure Plan...




GeoPlannerAdmin
January 30, 2017

Template for Green Infrastructure Planning

SELECT PREVIEW DETAILS

GeoPlanner Template for Land Use Planning




GeoPlannerAdmin
April 21, 2014

Template for Land Use Planning

SELECT PREVIEW DETAILS

GeoPlanner Template for Learn.arcgis.com




GeoPlannerAdmin
February 23, 2018

Template for Learn.arcgis.com

SELECT PREVIEW DETAILS

GeoPlanner Template for Public Safety




GeoPlannerAdmin
April 21, 2014

Template for Public Safety

SELECT PREVIEW DETAILS

GeoPlanner Template for Special Event Planning



GeoPlannerAdmin
April 21, 2014

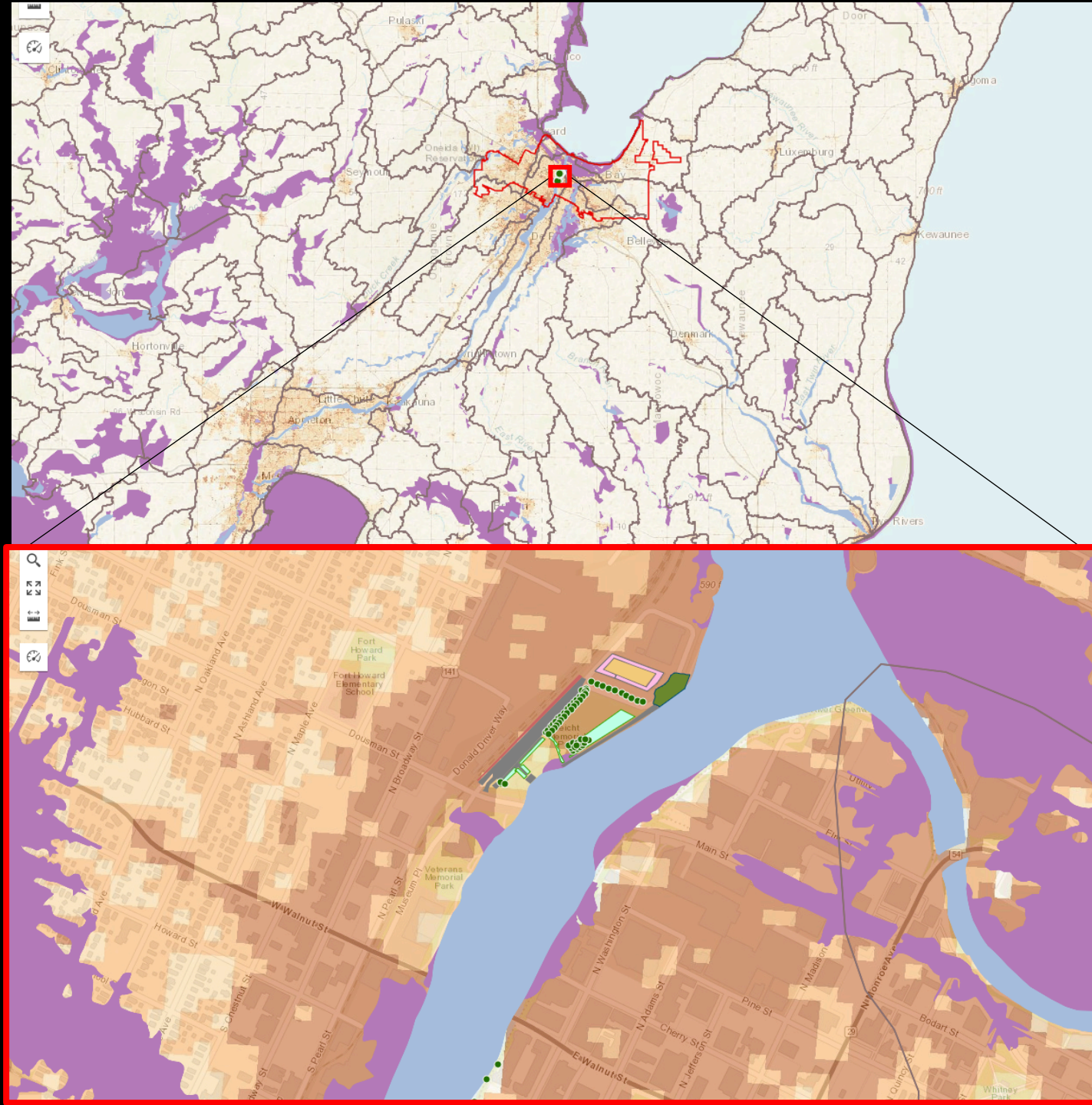
Template for Special Event Planning

SELECT PREVIEW DETAILS

« < 1 > » 8 Items

GeoPlanner: Multiscale Planning

- Design and visualization of planning projects at multiple levels of scale
 - *Site level*
 - *Block level*
 - *Neighborhood level (sewersheds)*
 - *Municipal level*
 - County level
 - Regional level
 - Watershed level

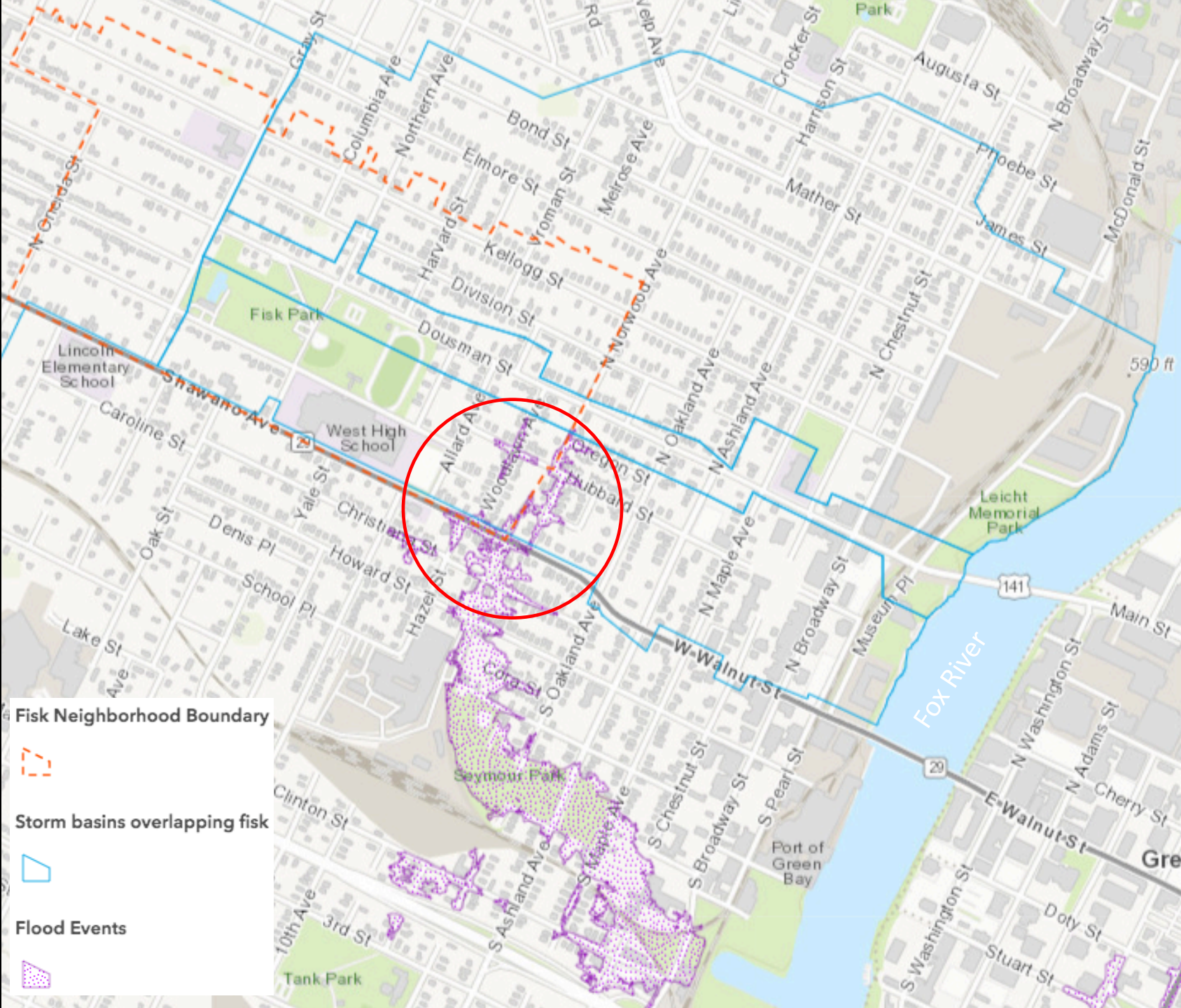


GeoPlanner: Neighborhood level



Historic Slough Intersecting the Fisk Neighborhood

- Incorporating GI may lessen severity of floods
- This project site has the potential to incorporate GI practices with stormwater basins.

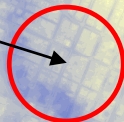


Historic map of slough 1853



Elevation

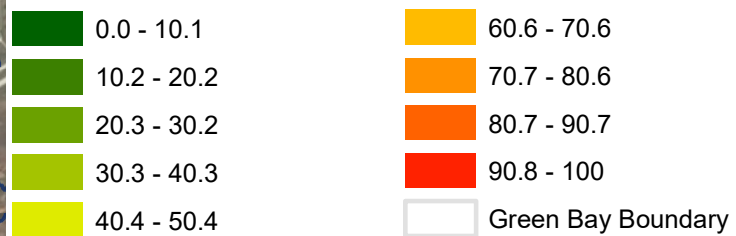
Fisk
Neighborhood



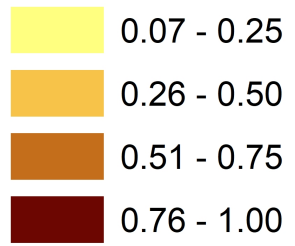
Impervious Surface

Fisk
Neighborhood

Percent Imperviousness

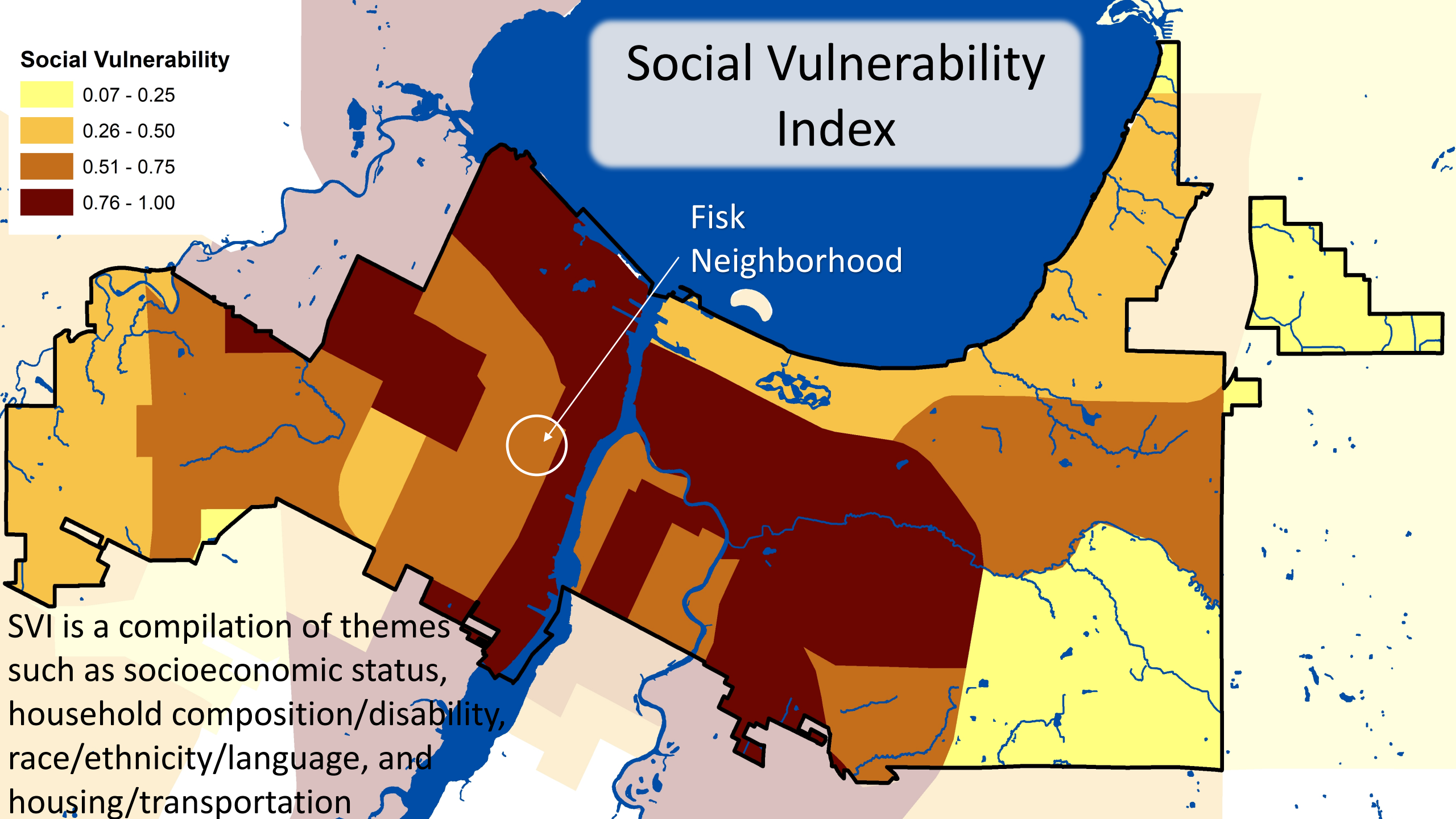


Social Vulnerability



Social Vulnerability Index

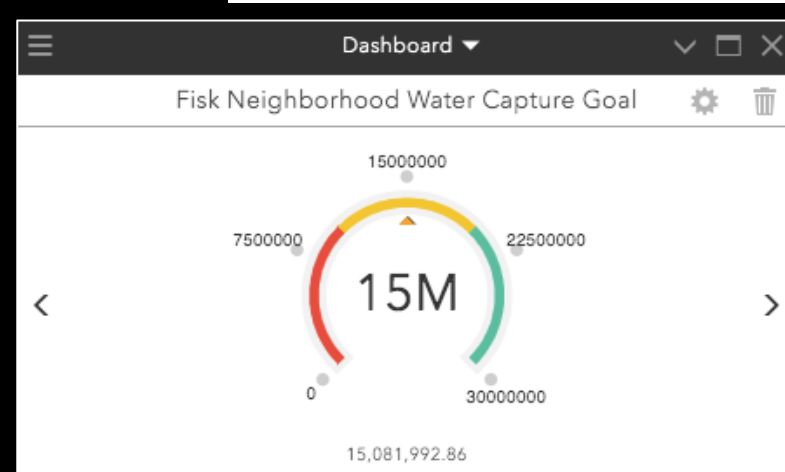
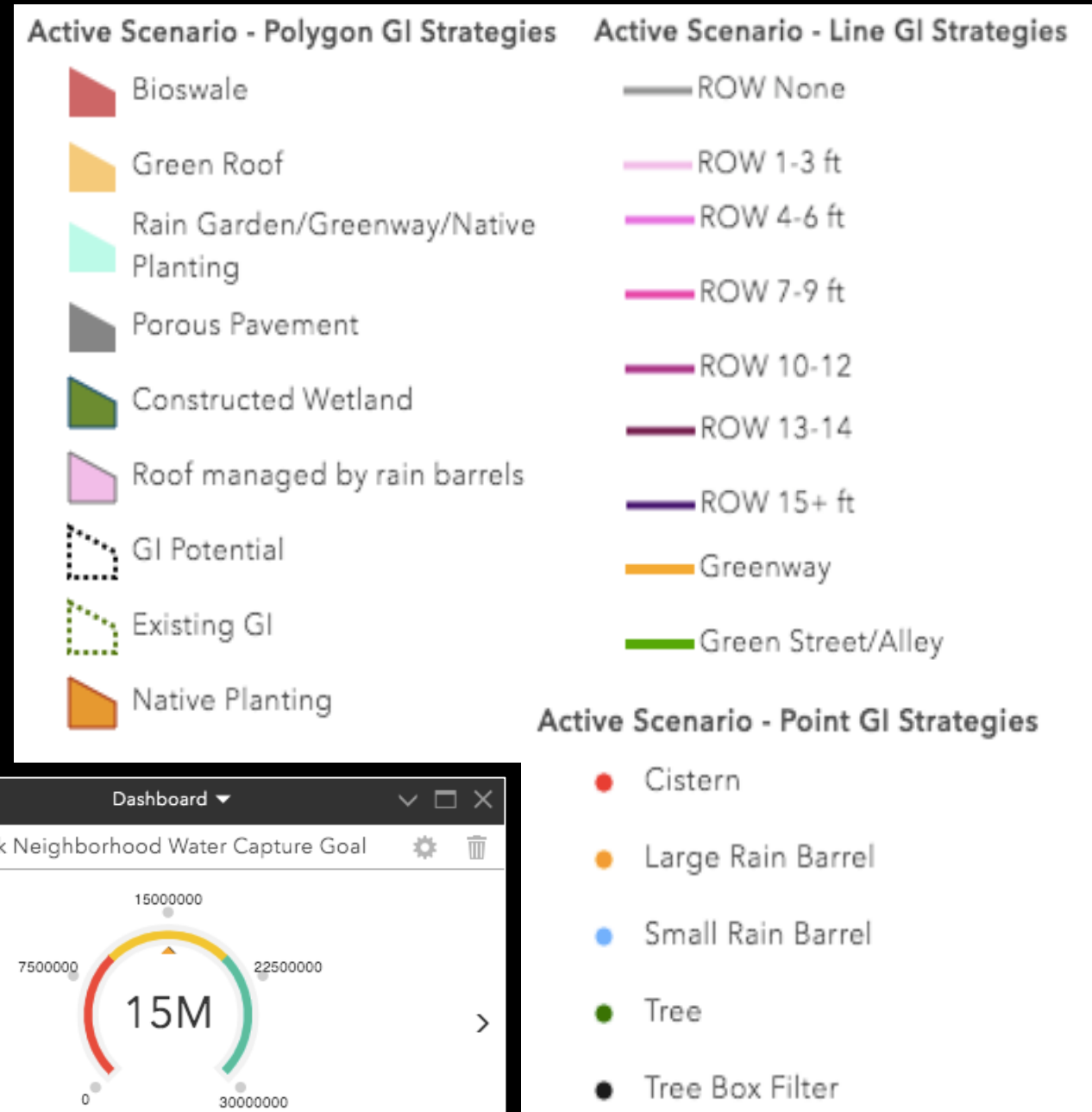
Fisk
Neighborhood



SVI is a compilation of themes such as socioeconomic status, household composition/disability, race/ethnicity/language, and housing/transportation

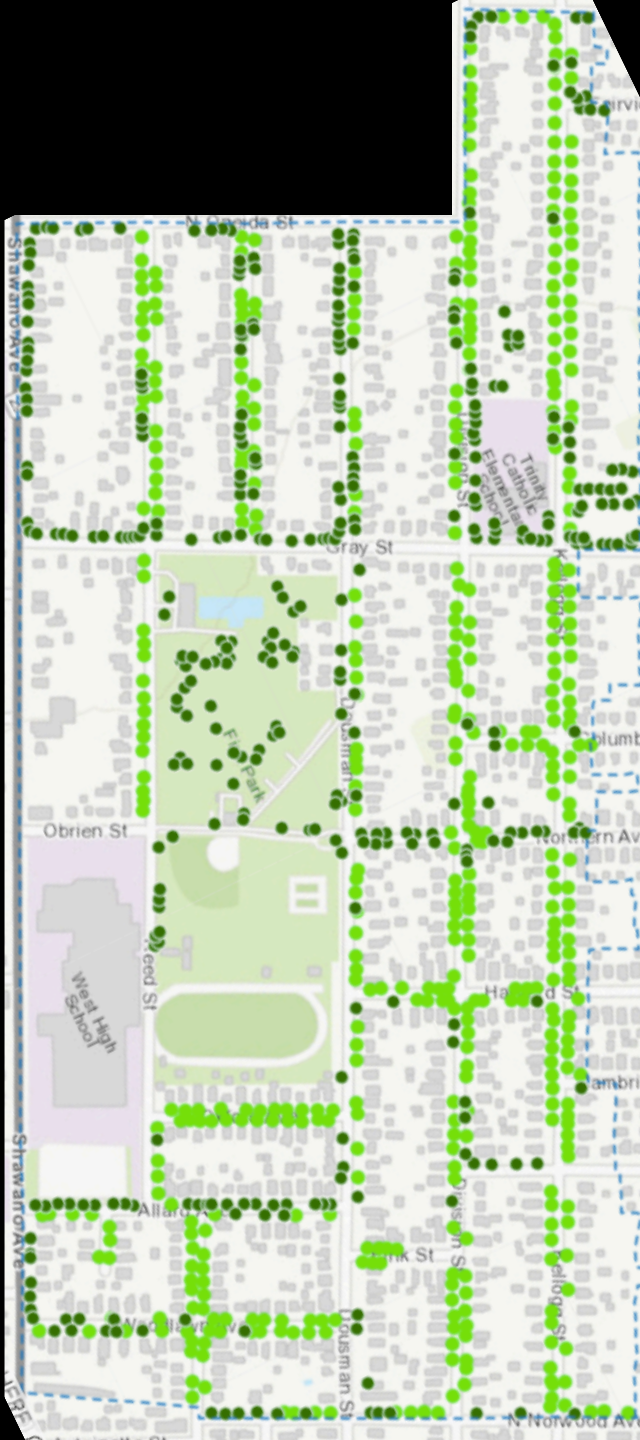
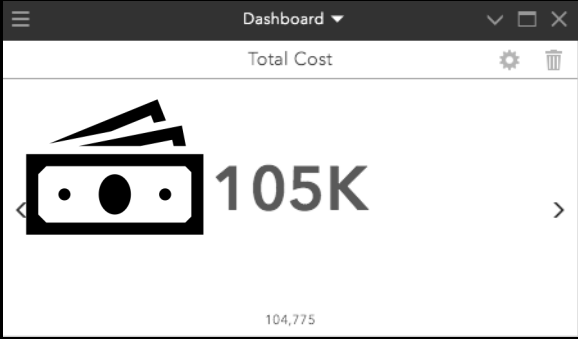
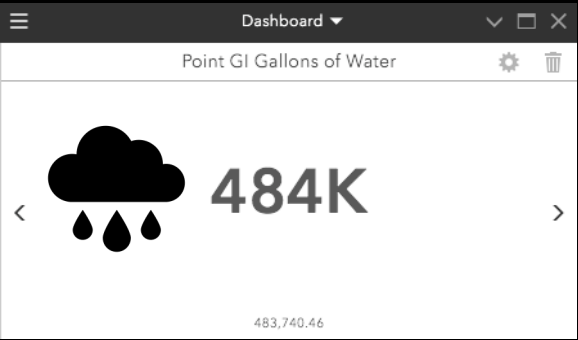
GeoPlanner GI Template

- GI planning template for stormwater management
- Assist planning for GI placement and future precipitation trends
- Integration of ESRI's Living Atlas and Green Bay's municipal layers
- Dashboard keeps track of cumulative impact of runoff reduction and cost



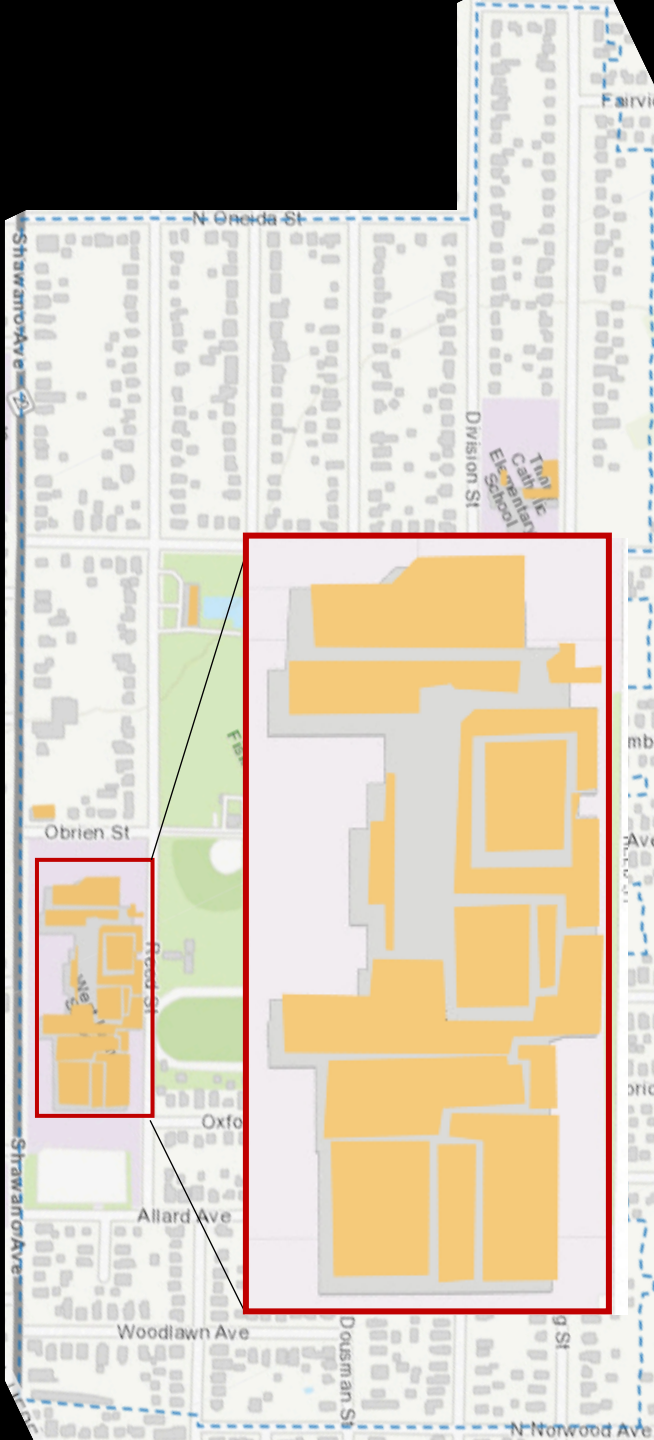
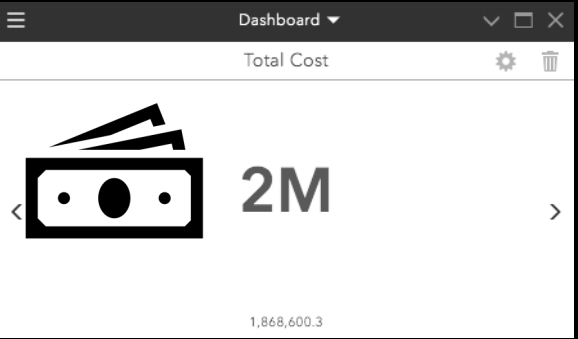
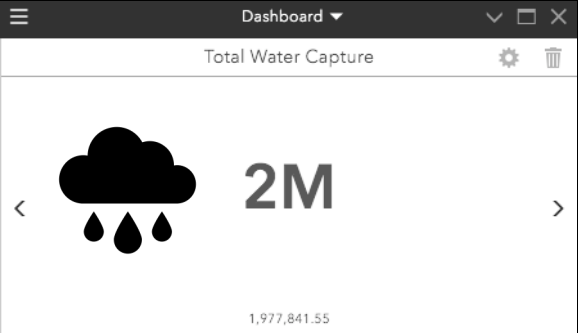
Street Trees

Water
capture/tree/yr:
1269.66 gal
Cost/tree: \$275.00



Green Roofs

Water capture/SF/yr:
13.76 gal
Cost/SF: \$12.00



Stormwater runoff reduction goal

- Create a goal based on surface area, precipitation, impervious surce
- Plan GI to reach that goal
- Community focused

Calculate area of study site (ArcMap)	7,700,000 ft ²
Calculate percent impervious surface of study site (iTree)	50%
Find mean annual precipitation	29.52 in
Calculate annual runoff in gallons	$7,700,000\text{ft}^2 \times 29.52\text{in}/12\text{in}/\text{ft} \times 7.48\text{gal}/\text{ft}^3 \times .5$ $= 70.8 \text{ million gal}$

How we came up with estimates

- Cost and water capture based on heavily on Milwaukee Metropolitan Sewerage District and Philadelphia's GI plans + others
- Estimates entered into GeoPlanner as Key Performance Indicators which feed into dashboard
- Doing research into hydrology-based results

GI Measure	Capital Cost per Unit of Measurement	Gallons per Unit of Measurement	Cost per Gallon
STORMWATER TREES	\$250/each	169-449 gallons/year	\$0.80
RAIN BARREL	\$45-\$190/each	40-80 gallons/barrel	\$1.95 (MMSD Barrel = \$0.81 /gallon)
CISTERN	\$500-\$10,000/each	Dependent on cistern size	\$1.00 (based on 500 gallon cistern)
RAIN GARDENS	\$3-\$12/sq. ft.	1-3 gallons/sq. ft.	\$3.75
NATIVE LANDSCAPING	\$3,400-\$5,975/acre	43,560-87,120 gallons/acre OR (1-2 gallons sq. ft.)	\$0.07
BIO-SWALE	\$3-\$10 cu. ft.	5 gal/cu. ft. (based on swale size of 10m long x 2m wide x 1m depth)	\$1.30
GREENWAYS (Walk/Bike Trail/ Riparian)	\$200,000 - \$500,000/mile	246,000 gallons/mile (based on 75 ft wide x 1 mile long trail)	\$0.70
GREEN ROOF	\$8-\$25/sq. ft	1.0-5.0 gallons/sq. ft.	\$5.50
POROUS PAVEMENT	\$87,120-\$217,800/acre	130,680-740,520 gallons/acre OR (3-17 gallons/sq. ft.)	\$0.35

Fisk Neighborhood Observations

N of Resch
Aquatic Center

Community
Policing Station

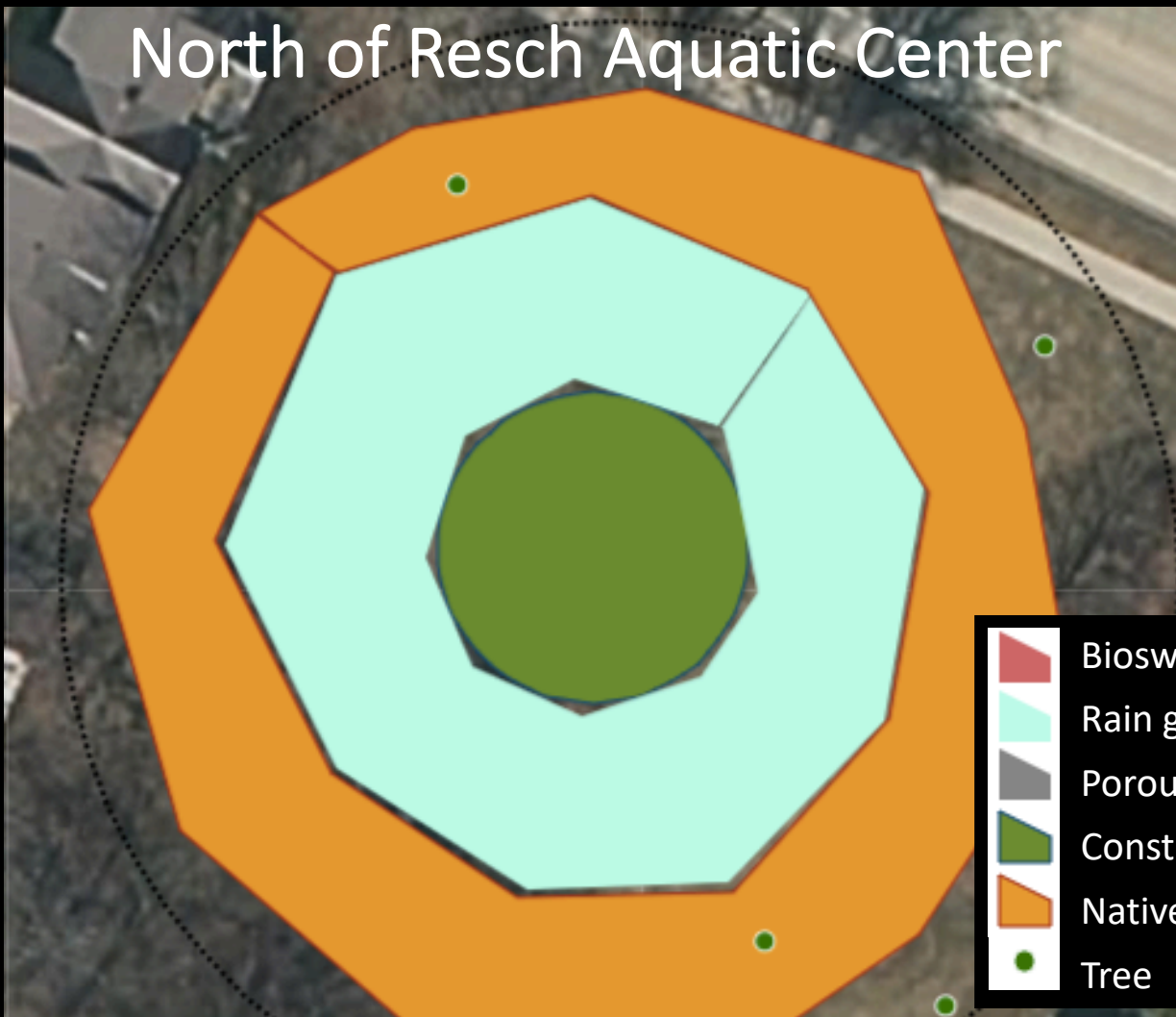
Active Scenario - Polygon GI Strategies

- Bioswale
- Green Roof
- Rain Garden/Greenway/Native Planting
- Porous Pavement
- Constructed Wetland
- Roof managed by rain barrels
- GI Potential
- Existing GI
- Native Planting

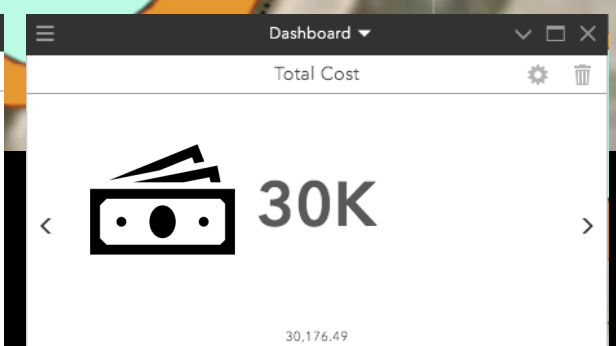
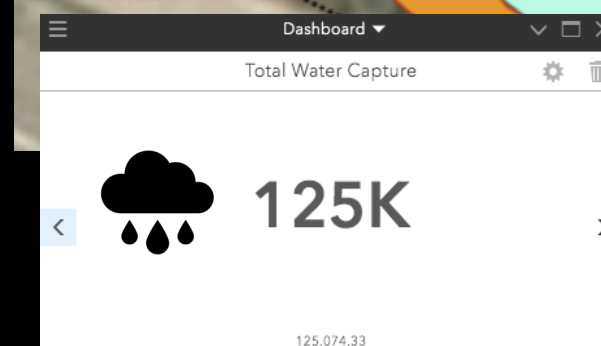
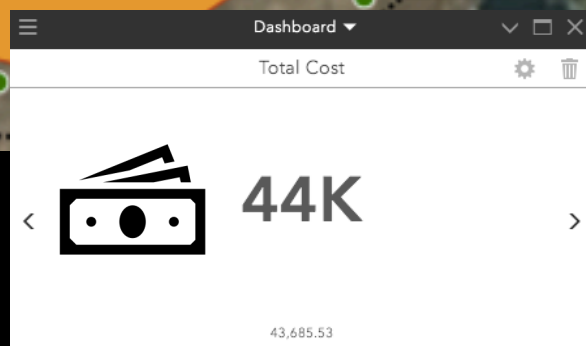
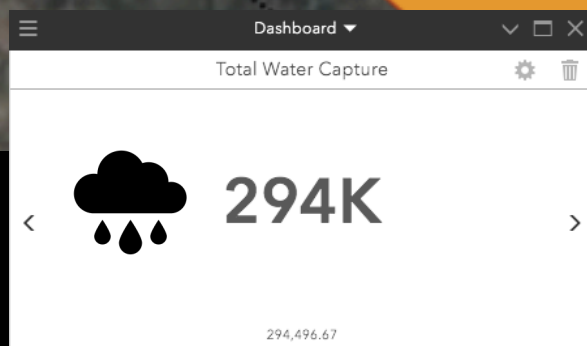
Active Scenario - Line GI Strategies

- ROW None
- ROW 1-3 ft
- ROW 4-6 ft
- ROW 7-9 ft
- ROW 10-12
- ROW 13-14
- ROW 15+ ft

North of Resch Aquatic Center



Community Policing Station

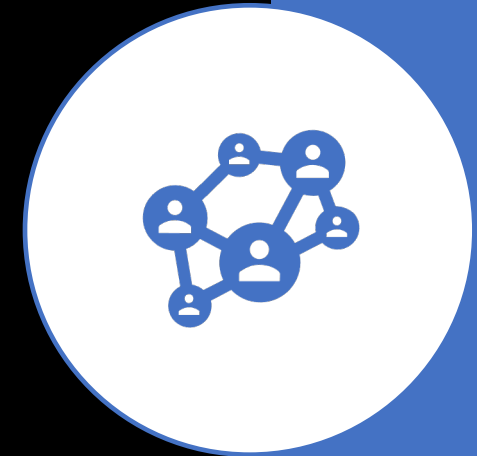


Where do we go from here?

- Incorporate new higher resolution LiDAR data
- Develop stormwater capture goals based on municipal staff engagement
- Develop a range of green infrastructure scenarios
- Determine who interested stakeholders are
- Determine how we are going to engage with stakeholders

Challenges we have faced

- Engaging with local officials
- Selling concepts of green infrastructure and geodesign
- Collaboration in a virtual environment during a pandemic



Next steps and opportunities



Urban tree canopy



Use new LIDAR data to extrapolate new details (tree cover, impervious surface, ideal GI location)



Potential to do a detailed stormwater flow mapping



Search out community interest



Thank you!

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