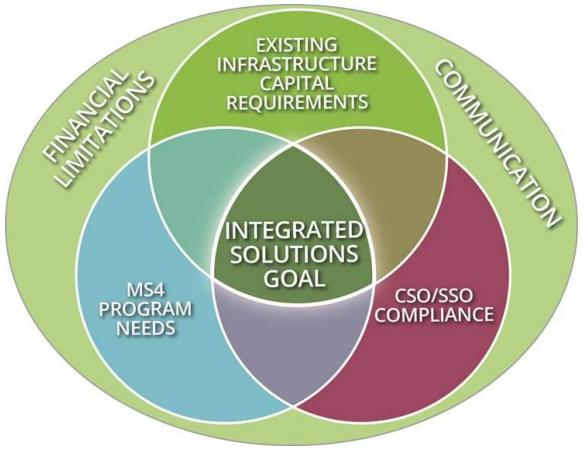
Stormwater Challenges in the Face of Climate Change

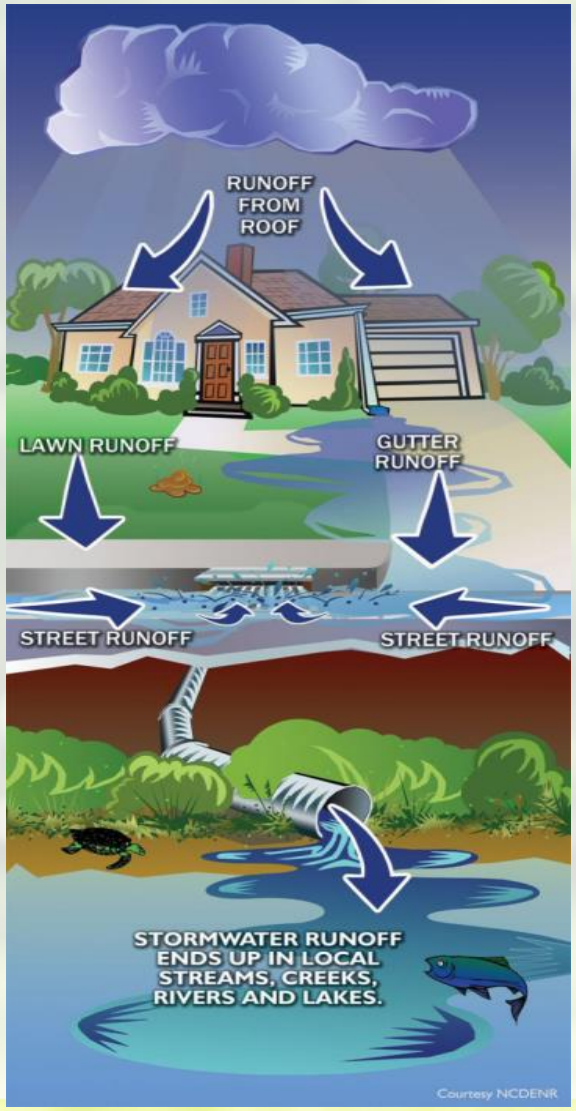
ms consultants, inc.
engineers, architects, planners



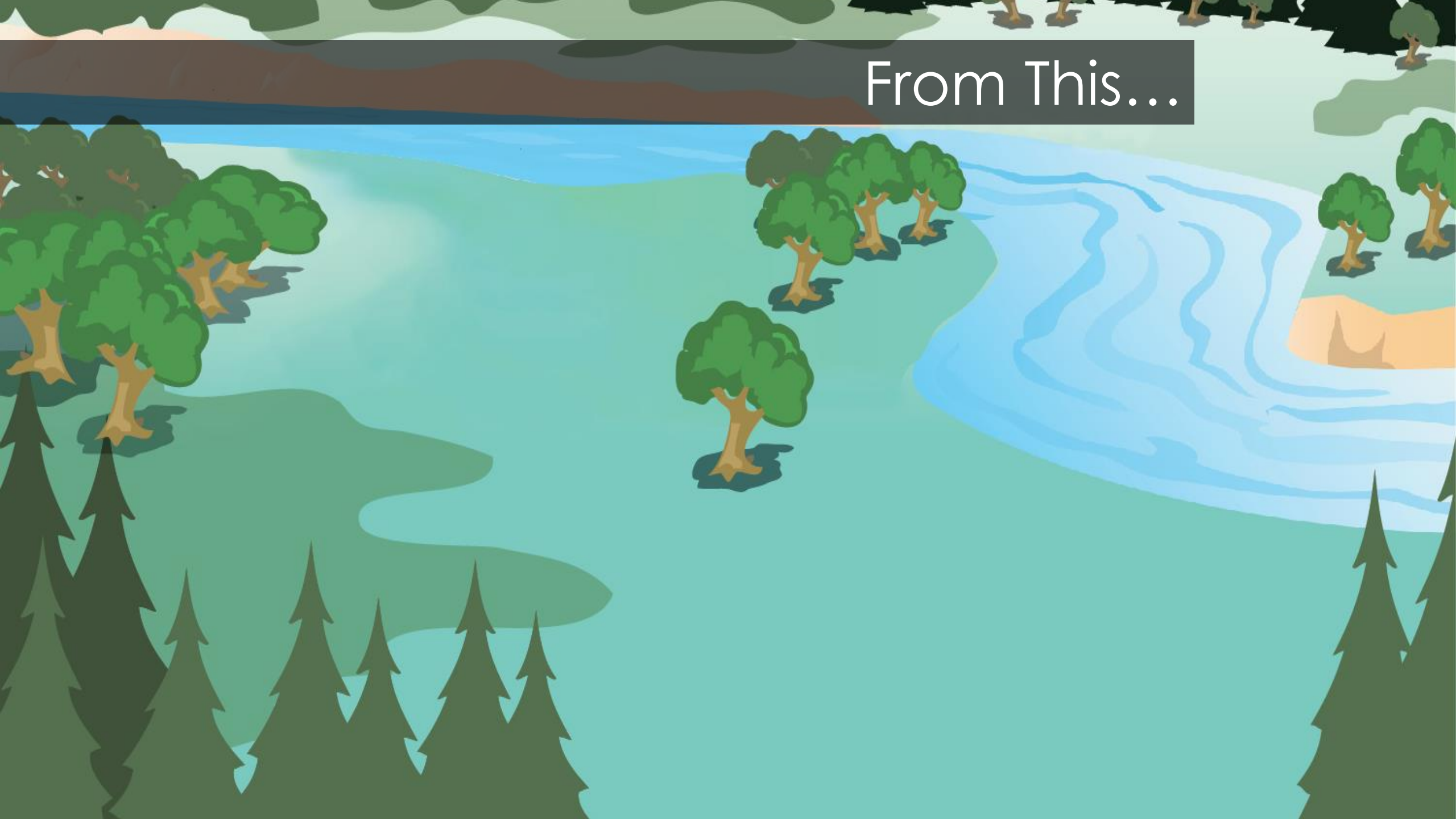
Presented by
ms consultants
May 25, 2023

What Will Be Covered

- What Do We Know about the Challenges with Stormwater and Climate Change?
- What have we seen really work and what doesn't?
- Lessons Learned and Case Studies of Sustainable Projects using GSI
- Flip the Script
- OSWA Extreme Events Committee



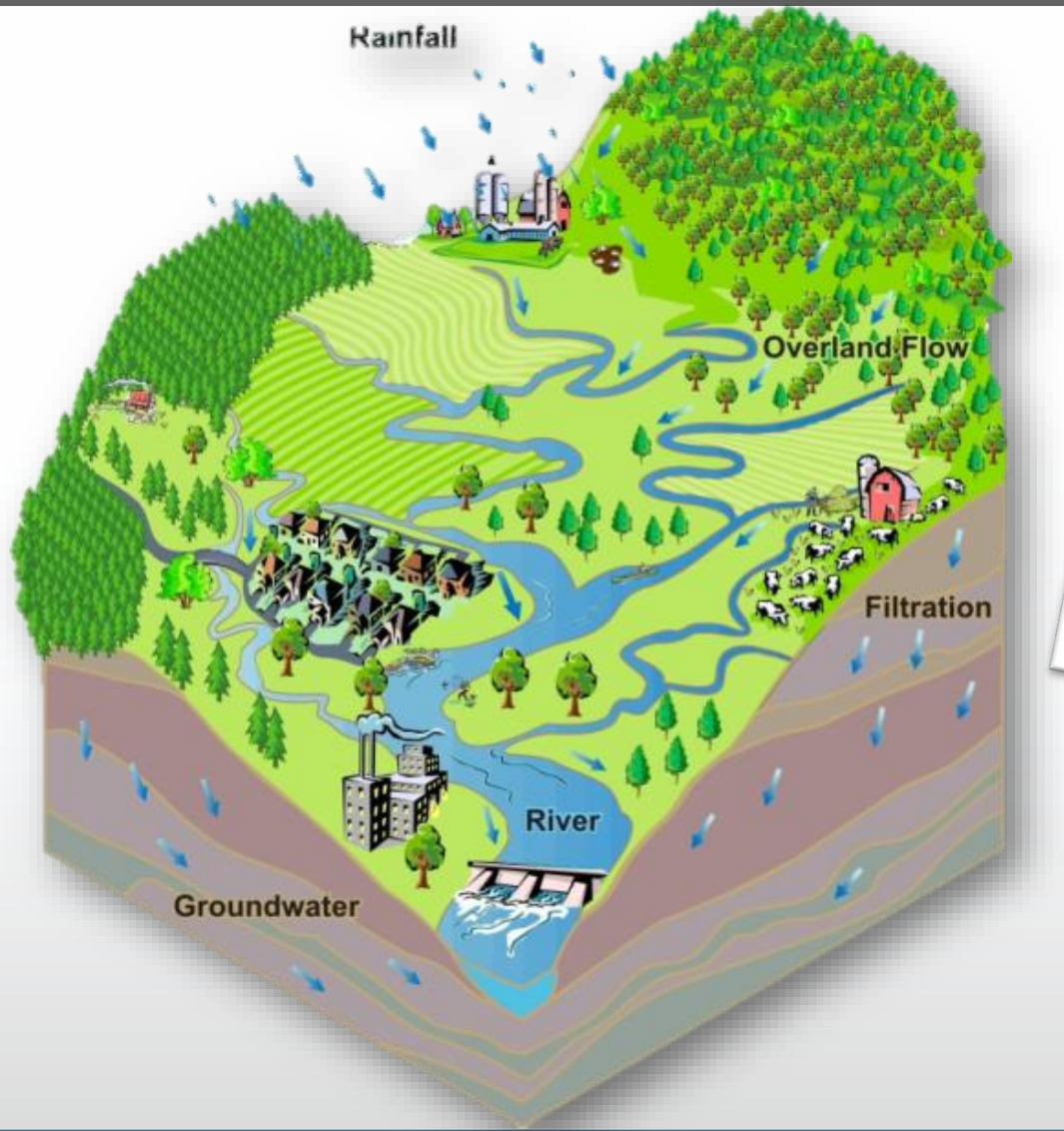
From This…



To This…

- Increased imperviousness increases flows
- Decreased water quality
- Increased erosion and sediment in streams
- Increased Flooding

Seeing the Significance of the Hydrologic Impacts of Urbanization Over Time



What Do We Really Know?

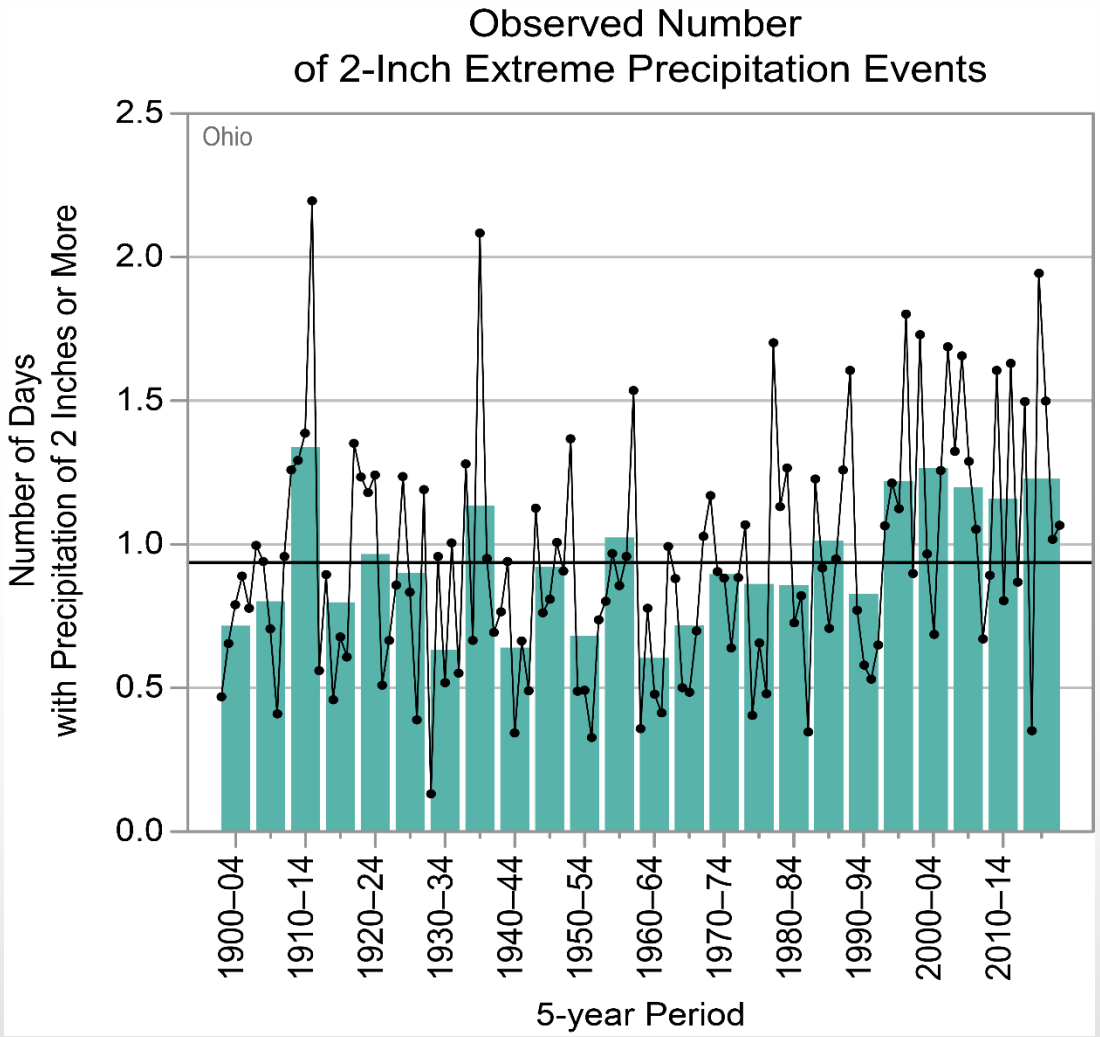
Climate changes, including more frequent and intense storms and more extreme flooding events, can increase stormwater runoff. An increase in stormwater runoff can exacerbate existing, or introduce new, pollution problems.

Source: USEPA

What About Climate Change in Ohio?

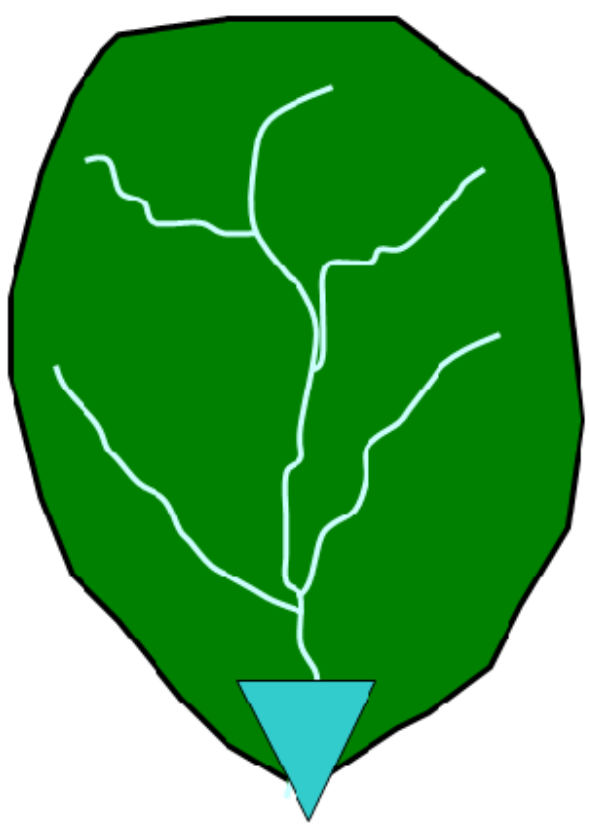
- The average temperature in Ohio has risen 1.5 degrees since the beginning of the 20th Century
- Drought events have also increased
- Ohio has experienced a significant increase in heavy rain events

Ohio has experienced a significant increase in the number of 2-inch extreme precipitation events since the mid-1990s

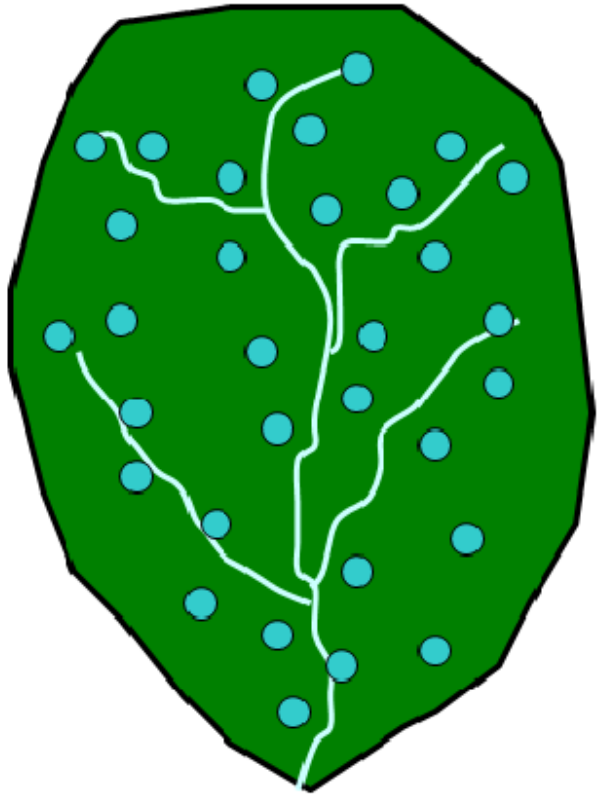


Source: NOAA

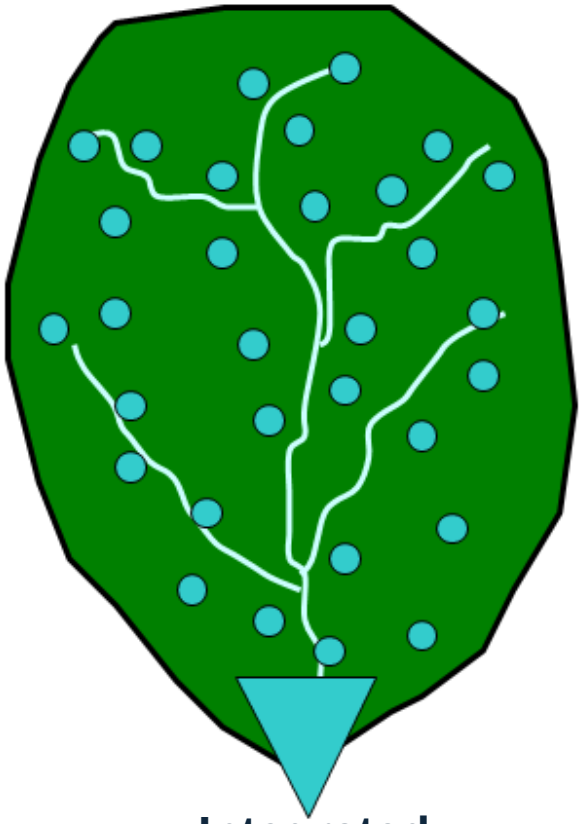
Stormwater Management has NOT really Evolved…



Traditional Regional Technique

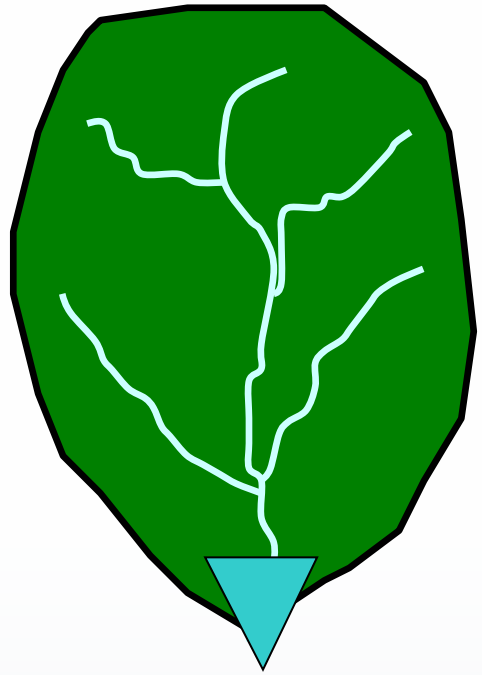


Distributed Stormwater Features

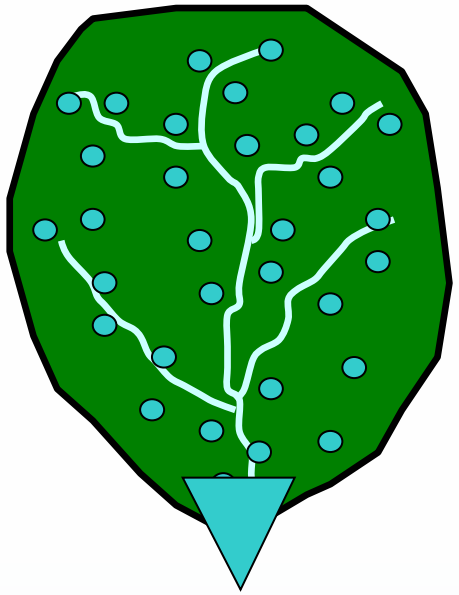


Integrated Stormwater Controls

Traditional Stormwater Regional Controls



Integrated Stormwater Controls



Proven GSI Types

Sustainable Design Examples

Blueprint Integrated Solutions

Permeable Street Green Infrastructure

- Bioretention
- Energy Efficient Materials
- Energy Management + Infrastructure
- Erosion & Sediment Control
- Floodplain Management
- Green Globes® Certification
- LEED® Certification
- Green Buildings
- Green Infrastructure
- Green Streets
- Indoor Environmental Quality
- Inflow + Infiltrations Mitigation
- Integrated Planning
- Pervious Pavements
- Rain Gardens
- Stormwater Master Planning
- Stormwater Permitting
- Sustainable Sites
- Water Conservation
- Wet Weather Planning

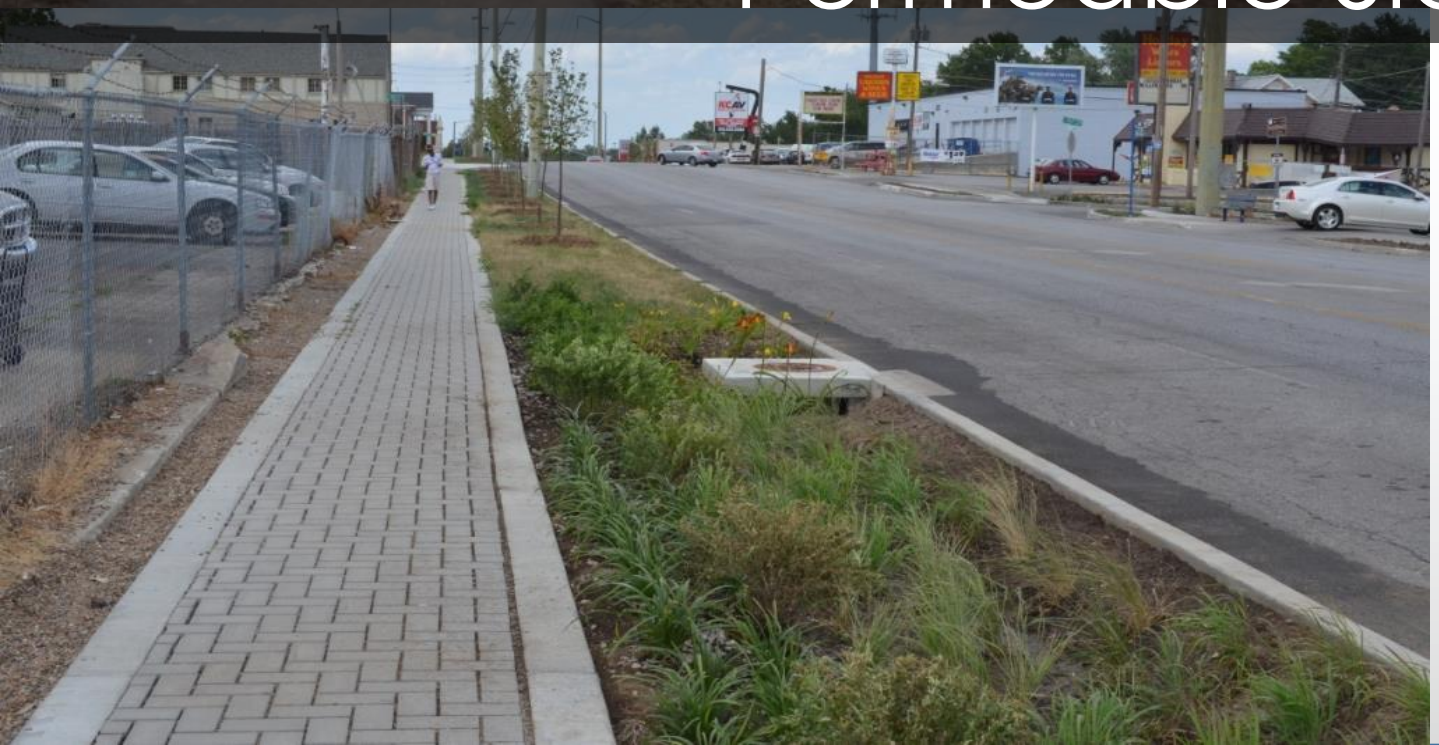
Stormwater Solutions with a Great Impact

Large events will be impacted by sustainable design by providing resiliency

Smaller events will be positively impacted

Most flood reduction benefits come from addressing smaller, frequent events.

Permeable Sidewalks



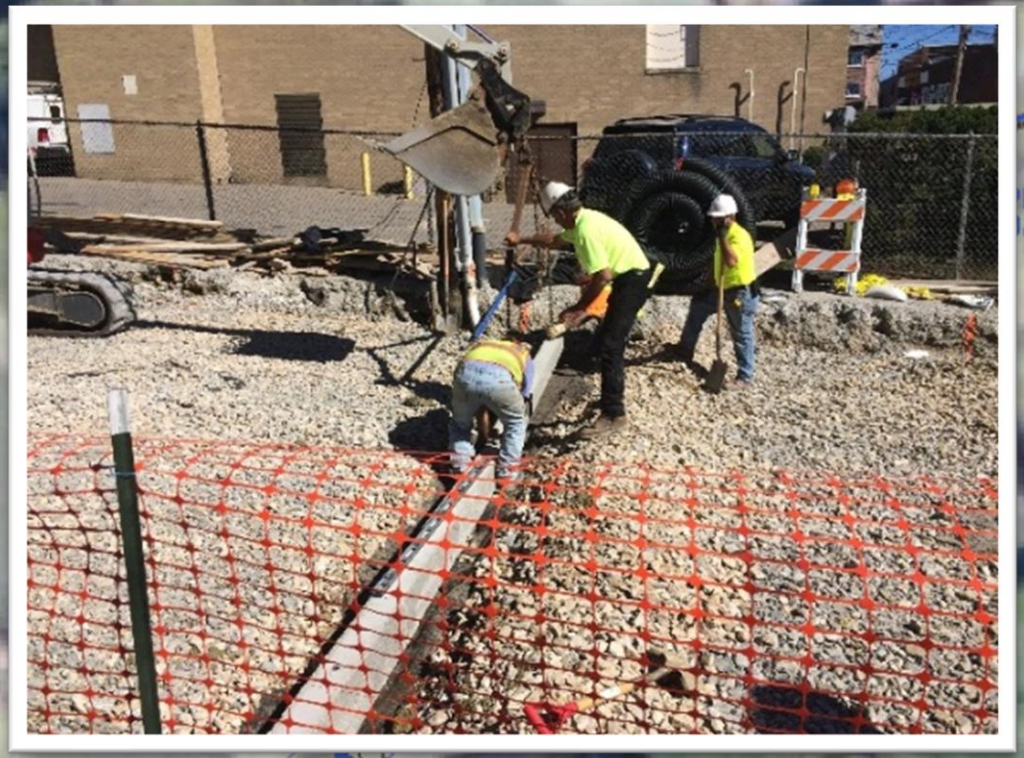
- Works in Tight Spaces
- Good companion to Turf Grass
- Needs a buffer
- Can be considered less desirable due to not being smooth
- Doesn’t work well with dense tree canopy

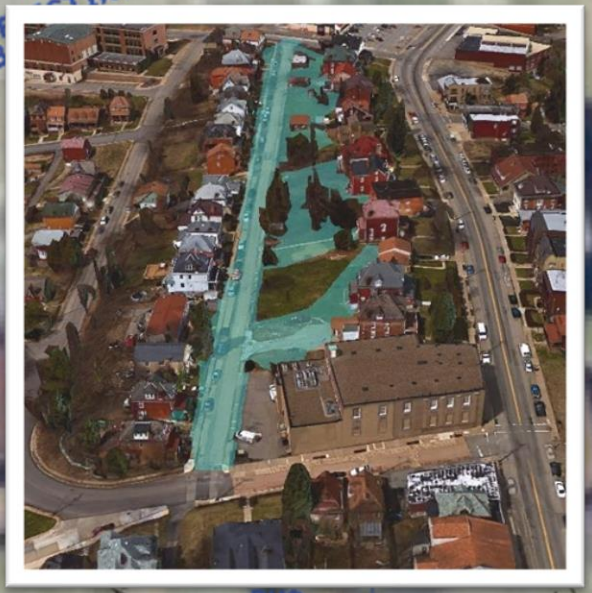
Permeable Streets

- High Resiliency Factor
- Visually appealing
- Can be built on slopes
- Collects a lot of stormwater
- Low Maintenance costs
- Upfront costs are expensive

Dellrose Street Green Infrastructure

Pittsburgh, Pennsylvania





TIE TO
CATCH B

ROPOSED 8" PAVEMENT
ASE DRAIN

TIE LATERAL EX
TO 6" UNDE
USING WYE CONN

SAN MH
RIM = 1209.96
INV IN = 1205.21
INV OUT = 1205.19

PVC
CLEANOUT

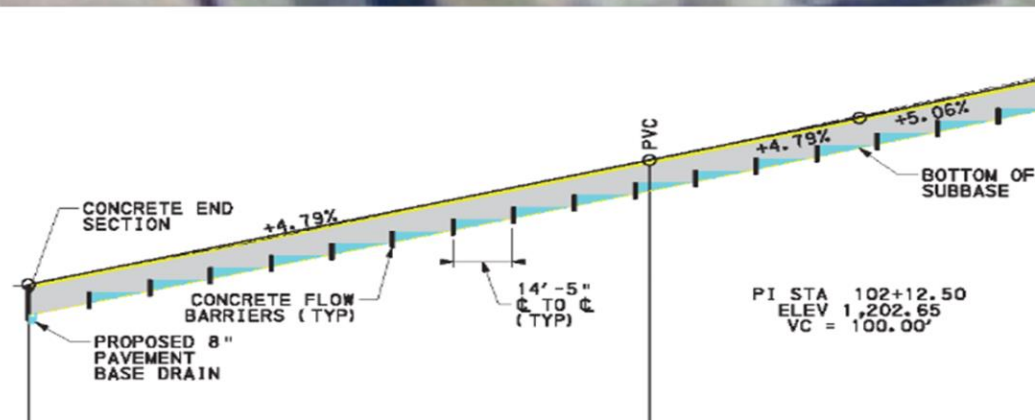
PROPOSED 8"
PAVEMENT
BASE DRAIN

TIE 6" UNDERDRAIN
TO PAVEMENT
BASE DRAIN

SAN MH
RIM = 1192.48
INV IN = 1187.73
INV OUT = 1187.63

EXTEND 8" PAVEMENT BASE
DRAIN ACROSS DELLROSE ST

8" PVC



Lessons Learned-Built in 2015

Permeables Work!

- Minimal space disruption
- Integrated into the existing corridor
- Water quality benefit
- Steep slopes are manageable

Inter-Agency Coordination

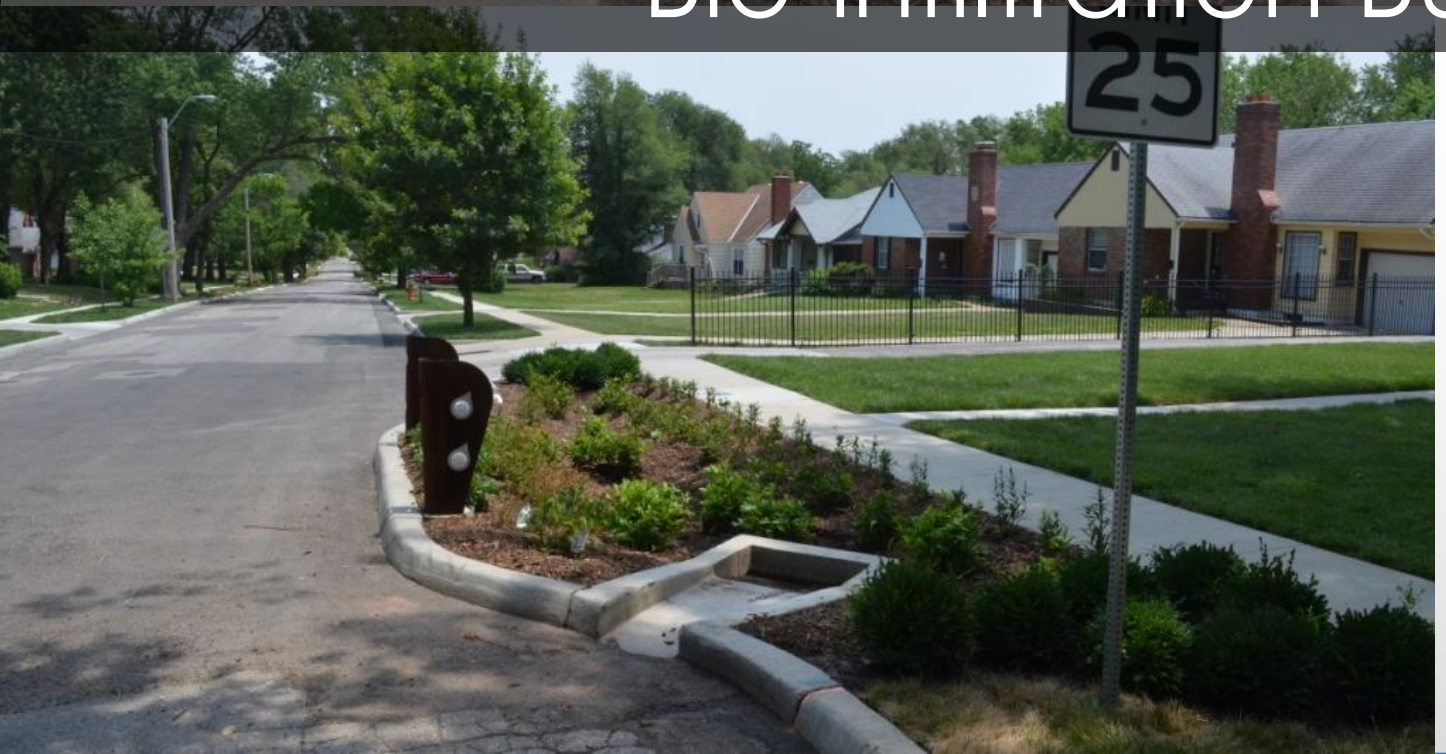
- Leveraging agency dollars from different departments
- Life-cycle costs
- Collaboration on specs.

Integrated Planning is a Win-Win

- **> 100 in/hr Rainfall Accepted by Permeable Pavers**
- **15,000 gallons Retained as Subsurface Storage**
- **18,000 gallons Retained/Conveyed (Design Storm)**
- **8.1 cfs (~3,600 gpm) of Tributary Peak Runoff Rate Managed**
- **1.4 cfs (~630 gpm) of Peak System Discharge**

- 83% Reduction in Peak Discharge Rate (Design Storm)

Bio-infiltration Bump Outs

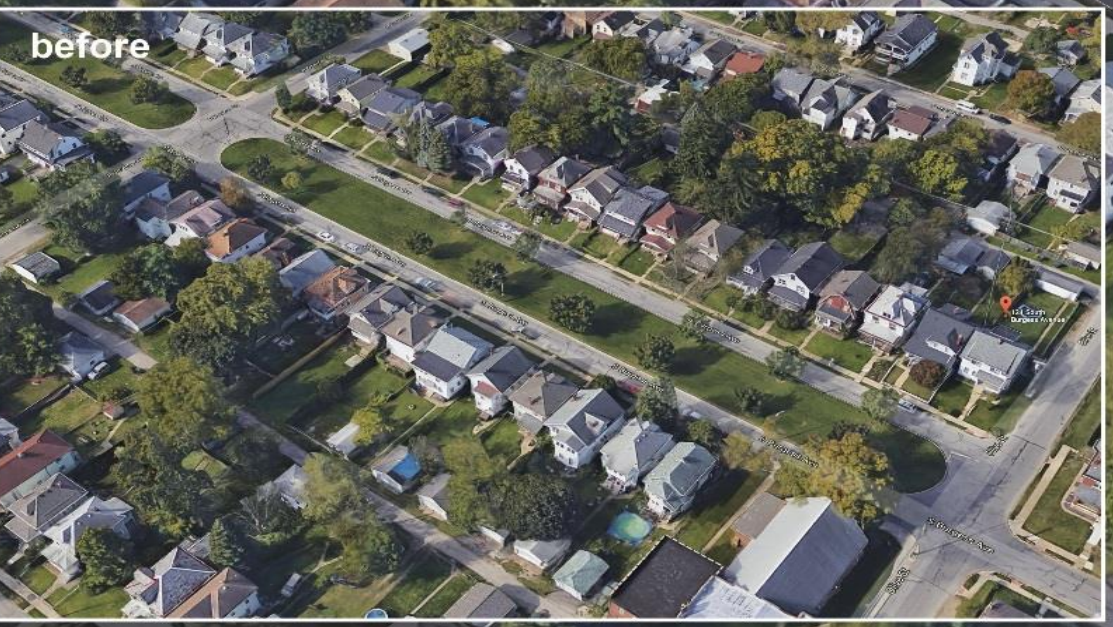


- Collects a good amount of SW
- Visually appealing
- Can be built on slopes
- Highest maintenance costs
- Used as traffic calming
- Takes away parking spaces

Bio-Tree Trench

- High Resiliency Factor
- Visually appealing/Blends in
- Collects a lot of stormwater
- Low Maintenance costs
- Can be done with retrofits or with larger linear roadway work

CONCEPTUAL BIRD'S EYE



S Burgess Ave

S Burgess Ave

Palmetto St

Palmetto St

121 South Burgess Av

Olive St

Burgess Ave

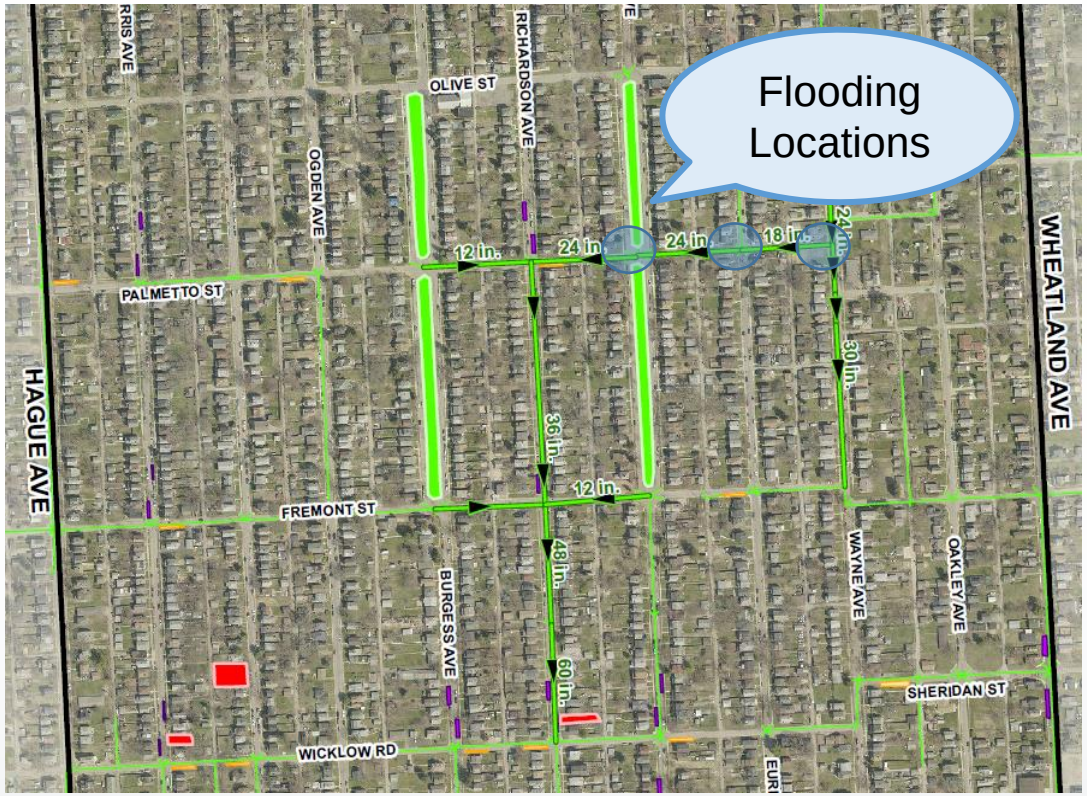
Olive St

ms consultants, inc.
engineers, architects, planners

Integrated Planning/Regional Solutions

- Boulevards
- Land Bank Parcels
- In-Street and Behind-the-Curb GI
- Permeable Street Pavements
- Bumpouts

Integrated Planning



- Convert Boulevards to GI
- Replace existing Storm Sewers on Palmetto and Fremont, redirect to Richardson.
- Add new storm relief on Richardson Avenue for positive outfall from Boulevard GI to mitigate flooding at Eureka and Palmetto and Terrace and Palmetto
- Upsize Storm Sewer on Wayne Avenue to mitigate flooding at Palmetto and Wayne

Lessons Learned

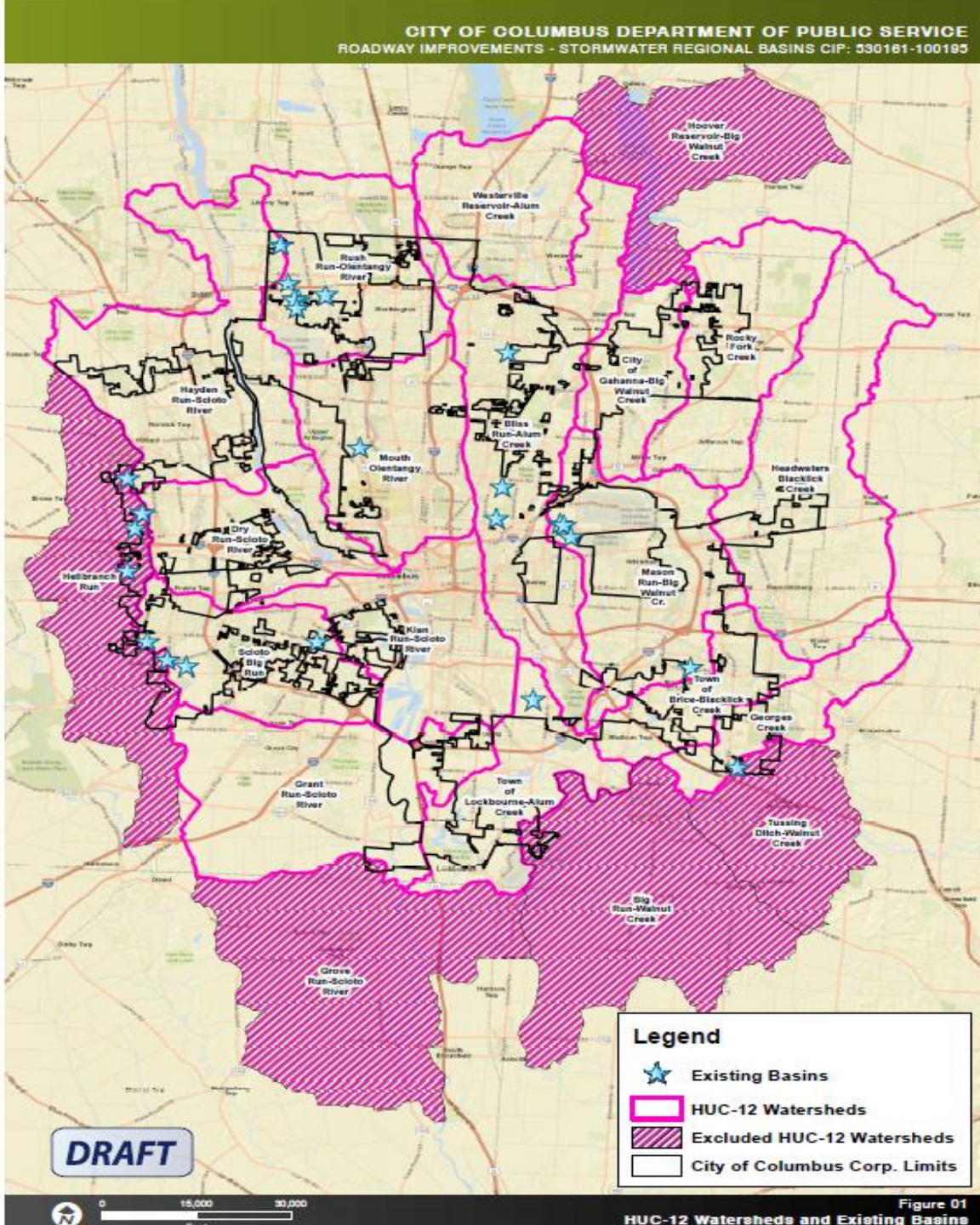
Public Perception
- Bump-Outs
- Permeables
- Buy-in from adjacent neighbors

Inter-Agency Coordination
- Workshops
- Spec Development
- Buy-in from all agencies involved

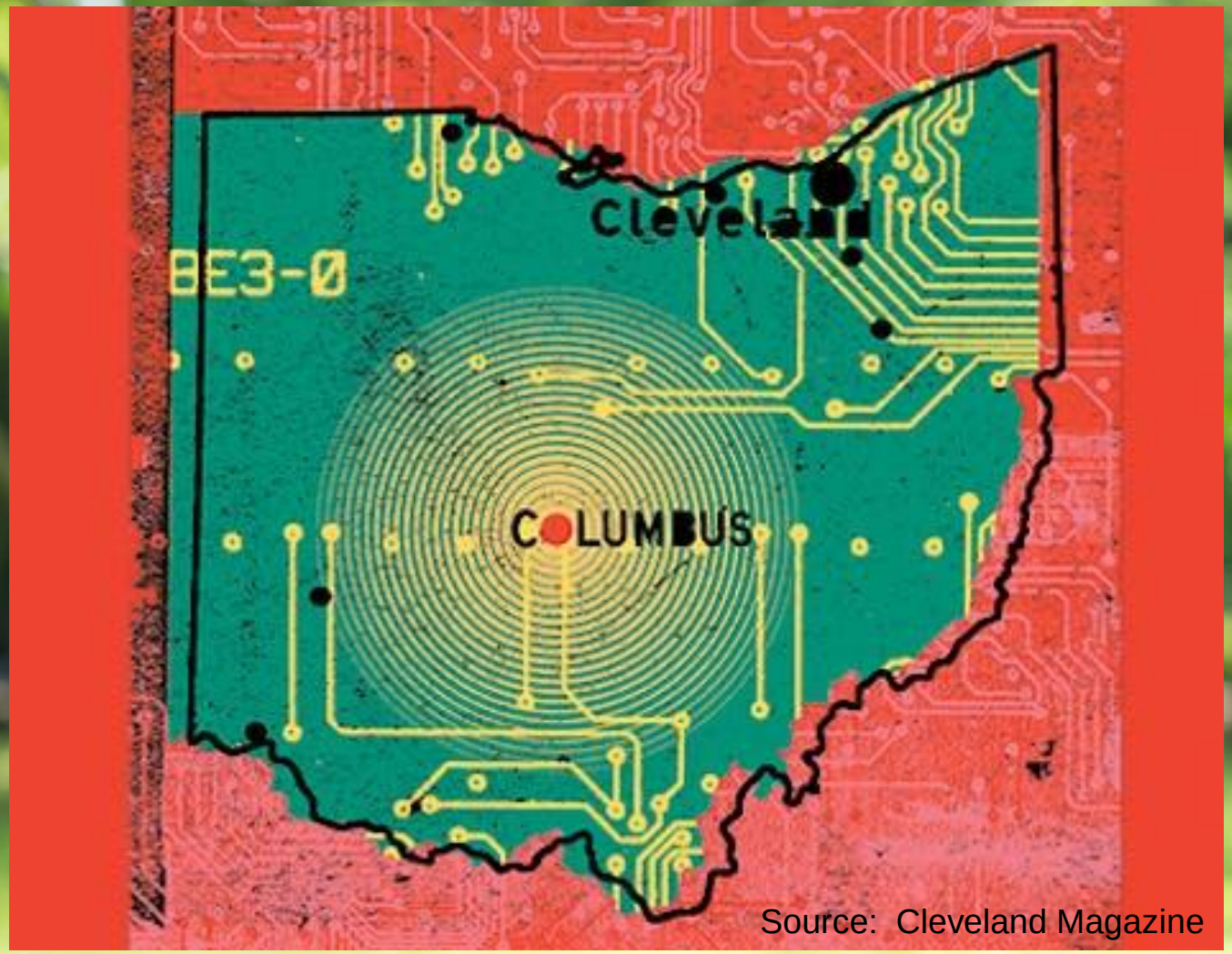
Integrated Planning is a Win-Win
- BP vision has evolved
- Water Quality first but direct benefit with Quantity
- Cost effective

DPS Regional Stormwater Basin Analysis and Flood Control Bank

Columbus, Ohio



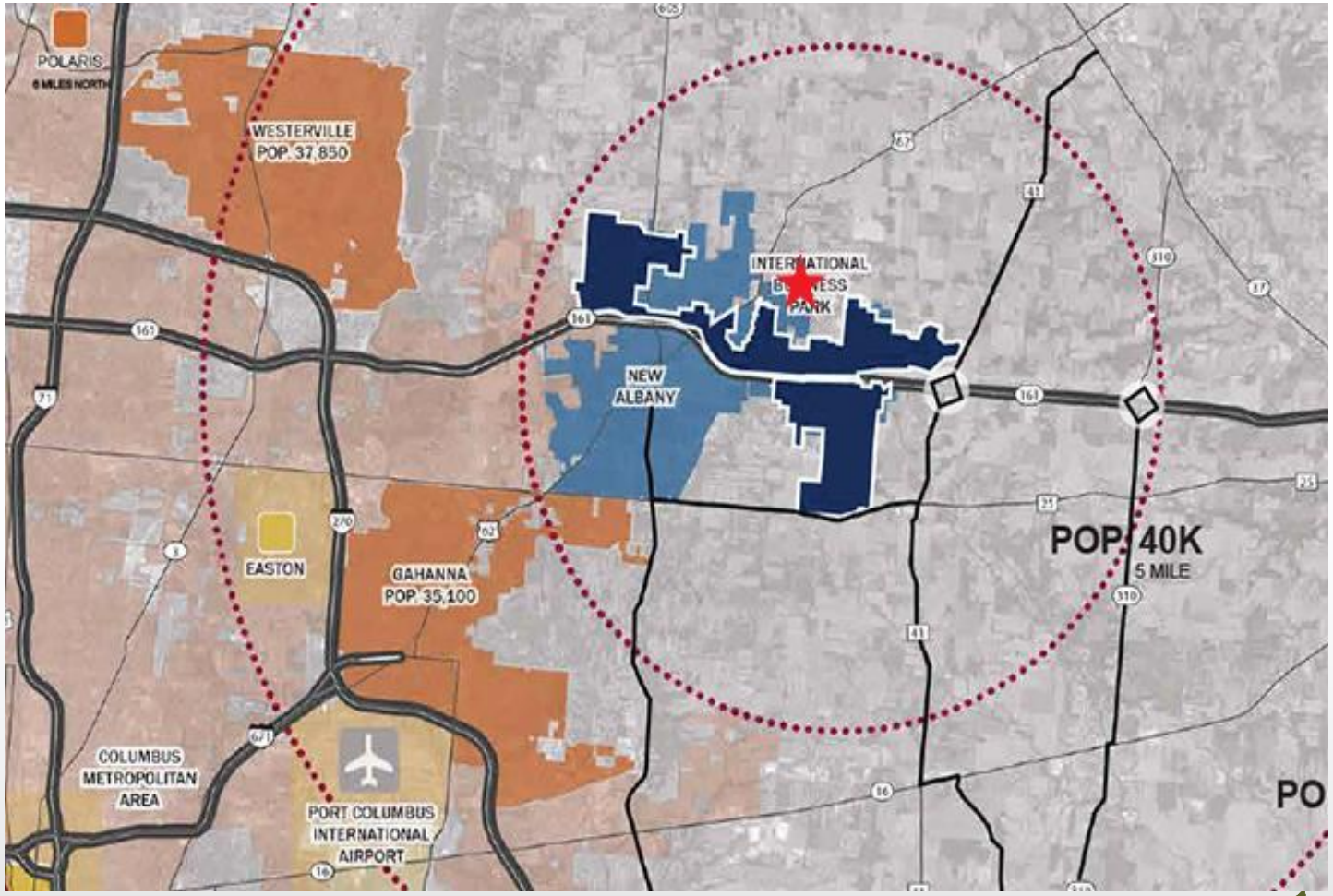
Flip the Script



Source: Cleveland Magazine

Alternative SW Regulations?

- Several communities within Central Ohio have some sort of advanced standard for stormwater
- What if Sustainable Design, GSI was required?
- How would the Development Community react?



OSWA Extreme Events Committee

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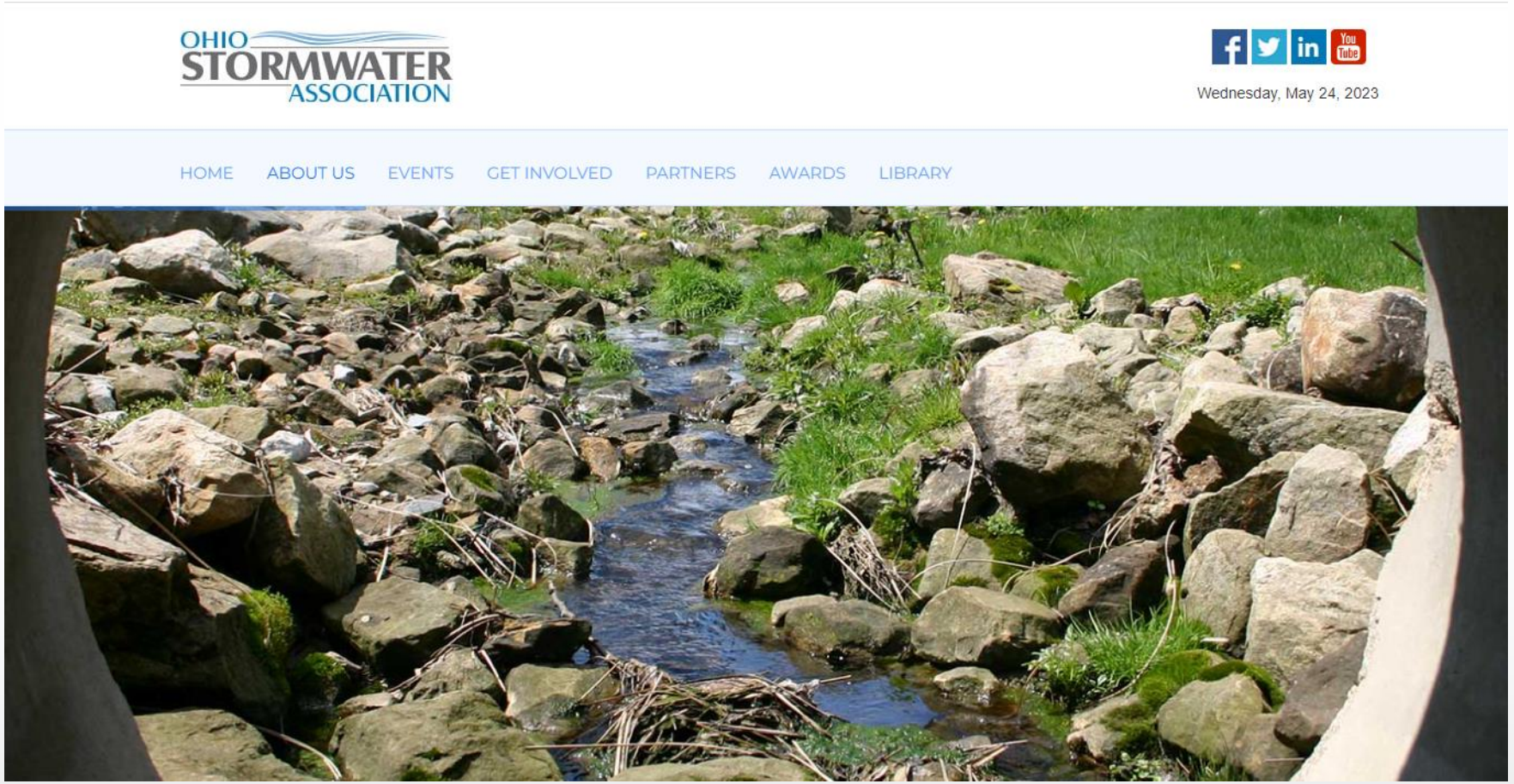
Chair of the OSWA Extreme Events Committee



https://ohioswa.com/about-us/committees/

Questions?

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