



Using Green Infrastructure in Your MS4 Community

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Today's Discussion

- What is Green Infrastructure?
- Why should I consider Green Infrastructure?
- What practices could work for me?
- What else should I consider?



Green Infrastructure

- Using plants, soils and nature to manage stormwater
- Natural and managed green areas in both urban and rural settings
- Strategic connection of open green areas
- Treating rainwater as a resource
- Transforming “grey” stormwater infrastructure to green through restoration of watersheds to slow and store water



Green Infrastructure

- Rain gardens and bioswales
- Bioretention and planter boxes
- Rain barrels and cisterns
- Green roofs
- Permeable pavements
- Urban tree canopy
- Green alleys and streets
- Conservation landscaping

What else?



- Educating the public about water quality, sewer and stormwater concerns
- Promoting green solutions
- Helping communities meet their permit goals
- Enhancing public perception (sustainable cities)
- Leverage State and Federal Program Dollars (brownfield redevelopment)
- Evaluating opportunity to “marry” two forms of public work effort (street, sidewalks, stormwater management)

Why Should You Consider Green Infrastructure?



Photo: Rusty Schmidt

Watershed Goals

- Improve water quality
- Reduce flooding from rain events
- Repair troubled areas
- Prevent degradation of streams
- Stabilize streams
- Comply with regulatory requirements
- Improve overall watershed health



Watershed Assessments

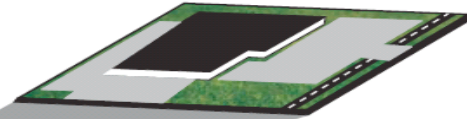
SITE LEVEL

Where can BMPs be incorporated into typical sites?

Which are most effective locally?

What density is required to meet performance objectives?

Constructability and Cost



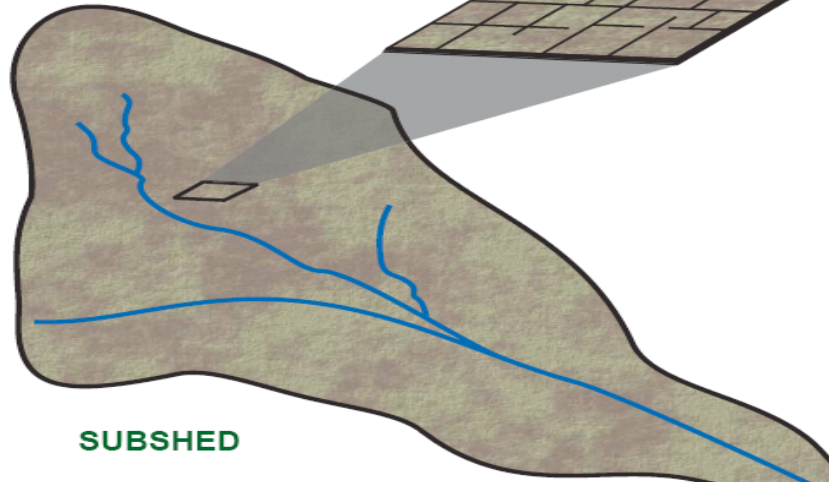
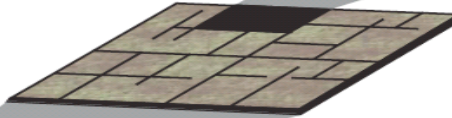
NEIGHBORHOOD

How to scale up from the site level to city blocks?

Available public space

Working with private property owners

Incentives



SUBSHED

Land Use Analysis - where can Green Infrastructure be added to the subshed?

- Drainages
- Public lands
- Property lines
- Greenspace
- Open space on public or private lands
- Soil Types

Hydrologic Studies - what density of BMPs will make a difference?



REGIONAL ISSUES

Political Cooperation

Community Acceptance

Consistent Policies, Codes, and Ordinances

Program Challenges

- Funding
- MS4 boundary issue
- % restoration requirement
- Aggressive timeframes
- Local and Chesapeake Bay TMDLs
- Tracking progress
- Reporting
- Perception



Site Challenges

- Highly impervious areas with limited available space
- Poor soils
- Utility conflicts
- Flooding issues
- Parking
- Existing grading and other site constraints
- Interruptions during construction activities
- Public expectations



Potential Solutions

- Traditional Capital Improvement Projects (CIPs)
- **Green Infrastructure solutions**
- Source control/pollution prevention strategies
- Operational or behavioral changes
- Coordination with other jurisdictions
- Expand public outreach and education



Effectiveness

- **More data now that projects have been implemented**
- **We partnered with US EPA Office of Research and Development**
 - EPA's involvement in GI validation process – monitoring lead
 - Green Infrastructure Selection
- **More communities doing Triple Bottom Line analyses**



Incorporating Green Infrastructure

- Evolving nature and challenges of urbanized watersheds
- Consider alternatives to help meet WLA
- Outreach/community education
- Innovative solutions like Green Infrastructure are needed



What Types of Green Infrastructure Could Work for My Community?



Photo: Rusty Schmidt



Maintenance/O&M
Strategies



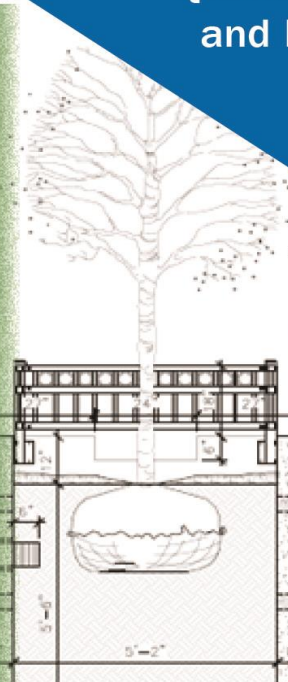
Planning
and Modeling



Construction
Oversight and
Implementation



Quantification
and Design



Bioretention Gardens: Rain Gardens with Engineered Soil + Underdrains



Photos: URS

Cascades



Curb Extensions with Below-Grade Storage

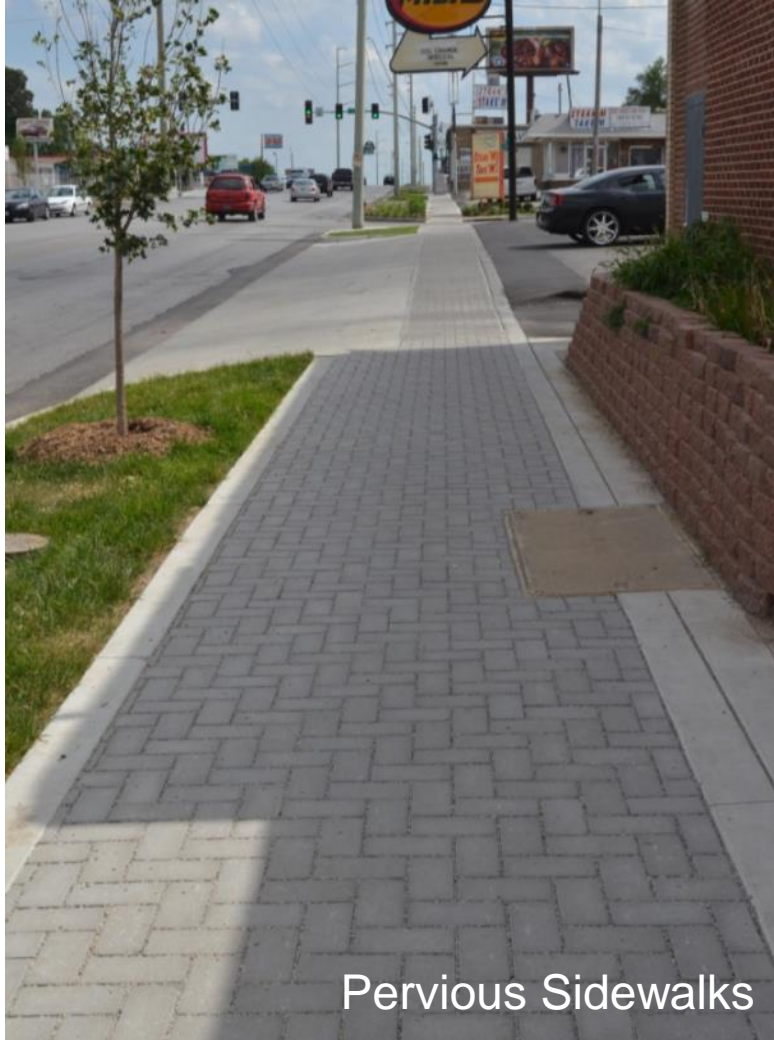


Photos: URS

- Stormwater Collection Focal Points
- Traffic Calming



Commercial Street: Little Greenspace – Lots of Utilities



Pervious Sidewalks



Below Grade Storage

Photos: URS

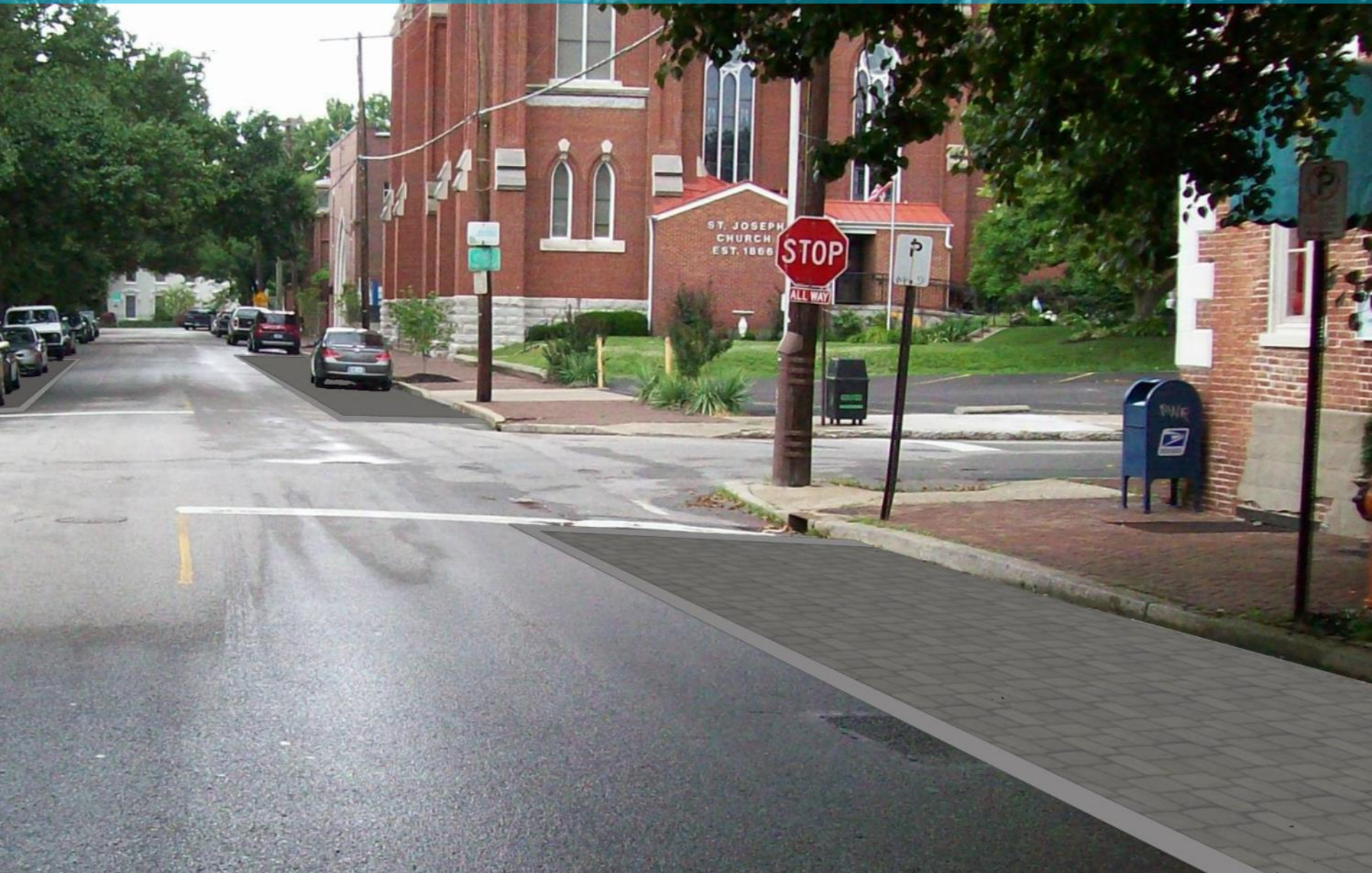
Articulated Concrete Block Installation



Articulated Concrete Block Installation



Rights-of-Way



Porous Concrete Sidewalks



Photos URS



Tree Box Application



Targeted Tree Planting



Commercial Pocket Park Opportunity



N, 17TH ST./BANK ST. POCKET PARK LOOKING WEST (BEFORE)



N, 17TH ST./BANK ST. POCKET PARK LOOKING WEST (AFTER)

Vacant Lots



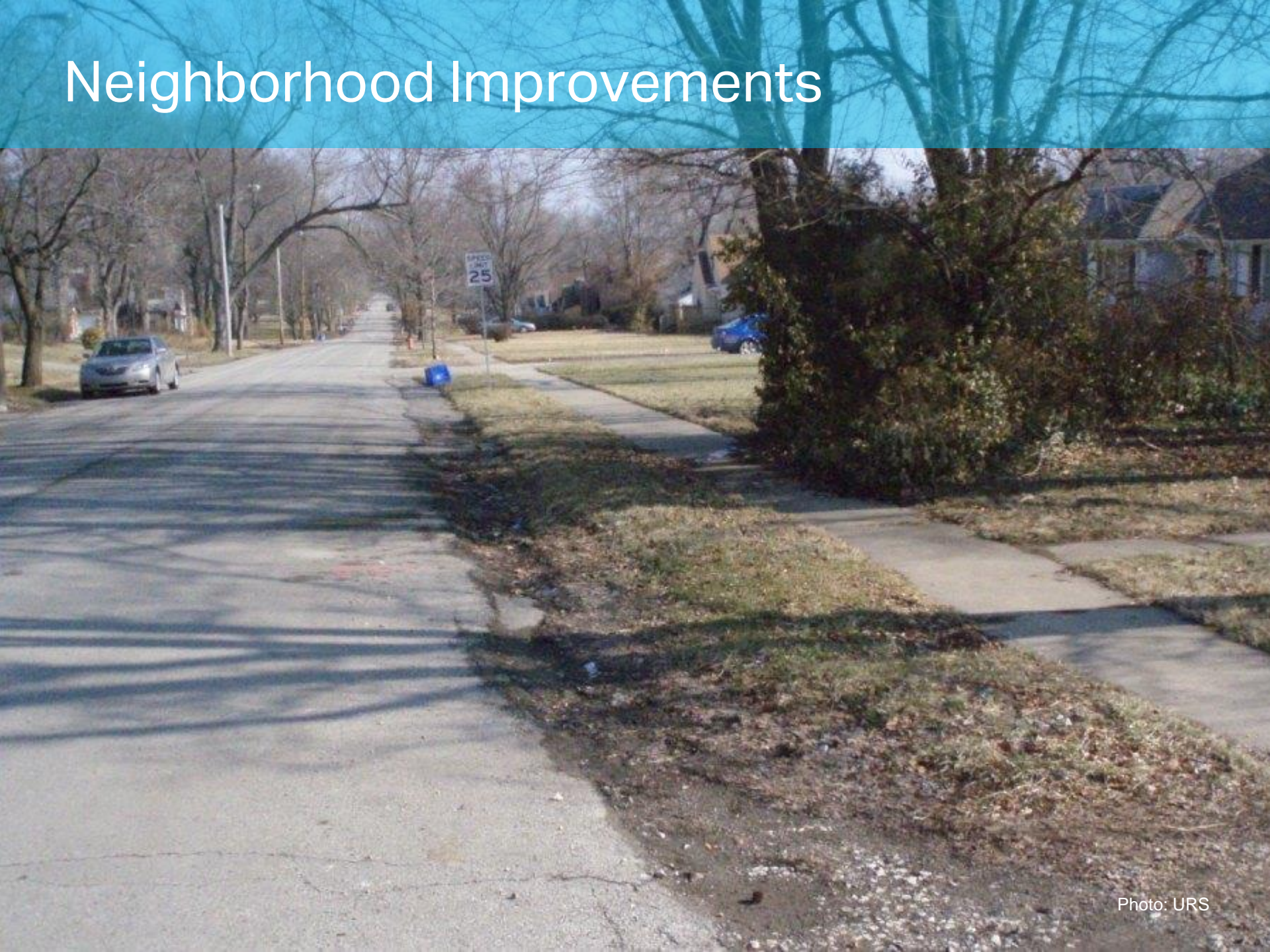
Neighborhood Improvements



Neighborhood Improvements



Neighborhood Improvements



Neighborhood Improvements



What Else Should Be Considered?



Photo: Rusty Schmidt

Maintenance Matters!



Maintenance Matters!



Maintenance – Design with the End in Mind

- Inspections
- Preventive maintenance
- Regular schedule that works with other maintenance activities
- Tracking progress
- Reporting
- Funding



How to Incorporate Green Infrastructure

- **Develop community specific criteria**
- **Add to your watershed assessments**
- **Coordinate with other departments**
- **Integrate with neighborhood improvements**
- **Combine with educational activities**
- **Work with private groups**
- **Work with private property owners**



Neighborhoods

MCDEP RainScapes Program

- Rain barrels
- Cisterns
- Dry wells
- Rain gardens
- Conservation landscaping techniques
- Permeable pavers
- Pavement removal
- Tree canopy
- Green roofs



RainScapes
Environmentally-Friendly Landscapes for Healthy Watersheds

Tree Canopy

Why should I plant trees?

Planting trees is an easy, affordable way to benefit the environment. Tree canopies reduce storm water runoff by absorbing and collecting rainfall on leaves and branches. Water evaporating off the surface of leaves returns to the atmosphere. Tree roots promote rainwater infiltration through the soil. Studies that have measured the stormwater benefits of trees found that over 700 gallons of rainfall can be captured each year by a single mature tree with a 30-foot radius crown.



What is a tree canopy?

A tree canopy is the crown of one or many trees that create an "umbrella" or cover of leaves. The leaves and branches shade paved surfaces, such as sidewalks, driveways, and patios, reducing the temperature of rainwater runoff. Tree canopy intercepts rainfall before the water hits the ground and becomes stormwater runoff. Trees provide many benefits to the health and well-being of communities. Often, trees can easily be added to the landscape to provide stormwater benefits.



Tree Canopy Intercepting Rainfall

Tree Canopy

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Putting It Together

Communication up front is key!

Integrated planning—identify opportunities to incorporate Green Infrastructure into planned projects



Questions?

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