Photos: Kari Mackenbach

Green Infrastructure Successes In US Benefit China

Presented by:

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Director of Sustainability

ms consultants, inc.
engineers, architects, planners

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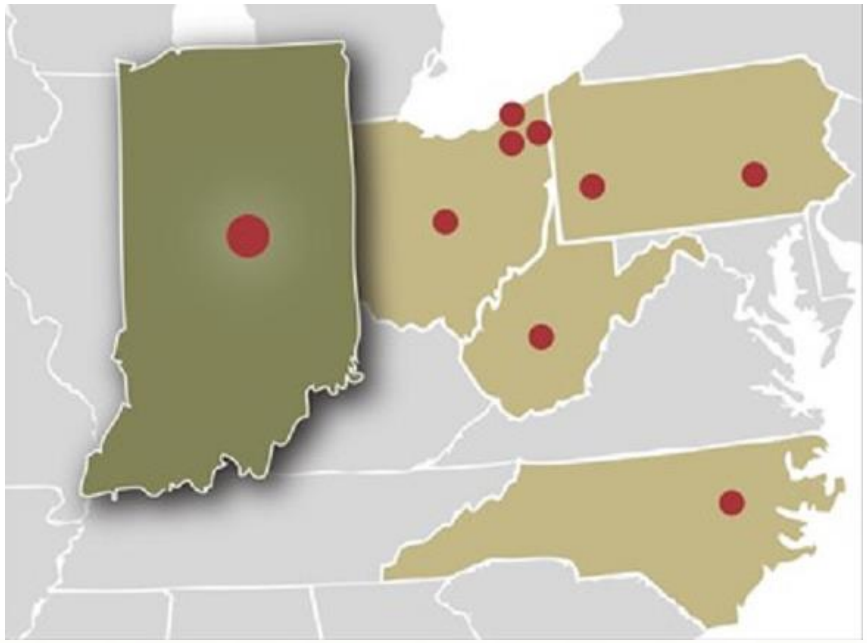

Regional Experts at Your Doorstep

- 50+ years in business: we've practically seen it all and can handle all projects/issues effectively
- Large, Regional-based staff: access to in-person services quickly
- Consistently top-ranked in industry: longevity and success in business attributed to our focus on client and community needs without exception

Committed to sustainability

Our Sustainable Commitment

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN
LEED
GOLD

20+ LEED AP Professionals

60+ LEED Certified Projects

ENVISION™

INSTITUTE FOR SUSTAINABLE INFRASTRUCTURE CHARTER MEMBER

10 Envision Sustainability Professionals (ENV SP)

GREEN GLOBES®

5+ Green Globes Professionals

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SPONGE CITIES

- Baicheng
- Nanning
- Wuhan
- Changde
- Chenzhou
- Chongqing
- Gui'an New District
- Hebi
- Jiaxing
- Jinan
- Pingxiang
- Qian'an
- Suining
- Xiamen
- Xixian New District
- Zenjiang

0 900 1,800
Kilometers

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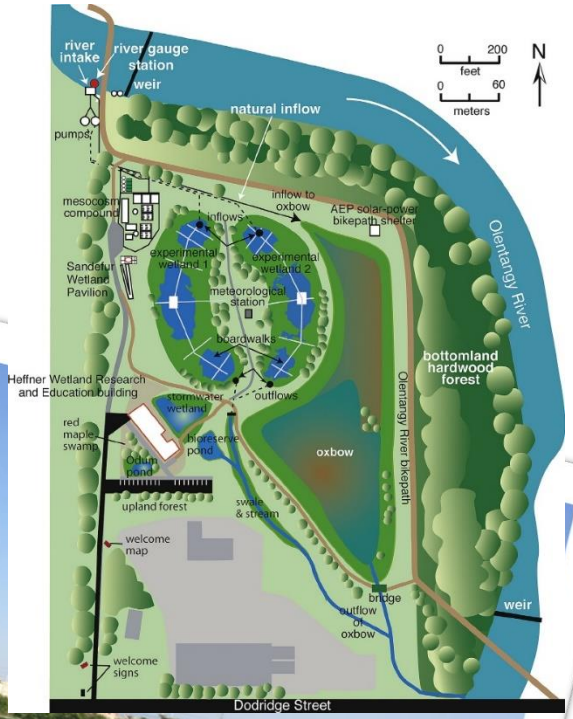
Shenzhen, China

Pingshan New District Shenzhen China

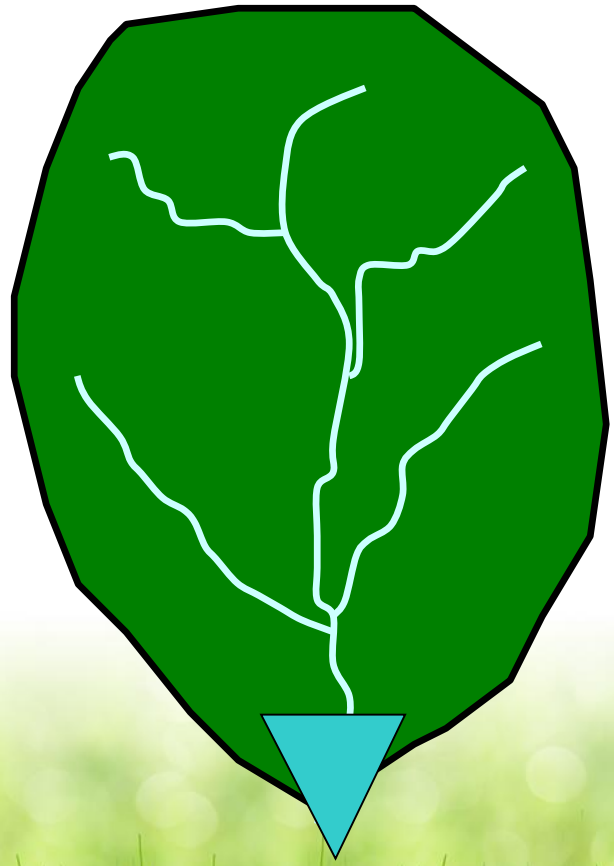


Natural Water Cycle: Pre-Development

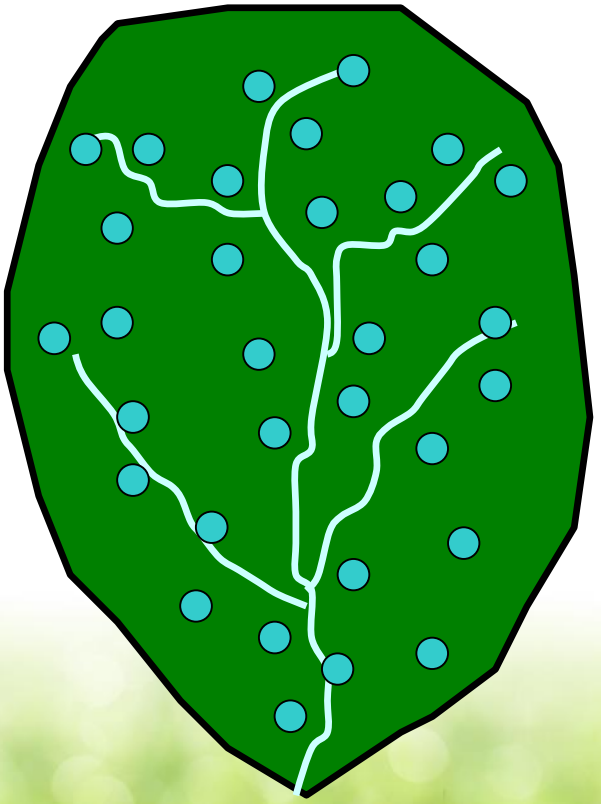
Natural Water Cycle: Post-Development

- Increased imperviousness increases flows
- Puts structures and people in harm's way

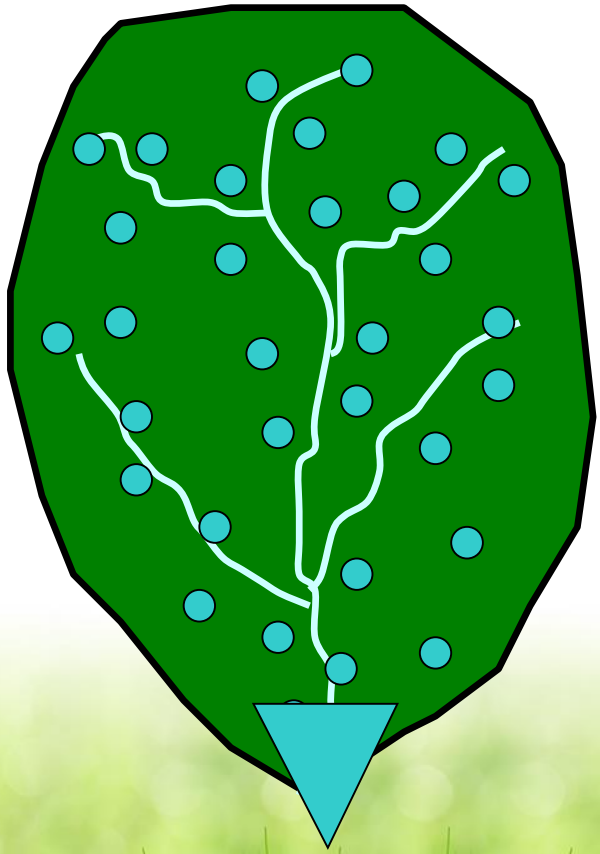
Distributed Stormwater Controls Close to Runoff Sources



Traditional Regional Technique



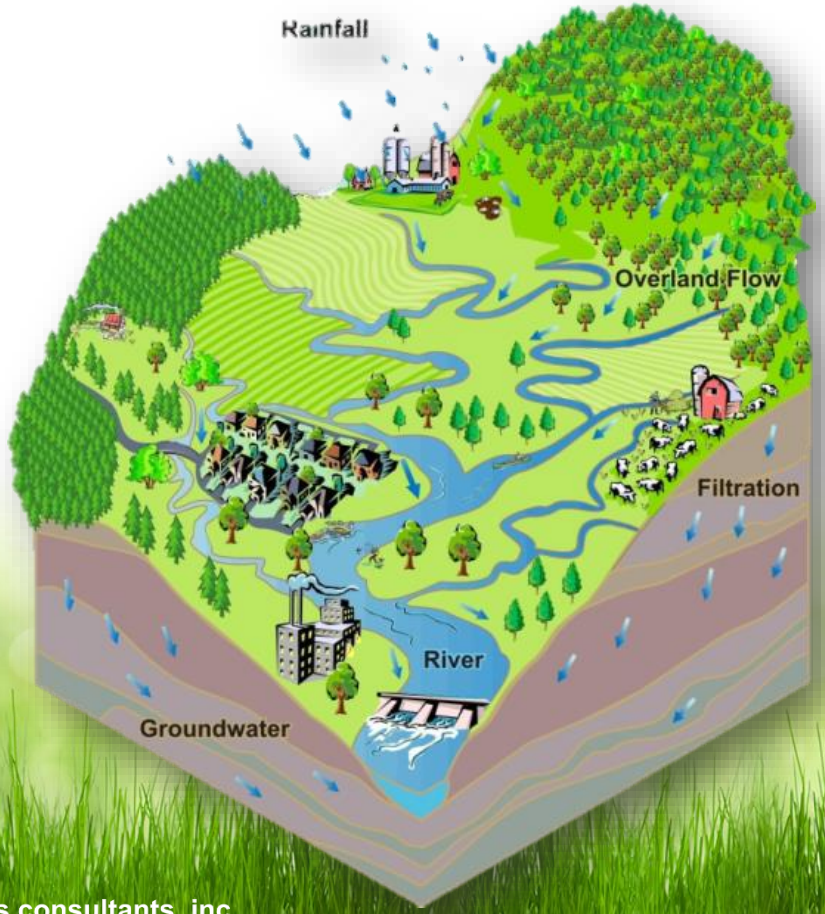
Distributed Stormwater Features



Integrated Stormwater Controls

How is Green Infrastructure & Flooding Connected?

Seeing the Significance of the Hydrologic Impacts of Urbanization Over Time



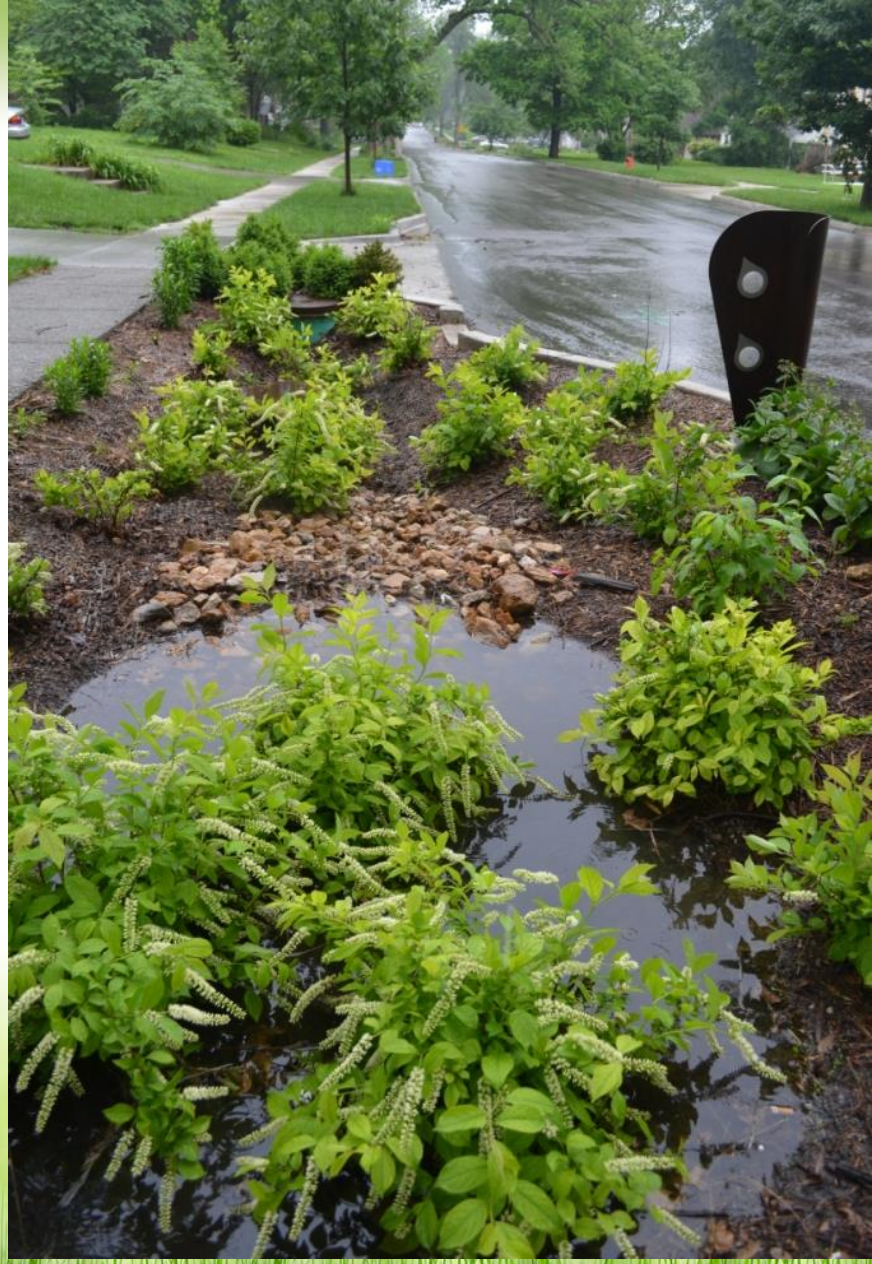
Green Infrastructure Technology Types

Rain Gardens and Bio-infiltration

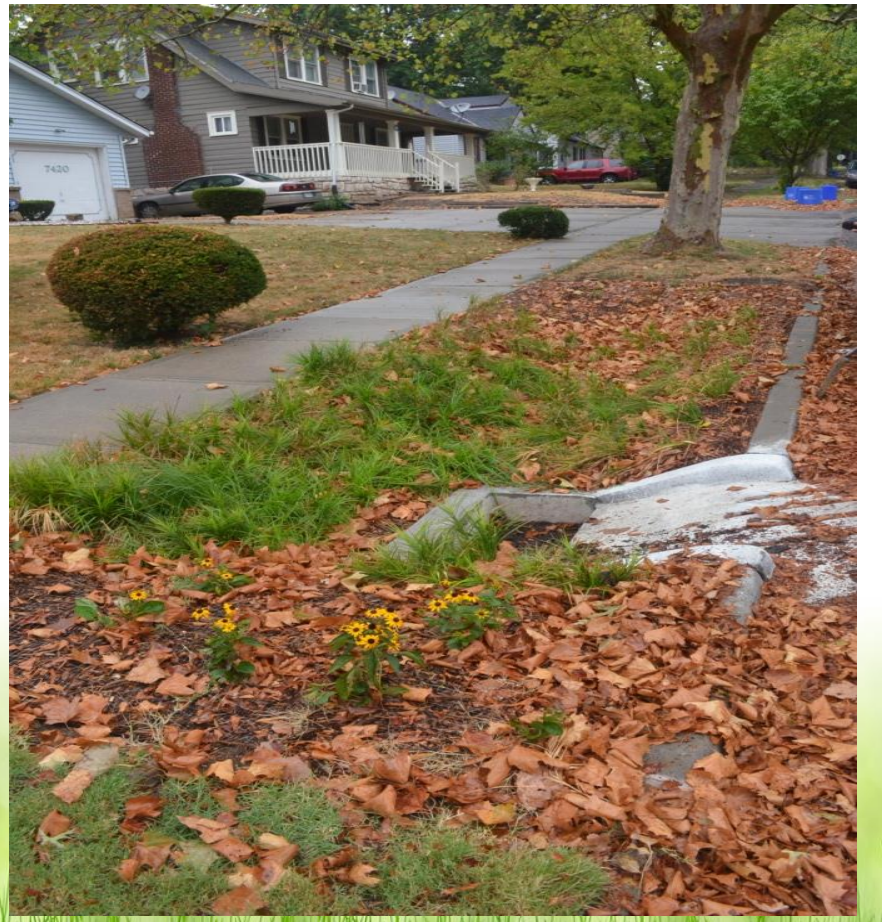
Retrofit between existing curb & sidewalk
Slow the Water Down & Innovative Plant Media

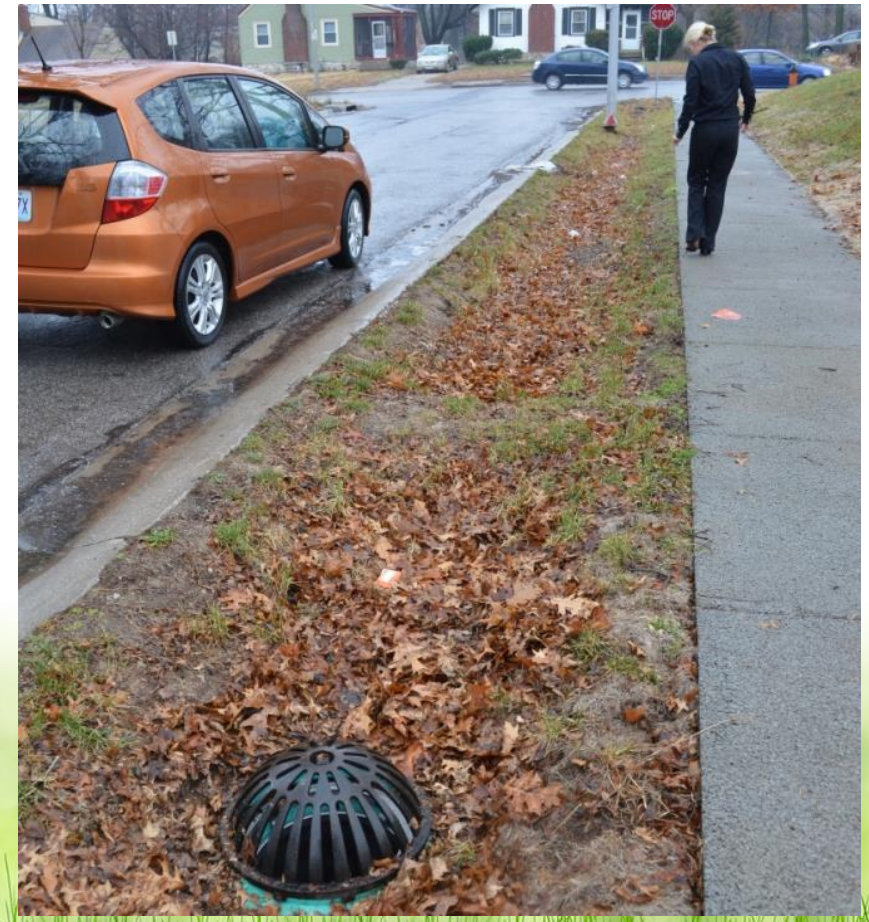
Curb Extensions

With below-grade storage



Consideration: Evaluate the Existing Conditions of the Area





Consideration: Small spaces can equal great impact

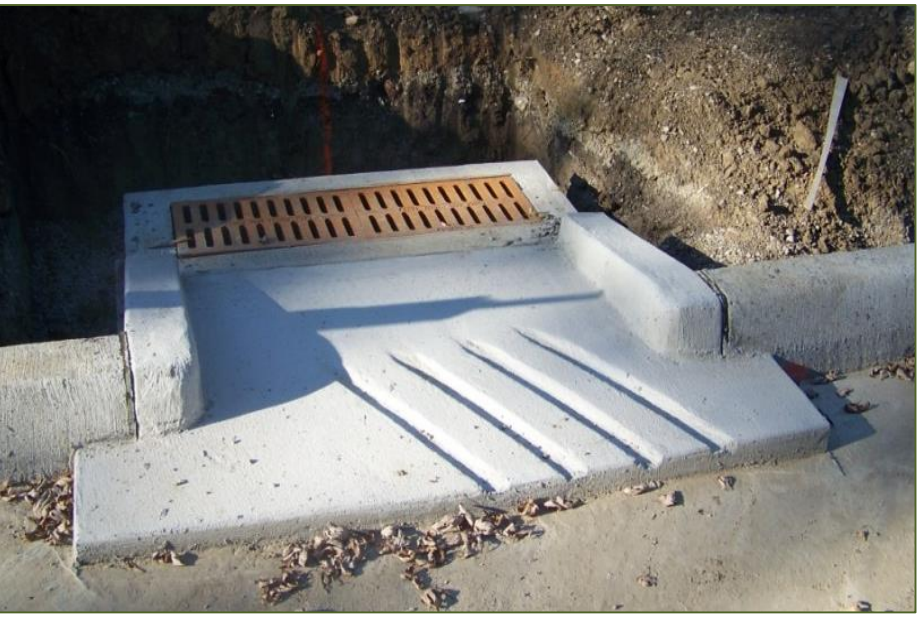
Small footprint GI Practices work if you have good infiltration

Consideration: Interconnection of Systems

Rain Garden, Gravel Parking, Bioswales, & Below Grade Storage

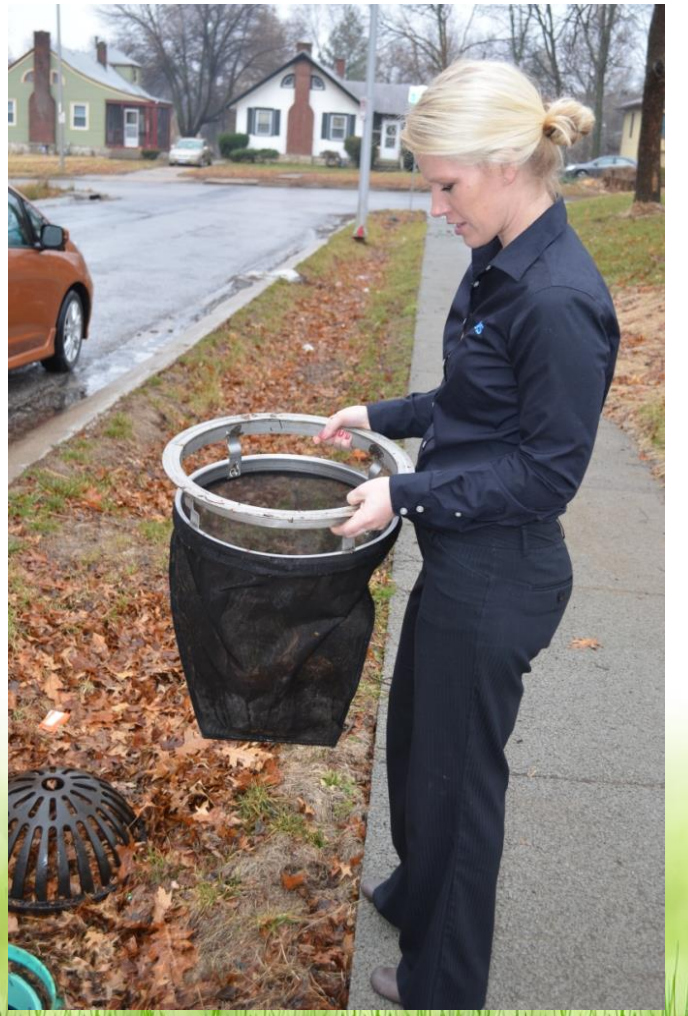
Consideration: Pilot Tested Design Details

Inlets, Fore-bays, Edging and Filter Strips



Consideration: Inlet and Outlet Designs

Inlet designs for debris management are key

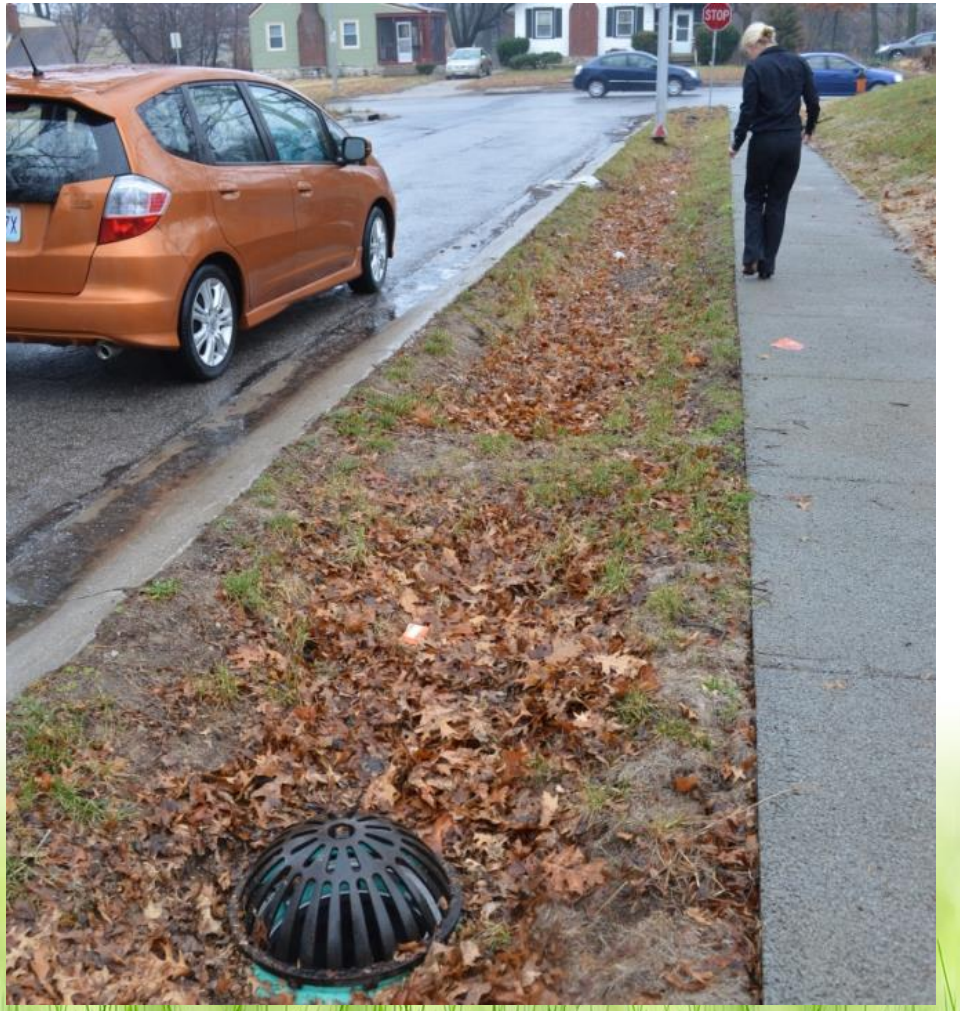


Consideration: Trash will find its way into the GI Practice

Whether at the Inlet or Outlet or Outright in your Practice

Consideration: Location & Maintenance

Leaves & debris kill grass if not cleaned



Consideration: Long-term Maintenance

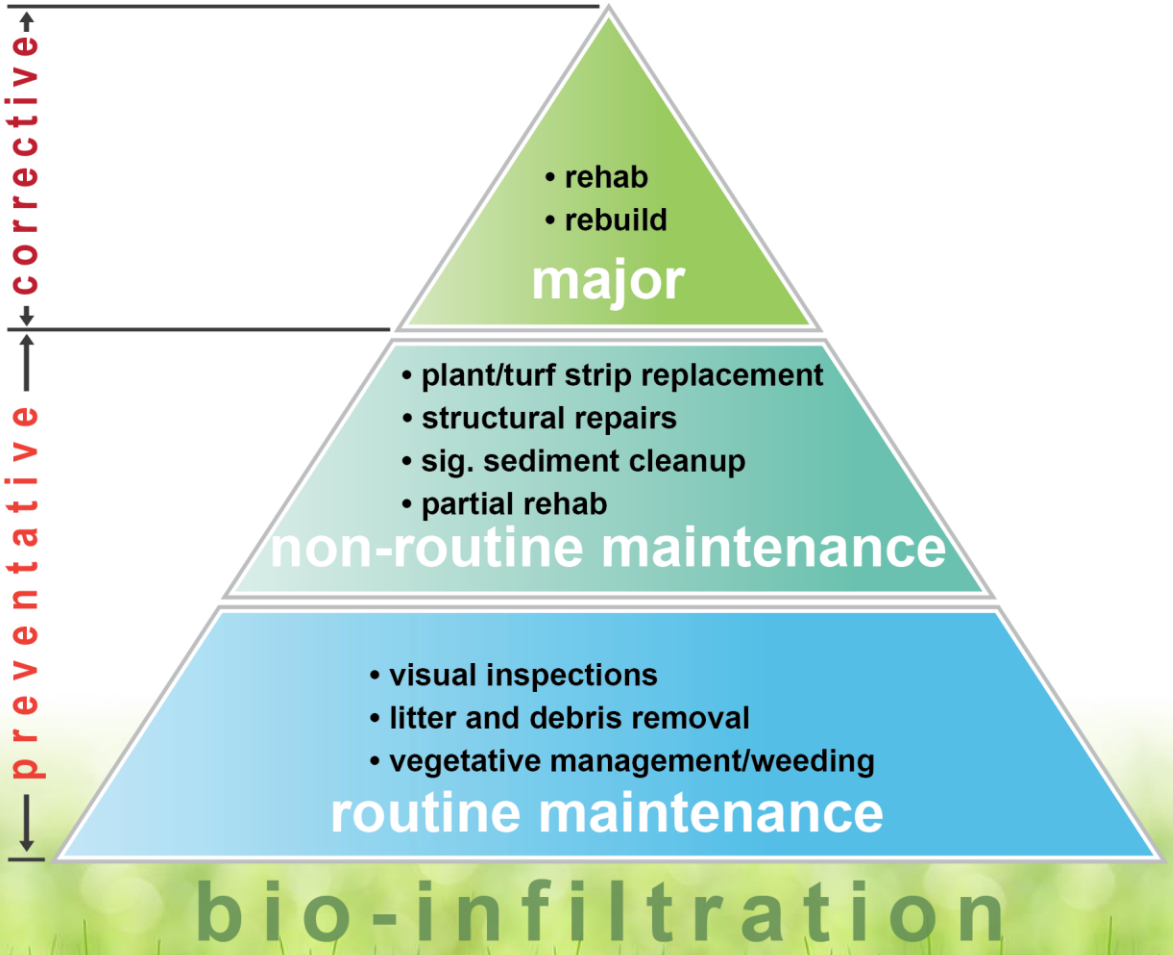
Sediment affects performance

Consideration: Winter Infiltration

Estimate 30% performance as compared to summer infiltration

Bio- Infiltration Maintenance Considerations

- Salt kills plants
- Fall Leaf Collection
- Consider all LFs
- Inspection of GI/Monitoring
- Pick Plants based on existing use
- Cold Weather Climate Functionality



Permeable Pavements –"3 P's"
Pervious, Porous and Permeable

Retrofit between existing curb & sidewalk

Articulated Concrete Block Mat

Within the ROW

Porous Asphalt

Lower Cost-Needs More Research

Pervious Concrete

Retrofit between existing curb & sidewalk

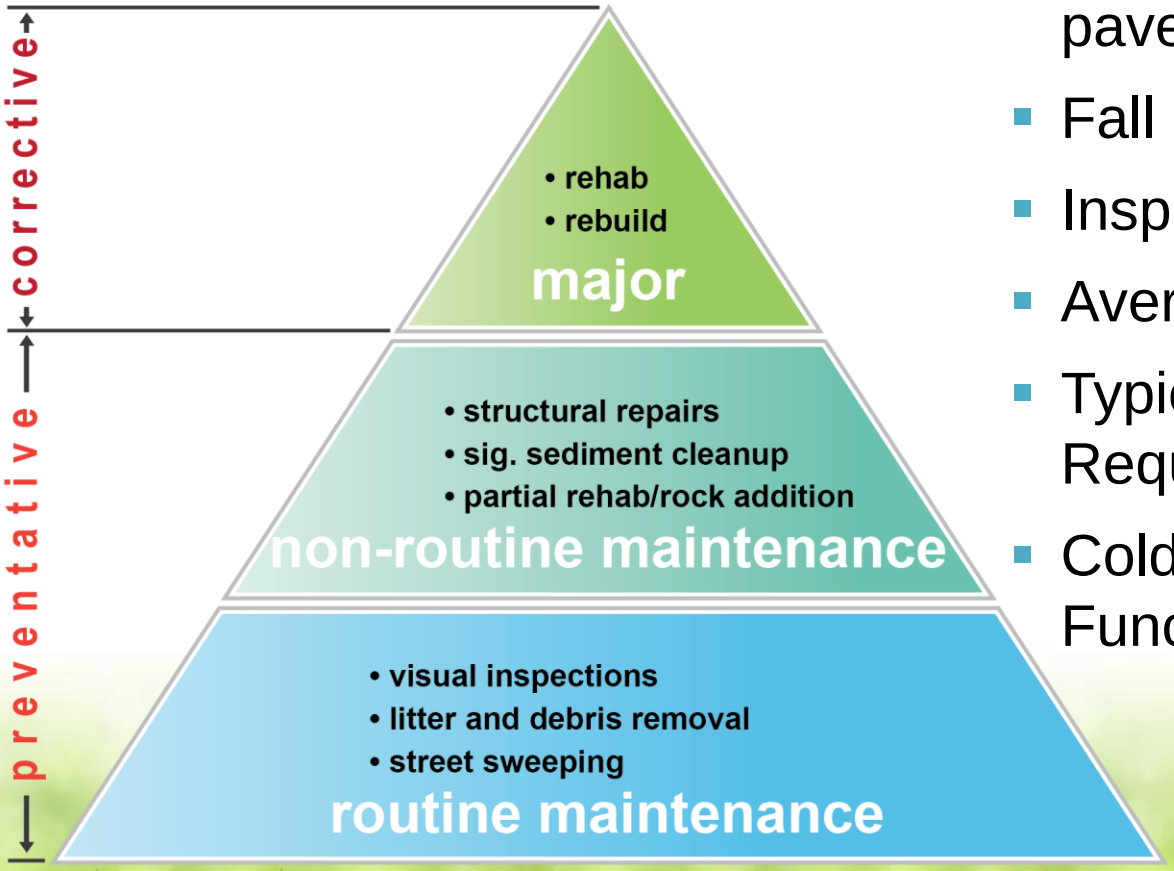
Pervious Concrete Lessons Learned

- Works well when turf grass is used in conjunction with practice
- Collector of sediment and fines
- Tends to clog and get permanently clogged in areas of high sediment and fines
- Aesthetic concerns by residents
- Can be costly
- Long term maintenance research has not be addressed

Pavement Innovations

- Cost curve coming down
- Technology Advancements are catching up
- Resiliency is the key
- Life Cycle Costs are there
- Cold Weather Climate Functionality

Pervious Pavements Maintenance Considerations



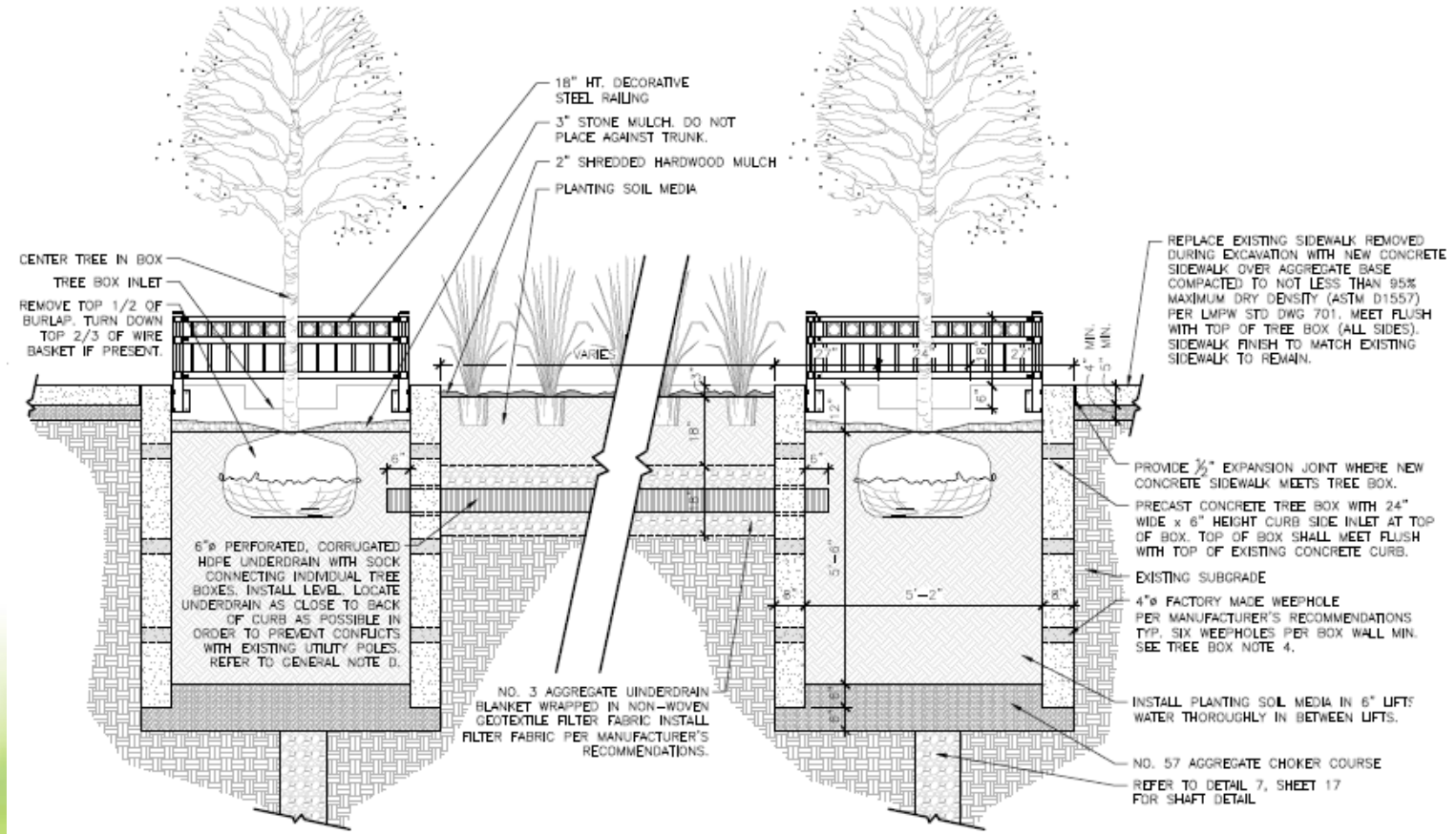
- Salt can break down pavement
- Fall Collection
- Inspection of GI/Monitoring
- Average Time Maintaining
- Typical Maintenance Required
- Cold Weather Climate Functionality

pervious pavements

Tree Boxes

Below-grade storage, multiple applications

Tree Box - Design



4 / 16 TREE BOX / 3' WIDTH PLANTING AREA WITH UNDERDRAIN: LONGITUDINAL SECTION

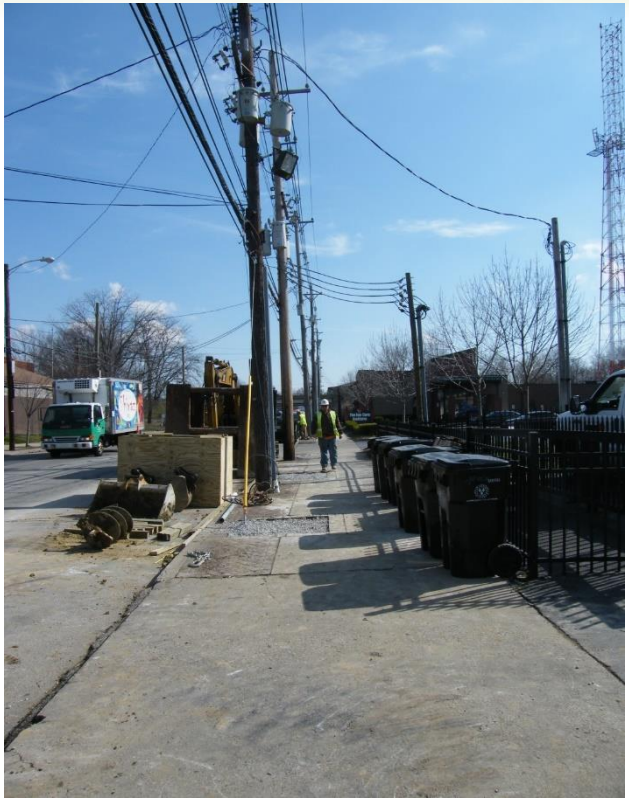
SCALE: 1/2"=1'-0"

Construction Tree Boxes

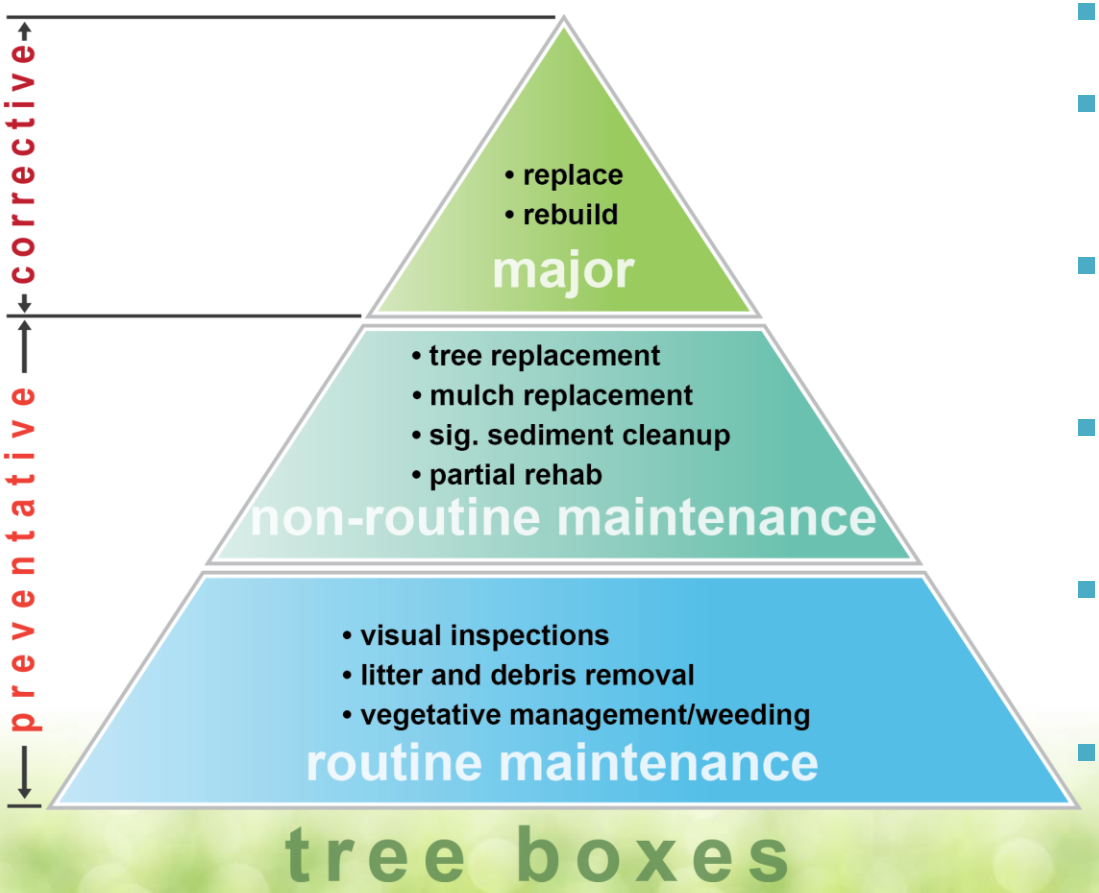
- Choosing the correct variety of tree
- Interconnected tree boxes vs. individual boxes
- Proprietary boxes vs. custom design
  - Infiltration considerations
  - Less surface area
- Media type
  - Water quality or water quantity only
- Pretreatment/trash and debris

Tree Box Lessons Learned

- Tree box is very heavy and may settle over time
- Challenging to combine level of the box with sloping sidewalk
- Need buy-in for how tree box is ADA compliant (curb, railing, grating)
- Tree boxes can be too expensive to put in unless you are doing numerous applications at a time
- Consider tree trench with visual tree box on surface



Tree Box Maintenance Considerations



- Salt Resistant Trees
- Inspection of GI/Monitoring
- Typical Urban Tree Maintenance
- Cold Weather Climate Functionality
- Cost effective only in significant numbers
- Proprietary products cost prohibitive

In Summary…

- Green does not entirely replace gray
- Be thoughtful of your current surroundings
- Green can reduce capital costs and O&M of gray technologies
- Get out from behind your computer and experience your basin
- Not all green infrastructure will work in every location
- You will run into utilities
- Design with the end in mind
- Operation and Maintenance of these practices are still evolving
- When in doubt go with something tried and true

Knowledge of infrastructure + Dedication to sustainability = Right firm for the job

Questions

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