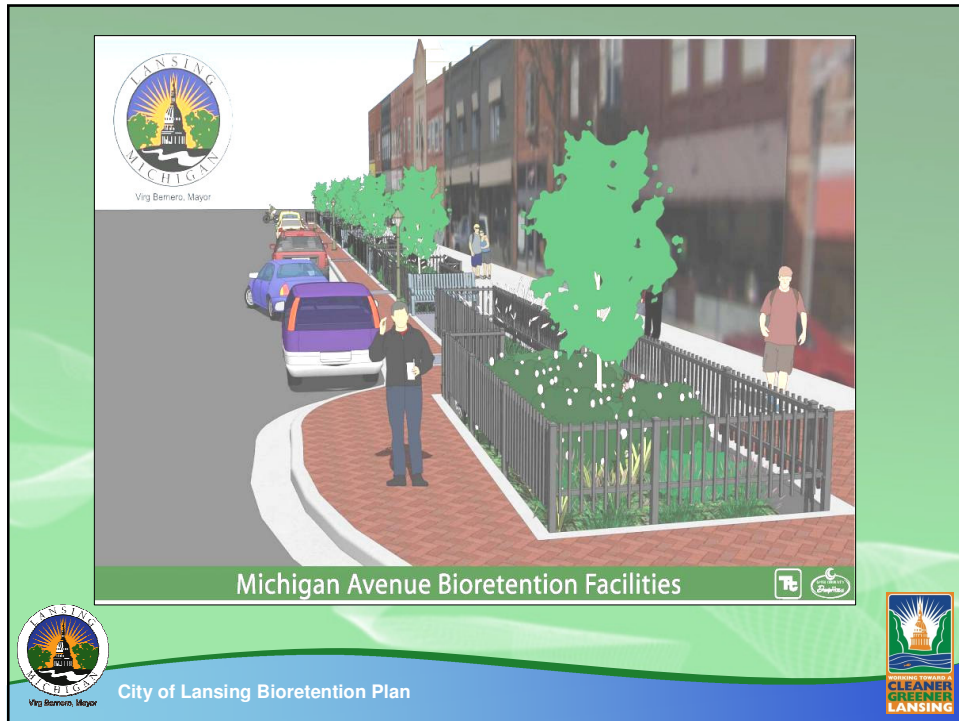




Design Challenges & Solutions

- **Public Perception**
 - Pedestrian safety and storefront access
- **Bioretention Layout**
 - Existing utilities
 - Tie-in to existing storm system
 - Existing landscaping and driveways
- **Construction Concerns**
 - *Constructability/structural and cost concerns*



City of Lansing Bioretention Plan



Design Challenges & Solutions

Plant Challenges

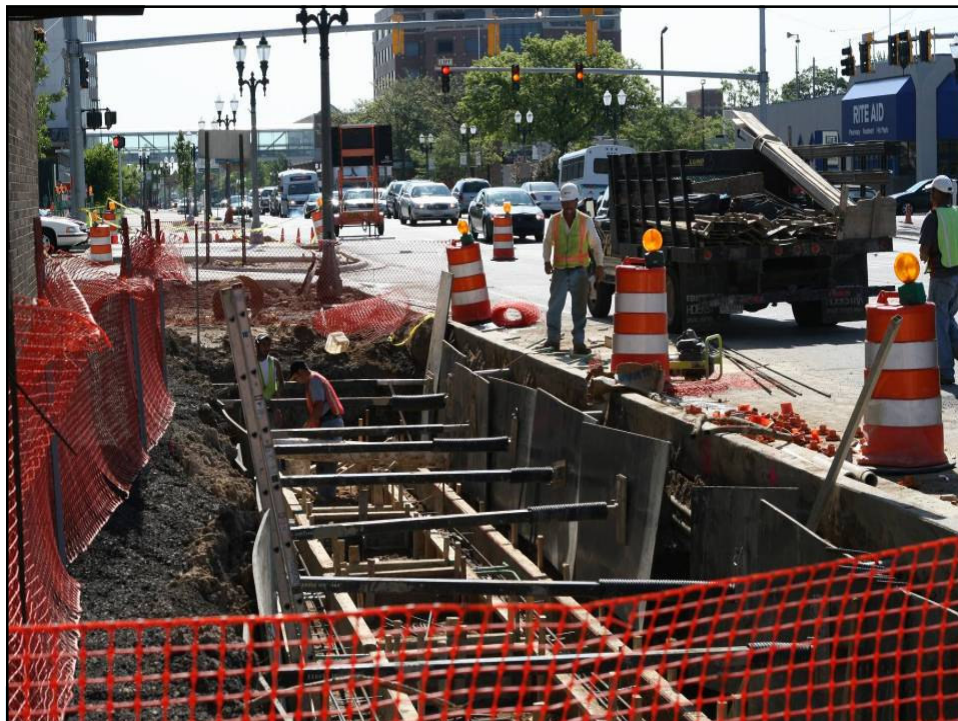
- Road Salt
- Drought / Flooding
- Shade
- Height
- Beauty
- Business Opinion

Soil Challenges

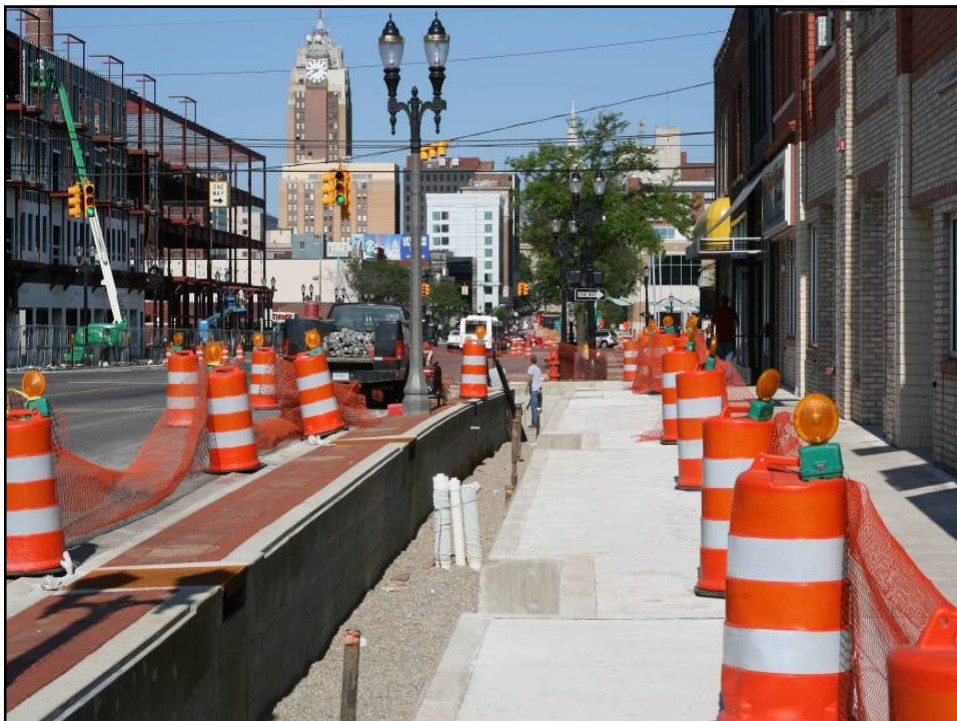
- Permeability
- Compaction
- Longevity
- Available Nutrients



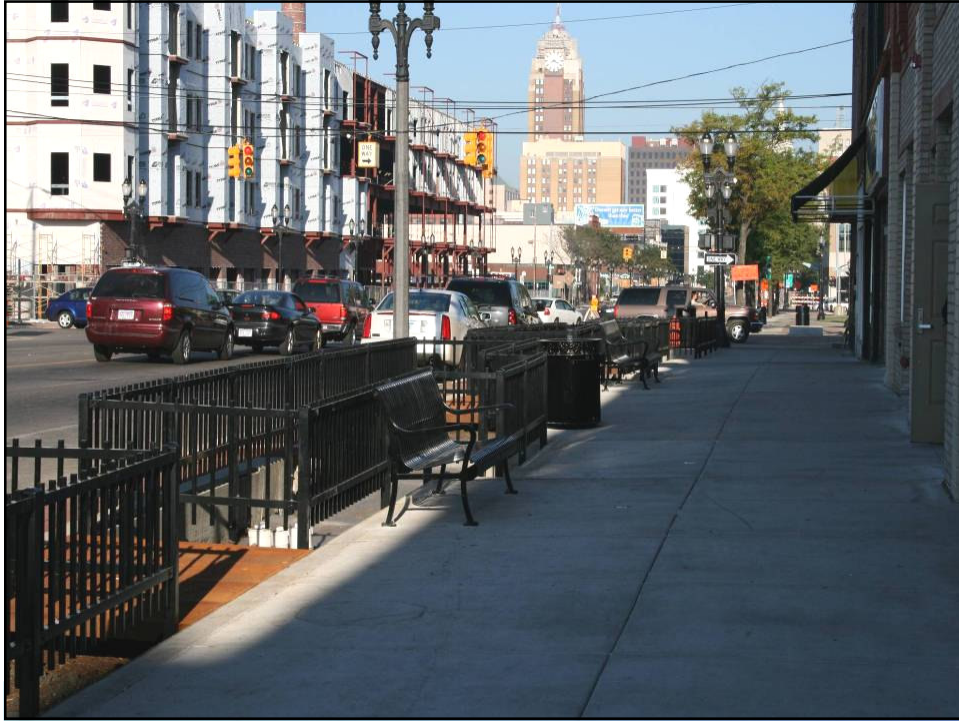
City of Lansing Bioretention Plan

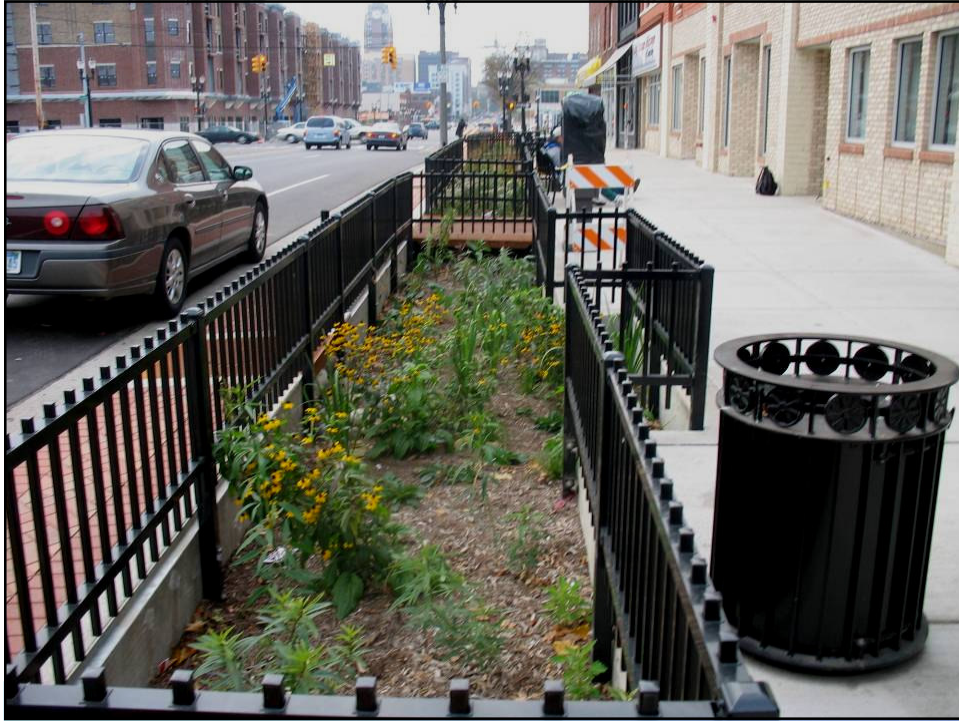












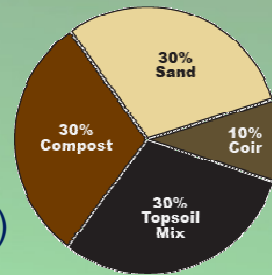






Engineered Soil Specification

- **30% Sand** (MDOT 2NS)
- **30% Topsoil**
(10% sand, 40% silt, 40% clay, 10% organics)
- **10% Coir Fiber** 
- **30% Municipal Compost**
(aged 12 months)



City of Lansing Bioretention Plan



WEEDS

It is important to weed regularly during plant establishment, as newly planted species may have a tough time competing with more aggressive weeds. The plants shown on this list are considered weeds that don't belong in the rain garden. There are many more weeds that are not shown, but these are the top 16 most common weeds to expect to encounter. Lansing: Thanks goes to Eric Hill at www.natureworks.org for helping develop this list. Please remember that weeds must be pulled by hand in the rain garden - use of any chemical product is strictly prohibited. For more details about these and other common weeds in Michigan, please visit www.natureworks.org and www.natureworks.org.

KEEPERS

Native plants may look like weeds when they pop up in the Spring, but the plants shown on this list are the "keepers" that we want in the rain garden. If you aren't sure if a plant is a weed or a keeper, check with us before starting any project. Plant names with an asterisk (*) will most likely be found under trees.

WEEDS: Wild Violet, Nodding Wild Onion, Marsh Blazing Star, Boneset, Joe-Pye Weed, Beardtongue, Ironweed.

KEEPERS: Southern Blue Flag, Tall Tickseed, Rough Blazing Star, Switch Grass, Sweet Flag, Swamp Milkweed, St. John's Wort, Rose Mallow.

cited page, all of them

- **Maintenance**
 - City of Lansing/PSD
 - “Adopt a Rain Garden”
- **Monitoring**
 - Before/After Photos
 - Trash/Debris Removed
 - Plant Health
 - Social Survey

Public Education

STORMWATER DESERVES A TREAT

Urban stormwater traditionally flows to a storm drain and enters the river without treatment. Here on Michigan Avenue, stormwater is first routed to three engineered rain gardens (bioretention areas) for treatment.

Treatment begins with the removal of trash and sediment (the most common pollutant in runoff). Stormwater then flows to the engineered rain gardens, which contain selected plants and soil that help remove pollutants. Treated stormwater not absorbed by the plants flows to an underground pipe that discharges into the Grand River.

You can help by:

- Putting cigarette butts in an ashtray, not on the street
- Telling friends about rain gardens
- Keeping your car well-maintained and leak-free

WHERE DOES RAIN GO?

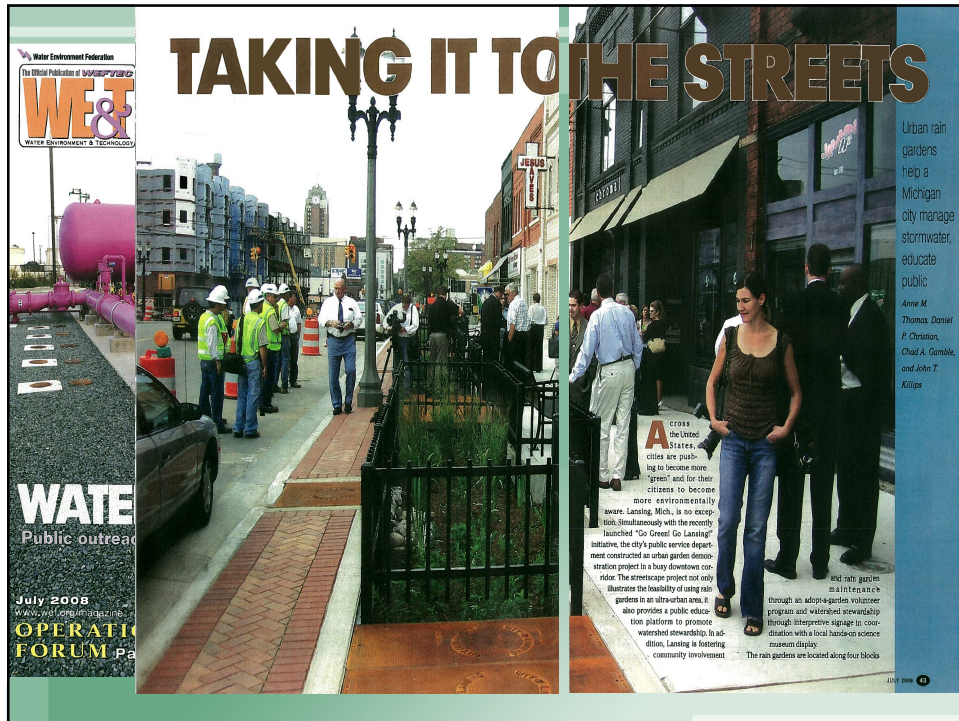
Urban landscapes are mostly hard - pavement and roofs. These are "impervious" surfaces that rain can't penetrate. When it rains, rainwater runs off these surfaces into storm drains. These storm drains lead to the Grand River.

But rain gardens can help! Rain gardens are designed to catch rainwater and let it soak into the ground. This helps to recharge the groundwater and filter out pollutants before they reach the Grand River.

A lot of rain gardens are being installed in Lansing. You can help by keeping your rain garden clean and healthy. For more information, visit www.lansing.gov.

City of Lansing
Vicki Burrows, Mayor

City of Lansing Bioretention Plan



Bid Tabulation

Retaining Wall	\$22/SF
Plants and Watering	\$4.25/SF
Engineered Soil	\$27/CY
Peastone (washed)	\$40/CY
Top Mulch	\$42/CY
Sediment Forebay	\$1700 EA
Metal Plates	\$1.40/LB

• **Bid: \$1,000,000***

• **\$122/SF**
(Ultra-urban)

• **\$30/SF**
(Without urban constraints)

*** As this was part of a larger project, the total bid cost is an estimated portion of the whole.**



City of Lansing Bioretention Plan



Lessons Learned

- Soil mixture specification
- Infrastructure age
- Grass roots support
- Working with adjacent property owners



City of Lansing Bioretention Plan

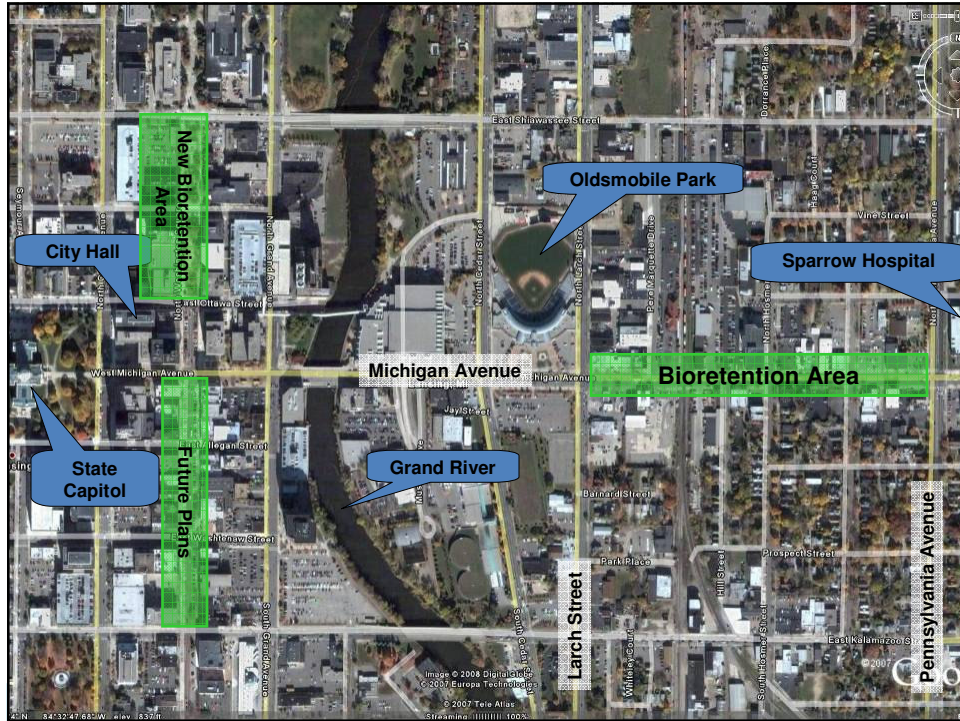


New Bioretention Areas and Future Projects



City of Lansing Bioretention Plan





Take Home Message

- Clean water is the goal, stormwater is a critical piece of the puzzle
- Large scale green infrastructure projects in ultra-urban areas are possible
- Integrate stormwater improvements with other capital improvement projects
- Use a multi-disciplinary team
 - Aesthetics, soils, plants, stormwater, maintenance, education, participation, community buy-in
- Think Outside the Pipe!
- Don't give up . . . education, education, education- *especially State Government!*



Virg Bernero, Mayor

City of Lansing Bioretention Plan



'Hibiscus moscheutos' Rose Mallow



'Clematis virginiana' Virginsbower



'Eupatorium perfoliatum' Boneset



'Liatris spicata' Marsh Blazing Star



'Aronia melanocarpa' Black Chokeberry



'Hypericum ascyron' Giant St. John's Wort



Virg Bernero, Mayor



'Iris Versicolor' Blue Flag



To learn more go to <http://gogreengolansing.com/>
or search "Lansing Rain Gardens"

