Trees as part of a Resilient Region

City of Grand Rapids
Suzanne Schulz
Design & Development – Planning, Managing Director
## GI Benefits and Practices

<table>
<thead>
<tr>
<th>Practice</th>
<th>Reduces Stormwater Runoff</th>
<th>Improves Water Treatment Needs</th>
<th>Improves Water Quality</th>
<th>Reduces Grey Infrastructure Needs</th>
<th>Reduces Flooding</th>
<th>Increases Available Water Supply</th>
<th>Increases Groundwater Recharge</th>
<th>Reduces Salt Use</th>
<th>Reduces Energy Use</th>
<th>Improves Air Quality</th>
<th>Reduces Atmospheric CO₂</th>
<th>Reduces Urban Heat Island</th>
<th>Improves Community Livability</th>
<th>Improves Aesthetics</th>
<th>Increases Recreational Opportunity</th>
<th>Reduces Noise Pollution</th>
<th>Improves Community Cohesion</th>
<th>Improves Urban Agriculture</th>
<th>Improves Habitat</th>
<th>Cultivates Public Education Opportunities</th>
</tr>
</thead>
</table>

- **Yes**: Benefit is present
- **Maybe**: Benefit is somewhat present
- **No**: Benefit is absent
Why Trees are Important

- Reduces Stormwater Runoff
- Increases Groundwater Recharge
- Reduces Atmospheric CO2
- Reduces Energy Use
- Improves Air Quality
- Reduces Urban Heat islands
- Improves Habitat
- Improves Community Livability
- Green Cities: Good Health

http://depts.washington.edu/hhwb/
Urban Forestry Committee

- Advisory group established by the Mayor, original response to the Emerald Ash Borer crisis
- Advocate & Awareness for trees
  - Tree City U.S.A
  - Mayor’s Tree of the Year
- Secure Grant Funding
- Initiate various studies (canopy coverage, tree sampling), review plans/policies/ordinances
- Created Urban Forest Plan, 2009 (update 2016)
- Partners in The Urban Forest Project (inventory, educate citizen foresters, advocate, and build awareness)
Strategies

• Plant new trees
  • Identify Locations
  • City vs. private
  • Soil volume
  • Right tree right place

• Grow Trees to Maturity
  • Inventory
  • Maintenance

• Protect existing trees
  • Zoning Ordinance
  • Root protection zones
  • Sidewalk replacement specifications
Trees to Maturity

• Asset Inventory

• Identify Existing and Potential Conflicts
  o Utilities- Above & Below
  o Sidewalks
  o Traffic

• Horticultural Necessities
  o Soil, Water, Nutrients

• Proactive Maintenance
Three Canopy Studies to Date:
- Rod Denning (GVSU) 2008
- Plan-it Geo 2015
- iTree Hydro 2016

Grand Rapids Canopy
- 2008 – 34.6%
- 2015/16 – 34%

Complete Street Tree Inventory Underway

34%
Average (UTC) in Grand Rapids
$2.64 million*
Annual Ecosystem Services
-0.7%
Percentage Point UTC Change from 2005-2014
7,032
Acres Possible Planting Area
1,640
Acres Increase Needed to Meet 40% UTC Goal
Green Grand Rapids: Greening

- Increase the tree canopy to 40%
- Improve built (gray) infrastructure performance with green
- Shade for disadvantaged populations
b. Protect/expand the urban forest canopy.

- Endorse Urban Forestry Committee 40% citywide canopy goal.
- Develop an inventory of existing trees as the basis for a detailed planting and management plan.
- Establish sub-area canopy targets; prioritize improvements.
- Enhance tree preservation and landscape ordinance requirements and incentives.
- Augment Urban Forestry Department resources.
- Encourage private revegetation efforts in already built areas through education and incentives.
- Improve the viability of newly planted trees by increasing home owner education.
Urban Forest by Neighborhood Type and Zoning Map

- Mid-Century Neighborhoods (46.86%)
- Modern Neighborhoods (42.88%)
- Special Districts (30.34%)
- Traditional Neighborhoods (30.15%)
- Right-of-Way (23.59%)
Urban Forest Canopy: Goal Setting

• Established cover goals by zoning type to meet **40% city-wide goal**.
• Trees / acre (based on Seattle study)
• “Burden” refers to the proportion of new trees a zoning type contributes to the overall goal.
• Cover goals from American Forest recommendations by land use.

<table>
<thead>
<tr>
<th>Use Type</th>
<th>% Cover</th>
<th>Cover Goal</th>
<th>% Increase</th>
<th>New Acres</th>
<th>Burden</th>
<th>Tree/Acre</th>
<th># of trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transitional City Center</td>
<td>8.34%</td>
<td>15.00%</td>
<td>79.96%</td>
<td>46.74</td>
<td>3.04%</td>
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<td>9.19%</td>
<td>15.00%</td>
<td>63.23%</td>
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<td>22.87%</td>
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<td>4.07%</td>
<td>15.00%</td>
<td>268.50%</td>
<td>40.57</td>
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<td>19.93</td>
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<td>Open Space</td>
<td>44.22%</td>
<td>60.00%</td>
<td>35.68%</td>
<td>321.37</td>
<td>20.90%</td>
<td>225</td>
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<td>Neighborhood Office Service</td>
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<td>27.00%</td>
<td>2.07%</td>
<td>2.27</td>
<td>0.15%</td>
<td>100</td>
<td>227.03</td>
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<td>Industrial - Transportation</td>
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<td>15.00%</td>
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<td>ROW</td>
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<tr>
<td>Commercial</td>
<td>6.50%</td>
<td>15.00%</td>
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<td>8.02%</td>
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<td>194.25</td>
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<td>10446.46</td>
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<tr>
<td>Commercial</td>
<td>16.47%</td>
<td>17.00%</td>
<td>3.22%</td>
<td>1.17</td>
<td>0.08%</td>
<td>130</td>
<td>152.33</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Acres to Plant</th>
<th>1537.30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees to Plant</td>
<td>184418.26</td>
</tr>
</tbody>
</table>
i-Tree Hydro Study Area
### Core City Sub-Watersheds

<table>
<thead>
<tr>
<th>Cover Scenario</th>
<th>Annual Impervious Runoff (m$^3$)</th>
<th>% Change from Current</th>
<th>Olympic Sized Swimming Pools</th>
<th>Monetary Estimation*</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Cover</td>
<td>22,474,718</td>
<td>76%</td>
<td>8,996</td>
<td>$2,382,320,000</td>
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<tr>
<td>Current Cover (34%)</td>
<td>12,786,591</td>
<td>0</td>
<td>5,118</td>
<td>$1,355,379,000</td>
</tr>
<tr>
<td>40% Cover</td>
<td>11,077,599</td>
<td>-13%</td>
<td>4,434</td>
<td>$1,174,225,000</td>
</tr>
</tbody>
</table>

### Plaster Creek Impervious Flow Comparisons

![Bar chart comparing impervious flow for different cover scenarios in Plaster Creek watersheds.](chart)

*Monetary estimation based on the assumption of Olympic-sized swimming pools.*
Protect Existing Trees
Tree Space Design
Growing the Tree Out of the Box
Zoning as a Mechanism

Goals:

• Support achievement of the community’s 40% canopy goal
• Revise language to reflect how ordinance is applied
• Develop policies to support planting and retention
• Maximize tree health and longevity
• Strengthen tree species diversity
• Provide clear, unambiguous directions and education

♦ Plant ♦ Grow ♦ Protect
Article 11 Landscaping and Green Infrastructure

- Purpose and Intent:
  - Quality of Life
  - Resiliency
  - Economic Impact
  - Stormwater Impact
  - Human Health
  - Tree Canopy
  - Community Priorities

- Human Health: Decrease urban heat island effect on vulnerable populations, increase opportunity for physical activity by using shade to improve pedestrian comfort, improve air quality for asthmatic persons, and offer connections to nature to reduce stress.
Zoning Requirements: Plant

- Changed tree replacement requirements:
  - 2:1 now, changed to caliper basis with iTree
  - Payment in lieu allowed

- Mixture of tree species:
  - No more than 33% of any single tree genus
  - At least 50% of tree plantings shall be native to Michigan
Zoning Requirements: Plant

- Existing single-family and two-family lots excluded from requirements.
- Minimum canopy coverage calculated by lot, percent goals by Zone District and pre-development percentage for large sites determined by Urban Tree Canopy Analysis Map (2015).
- Canopy shall be distributed throughout the site.
Credit for existing vegetation and its contribution to tree canopy percentage; including unaccredited species.

Credit for young vegetation if planted within 36 months.

Credit for street tree canopy.

Administrative Departure allowed up to 33% for using green roofs, permanent planters, and vegetated walls.
Zoning Requirements: Plant

- Parking lot screening and streetscape req’s the same.
- Interior landscape standards are modified:
  - Parking lot with 15 or > vehicles shall have 1 tree for every 15 spaces or fraction thereof.
  - Three different tree planting methods that may be used singly or in combination:
    - Open soil landscape islands with minimum area of 250 sq ft
    - Covered soil landscape areas, specifically designed to accommodate tree root growth
    - Open soil and covered soil planting hybrids connected to green space with root paths.
Zoning Requirements: Grow

- Minimum required soil volume
- Credit given for contiguous/shared areas, structural soil, and soil cells

<table>
<thead>
<tr>
<th>Plant Material</th>
<th>Minimum Plant Size</th>
<th>Spacing</th>
<th>Soil Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canopy/Shade Trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>1.5 in caliper</td>
<td>25 ft on-center</td>
<td>250 cu ft</td>
</tr>
<tr>
<td>Medium</td>
<td>2.5 in caliper</td>
<td>35 ft on-center</td>
<td>500 cu ft</td>
</tr>
<tr>
<td>Large</td>
<td>2.5 in caliper</td>
<td>45 ft on-center</td>
<td>750 cu ft</td>
</tr>
</tbody>
</table>
Tree and Root Protection Plan required, including methods and details for protection during construction as part of LUDS permit.

Tree Protection Plan
- Identifies trees to be conserved. The plan shall minimize the loss of soil and roots that would compromise the health and stability of trees; including compaction, water diversion, and soil structure damage.

Tree Protection Zone
- A TPZ shall be established around the drip line of the trees and established prior to any excavation, grading, boring, and demolition and remain in place for the duration of the project.
Zoning Requirements: Protect

- Critical Root Zone shall include any tree roots present on the property to be disturbed, including roots from adjacent properties.
- No more than 33% of a single tree’s Critical Root Zone shall be disturbed within the TPZ. If more than 33% is disturbed, then the tree shall not count towards minimum canopy requirements.
- Damage to trees during construction shall be mitigated. If it is determined to be lethal, the tree shall be replaced. Removal of 25% of leaf surface shall be considered removal.
- Tree replacement shall be on an inch by inch basis for equivalent caliper. Must achieve same canopy benefit.
Water Protection

- **Water Protection intent:**
  - Provide flood control, reduce pollution, maintain and enhance water quality, provide fish and wildlife habitat, and preserve open space.

- **Protection area:**
  - 75’ setback required from edge with waivers.
  - Grading, removal of vegetation, new structures and paving are not permitted.
  - Plantings must be native species.
  - Permitted trees near water features, which count towards canopy but can also apply to stormwater uptake: black walnut, willow, cottonwood, popular, aspen, catalpa, slippery elm.
Steep Slopes

- Steep Slopes: Slopes of 20% or greater are protected. Grading or removal of vegetative cover shall not be permitted.

- Clustered Development: Significant slopes and ridgelines shall be maintained in their natural state by clustering development.
Vital Streets

- Complete Streets + Green Infrastructure approach
- Expand areas for street trees and landscaping for water capture.
Water Quality Islands

How they work

This graphic illustrates the secret to how Water Quality Islands, like those installed on Plainfield Avenue NE, function to improve water quality in the Grand River.

1. Rain from the street is directed to the island and dispersed here.
2. Plants and soils filter and absorb rainwater.
3. The overflow of water in the island travels to this drain.
4. Excess water permeating the soil makes its way here via this underdrain.
5. Final soil filtration and absorption takes place at this catch basin.
6. Excess water in the basin flows to the storm sewers and into the Grand River.

Benefits of the Plainfield Islands

Economic
- Enriches the neighborhood
- Triggers additional investments
- Increases property values

Social
- Enhances pedestrian safety through traffic calming and increases driver awareness
- Heightens community pride
- Provides inspiration for social responsibility

Environment
- Filters out pollutants and keeps them from the Grand River
- Reduces the volume of water going to the river and decreases flooding
- Slows the velocity of water flowing to the river and minimizes erosion
Identified as an “area in need of change” by neighborhood
Thank You!