The Fractured Water Cycle: The Problem - The Solutions

John Jackson,
Greater Lakes Project Manager

October 14, 2015
The Greater Lakes Project
The Problem

In urban areas, we have fractured water systems that disrupt natural water flows.
The Natural Water Cycle

40% Evapotranspiration

10% Runoff

50% Deep & Shallow Infiltration

Natural Ground Cover

Credit Valley Conservation
Urban Hydrology

Typical development: Stormwater management using End of Pipe SWM Pond

- 35% evapotranspiration
- 30% runoff
- 20% shallow infiltration
- 15% deep infiltration

30-50% impervious cover

SWM Pond delays and treats runoff but does not control increase in runoff volume.
Reconnecting the Water Cycle

Key:
- natural state
- altered state
Reconnecting the Great Lakes Water Cycle
Take Actions towards Integrated Water Management

- Set up strong source water protection programs on watershed basis
- Engage in water efficiency and conservation
- Set up waste water reuse systems
- Use drinking-water quality water only for uses that require that level of purity
- Reduce impervious surfaces so that water can infiltrate into the ground
• Treat green and grey infrastructure as one system
• Set up cistern and rainbarrel systems to capture stormwater for indoor and outdoor uses
AWE Water Conservation Tracking Tool:
Planning and Evaluating Cost-Beneficial Water Conservation Programs

Bill Christiansen, Program Planner
william@a4we.org
www.allianceforwaterefficiency.org
Components of Benefit-Cost Analysis

**Inputs**
- Demographic data
- Weather data
- Customer utility rates
- Water demand forecast
- Avoided utility costs
- Efficiency program information
- Energy data

**Outputs**
- Water savings
- Costs and benefits
- Impact to revenue and rates
- Greenhouse gas and energy reductions
What are Example Benefits Associated with Water Conservation Programs?

• Short-term
  – Water purchase costs (if supplied by wholesaler)
  – Variable water treatment costs
    • Energy costs related to pumping and treatment
    • Chemical costs

• Long-term
  – Avoid, Defer, and/or Downsize Expansion Projects
# Guelph, ON Costs and Benefits

<table>
<thead>
<tr>
<th>Activity Name</th>
<th>PV Cost ($)</th>
<th>PV ($) Benefit</th>
<th>NPV ($)</th>
<th>B/C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Flush Toilet Rebate, SF</td>
<td>$1,676,300</td>
<td>$12,068,155</td>
<td>$10,391,855</td>
<td>7.20</td>
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<tr>
<td>Royal Flush Toilet Rebate, MF</td>
<td>$525,400</td>
<td>$2,534,944</td>
<td>$2,009,544</td>
<td>4.82</td>
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<td>Royal Flush Toilet Rebate, ICI</td>
<td>$55,800</td>
<td>$441,405</td>
<td>$385,605</td>
<td>7.91</td>
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<tr>
<td>Smart Wash Washing Machine Rebate</td>
<td>$1,333,250</td>
<td>$4,806,374</td>
<td>$3,473,124</td>
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<tr>
<td>Blue Built Home - Bronze</td>
<td>$329,280</td>
<td>$545,126</td>
<td>$215,846</td>
<td>1.66</td>
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<tr>
<td>Blue Built Home - Silver</td>
<td>$15,900</td>
<td>$21,487</td>
<td>$5,587</td>
<td>1.35</td>
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<tr>
<td>Greywater Reuse Systems</td>
<td>$21,000</td>
<td>$3,157</td>
<td>$(17,843)</td>
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<tr>
<td>ICI Audit and Capacity Buyback Program</td>
<td>$967,395</td>
<td>$12,323,719</td>
<td>$11,356,324</td>
<td>12.74</td>
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<tr>
<td>Rainwater Harvesting System</td>
<td>$50,000</td>
<td>$7,264</td>
<td>$(42,736)</td>
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<td>Healthy Landscape Visit</td>
<td>$368,970</td>
<td>$36,022</td>
<td>$(332,948)</td>
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<tr>
<td>Efficient Home Visit Surveys (GEL/NetZero City)</td>
<td>$229,505</td>
<td>$24,127</td>
<td>$(205,378)</td>
<td>0.11</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$5,572,800</strong></td>
<td><strong>$32,811,780</strong></td>
<td><strong>$27,238,980</strong></td>
<td><strong>5.89</strong></td>
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</tbody>
</table>
# Oakland County, Michigan Costs and Benefits

<table>
<thead>
<tr>
<th>Activity Name</th>
<th>Commerce</th>
<th>Lyon</th>
<th>SW Oakland</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B/C Ratio</td>
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<td>B/C Ratio</td>
</tr>
<tr>
<td>Residential High-Efficiency Toilet Rebates</td>
<td>13.57</td>
<td>1.42</td>
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<tr>
<td>Residential High-Efficiency Clothes Washer Rebates</td>
<td>2.84</td>
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<td>Residential Efficient Irrigation Nozzle Replacements</td>
<td>0.51</td>
<td>0.09</td>
<td>0.09</td>
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<td>Residential Irrigation ET Controller Rebates</td>
<td>1.22</td>
<td>0.20</td>
<td>0.21</td>
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<tr>
<td>Residential Soil Moisture Sensor – Targets High Water Users</td>
<td>3.08</td>
<td>0.69</td>
<td>0.83</td>
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<td>Large Landscape Surveys</td>
<td>4.27</td>
<td>0.74</td>
<td>0.77</td>
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<tr>
<td>Large Landscape Irrigation Controller Rebates</td>
<td>3.94</td>
<td>0.64</td>
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<td><strong>Total</strong></td>
<td><strong>7.22</strong></td>
<td><strong>0.75</strong></td>
<td><strong>0.97</strong></td>
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</tbody>
</table>
2010 Total Water Consumption by Quarter (MG)

Lyon Township (PF = 2.42)
SW Oakland Township (PF = 3.32)
Commerce Township (PF = 1.91)