Introduction to the Watershed Treatment Model (WTM)

The Need

There is no simple way to track the full range of management options in urban watersheds.
The Watershed Treatment Model

Deb Caraco, Center for Watershed Protection
Paula Smith, Monroe County DES
About the Center for Watershed Protection

Non-profit 501(c)3, non-advocacy organization
Work with watershed groups, local, state, and federal governments
Provide tools communities need to protect streams, lakes, and rivers
Over 20 staff in MD, VA, NY

www.cwp.org
What is the WTM?

- A simple, spreadsheet model for the rapid assessment of watershed treatment options
- Annual output
  - Pollutant loads (lbs/acre)
  - Bacteria Loads (MPN/yr)
  - Runoff Volume (acre-ft/yr)
WTM Terminology

- Primary Sources
- Secondary Sources
- Management Practices
- Discount Factors
Primary Sources

• Determined entirely from land use/cover
  - Residential
  - Commercial
  - Industrial
  - Forest
  - Rural
Secondary Sources

• Cannot be calculated solely by land use

• Examples
  - CSOs, SSOs
  - Septic Systems
  - Channel Erosion
Types of Management Practices

- **Structural:**
  - ponds, swale, LID etc.
- **Non-Structural:**
  - street sweeping, downspout disconnect, buffers
- **Programmatic:**
  - lawn and pet waste education, etc
Discount Factors

• Ideal load reductions can rarely be achieved
  - Lack of space
  - Imperfect practice application
  - Inability of programs to be completely effective

• Discount factors "discount" load reductions to account for less than perfect application of practices.
Example: Erosion and Sediment Control (ESC)

Base Conditions

• Load from “uncontrolled” construction is 1000 lb TSS/year
• Practices can achieve 70% effectiveness (base efficiency), or 700 lb/year
ESC Discount Factors

*BUT*...

- Only 80% of Sites are Regulated...
  Down to $0.8 \times 700$, or 560 lbs/year

- A combination of poor installation and maintenance reduces practice implementation/effectiveness by 25%
  Down to $0.75 \times 560$, or 420 lbs/year
Key Updates in the 2010 WTM

- Evaluates turf and septic systems in more detail
- Runoff is based on both pervious and impervious surfaces
- More user input guidance on-screen
- More detailed breakdown of surface/subsurface flows
- Revised estimates for benefits of septic systems, lawn care, and stormwater retrofit practices
A Few WTM Details

- Model Structure
- Some Data Entry Tips and Rules
- Ongoing WTM Updates

The (Tasmanian) Devil’s in the Details
Step 1. Calculate Existing Pollutant Loads

Primary Sources + Secondary Sources - Existing Management Practices = Existing Loads

Step 2. Apply “Future” Management Practices


Retrofit Worksheet → Stream Restoration Worksheet

Step 3. Account for Future Growth

Loads with Future Management Practices + New Development = Loads with Future Growth

Future Land Use
Spreadsheet “Tabs”

Step 1:
1a. Primary Sources
1b. Secondary Sources
1c. Existing Management Practices
1d. Existing Loads

Step 2:
2a. Future Management Practices
2b. Retrofit Worksheet
2c. Stream Restoration Worksheet
2c. Load with Future Management Practices

Step 3:
3a. Future Land Use
3b. New Development
3c. Loads With Future Growth
Data Entry: The WTM is Color-Coded!

Green (Cells and Tabs) require user input
Blue Cells are defaults the user can override
Grey Cells should not be modified
Purple (Cells and Tabs) represent Final Outputs

<table>
<thead>
<tr>
<th>Pet Waste Education</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Program in Place?</td>
<td>yes</td>
</tr>
<tr>
<td>Both</td>
<td></td>
</tr>
<tr>
<td># of dwelling units</td>
<td></td>
</tr>
<tr>
<td>Fraction of Households with a Dog</td>
<td>Enter Value</td>
</tr>
<tr>
<td>Owners who Walk their Dogs (fraction)</td>
<td>40%</td>
</tr>
<tr>
<td>Owners who Clean Up (fraction)</td>
<td>50%</td>
</tr>
<tr>
<td>Fraction willing to change behavior</td>
<td>60%</td>
</tr>
<tr>
<td>Awareness of Message (Fraction of Population)</td>
<td>Enter Value</td>
</tr>
</tbody>
</table>

Use Local Data if Available
## Erosion and Sediment Control

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Efficiency</td>
<td>70%</td>
</tr>
<tr>
<td>% of Building Permits Regulated</td>
<td>0%</td>
</tr>
<tr>
<td>Sedation/Maintenance Discount</td>
<td>0.0</td>
</tr>
</tbody>
</table>

### Sweeper Type

<table>
<thead>
<tr>
<th></th>
<th>Streets</th>
<th>Resid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Regenerative Air</td>
<td>0.5</td>
<td>0.9</td>
</tr>
</tbody>
</table>

*Accounts for ESC Program:
- Few inspectors, no pre-construction meeting
- Inspectors visit monthly; pre-construction for larger sites
- Inspectors visit weekly, contractor education, pre-construction meeting for most sites*
A Few Data Entry Tips

- Keep a copy of the original (unmodified) for future watershed plans.
- At cells with a pull-down menu, you cannot override the options.
- Make sure you scroll over completely. On some screens (especially the Retrofit Worksheet), data entry cells may not be visible immediately.
Shipbuilders Creek Stormwater Assessment and Action Plan

Prepared by: Monroe County
Department of Environmental Services
444 E. Henrietta Rd.
Rochester, NY. 14623

Assessing Restoration Potential in Shipbuilders Creek
Monroe County NY
Watersheds In Monroe County NY

- Shipbuilders Creek Watershed
- Rochester
- Lake Ontario
Urban Storm Sewershed
Land Use

- Export GIS parcel data and sort by property class
<table>
<thead>
<tr>
<th>Land Cover</th>
<th>Subwatershed D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>2.38%</td>
</tr>
<tr>
<td>Forest</td>
<td>30.67%</td>
</tr>
<tr>
<td>Wetland</td>
<td>1.22%</td>
</tr>
<tr>
<td>Impervious</td>
<td>17.49%</td>
</tr>
<tr>
<td>Grass</td>
<td>17.02%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>24.71%</td>
</tr>
<tr>
<td>Bare Earth</td>
<td>6.52%</td>
</tr>
<tr>
<td>Total Percent</td>
<td>100.00%</td>
</tr>
</tbody>
</table>
Tracking Pollutants of Concern

- Stream impacts from urban land use and channelization
- Upland contributions from hotspots and large impervious areas
## Summary of Existing Loads

<table>
<thead>
<tr>
<th>Source</th>
<th>TN (lb/year)</th>
<th>TP (lb/year)</th>
<th>TSS (lb/year)</th>
<th>Fecal Coliform (billion/year)</th>
<th>Runoff Volume (acre-feet/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Land</td>
<td>25,811</td>
<td>5,386</td>
<td>528,257</td>
<td>911,525</td>
<td>47,718</td>
</tr>
<tr>
<td>Active Construction</td>
<td>139</td>
<td>28</td>
<td>94,508</td>
<td>-</td>
<td>88</td>
</tr>
<tr>
<td>SSOs</td>
<td>386</td>
<td>64</td>
<td>2,572</td>
<td>291,960</td>
<td>-</td>
</tr>
<tr>
<td>Illicit Discharges</td>
<td>398</td>
<td>96</td>
<td>2,846</td>
<td>256,238</td>
<td>-</td>
</tr>
<tr>
<td>Channel Erosion</td>
<td>919</td>
<td>873</td>
<td>229,764</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rural Land</td>
<td>1,352</td>
<td>288</td>
<td>52,902</td>
<td>22,924</td>
<td>35</td>
</tr>
<tr>
<td>Livestock</td>
<td>420</td>
<td>48</td>
<td>0</td>
<td>1,600</td>
<td>-</td>
</tr>
<tr>
<td>Open Water</td>
<td>192</td>
<td>8</td>
<td>2,325</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>29,617</strong></td>
<td><strong>6,791</strong></td>
<td><strong>913,177</strong></td>
<td><strong>1,484,257</strong></td>
<td><strong>47,841</strong></td>
</tr>
</tbody>
</table>
Stream and Stormwater Retrofit Locations

Lake Ontario

Irondequoit Bay

Dickinson

Seneca

Ridge

Bay View

Helderlage

Marchner

Woodhull

Stream and Stormwater Retrofit Locations
# Reduction From Retrofits

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>24,143</th>
<th>5,799</th>
<th>634,237</th>
<th>945,391</th>
<th>47,655</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Reduction from Existing</td>
<td>18</td>
<td>14</td>
<td>30</td>
<td>31</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>91</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Stormwater Pond Retrofits 55
- Proposed New Ponds 3
- Stream Stabilization 15
- Riparian Reforestation 16
- Pollution Source Control 2

Total 91
P Load Reduction from Retrofits

- Channel Protection
- Lawn Care Eduction
- SSO Repair/Abatement
- Erosion and Sediment Control
- Illicit Connection Removal
- Riparian Buffers
- Catch Basin Cleanouts
- Stormwater Retrofits
Project Outputs

- Prioritized project list
- Justification for long term funding mechanism
- MS4 Strategies for achieving TMDL pollutant load allocations
- Compliance with MS4 Permit requirements for 303(d) streams/waters
- Improved water quality and reduced flooding
Challenges and Next Steps

**Challenges** – funding needed for:
- public involvement process,
- more complete storm sewer mapping, and
- retrofit implementation.

**Next Steps** -
- complete 5 watershed assessments by 12/2011
- Determine each watershed priorities
- More utility mapping
Where to go for More Information

- The WTM is Available at the Center for Watershed Protection’s Website:
  - [www.cwp.org](http://www.cwp.org)