Pondering an impervious cover TMDL

2010 LID Conference
Kelly Collins, CWP
John Rozum, NatureServe
Acknowledgements

EPA 319 Program

Town of Mansfield

CTDEP

Center for Watershed Protection

Office of Environmental Policy

Horsley Witten Group

Sustainable Environmental Solutions

CLEAR
Connecticut’s Changing Landscape Project

2006 Land Cover

- Forest: 55%
- Developed: 19%
- Water/Wetlands: 8%
- Turf: 8%
- Agriculture (AG): 7%
The Impervious Cover Model

- **Good**
- **Fair**
- **Poor**

Stream Quality

- Sensitive
- Impacted

Watershed Impervious Cover

- 10%
- 25%
- 60%
- 100%

Watershed Impervious Cover

Urban Drainage

Non-Supporting

Sensitive

Impacted

Urban Drainage

Non-Supporting

Watershed Impervious Cover
A TMDL establishes the maximum amount of a pollutant that a waterbody can receive without adverse impact to fish, wildlife, recreation, or other uses.

Under section 303(d) of the Federal Clean Water Act (CWA), states are required to develop TMDLs for waters impaired by pollutants.

The end result of the TMDL process is a Water Quality Management Plan with quantitative goals to reduce pollutant loadings to the impaired waterbody.

To date, TMDL goals have been expressed as pollutant concentration targets, percent reductions in pollutant levels, or reductions in mass loads.
## Connecticut Probable Sources of Impairments for Threatened and Impaired Rivers and Streams Reporting Year 2006

<table>
<thead>
<tr>
<th>Probable Source</th>
<th>Probable Source Group</th>
<th>Miles Threatened or Impaired</th>
</tr>
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<tbody>
<tr>
<td>Source Unknown</td>
<td>Unknown</td>
<td>393</td>
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<tr>
<td>Unspecified Urban Stormwater</td>
<td>Urban-Related Runoff/Stormwater</td>
<td>214</td>
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<tr>
<td>Municipal Point Source Discharges</td>
<td>Municipal Discharges/Sewage</td>
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<tr>
<td>Sources Outside State Jurisdiction Or Borders</td>
<td>Other</td>
<td>107</td>
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<tr>
<td>Industrial Point Source Discharge</td>
<td>Industrial</td>
<td>105</td>
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<tr>
<td>Combined Sewer Overflows</td>
<td>Municipal Discharges/Sewage</td>
<td>80</td>
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<tr>
<td>Landfills</td>
<td>Land Application/Waste Sites/Tanks</td>
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<tr>
<td>Contaminated Sediments</td>
<td>Legacy/Historical Pollutants</td>
<td>40</td>
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<tr>
<td>Sanitary Sewer Overflows (Collection System Failures)</td>
<td>Municipal Discharges/Sewage</td>
<td>47</td>
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<tr>
<td>Impacts From Hydrostructure Flow Regulation/Modification</td>
<td>Hydromodification</td>
<td>42</td>
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<tr>
<td>Upstream Impoundments (E.G., PI-565 Nrcs Structures)</td>
<td>Hydromodification</td>
<td>41</td>
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<tr>
<td>Channelization</td>
<td>Hydromodification</td>
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<tr>
<td>Site Clearance (Land Development Or Redevelopment)</td>
<td>Construction</td>
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<td>Baseflow Depletion From Groundwater Withdrawals</td>
<td>Hydromodification</td>
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<td>Agriculture</td>
<td>Agriculture</td>
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<tr>
<td>Above Ground Storage Tank Leaks (Tank Farms)</td>
<td>Spills/Dumping</td>
<td>25</td>
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<tr>
<td>Flow Alterations From Water Diversions</td>
<td>Hydromodification</td>
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<tr>
<td>Golf Courses</td>
<td>Recreation And Tourism (Non-Boating)</td>
<td>22</td>
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<tr>
<td>Dredge Mining</td>
<td>Resource Extraction</td>
<td>15</td>
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<tr>
<td>Loss Of Riparian Habitat</td>
<td>Habitat Alterations (Not Directly Related To Hydromodification)</td>
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<tr>
<td>Animal Feeding Operations (Nps)</td>
<td>Agriculture</td>
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<tr>
<td>Livestock (Grazing Or Feeding Operations)</td>
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<tr>
<td>Waterfowl</td>
<td>Natural/Wildlife</td>
<td>9</td>
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</tbody>
</table>
Linking the Bug Data with Impervious Cover Data

- 125 sites
- < 50 square miles drainage
- No point sources
- No streams with portion of watershed in another state
- Consistent level of sampling effort
Linking the Bug Data with Impervious Cover Data

Streams with <50 sq miles drainage upstream

% of Reference Community compares 7 metrics - Taxa Richness, Modified HBI, Scraper/Filterer, EPT/Chironomidae, % Dominant Taxa, EPT Index, Community Loss
Enter...the IC-TMDL

A Total Maximum Daily Load Analysis for
Eagleville Brook, Mansfield, CT

Final- February 8, 2007

This document has been established pursuant to the requirements of Section 303(d) of the Federal Clean Water Act

Aney Marrella
Deputy Commissioner

Betsy Wingfield, Chief
Bureau of Water Protection and Land Reuse

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
79 Elm Street
Hartford, CT 06106-5127
(860) 424-3020
Gina McCarthy, Commissioner

• Numerous impairments listed as “cause unknown”
• Attributed to “complex array of pollutants transported by stormwater runoff”
• IC can be used as surrogate
• Target is 11% impervious cover (12 – 1)
The IC-TMDL Location

Eagleville Brook Watershed
Eagleville Brook Watershed

- 2.4 sq.mi.
- 19% IC in Watershed
- Target is 11% IC
Project Approach

1. Data Collection/Mapping
2. Field Studies
3. Recommendations/Runoff Reduction Strategies
4. Implementation
Field Approach

• Focus on Effective or connected IC
• Site level reconnaissance required
• The emphasis is on runoff (volume) reduction, but opportunities to improve water quality will not be neglected

Goal *Is Not* to Reduce the % IC in the watershed per se, but to Reduce the *Impact* of IC through *Stormwater Management* to Levels Equivalent to < 11% IC.
IC-TMDL Implementation

• Look for site-level opportunities during the course of ongoing UConn and Mansfield activities

• Coordinated with the Master Plan, Master Landscape Plan, and Master Drainage Plan at UConn

• **GOAL:** to apply implementation concepts to all of campus and town, not just the Eagleville watershed
Evaluating Success

• Interim measurements
  – Reduction of IC
  – Flow and WQ improvements in stream

• Ultimately, success will be measured by assessing aquatic life directly
Field Survey & Analysis
IC-TMDL Strategies

Large surface parking lots
Redesign large surface parking lots to make use of bioretention

Gettysburg College, Gettysburg, PA
IC-TMDL Strategies

Large surface parking lots
Reduce impervious cover when repaving large surface parking lots.
IC-TMDL Strategies

Center campus / academic core

Concentrate on roof runoff using green roofs, cisterns, and rooftop leader disconnects to rain gardens
IC-TMDL Strategies

Center campus / academic core

Concentrate on roof runoff using green roofs, cisterns, and rooftop leader disconnects to rain gardens
IC-TMDL Strategies

Center campus / academic core
Increase tree cover in collaboration with UConn Master Landscape Plan

Trees can be major stormwater control devices!
IC-TMDL Strategies

Center campus / academic core

Recondition and protect (at least some!) turf areas to bring them back to a pervious condition
IC-TMDL Strategies

Dorms / Residence areas

Pervious and/or redesigned walkways, rain garden bioretention, roof leader disconnects
IC-TMDL Strategies

Peripheral areas: athletic complex

Innovative biological stormwater BMPs to reduce impact of runoff from athletic fields & facilities
IC-TMDL Strategies

Roads

combine aesthetics, stormwater management & safety with traffic calming & vegetated strips
Additional Considerations

- Alterations in watershed boundaries based on field verification;
- Discrepancies between actual IC and TMDL estimates;
- Difficulty determining connected vs disconnected impervious areas;
- Challenges in finding feasible, cost-effective retrofits in dense campus setting;
- Accounting for biological improvements by quantifying benefits from stormwater retrofits.
ID Retrofit Opportunities

50 retrofit opportunities analyzed

“Top Ten” opportunities chosen

Complete site reports & 25% design drawings for Top Ten
Field Survey & Analysis

Considerations for “Top Ten”

- Amount of IC removed / disconnected
- Use of different LID practices
- Locations in various parts of campus
- Retrofits involving different types of development (academic buildings, dorms, parking lots, etc.)
- Feasibility (timeline & cost)
- WQ benefits beyond just reduction of volume
Road Map to IC TMDL Implementation

http://clear.uconn.edu/eagleville/Eagleville_TMDL
Road Map to IC TMDL Implementation
Road Map To IC TMDL Implementation

Peripheral areas: athletic complex

Potential Sites for Impervious Disconnects or Treatment

Field Report

BLUE shows projects that will be advanced to 25% design stage
RED shows other identified projects
Eagleville TMDL “Quick fixes”

Disconnect IC from the brook!

Field House Pervious Concrete Lot
Eagleville TMDL “Quick fixes”

Towers Complex Pervious Asphalt Lot
Gant Plaza Green Roof – Sept. 2009

- 334 modules
- 2 ft by 4 ft
- 79% cover
- New gathering place
Measuring Progress

1. Volume Reduction
   - Stream volume monitoring at downstream weir
   - Runoff reduction estimates as retrofits occur
   - Possible runoff reduction modeling by UConn Engineering Dept.

2. Impervious Cover Mitigation
   - IC removed (pervious lots)
   - IC disconnected (bioretention)
   - % credits depending on practice?

3. Beyond Volume & Cover
   - Water quality projects (gravel wetland, source reduction)
   - Rehabilitate & plant trees
   - Rehabilitate soils
   - Restore stream buffers

4. Back to the Bottom-Line - Bugs
Lessons Learned

• IC TMDLs = quick path to implementation.
• Field Intensive analysis Required.
• Caution against developing “impervious cover tunnel vision.”
• Need some other measure of success to track progress (flow, biology, some indicator monitoring parameter).

Should we focus on impervious cover at this site?
Questions?

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