The fate of the 1st impervious cover TMDL in the nation

Kelly Collins, CWP
Chet Arnold, CLEAR/CT
NEMO

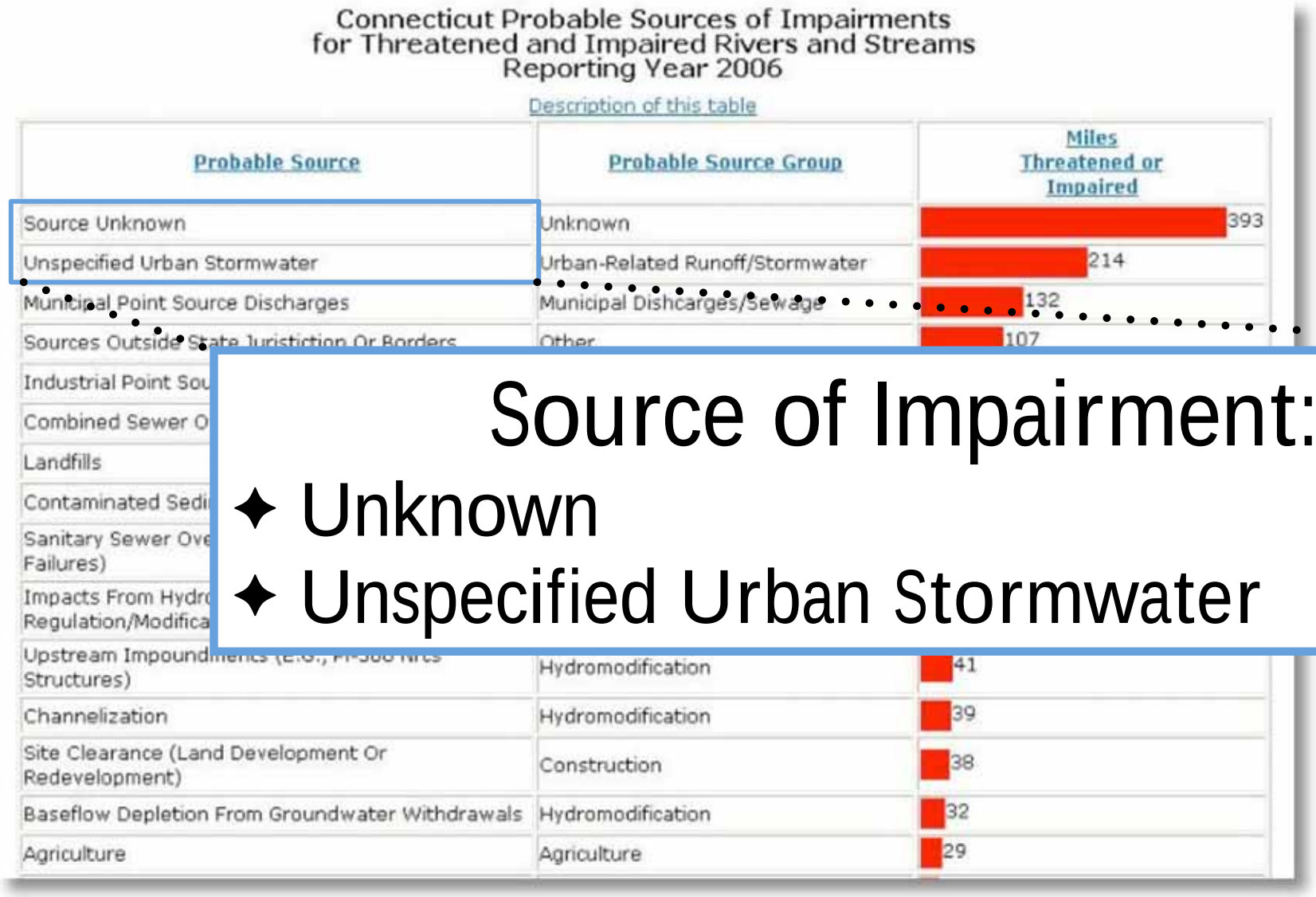
NEMO 007
9/29-10/1, 2010

Today's Tale

- development of the IC-TMDL
- a little about the watershed
- what the project did, and where we are
- lingering issues
- is it working?

Total Maximum Daily Load

- The maximum amount of a pollutant a waterbody can receive without adverse impact to designated uses
- Under section 303(d) of the Federal Clean Water Act (CWA), states are required to develop TMDLs for impaired waters
- The end result is a Water Quality Management Plan with quantitative pollutant load reduction targets



Connecticut Probable Sources of Impairments
for Threatened and Impaired Rivers and Streams
Reporting Year 2006

Description of this table

Probable Source	Probable Source Group	Miles Threatened or Impaired
Source Unknown	Unknown	393
Unspecified Urban Stormwater	Urban-Related Runoff/Stormwater	214
Municipal Point Source Discharges	Municipal Discharges/Sewage	132
Sources Outside State Jurisdiction Or Borders	Other	107
Industrial Point Sou		
Combined Sewer O		
Landfills		
Contaminated Sedi		
Sanitary Sewer Ove Failures)		
Impacts From Hydr Regulation/Modifica		
Upstream Impoundments (E.G., PL-566 NRCS Structures)	Hydromodification	41
Channelization	Hydromodification	39
Site Clearance (Land Development Or Redevelopment)	Construction	38
Baseflow Depletion From Groundwater Withdrawals	Hydromodification	32
Agriculture	Agriculture	29

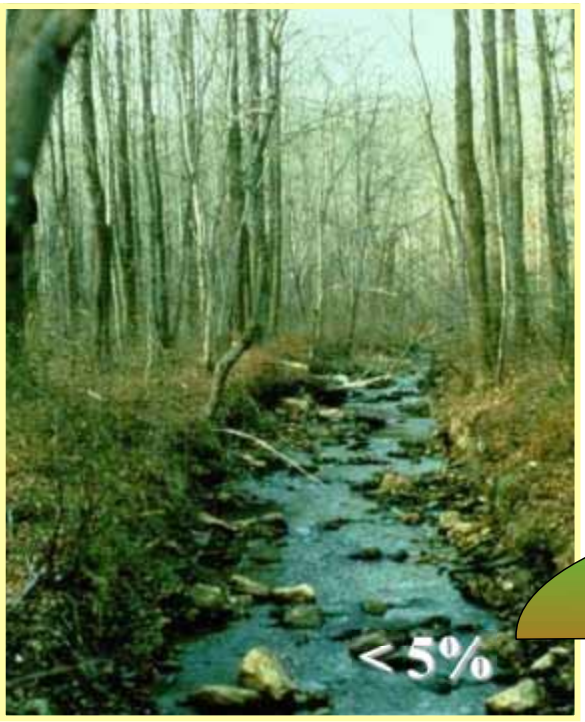
Source of Impairment:

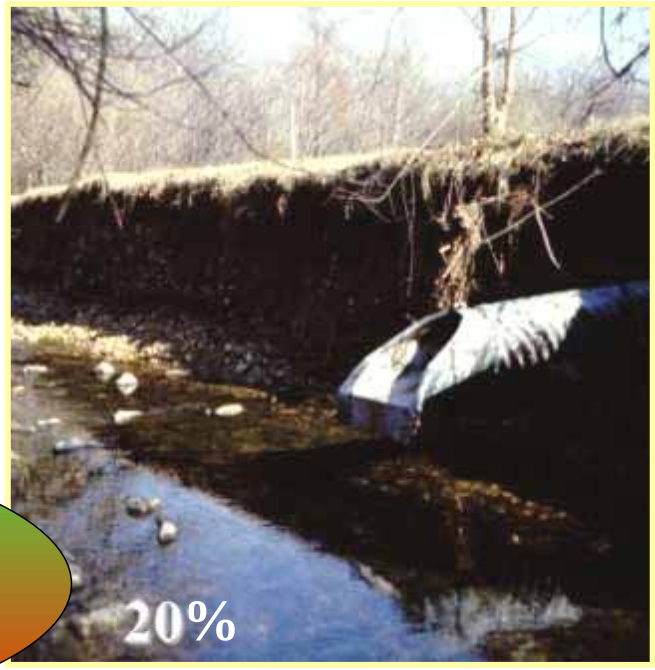
- ✦ Unknown
- ✦ Unspecified Urban Stormwater

- Numerous impairments listed as “cause unknown”
- Attributed to “complex array of pollutants transported by stormwater runoff”

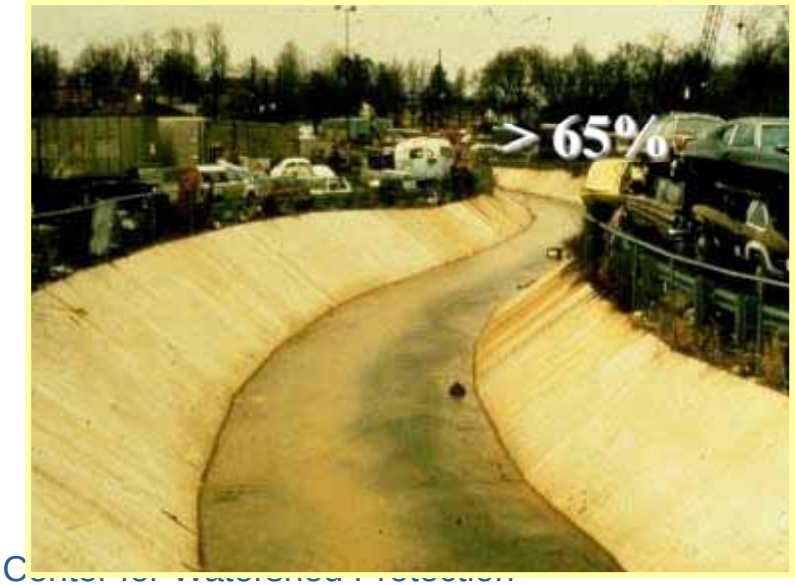

Urban Stream Syndrome
The mechanisms driving the syndrome are complex and interactive, but most impacts can be ascribed to a few major large-scale sources, primarily urban stormwater runoff delivered to streams by hydraulically efficient drainage systems.
Walsh et al., 2005

The Effect of IC on Stream Quality





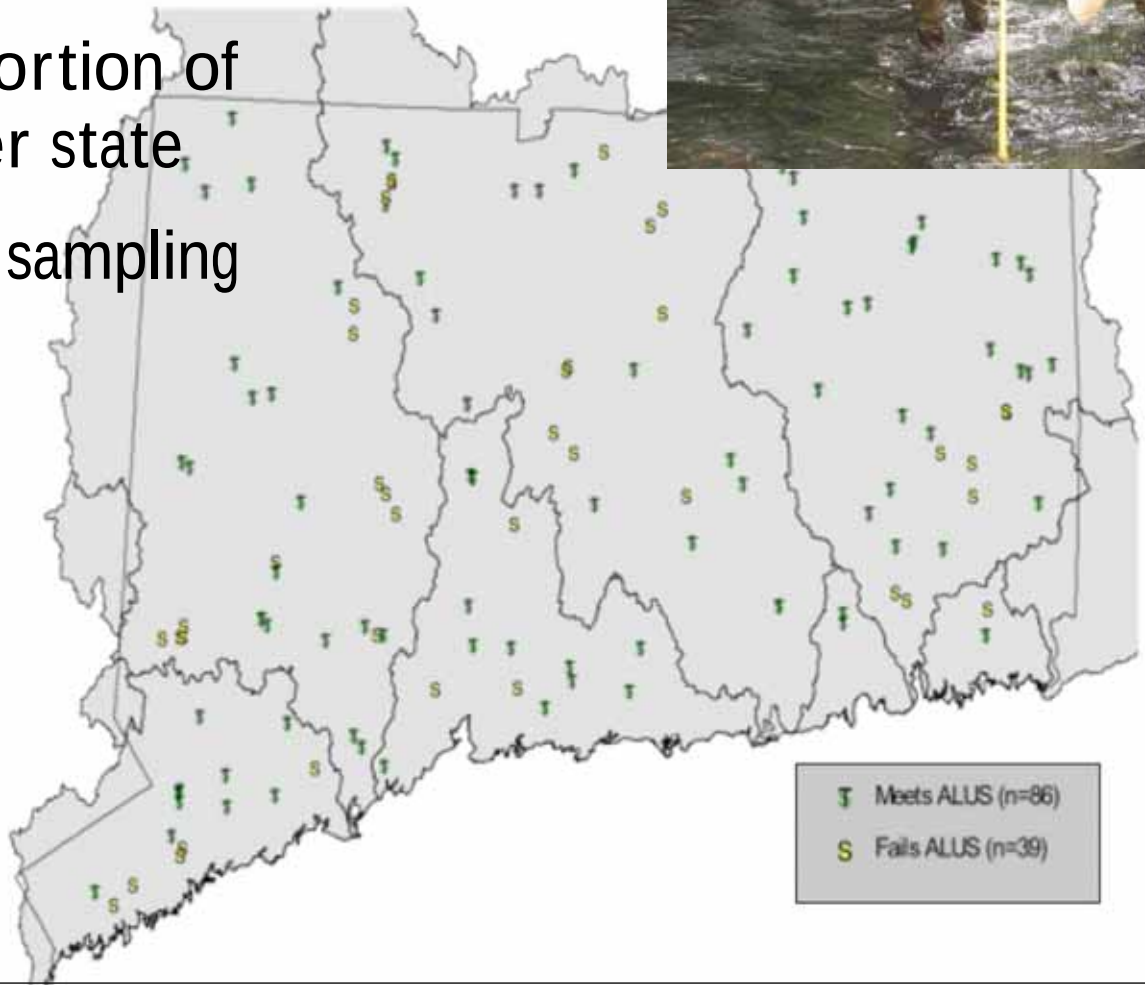
Impervious Cover



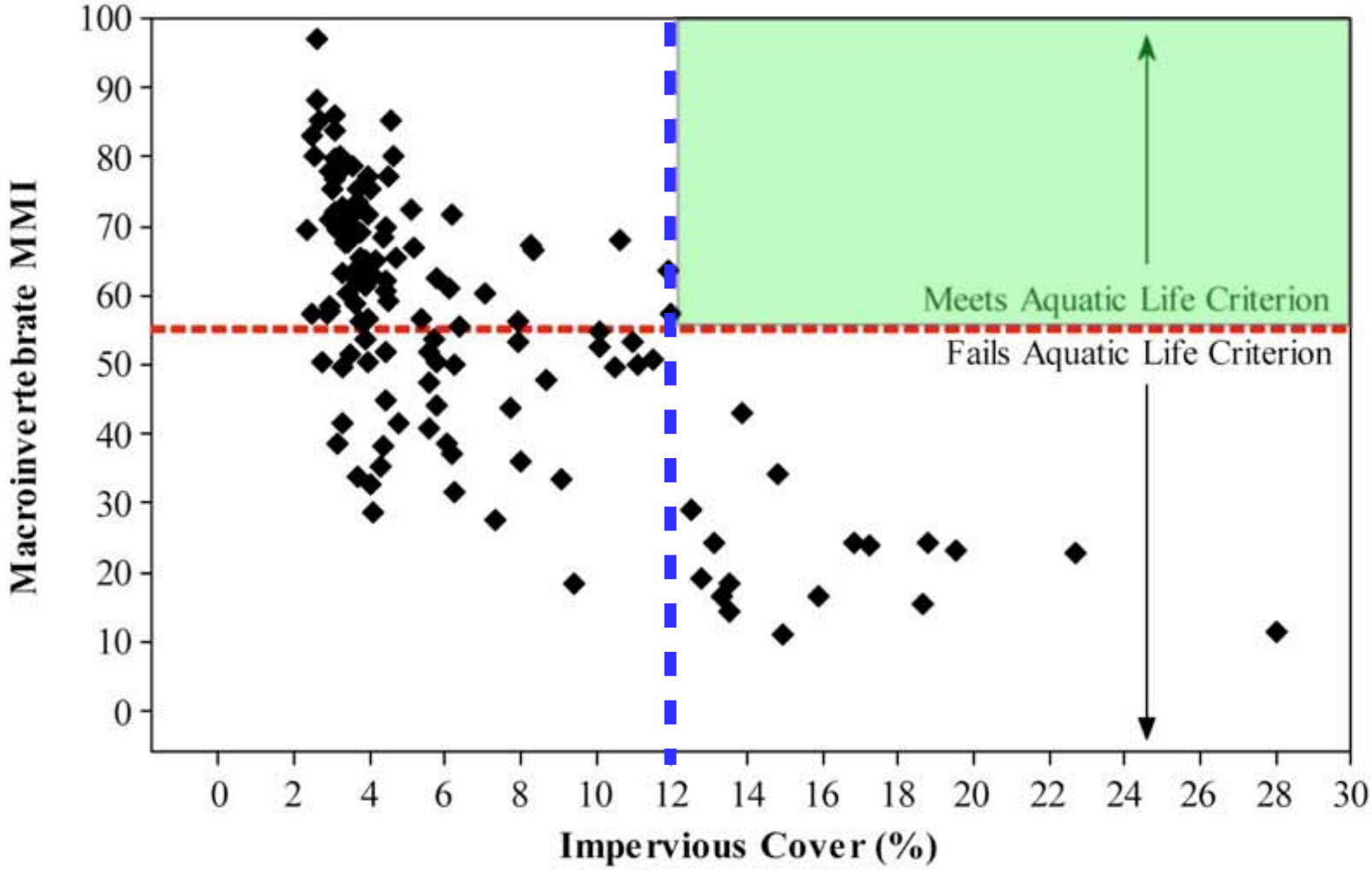
CT Macroinvertebrate Data

125 sites

- < 50 square miles drainage
- No point sources
- No streams with portion of watershed in another state
- Consistent level of sampling effort



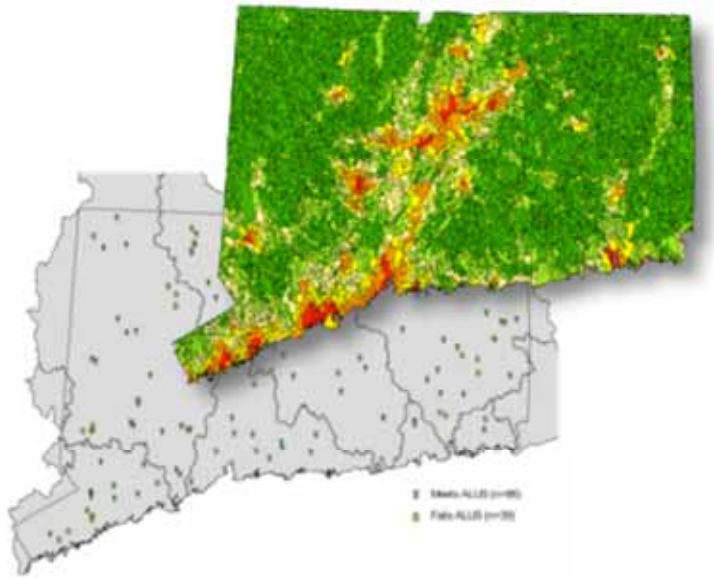
Linking the Bug Data with IC

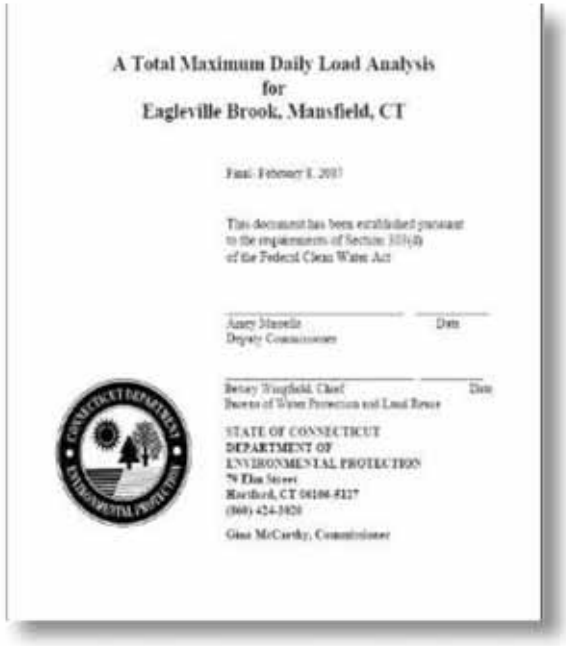


None of the 125 study sites with IC over 12% met CT's aquatic life criteria for a healthy stream.

Enter the IC TMDL

- IC can be used as surrogate
- Target is 11% impervious cover (12 – 1)
- Benefits of Using IC
  - ✓Simplifies complex impacts but based on good science
  - ✓Good correlation between IC and stream health
  - ✓IC data available statewide
  - ✓Measurable and generated by local land use





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

Final: February 1, 2007

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

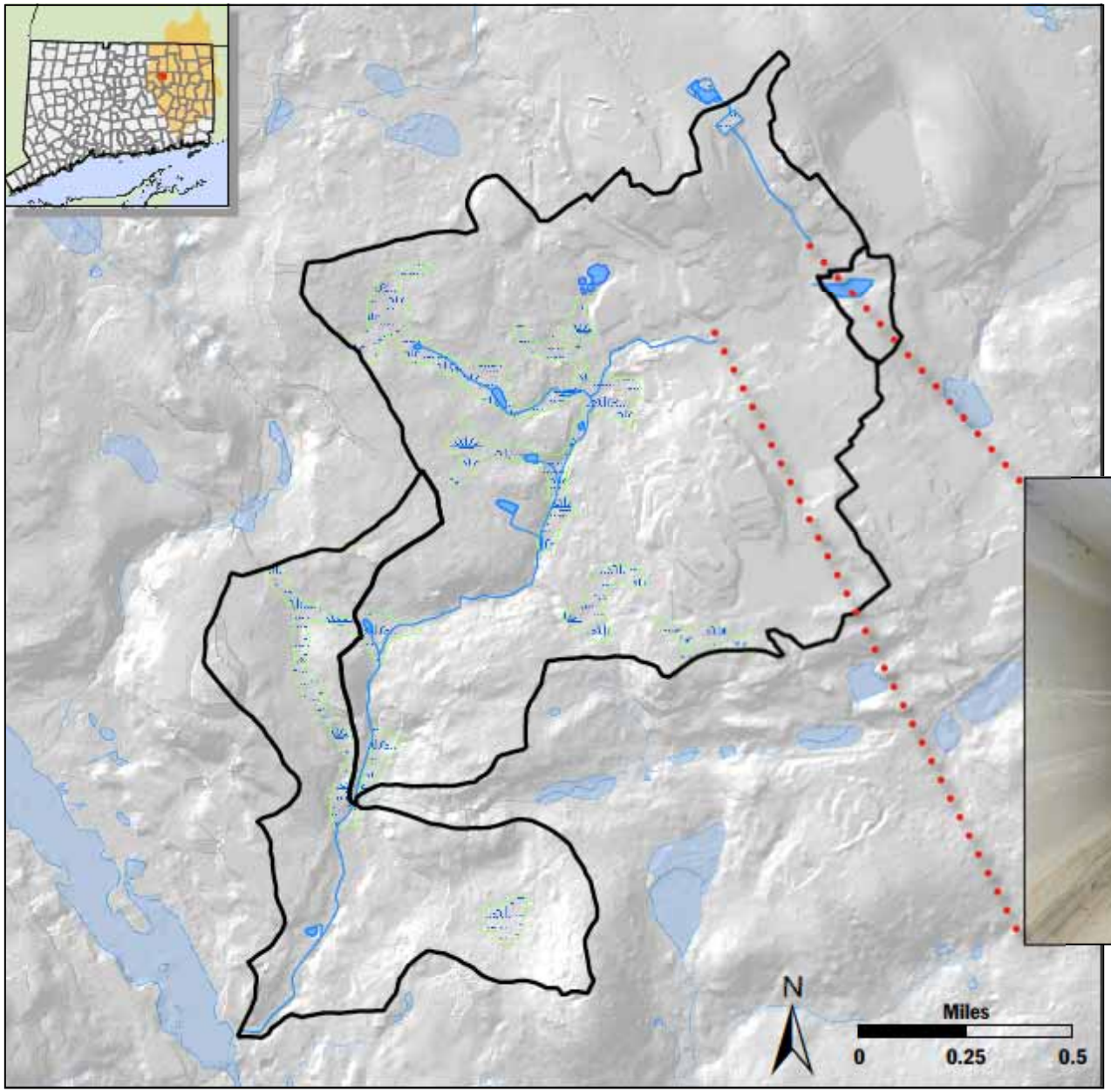
Amey Marrella — Date
Deputy Commissioner

Betsey Wingfield, Chief — Date
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

Eagleville Brook watershed



- 2.4 sq miles
- UConn and Town of Mansfield
- No MS4s
- 3 “subbasins”
- brook runs underground under much of campus

Project Partners

- UConn CLEAR/NEMO
- Center for Watershed Protection
- Horsley & Witten Group
- UConn Architectural & Engineering Services
- UConn Office of Environmental Policy
- CTDEP TMDL & Nonpoint Source Programs
- Town of Mansfield

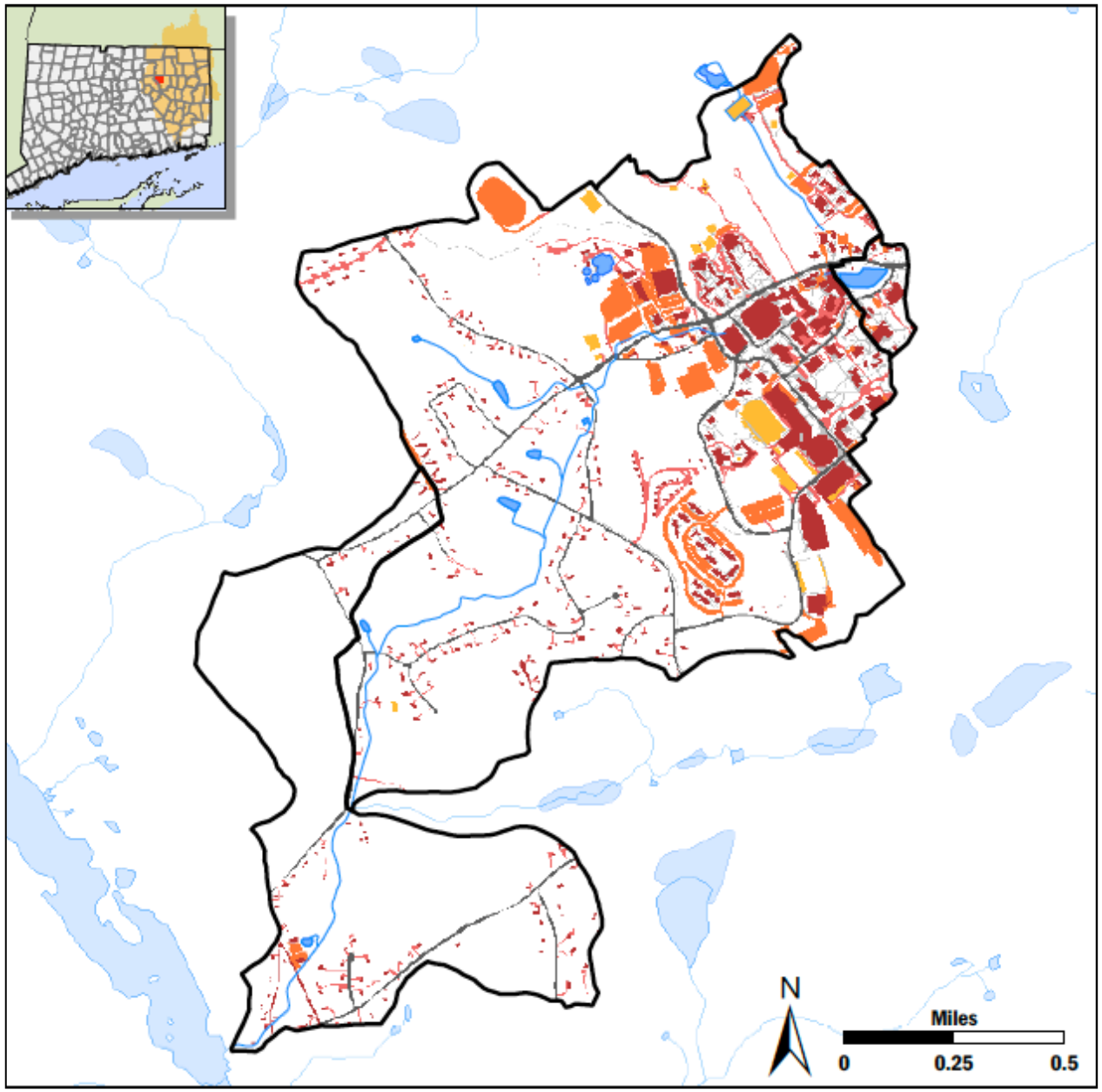
Horsley Witten Group
Sustainable Environmental Solutions

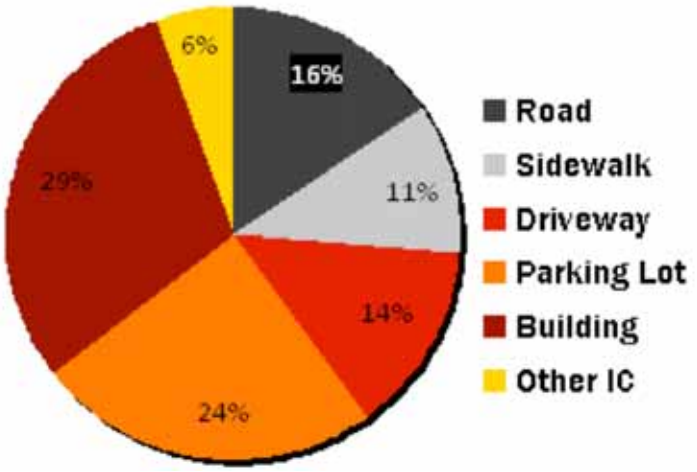
NEMO

CLEAR

CENTER FOR WATERSHED PROTECTION

IC in the watershed



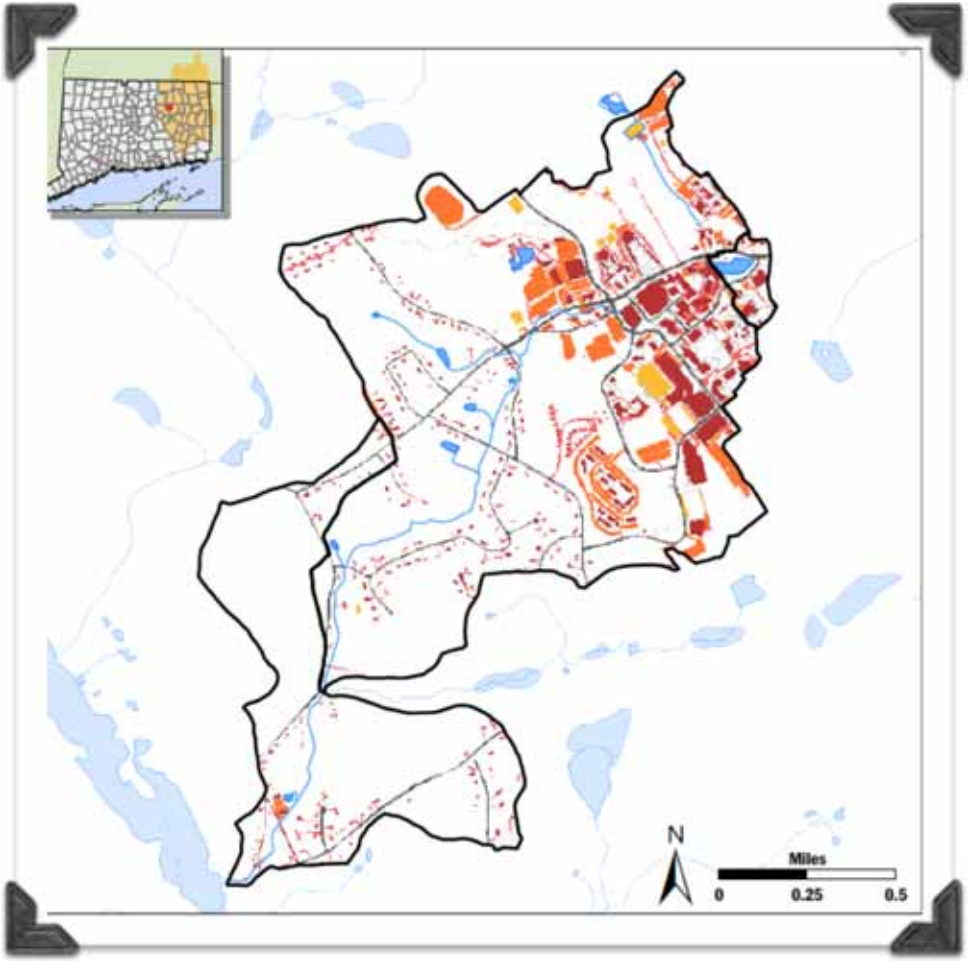


Total IC = 17.8%

Center campus is seriously urban

Project Approach

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 .



- Focus on effective or connected IC
- The emphasis is on runoff (volume) reduction, but opportunities to improve water quality will not be neglected
- Develop a plan to monitor progress over time.

Project Work Plan

- Update and improve CTDEP estimates with recent high resolution imagery
- Quantify existing impervious cover in the watershed with GIS mapping
- Conduct extensive field work to:
  - confirm drainage patterns & watershed boundaries
  - identify opportunities to reduce, disconnect or treat impervious cover.
- Combine field assessments & technical evaluations of each practice to help prioritize retrofit opportunities

Field Findings

In urban areas, you gotta look down a lot of holes

(and *hope* that they're storm drains)

Field Findings

1. Discrepancies between actual IC and TMDL estimates;
   - 26 ac did not drain to Eagleville Brook
   - 51 ac of watershed IC was already disconnected and should not be considered "effective."
2. Alterations in watershed boundaries based on field verification;
3. Difficulty determining connected vs disconnected impervious areas;
4. Challenges in finding feasible, cost-effective retrofits in dense campus setting;
5. Accounting for biological improvements by quantifying benefits from stormwater retrofits.

Adjusting the numbers

Eagleville Brook	Watershed IC	IC to Disconnect
TMDL estimate	11.80%	34 ac
Desktop Adjusted	17.80%	107 ac
Field Adjusted	13.90%	35 ac

Field Survey & Analysis

Considerations for "Top Ten"

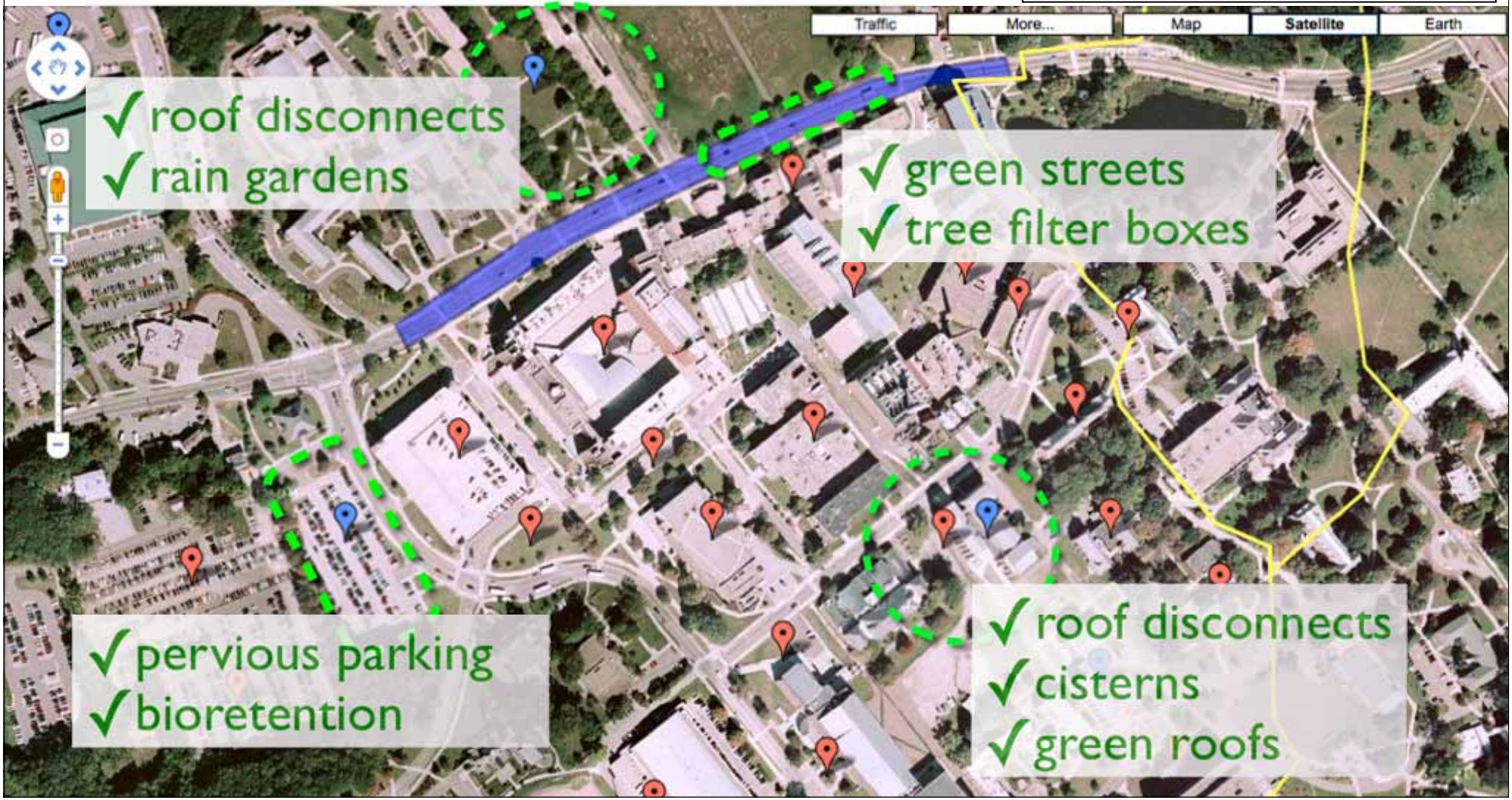
- ✓ Amount of IC removed / disconnected
- ✓ Use of different LID practices
- ✓ Locations in various parts of campus
- ✓ Retrofits involving different types of development (academic buildings, dorms, parking lots, etc.)
- ✓ Feasibility & opportunity (timeline & cost)
- ✓ WQ benefits beyond just reduction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

Field Survey & Analysis

51 retrofit opportunities analyzed

"Top Ten" opportunities selected

Complete site reports & 25% drawings for Top Ten



Adjusting the TMDL targets

Sites	IC treated	Watershed IC after implementation	Status
Top 10 Retrofit Sites	31 ac	11.30%	Does Not Meet
All 51 Retrofit Sites	61 ac	8.80%	Exceeds

Implementation, progress to date, and measuring progress

Project Status

- technical report is done
- formal plan yet to be drafted
- implementation has begun

Impervious Cover TMDL Field Survey & Analysis Report
University of Connecticut

Impervious Cover TMDL
Field Survey and Analysis Report

Prepared for:
Center for Land Use Education and Research
Department of Extension
University of Connecticut

Prepared by:
Center for Watershed Protection, Inc.
8390 Main Street, 2nd Floor
Ellicott City, MD 21043

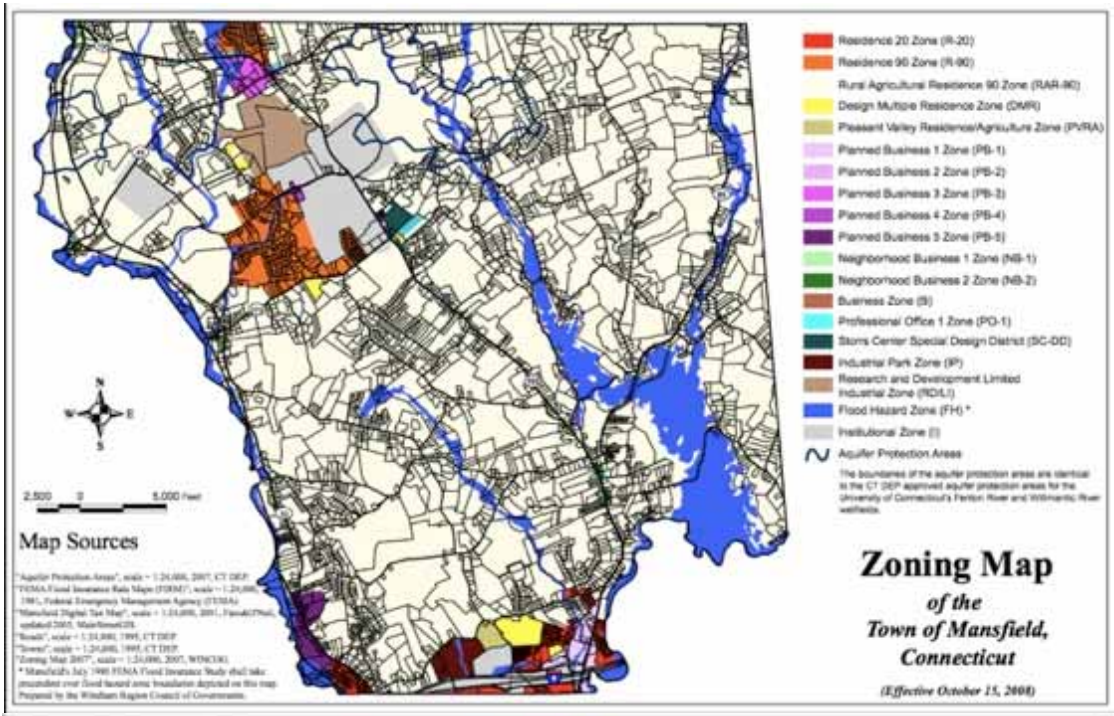
Horsley Witten Group
90 Route 6A
Sandwich, MA 02563

March 4, 2010

CENTER FOR WATERSHED PROTECTION

Horsley Witten Group
Sustainable Environmental Solutions

Next: Town of Mansfield Regulations



- performance standards
- stormwater plans
- road standards
- maintenance

Next: Watershed Plan

1. re-emphasize priorities

2. standard process for incorporating LID

3. 9-step framework or something different?

Basic Concepts of TMDL Implementation

- The goal is to apply implementation concepts to all of campus and town, not just to the Eagleville watershed
- implementation will be integrated with the Master Plan, Master Landscape Plan, Sustainable Development Guidelines and Master Drainage Plan at UConn
- Implementation will take place during the course of ongoing UConn and Mansfield activities, as opportunities occur at the site level

The case for waiting for redevelopment

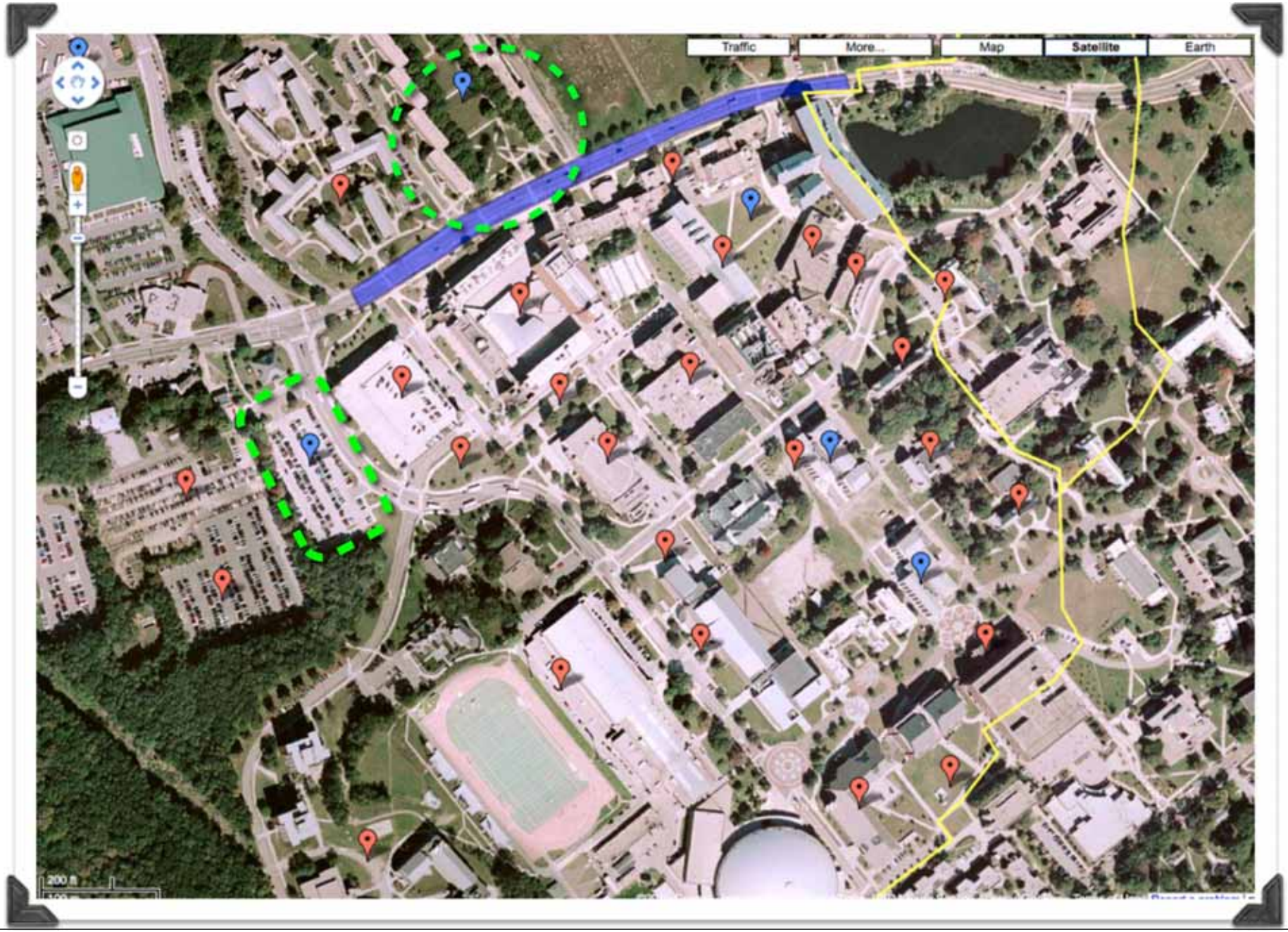
Implementation, **progress to date**, and measuring progress

Field House Parking Lot

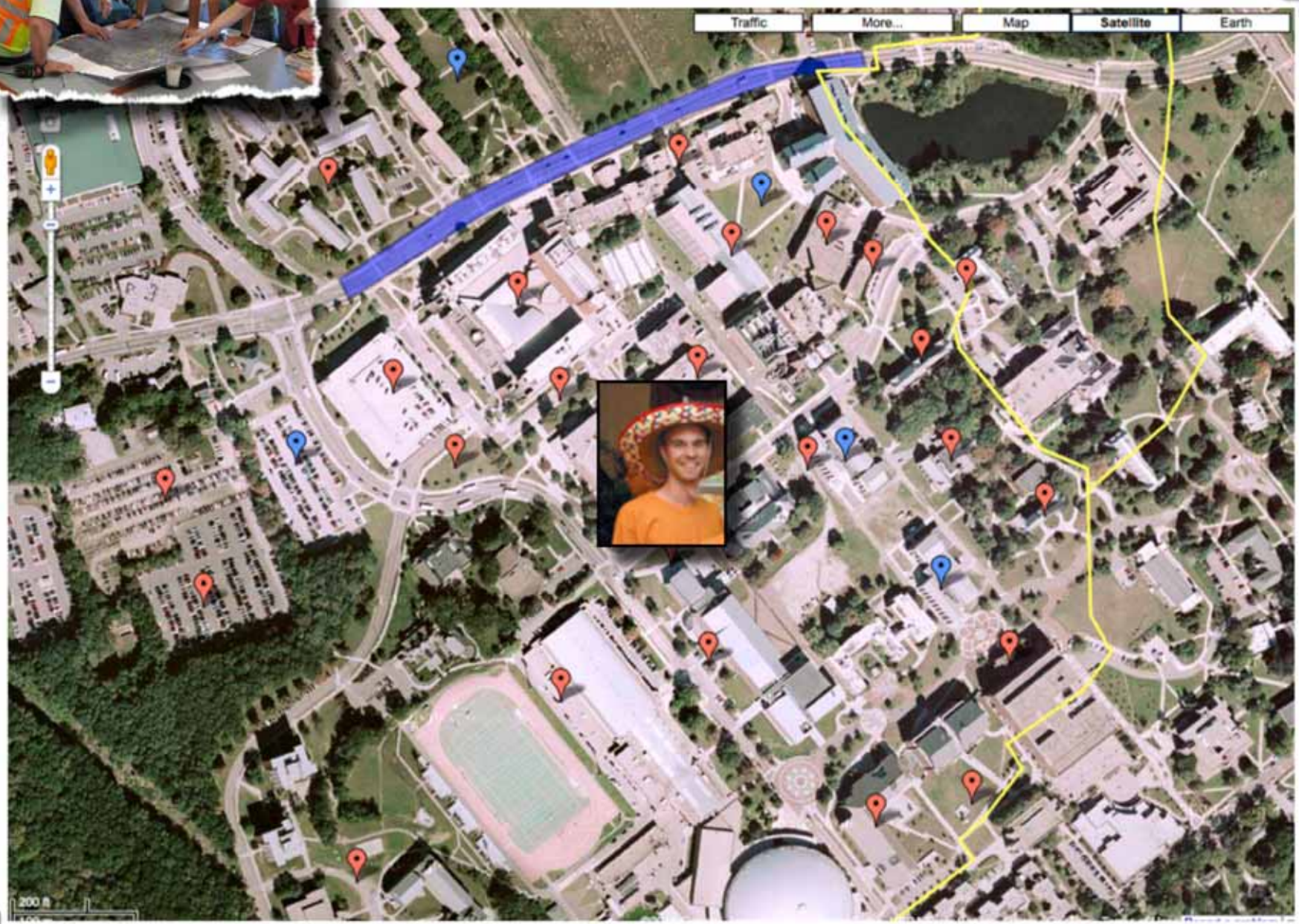
Tower Apartments Parking Lot

Northwoods Apartments

Next: "The Jungle" & Lot 9



Keeping LID in the mix



Implementation, progress to date, and **measuring progress**

1. Impervious Cover Mitigation

IC removed (pervious lots)
IC disconnected (bioretention)

2. Volume Reduction

Stream volume monitoring at downstream weir
Runoff reduction estimates in report
Possible runoff reduction modeling by UConn Engineering Dept.

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

Estimated Benefits*

Sites	Watershed IC after implementation	Runoff Reduction
Top 10 Retrofit Sites	11.30%	797,600 cf
All 51 Retrofit Sites	8.80%	2,494,150 cf

* *pollutant loads were also estimated*

Remaining Questions

Accounting Issues (short list)

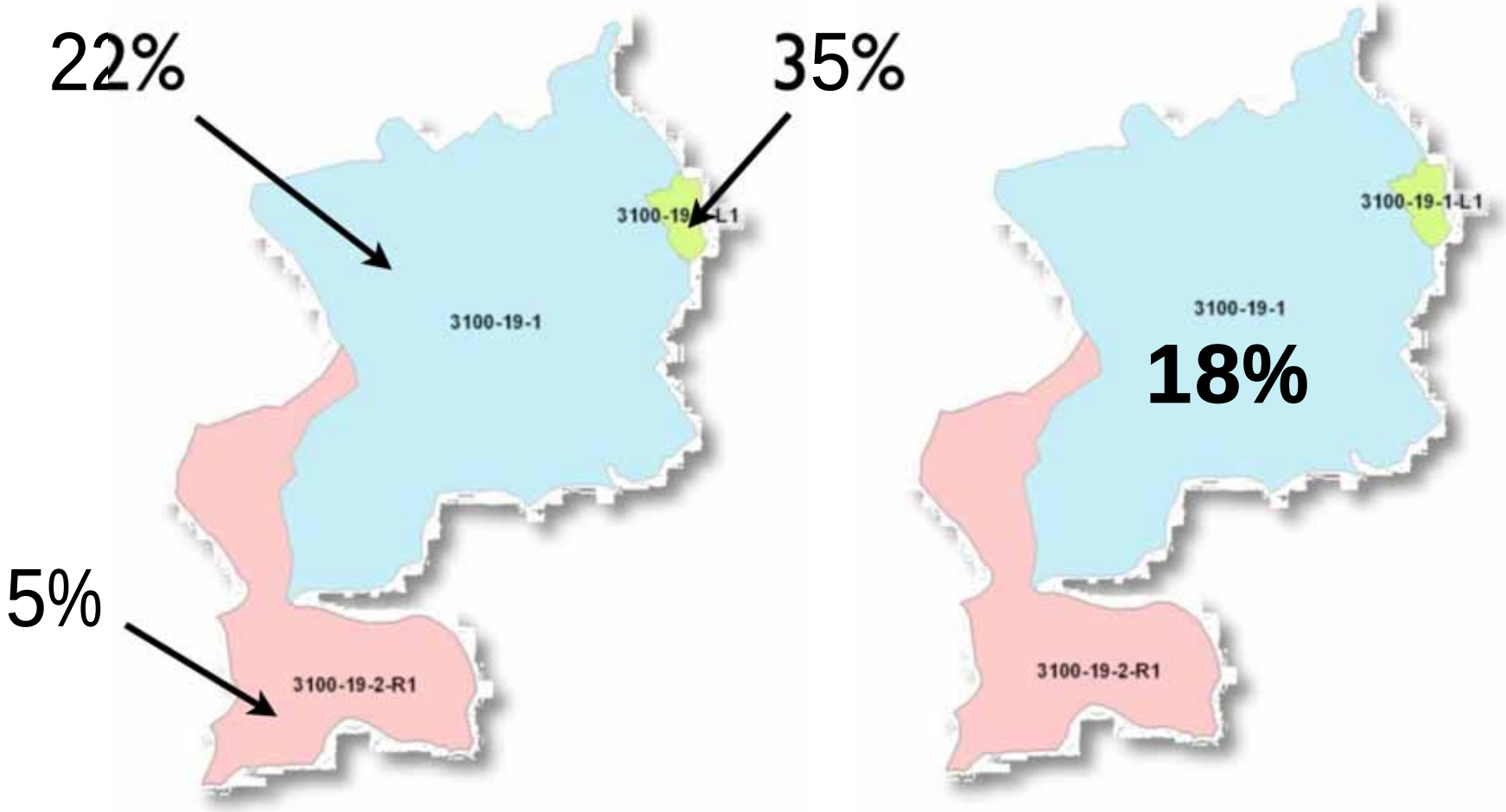
1. Is it kosher to take already disconnected IC off the table?

2. What's "pervious," and how does that fit into the picture?

3. How do we give credit for "partial" IC disconnection?(We account for it in the volume estimates, but not the IC estimates).

Remaining Questions

What watershed scale is appropriate for an IC-TMDL?



(corrected numbers, before subtracting disconnected IC)

CONCLUSIONS

- Field-intensive analysis is required.
- Must guard against developing "impervious cover tunnel vision."
- Tracking progress is not as easy as it seems. A non-IC measure of success (flow, biology, etc.) is helpful.

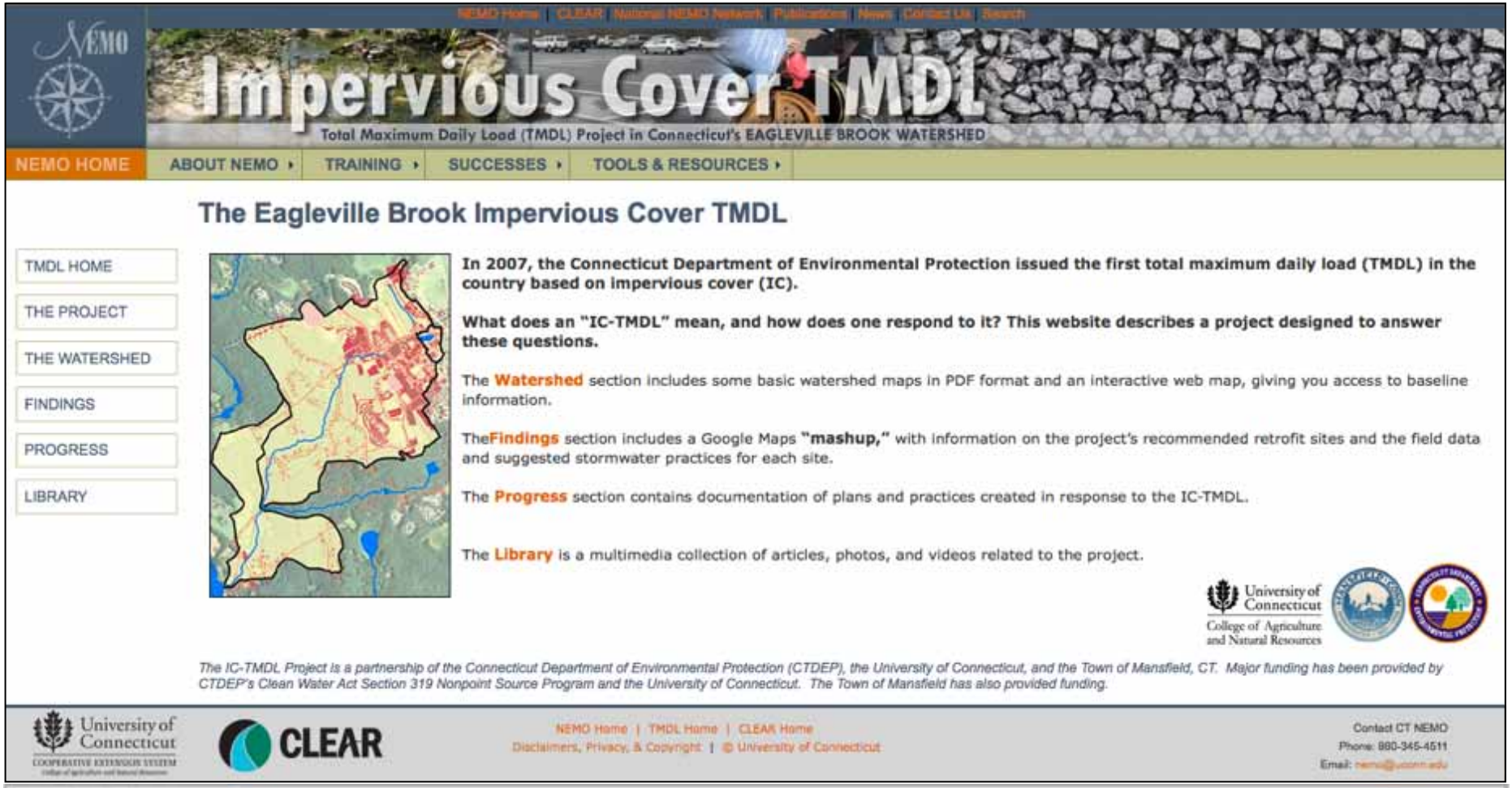
- Elevates LID as a preferred approach to stormwater management in impaired (and non-impaired)waters

- By marrying practical indicator (IC) with accountability (TMDL), an IC-TMDL provides quick path to implementation.

It's working...

(so far)

clear.uconn.edu/projects/tmdl



Questions?

(just remember the conference motto...)