Low Impact Development Techniques

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CT Nonpoint Education for Municipal Officials (NEMO)
Center for Land Use Education and Research

October 19, 2017
New Milford, CT

CLEAR

UCONN | COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

Center for Land Use Education and Research

CLEAR's Mission:
To provide information, education and assistance to land use decision makers in support of balancing growth and natural resource protection.

University of Connecticut
- College of Agriculture, Dept. of Extension
- College of Agriculture, Dept. of Natural Resources & the Environment
- Connecticut Sea Grant

- Connecticut NEMO
- National NEMO Network
- Geospatial Training Program
- Land Use Academy
- Extension Forestry Program

http://clear.uconn.edu

PL 92-500

- Water Pollution Control Amendments of 1972 – "Clean Water Act"
- In my lifetime, major improvements have taken place

» Ecology » October 18, 2017

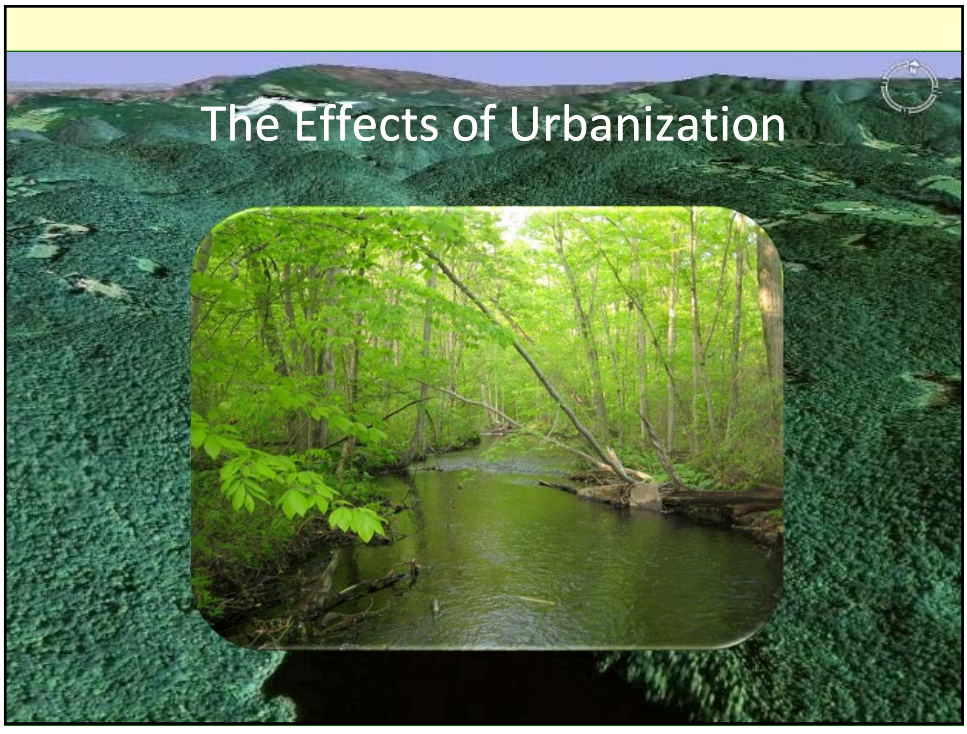
Illinois sportfish recovery a result of 1972 Clean Water Act, scientists report

October 18, 2017

Current Challenges:

- "Nonpoint" pollution
- Runoff from agricultural and urban areas
- Difficult to identify and control


Impervious Surfaces


The Effects of Urbanization

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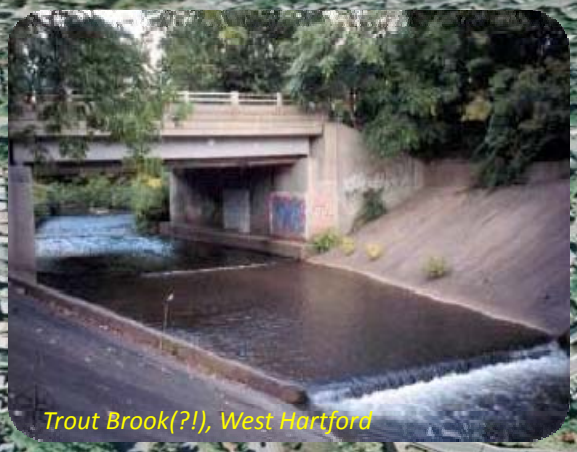
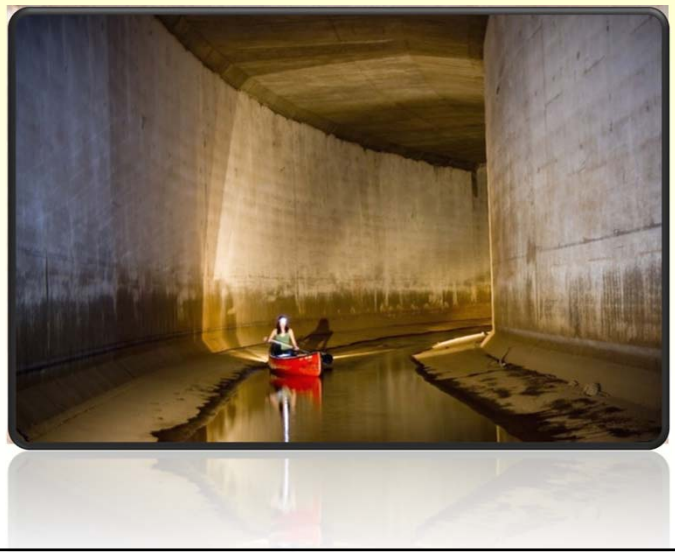
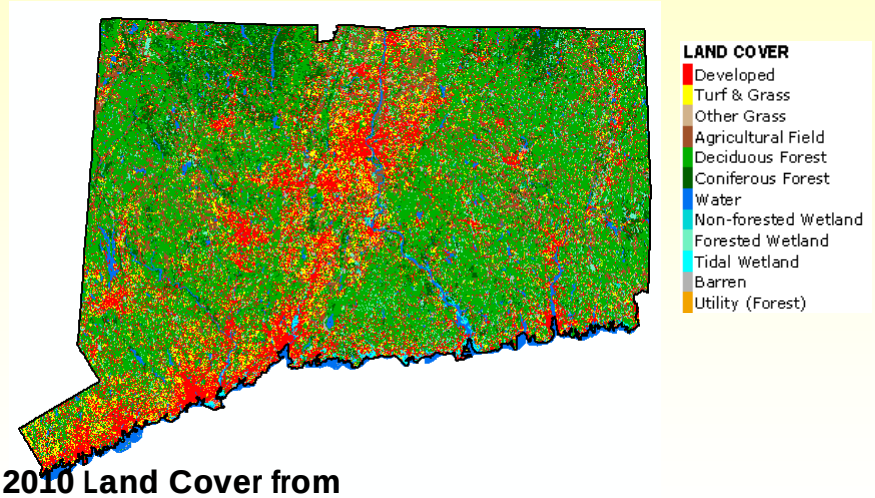


Trout Brook(?!), West Hartford

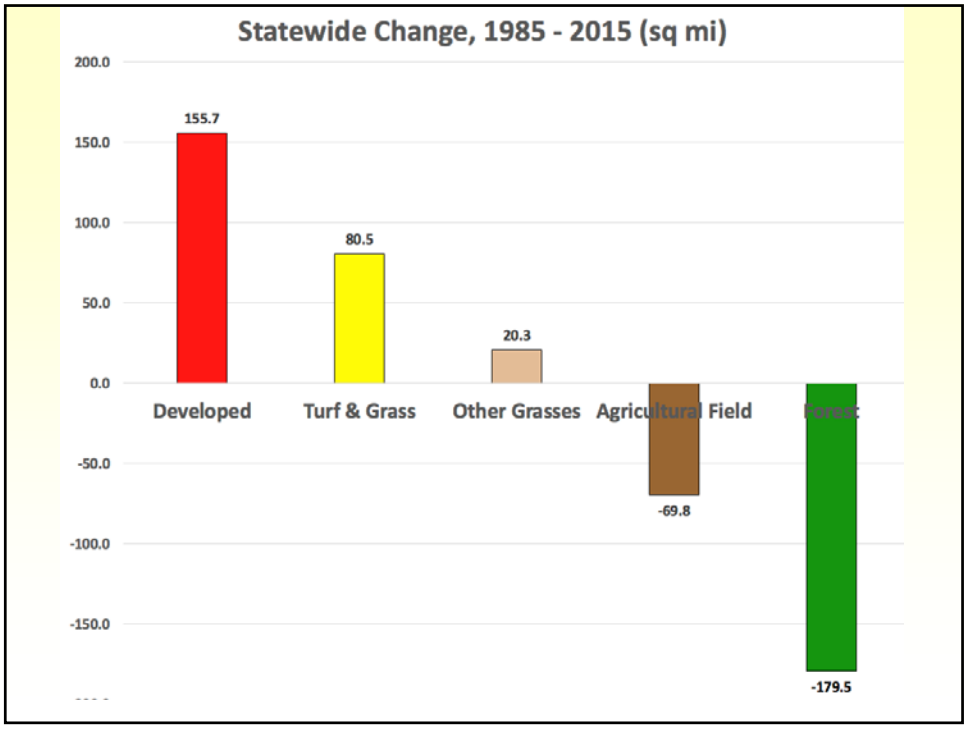
The Effects of Urbanization: Park River, Hartford CT



A view from above…

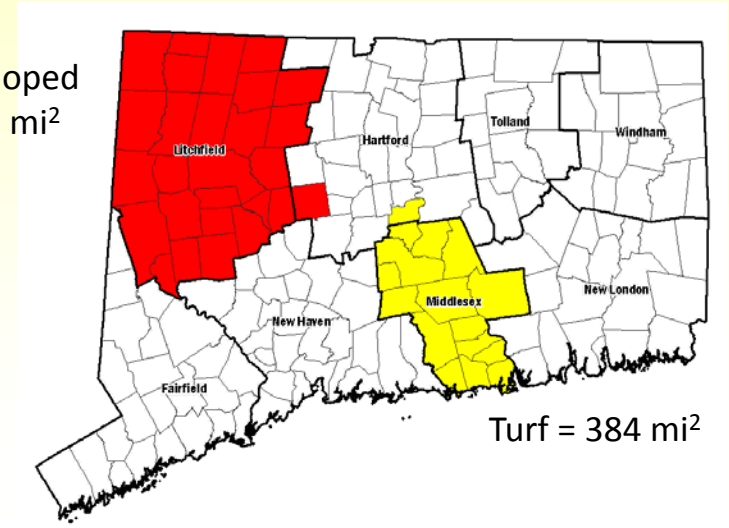


2010 Land Cover from
http://clear.uconn.edu/projects/landscapeLIS/index.htm
"Connecticut's Changing Landscape" project



The "development footprint"…

Developed
= 946 mi^2



Turf = 384 mi^2

Yeah, but is it really that big of a deal?

HOW much water????????

- 5,650 ft^2 of impervious area
- 1 inch of rain = **3,522 gallons!**
- Annual (48") = **169,070 gallons!**
- **This is one SMALL building!**

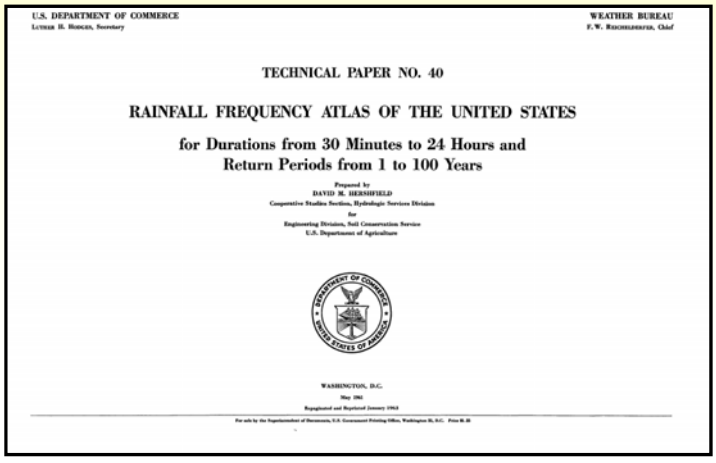
Precipitation Regime Changing

- More high-intensity events in some parts of the Northeast, along with more periods of drought

Rhode Island-Spring 2010

Uses of storm frequency values

- Engineering design of culverts, storm drainage
  - TP-40 values (1961)



U.S. DEPARTMENT OF COMMERCE
LUTHER H. HODGES, Secretary

WEATHER BUREAU
F. W. REICHELDERFER, Chief

TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and
Return Periods from 1 to 100 Years

Prepared by
DAVID M. HERSHFIELD
Cooperative Studies Section, Hydrologic Services Division
for
Engineering Division, Soil Conservation Service
U.S. Department of Agriculture

WASHINGTON, D.C.
May 1961
Reprinted and Reprinted January 1963

Effects of Using Outdated TP-40 Values

- Due to changes in precipitation intensity and frequency, older return period estimates are inaccurate
  - This can lead to undersized stormwater infrastructure
- Researchers at Cornell have updated these values, and NOAA has officially adopted them
  https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

Updated values

- For New Milford, the old 100-year 24 hour event was **7 inches**
- Updated data show that the current 24 hour 100-year storm is **8.65 inches**

New Milford, CT Precip. Values (24 hr)

RI	TP-40 (in)	Updated values (in)
1	2.5	2.75
5	4.0	4.53
10	4.5	5.45
25	5.5	6.71
50	6.0	7.68
100	7.0	8.65

Low Impact Development (LID) Site Planning and Design Concepts

- The Goal: To preserve pre-development hydrology
  - Runoff volume and rate
  - Groundwater recharge
  - Stream baseflow
  - Runoff water quality

Site Planning

- First step of LID
- Where does the water go?
- Good site design can be the most cost effective way to manage stormwater

Disconnected driveway

The Practices

- Bioretention/rain gardens
- Pervious pavements
- Green roofs
- Rainwater harvesting

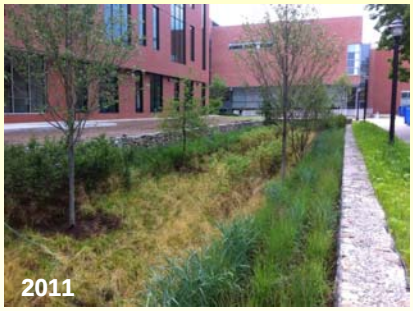
Bioretention/rain gardens

Photo courtesy of Steve Trinkaus


I'M BUILDING A RAIN GARDEN


Rain Gardens
Norwich Extension Office

Bioretention at UConn

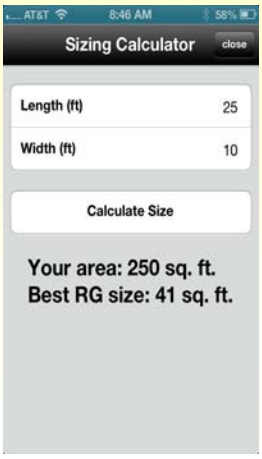


Plants

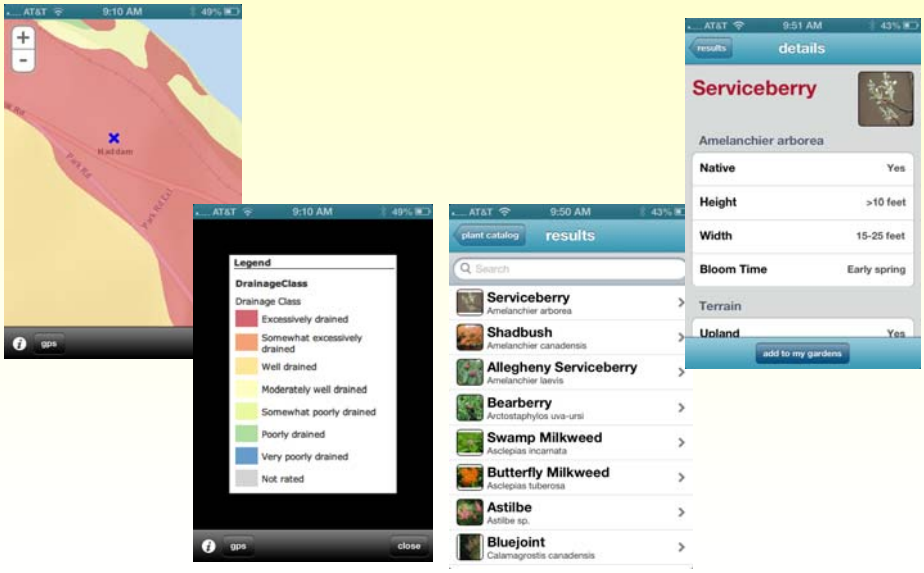
- Native or well-adapted non-natives
- Plants that like wet feet, but can tolerate extended dry periods
- Database in app or website

http://nemo.uconn.edu/raingardens

Smartphone app!



Rain garden app



Green Roofs - *intensive*

Green Roofs - *extensive*

Ford Motor Company
Assembly Plant, Dearborn, MI

Courtesy of Michigan State University Dept. of Horticulture

Green Roofs

- Yes we have some in CT!

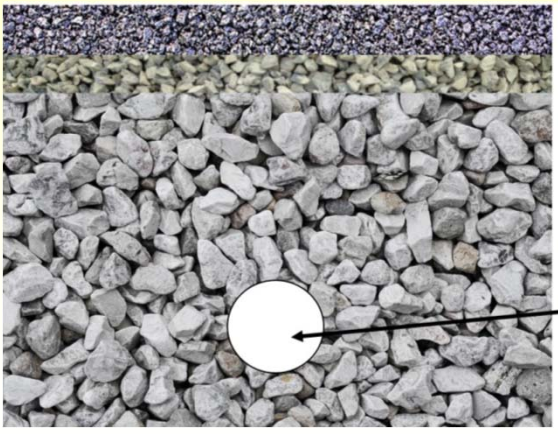
Green Roofs at UConn

Retained 51% of precipitation

Gregoire, B., and J. Clausen. 2011. Effect of a modular extensive green roof on stormwater runoff and water quality. *Ecological Engineering.* Vol. 37, pp. 963-969.

Permeable Pavements

Base preparation is different from traditional pavements



Permeable Interlocking Concrete Pavers (PICPs)

- Similar to traditional block pavers
- When installed, there are voids in between pavers that get filled with peastone or turf



PICPs at UConn


NORTH ENTRANCE
2013
Hillside Rd Snow Shelf


PLASTIC GRID PAVERS
GravelPave™ at West Farms Mall in CT

Plastic grid pavers

- NetPave®50

Pervious asphalt at CT State Capitol

Pervious asphalt at UConn

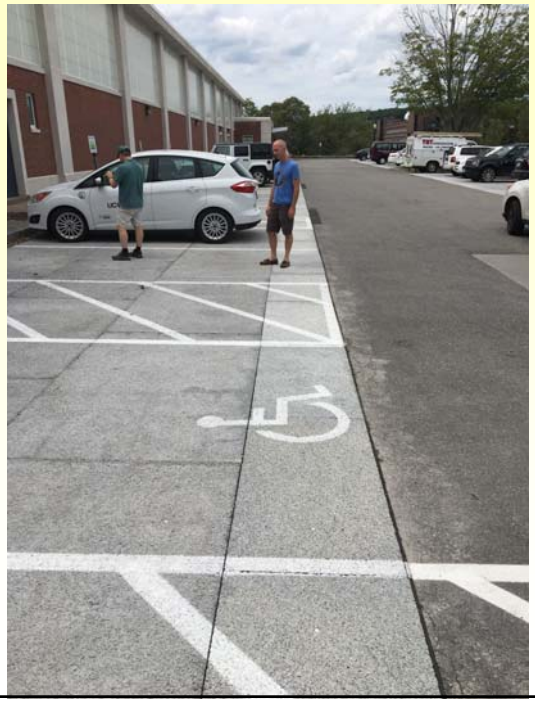
Towers-2009

Northwoods-2010

Pervious concrete at CT State Capitol

Pre-cast pervious concrete

- "Stormcrete" from Porous Technologies (Yarmouth, ME)



Maintenance is critical

- Everything needs maintenance
- Pervious pavements should NOT be sanded in the winter
- They will need regular cleaning with regenerative air suction equipment

Low Impact Development Practices

- Rainwater Harvesting
  - Rain barrels
  - Cisterns

New MS4 Rules

Municipal Separate Storm Sewer Systems

NEW

MS4 – LID considerations

□ **LID in Land Use Regulations**

- Require consideration of LID 1st
- Reduce/eliminate LID barriers in regs.
- Retain water quality volume onsite
  - Redevelopment of site >40% DCIA - retain ½ volume
  - Development or redevelopment of site <40% DCIA – retain ALL
  - If not – provide equivalent amount elsewhere

NEW

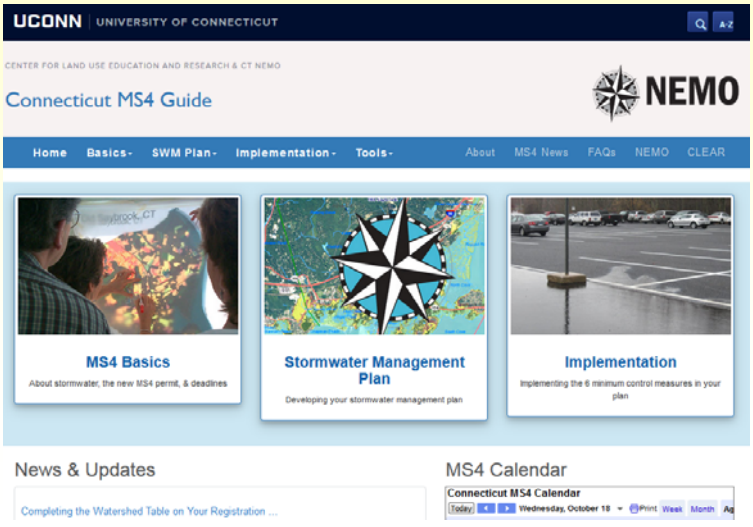
MS4 – LID considerations

□ **Disconnecting Impervious Cover**

- Reduce DCIA by 1% per year starting 7/1/20
  - 5 year look back - take credit for disconnects from 7/1/12
- Develop retrofit prioritization plan by 7/1/20

NEMO MS4 Resources

http://nemo.uconn.edu/ms4



Examples of LID Regulations in CT

http://s.uconn.edu/stateoflid

LID Atlas

http://lidmap.uconn.edu

In summary…

- We have drastically altered the hydrologic cycle
- LID practices work, they enhance aesthetics, increase property values, and can cost less!
  - **But they still need maintenance**
- Many towns in CT have made regulation changes to encourage LID
- New MS4 regulations are encouraging LID implementation

Resources

- CLEAR resources
  http://clear.uconn.edu
- Webinars
  http://clear.uconn.edu/webinars/CLEARseries/index.htm
- Rain garden page
  http://nemo.uconn.edu/raingardens
- TMDL Project
  http://clear.uconn.edu/projects/tmdl
- Jordan Cove
  http://jordancove.uconn.edu

Questions??

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