



Nonpoint Education for Municipal Officials

- What: Educational program
- Who: land use decision makers
- Message: Relationship between land use and water resource protection
- Hudson River Estuary Program: Expands NEMO to include biodiversity, open space, climate change

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The "Old Era" of Water Pollution

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Polluted Runoff is the #1 Water Quality Problem in the U.S.*

* USEPA

Local Land Use Decision Making: Educational Challenges

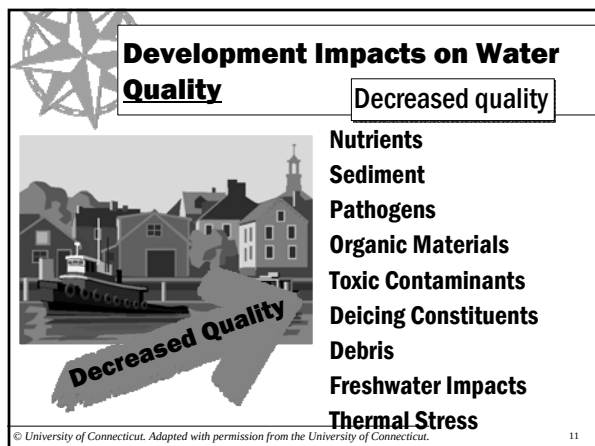
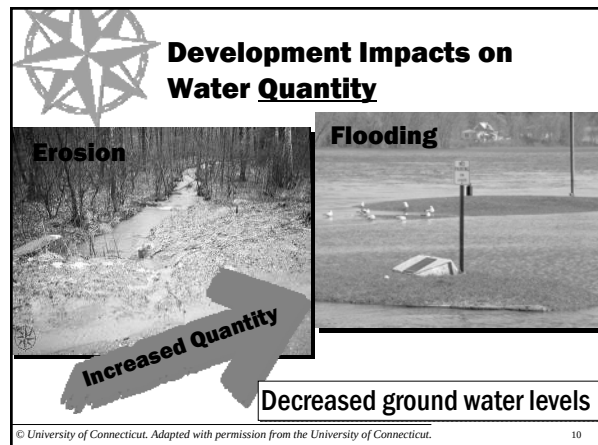
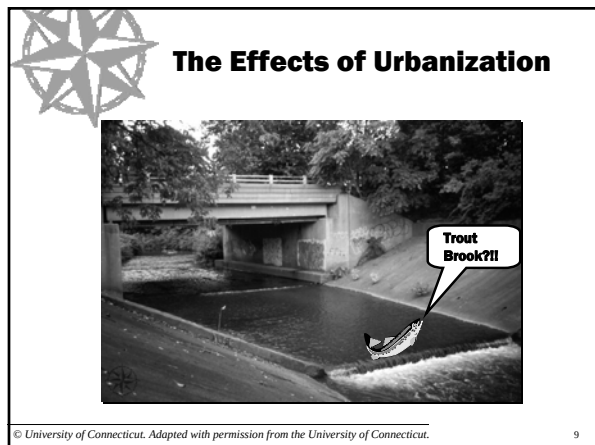
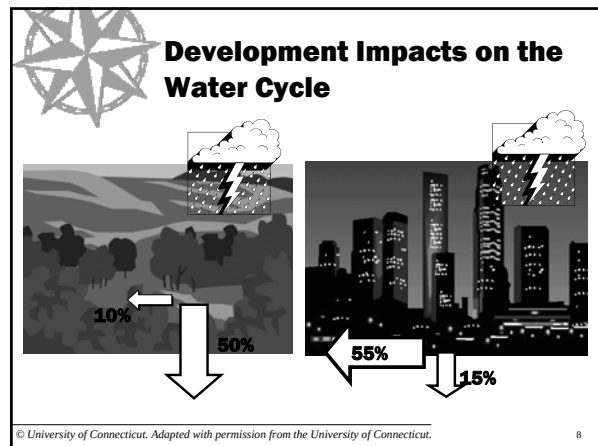
- Legal Mandates
- Full Plate
- High Turnover
- Complexity of Environmental Issues
- Tracking of Cumulative Impacts

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What We Are Going to Discuss...

1. Development Impacts on Water Resources
2. Using Watersheds as a Management Framework
3. Reducing Impacts from Development (Imperviousness)
4. A Strategy for Protecting Resources

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Pollutants in Polluted Runoff

Sediment

- Eroded soil
- Sand
- Smothers aquatic habitat
- Carries pollutants
- Reduces water clarity

Sources: road sand, construction sites, agricultural fields, disturbed areas



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Pollutants in Polluted Runoff

Pathogens

- Bacteria
- Viruses
- Associated with fecal matter
- Cause beach closures
- Cause shellfish bed closures

Sources: failing septic systems, animal waste, combined sewer overflows, marine sanitation devices



Kingston Point - Hudson River

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Pollutants in Polluted Runoff

Organic Materials

- Grass clippings
- Leaves
- Pet waste
- Deplete oxygen from streams, lakes & rivers
- Impacts aquatic life

Sources: animal waste, yard and landscaping waste, street litter.




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Pollutants in Polluted Runoff

Toxic Contaminants

- Heavy metals
- Pesticides
- Threaten health of aquatic life
- Threaten health of human life
- Resistant to breakdown

Sources: industrial, commercial, household and agricultural chemicals; auto emissions



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Pollutants in Polluted Runoff

Deicing Constituents

- Salts
- Sediments
- Used on roads, parking lots, driveways
- Harmful effects on water, soil and vegetation
- Large release during spring snowmelt

Sources: road salt & sand, antifreeze agents



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Pollutants in Polluted Runoff

Debris

- Plastics
- Trash
- Threaten aquatic life
- Detract from recreational use
- Diminish aesthetic values

Sources: illegal dumping, street litter, beach litter, boating waste



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Pollutants in Polluted Runoff





Habitat Impacts

- Stormwater discharge into:
 - freshwater wetlands
 - brackish & tidal wetlands
- Alters hydrology
- Alters salinity
- Encourages invasive species

Sources: Stormwater, roof runoff, septic systems



Pollutants in Polluted Runoff

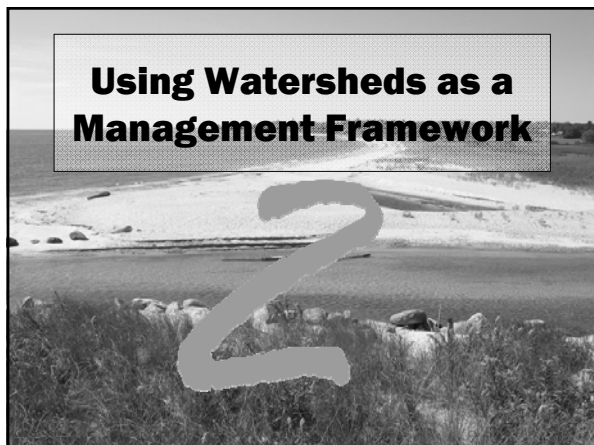


Thermal Stress

- Increase in water temperature
- Harms native species
- Helps nonnative species to spread

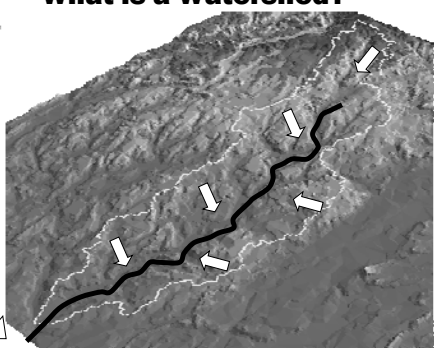
Sources:

- runoff from heat-absorbing impervious surfaces
- removal of streamside vegetation
- shallow water impoundments
- decreased base flow due to water withdrawal





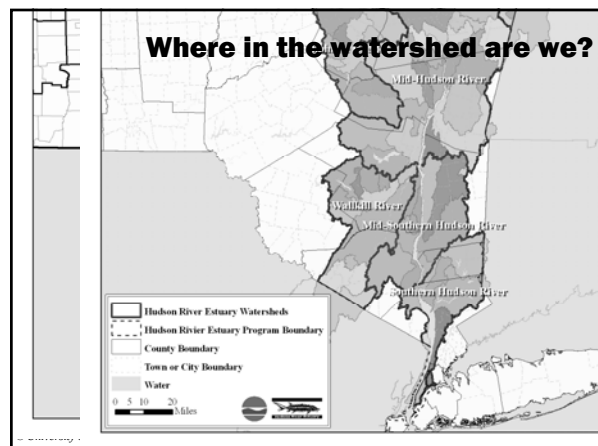
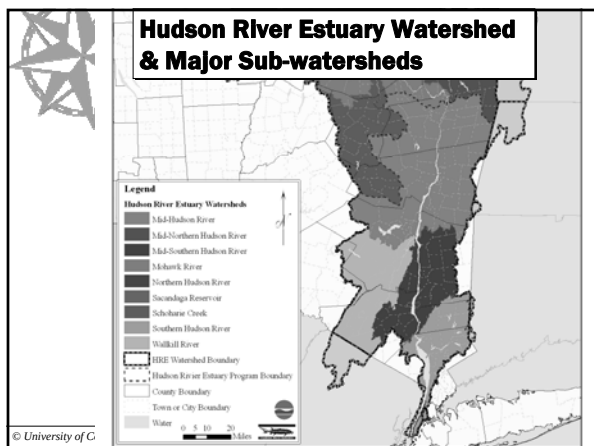
What is a Watershed?

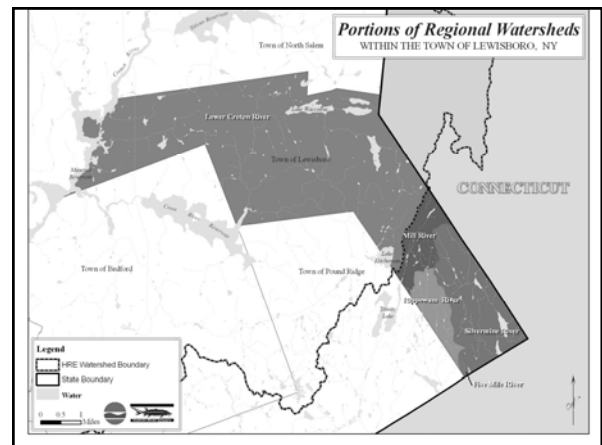
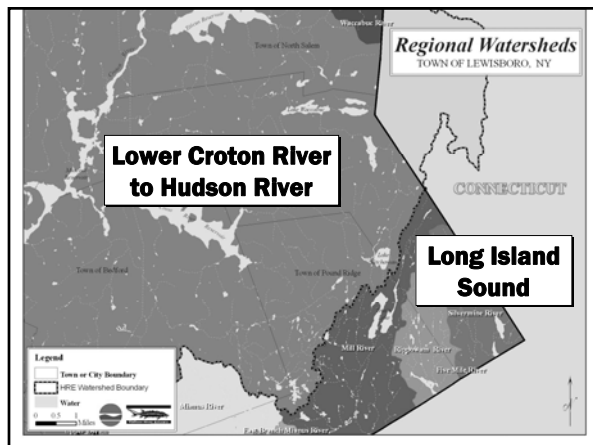
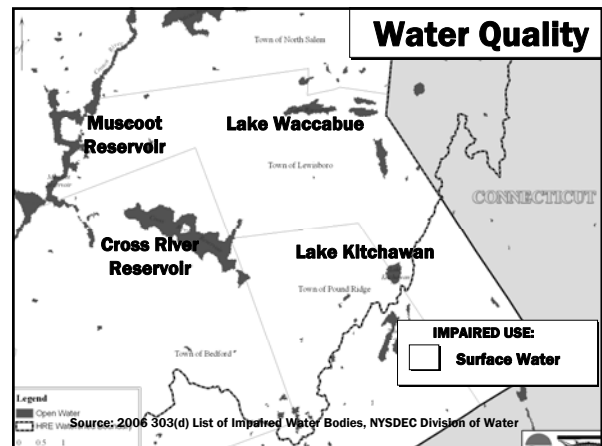
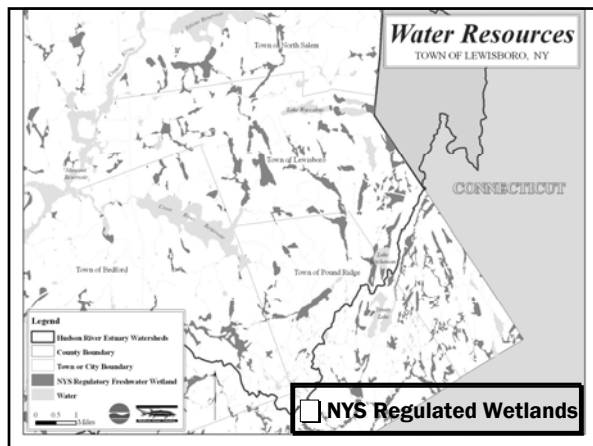


Area of land that drains to a single outlet

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22

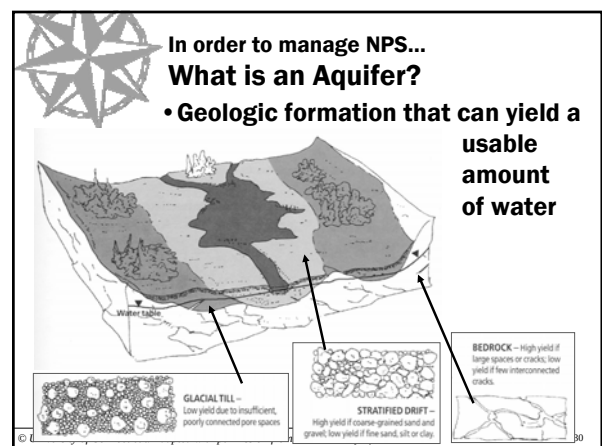


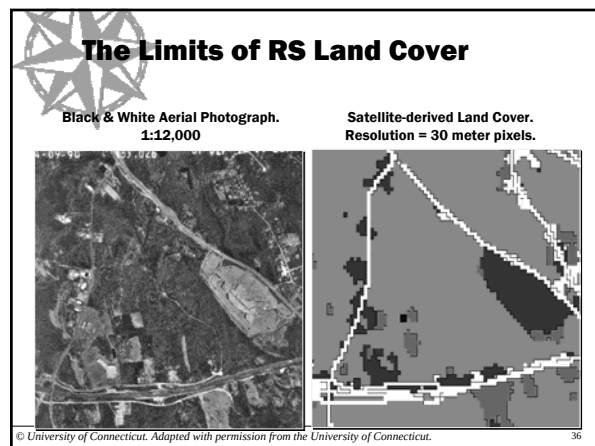
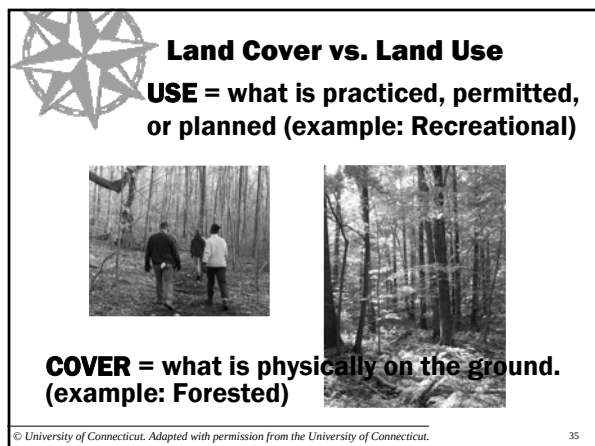
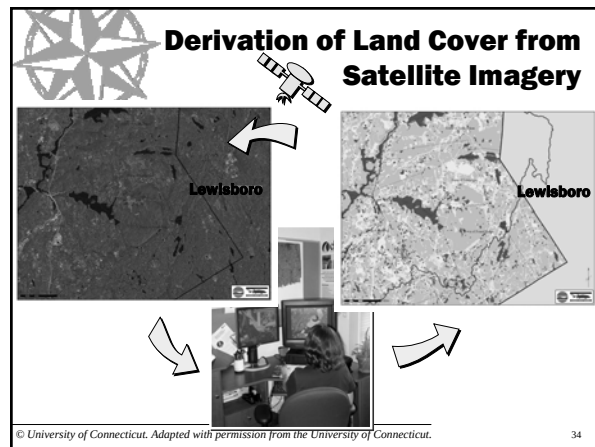
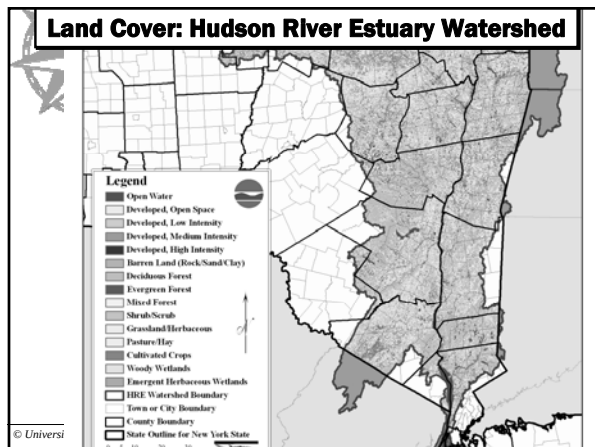
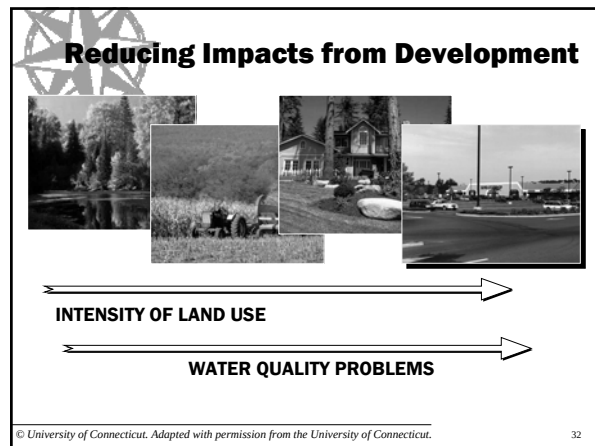
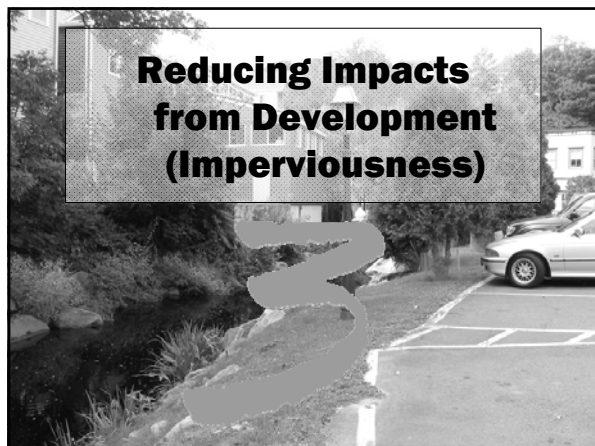


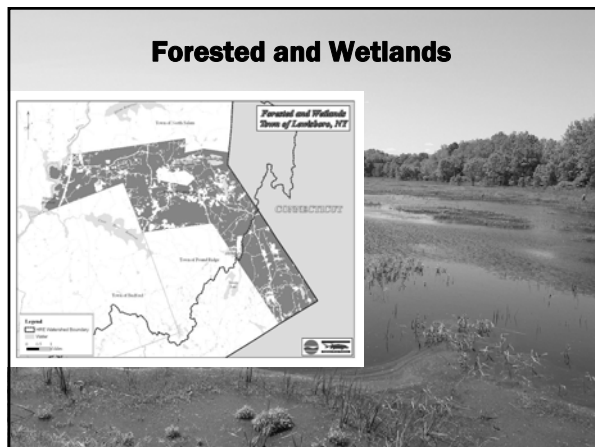
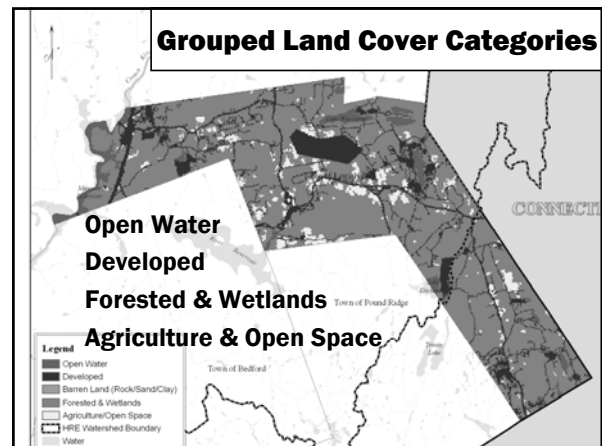
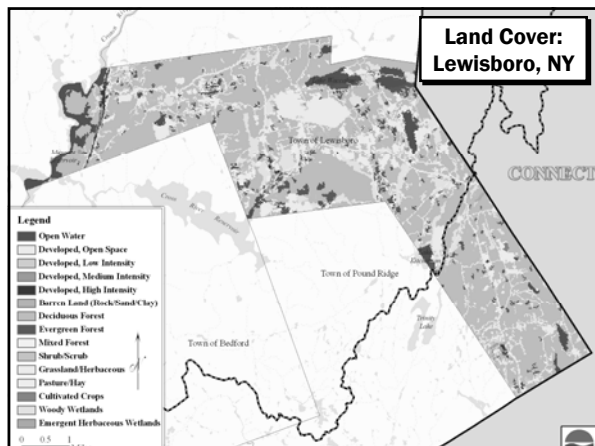
Thinking in Watersheds: It takes communication!

A Multi-town Compact!

- Inter-board communication Town/Village/City; Planning; Zoning; CAC
- Inter-department communication
- Inter-municipal cooperation





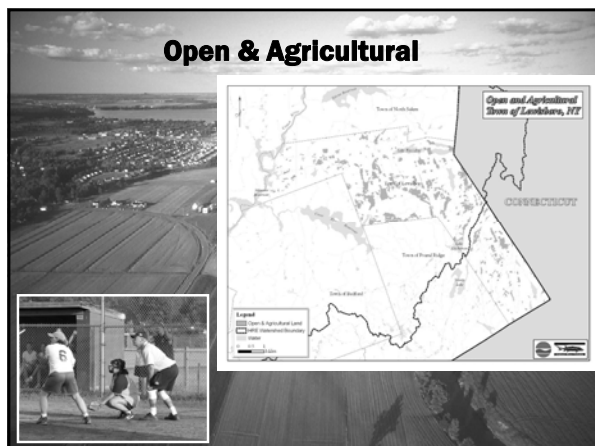


What to Look For:

Polluted runoff from Forests & Wetlands

Nutrients:
Pathogens: animal waste
Sediment: erosion from logging operations
Toxic:
Debris:
Thermal: removal of streamside vegetation

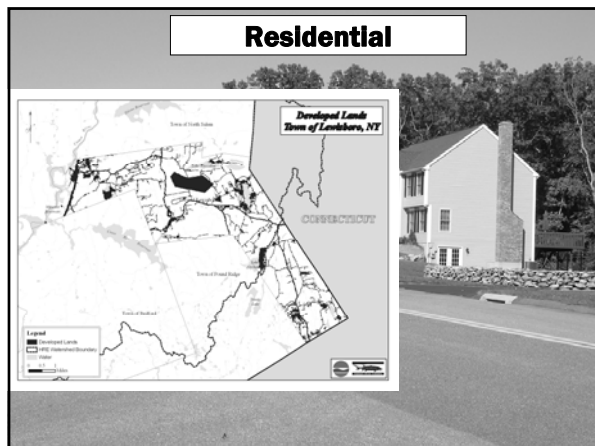
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What to Look For:

Polluted runoff from Agriculture & Open Space areas

Nutrients: fertilizer - farms, parks, golf courses
Pathogens: domestic animal & wildlife waste
Sediment: erosion - agricultural fields
Toxic: pesticides - ag. lands & golf courses
Debris: litter & illegal dumping
Thermal: removal of streamside vegetation, shallow water impoundments



What to Look For:

Polluted runoff from Residential areas

Nutrients: lawn fertilizers, septic systems

Pathogens: septic systems, pet waste

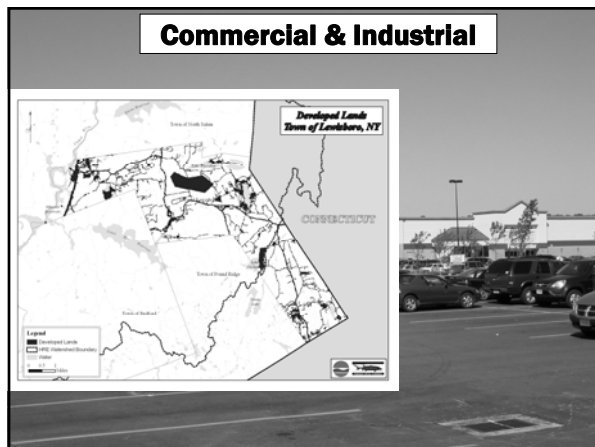
Sediment: construction, road sand, erosion from lawns & gardens

Toxic: household products, pesticides

Debris: litter & illegal dumping

Thermal: heated runoff, removal of streamside vegetation, impoundment's

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What to Look For:

Polluted runoff from Commercial & Industrial

Nutrients: acid rain & car exhaust

Pathogens: malfunctioning or overloaded septic systems & lagoons

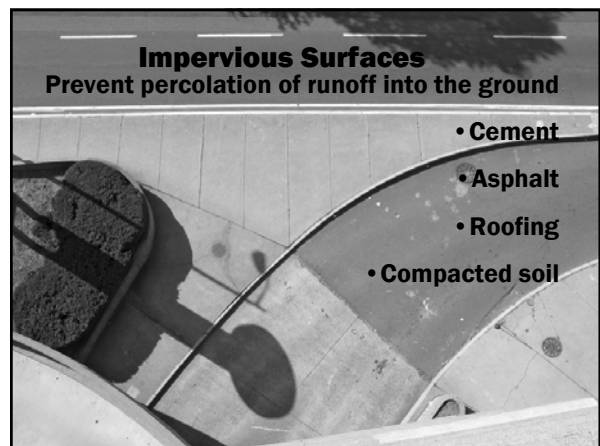
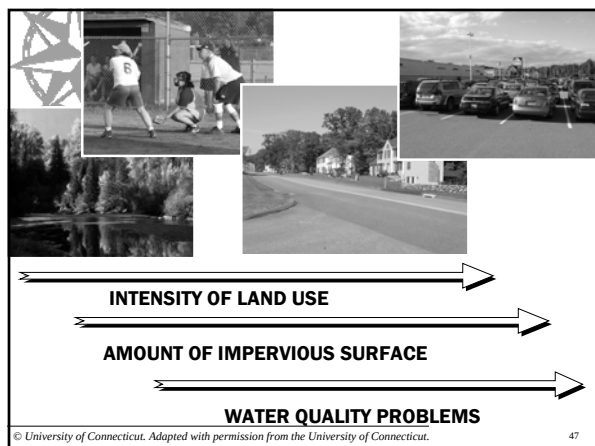
Sediment: construction, road sand, roadsides

Toxic: auto emissions, industrial pollutants

Debris: litter & illegal dumping

Thermal: heated runoff, streamside vegetation removal, impoundments

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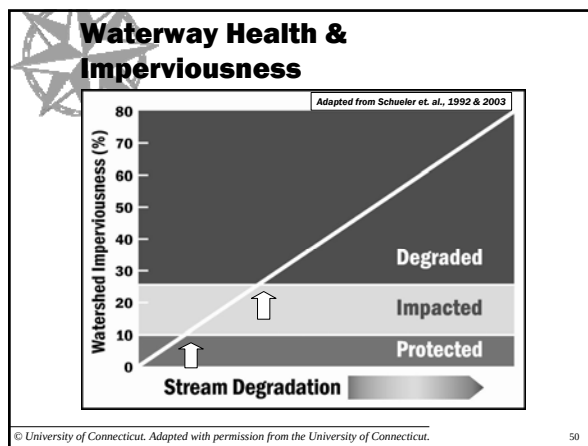
Impervious Surfaces



- Intensive land uses that cause pollution
- Inhibit groundwater recharge
- Prevent natural processing of pollutants in soil, plants
- Surface for pollutants to accumulate
- Direct route for pollutants to waterways

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49



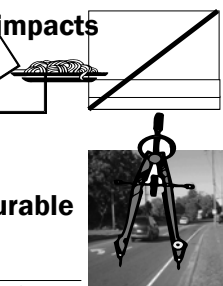


Impervious coverage is a practical tool:

1. it simplifies complex impacts
2. it is tangible & measurable

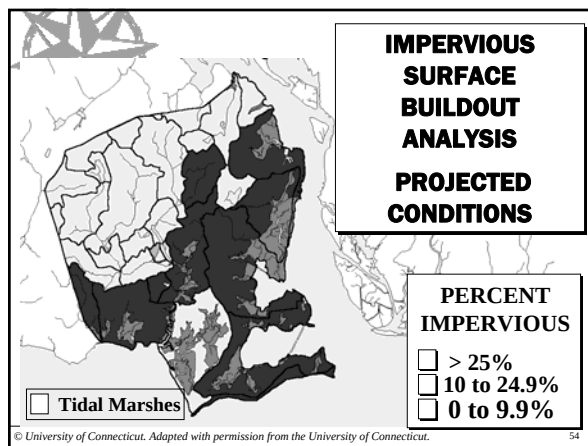
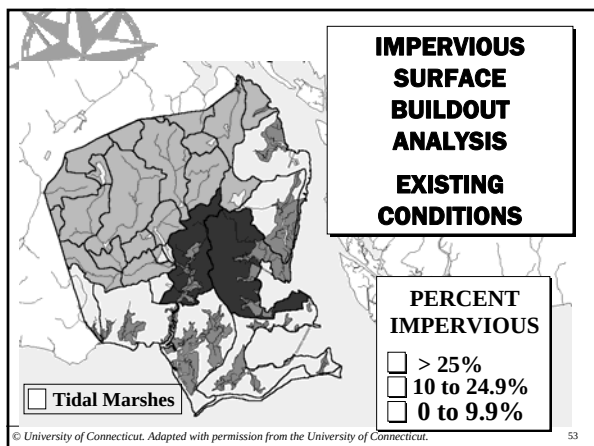
You Generate It!

$X = 3.6 + xy$



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So What Are We Supposed to Do?




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Three-tiered Strategy for Coping with Polluted Runoff

1. Natural Resource Based Planning
2. Site Design
3. Best Management Practices

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Strategy for Reducing Impacts from Development

1. Natural Resource Based Planning

- Inventory community resources
- Open space/economic development plan
- Comprehensive plan update
- Watershed plan
- Change regulations

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1. Natural Resource Inventory

The foundation of natural resource-based planning





Conducting a Community Resource Inventory

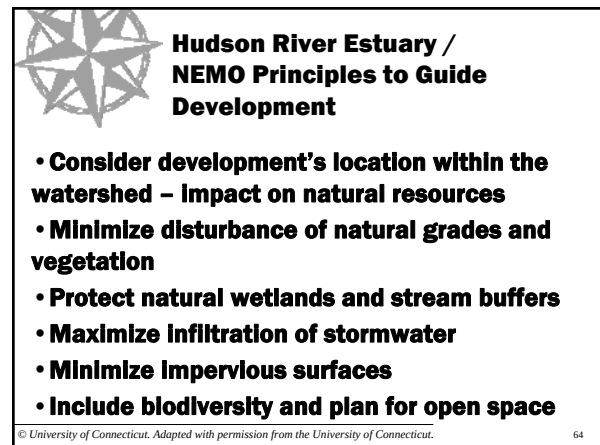
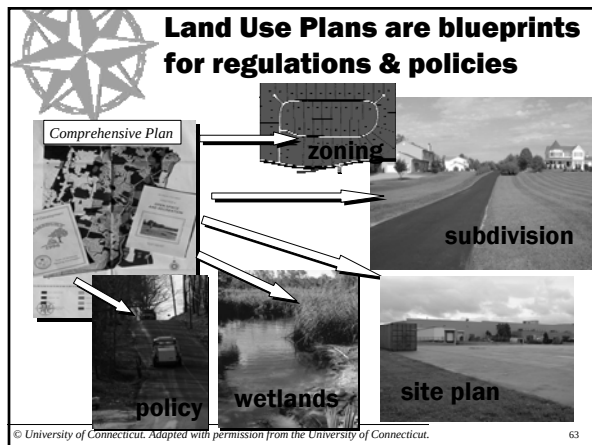
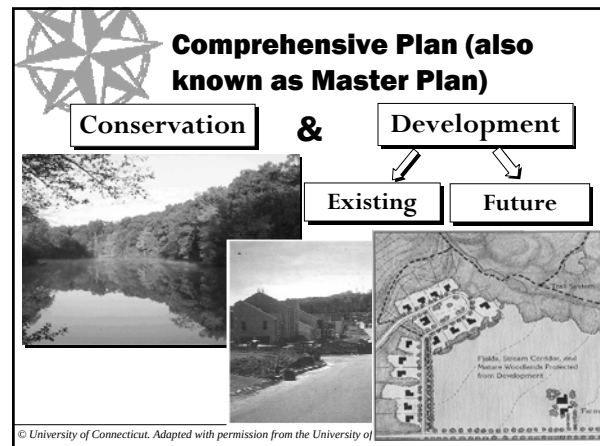
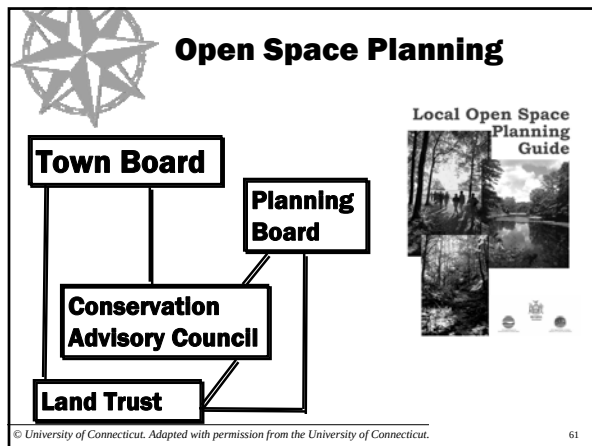
First step in preparing for your community's future...



Conservation Commissions/CACs are charged with conducting natural resource inventories

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<i>Environmental Resources: Town of Wappinger Comprehensive Plan</i>	
Goal: Encourage the preservation of environmentally significant features.	
Objectives:	
A.	Establish and preserve open space corridors along Wappinger Creek, Sprout Creek and the Hudson River, and improve access to these resources.
B.	Regulate the development of floodplains, wetlands, stream corridors, steep slopes, and ridge lines to ensure minimal disruption of their environmental functions and scenic qualities.
C.	Preserve the quality and quantity of the Town's surface and groundwater resources through land use regulation, monitoring, testing and promotion of water-saving systems.
D.	Protect surface water quality through regulation of stormwater runoff, particularly through new construction, and through rigorous enforcement.
E.	Develop a system of central utilities that will protect water resources by reducing the number of failing septic systems.
F.	Protect the Town's biodiversity through protection of endangered species and threatened plant and animal populations, as well as through control of invasive species.



Design Principles

Adapt Design Principles that Retain, Restore the Natural Landscape ...by Promoting Infiltration

10% 50%

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Maintain Vegetated Buffers

- Recognize importance of stream & wetland buffers
- Buffers are first line of defense against the impacts of impervious surfaces
- Natural vegetation buffers especially critical in urban areas

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Impervious Surface Budget

Transportation (Parking Lots, Roads, Driveways, Sidewalks)

65% Urban

35% Structures (Offices, Stores, Houses, Patios)

20% Rural

80%

Derived from the Connecticut's Changing Landscape data.

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Pavement Width varies with Function

LOCAL

18-24 ft

COLLECTOR

22-30 ft

ARTERIAL

24-32 ft

Hierarchy of road standards to reduce impervious surfaces

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ENGINEERED SWALES

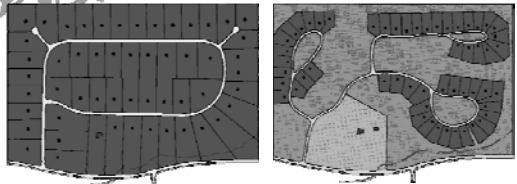
- Promote infiltration
- Most effective at sediment removal
- Open system easier to maintain & troubleshoot
- Installation costs comparable to piped drainage
- They look better!

Case Study

Old Saybrook, CT
May 2003

Same swale after contractor corrects design

Open Space Developments



• same number of housing units • 10-50% less impervious surface	• up to 50% open space • water resources protected
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Zoning & Site Plan Review

Parking Requirements



- zoning often requires almost twice the number of stalls actually used in peak periods
- developers often build more parking than required by zoning

Don't Zone for the Day After Thanksgiving!



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Alternatives to Pavement

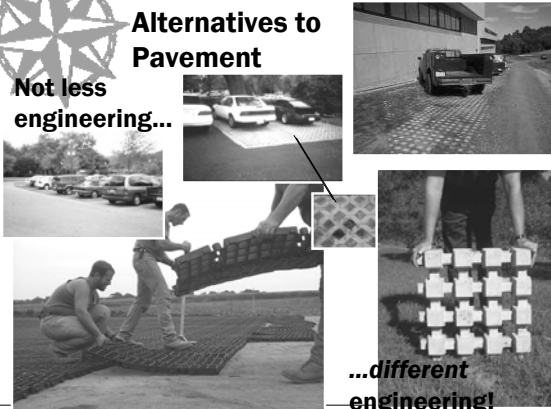


Conventional Parking

Overflow Parking

Alternatives to Pavement

Not less engineering...



...different engineering!

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Residential Roofs

- Redirect down spouts to pervious areas
- Rain gardens
- Rain Barrels

Residential Roof water is relatively clean, and can be easily taken out of the stormwater loop.



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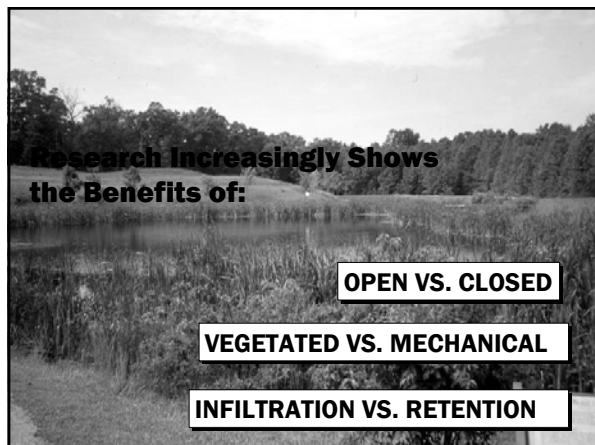

Strategy for coping with polluted runoff

1. Natural Resource Based Planning
2. Site Design
3. Best Management Practices

- Homeowners – lawn care, gardening, septic system care, household chemical use.
- Forested Land owners - management plans.
- Municipalities - maintain roads, lots, catch basins, and BMPs; support restoration where effective.

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New Stormwater Standards!

NYS Stormwater Management Design Manual

- Planning
- Design
- Treatment Practices
- Sizing
- Specifications

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82





Town Policies

Is there communication between your town supervisor is the KEY!

- Land use boards and commissions
- Departments in town hall?
- Surrounding towns?



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Strategy for Reducing Impacts from Development

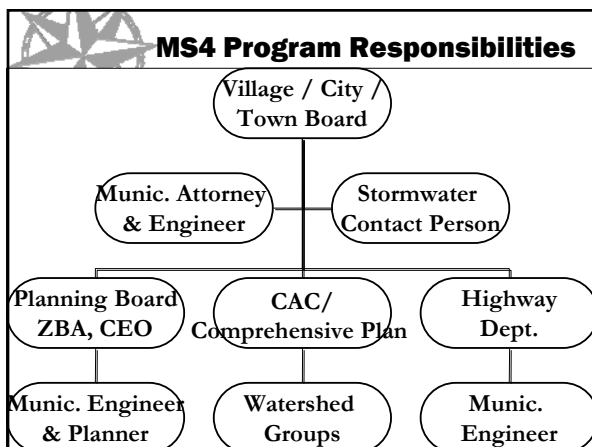
Municipal Property Management






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86





Strategy for Reducing Impacts from Development

Residential Property Management





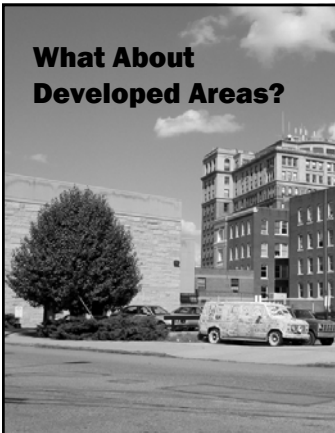

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88



Keep Westchester Water H2OK

- Lawn & Garden Care
- Household Chemical Use
- Care of Septic Systems



What About Developed Areas?

- It's STILL a planning issue!
- Every bit of GREEN helps
- Urban redevelopment reduces sprawl
- NYS Stormwater Manual Ch. 9

So Why Do This?

The good ol' *status quo*...



Is it really working all that well?

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So Why Do This?

It's More Than Quantity of Pavement...



...it's Quality of Life!

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Green is Good!

- For stormwater management
- For psychological health
- For aesthetics



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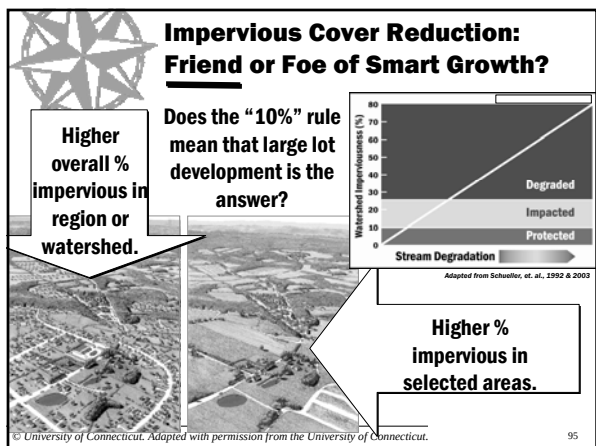
Support restoration where effective



Impervious Cover Reduction: Friend or Foe of Smart Growth?

Higher overall % impervious in region or watershed.

Does the "10%" rule mean that large lot development is the answer?



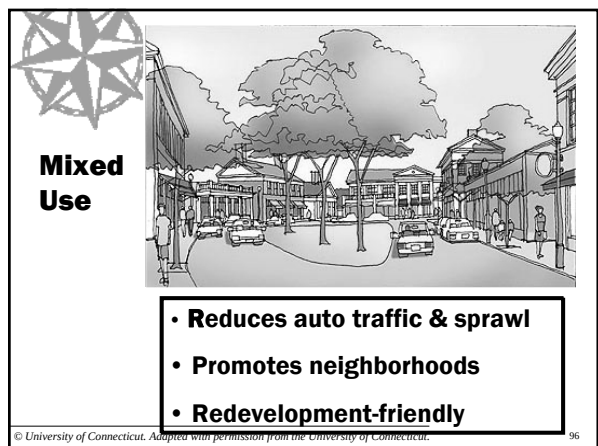
Higher % impervious in selected areas.

Adapted from Schueler, et. al., 1992 & 2003

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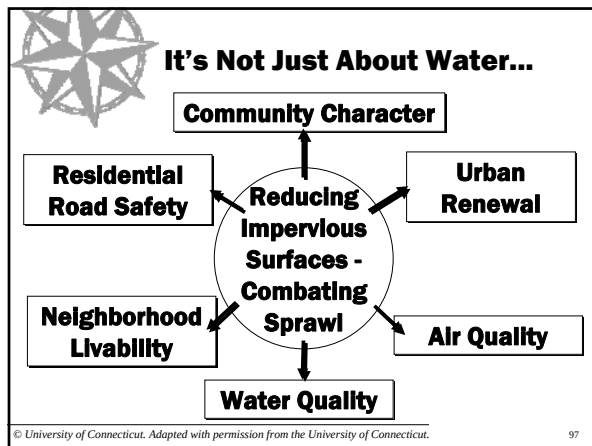
Mixed Use



- Reduces auto traffic & sprawl
- Promotes neighborhoods
- Redevelopment-friendly

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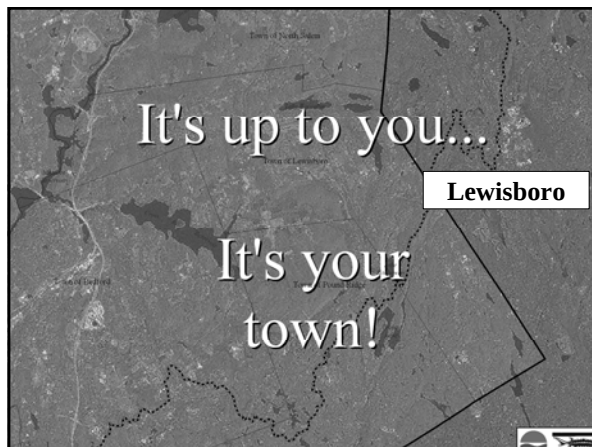


Support community education programs

- schools
- residents
- town staff & crews
- town officials

- stormdrain stenciling
- volunteer monitoring
- stream cleanup days

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We're Here to Help

NEMO

Hudson River Estuary Program

University of Connecticut
Cooperative Extension System
College of Agriculture and Natural Sciences

Connecticut State University

Connecticut State University

Hudson River Estuary EDUCATIONAL PROGRAMS

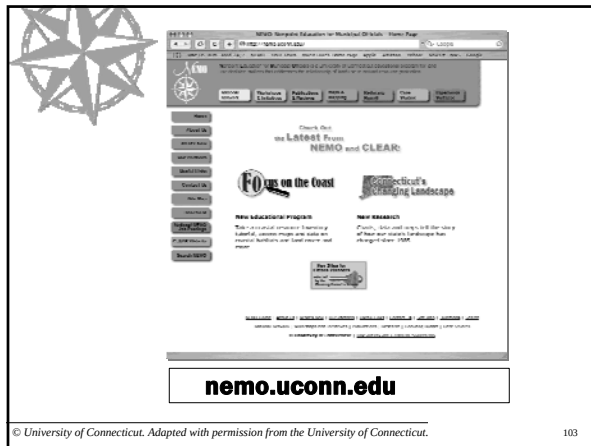
- **Better Site Design**
- **Biodiversity Assessment**
- **Watershed Planning**
- **Stream Buffer Protection**
- **Climate Change**
- **Open Space Planning**

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To Help You

- **Fact sheet series**
- **Technical papers**
- **Biodiversity habitat maps**
- **Grant program (April 2008)**
- **NEMO website: <http://nemo.uconn.edu>**
- **Hudson River Estuary Program website: <http://www.dec.ny.gov/lands/4920.html>**

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103

