Update on Stormwater Management "Stuff" in CT

CACIWC

Fall 2023

Mary Looney; Dave Dickson

CLEAR
University of Connecticut

provides research, tools, training, information, and assistance to community decision makers and other audiences in support of:

- better land use decisions
- healthier natural resources
- more resilient communities

UCONN
Extension + NRE + Sea Grant

Center for Land Use Education and Research (CLEAR)

https://clear.uconn.edu

CLEAR Focus Areas

Water

- NEMO
- Stormwater Management
- LID/GSI
- Rain Garden App
- Stormwater Corps

Land Use & Climate Resiliency

- Land Use Academy
- Climate Adaptation Academy
- Climate Corps
- CT DEEP Online Training

Geospatial

- CTECO
- Trails
- Geospatial Training Program (GTP)
- CT's Changing Landscape

Food Systems

- Beginning Farmer Training
- Local foods/Farm to Schools

STEM Education & Local Conservation

- E-Corps
- Natural Resources Conservation Academy (NRCA)

Flow Path

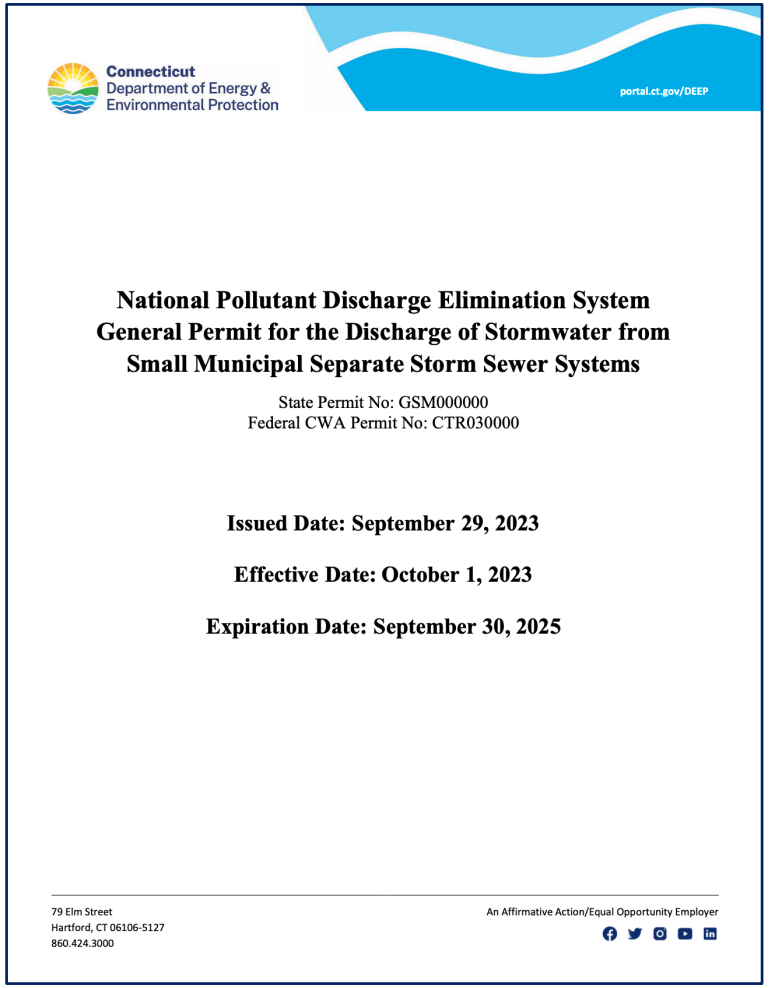
- MS4 Permit Updates
- New CT Stormwater Quality Manual Updates
- Stormwater Utilities
- Watershed Assessment Tool
- New & Noteworthy

Flow Path

- MS4 Permit Updates
- New CT Stormwater Quality Manual Updates
- Stormwater Utilities
- Watershed Assessment Tool
- New & Noteworthy

An MS4 Update

- Expired June 30th, 2022
- Renewed AS-IS October 1st, 2023
  - No changes
  - No re-registration
  - No new towns
  - 2 years, set to expire 2025
- Stakeholder input process for modifications



Connecticut
Department of Energy & Environmental Protection
portal.ct.gov/DEEP

National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems

State Permit No: GSM000000
Federal CWA Permit No: CTR030000

Issued Date: September 29, 2023

Effective Date: October 1, 2023

Expiration Date: September 30, 2025

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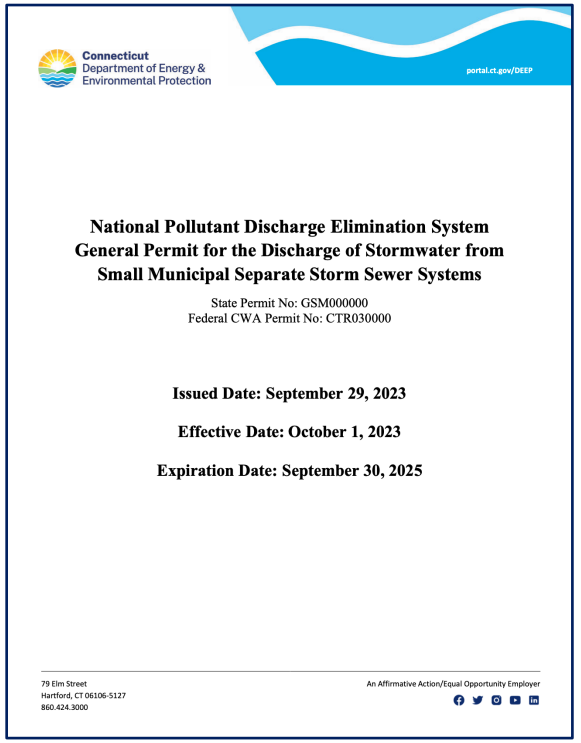
MS4 Requirements

1. Public Education and Outreach
2. Public Involvement and Participation
   - **Annual reporting**
3. Illicit Discharge and Detection Elimation
4. Construction Site Stormwater Runoff Control
5. Post-Construction Stormwater Management
   - **Regulations update, disconnection**
6. Pollution Prevention and Good Housekeeping
   - **Retrofits**



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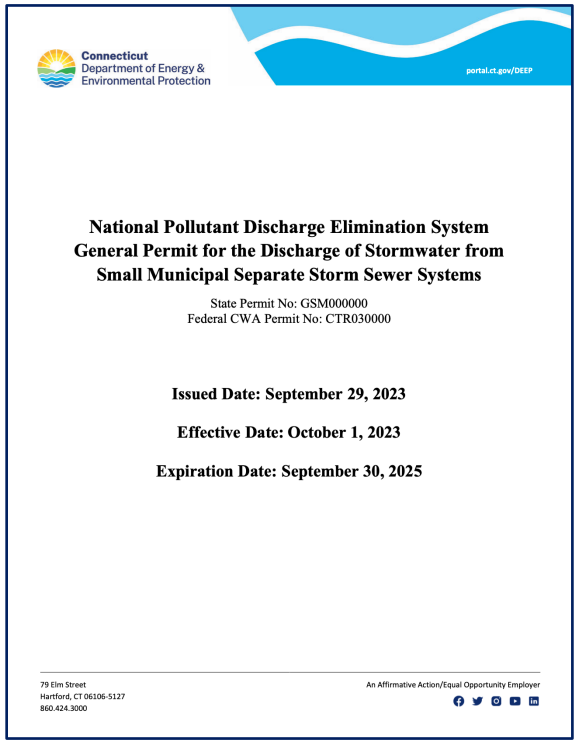
Annual Reports

- Municipalities expected to upload annual report with MS4 activities

- Dates:
  - January 31st: Notify public
  - February 15th: Post annual report; online and hardcopy
  - April 1st: Submit final report to DEEP

- 2023 MS4 Annual Report Template:

https://nemo.uconn.edu/ms4/tasks/annual-reports/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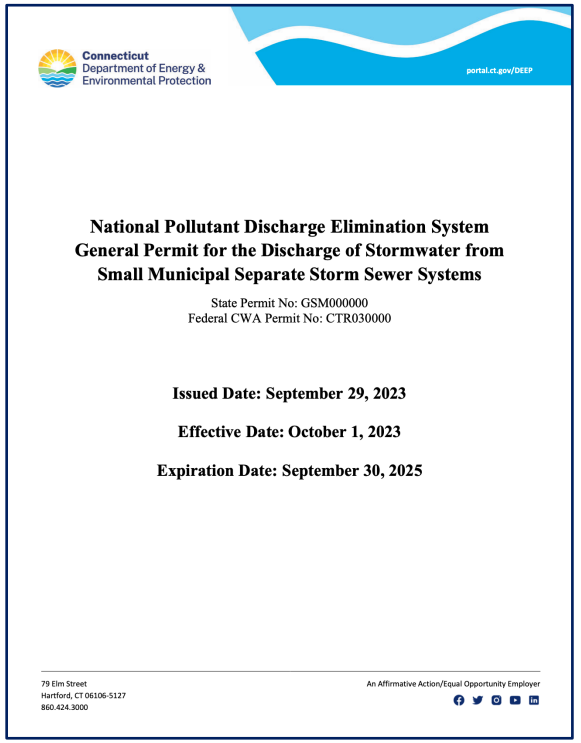
Disconnection / Retrofits

- Continue disconnection plan
- Reminder:
  - 2% by 2022; 1% annually after
  - TOTAL: ~5% by 2025

- Update according to new CT Stormwater Quality Manual
  - Required infiltration/treatment increasing from 1 inch to 1.3 inches



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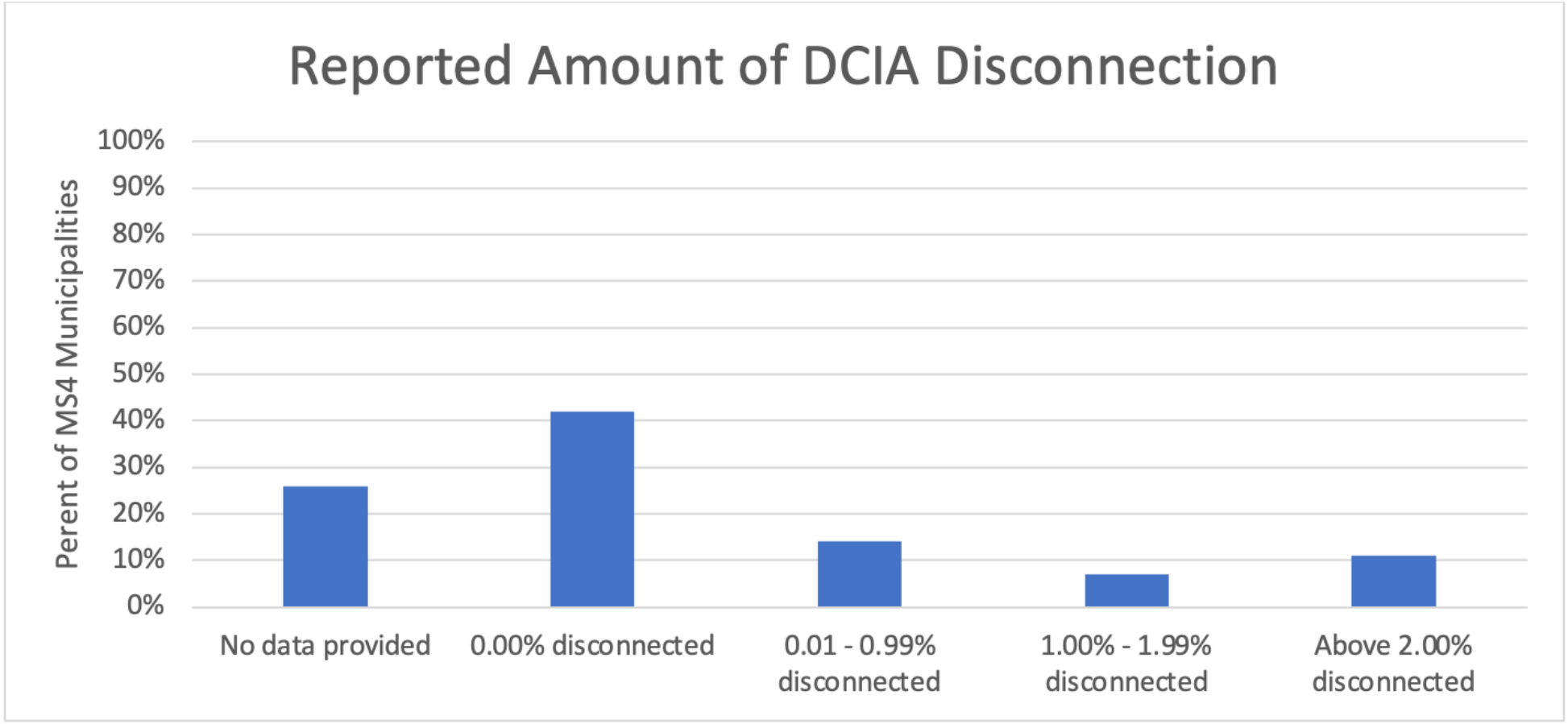
MS4 Survey



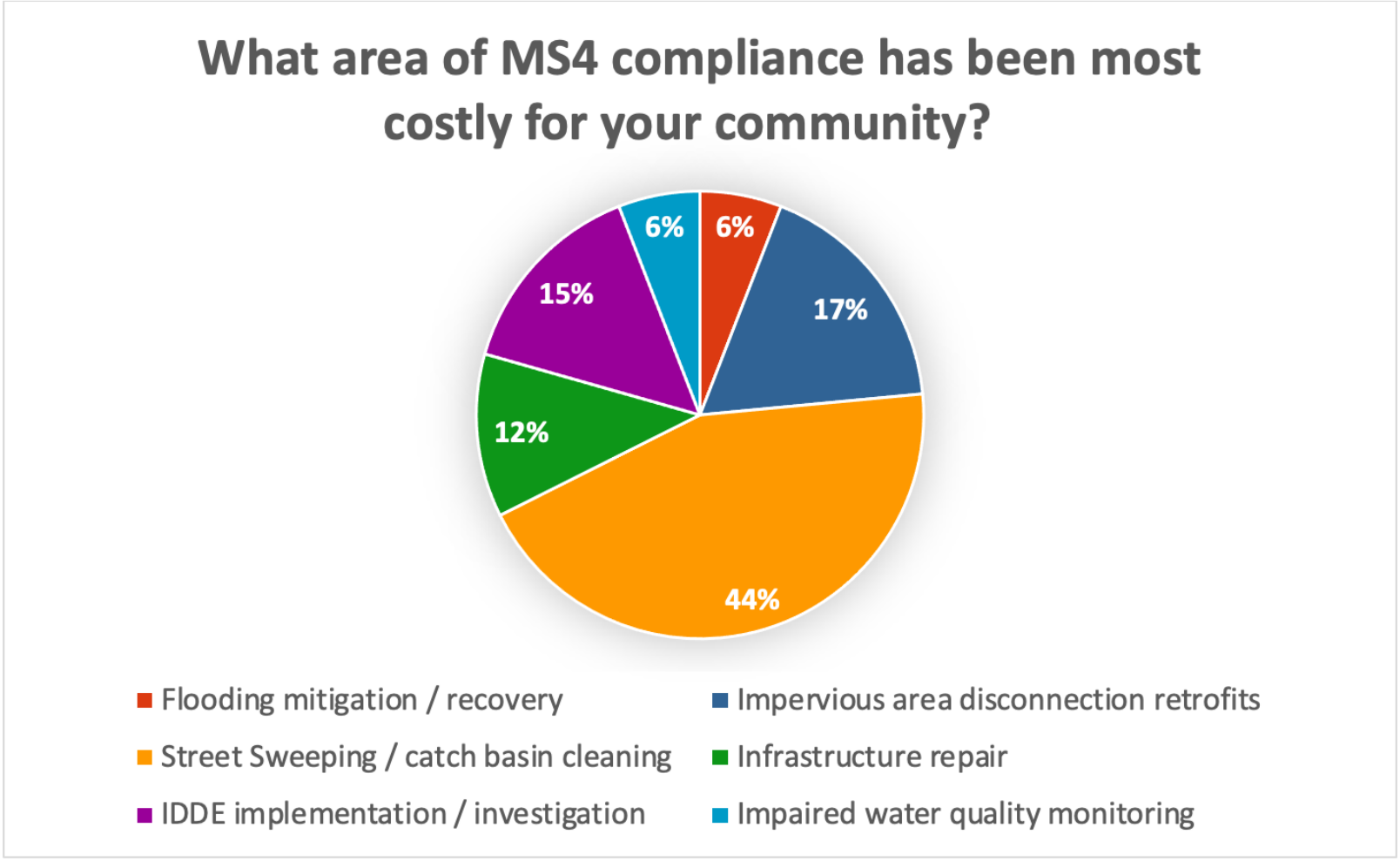
11% of towns hit the 2022 disconnection goal of 2%

MS4 Survey

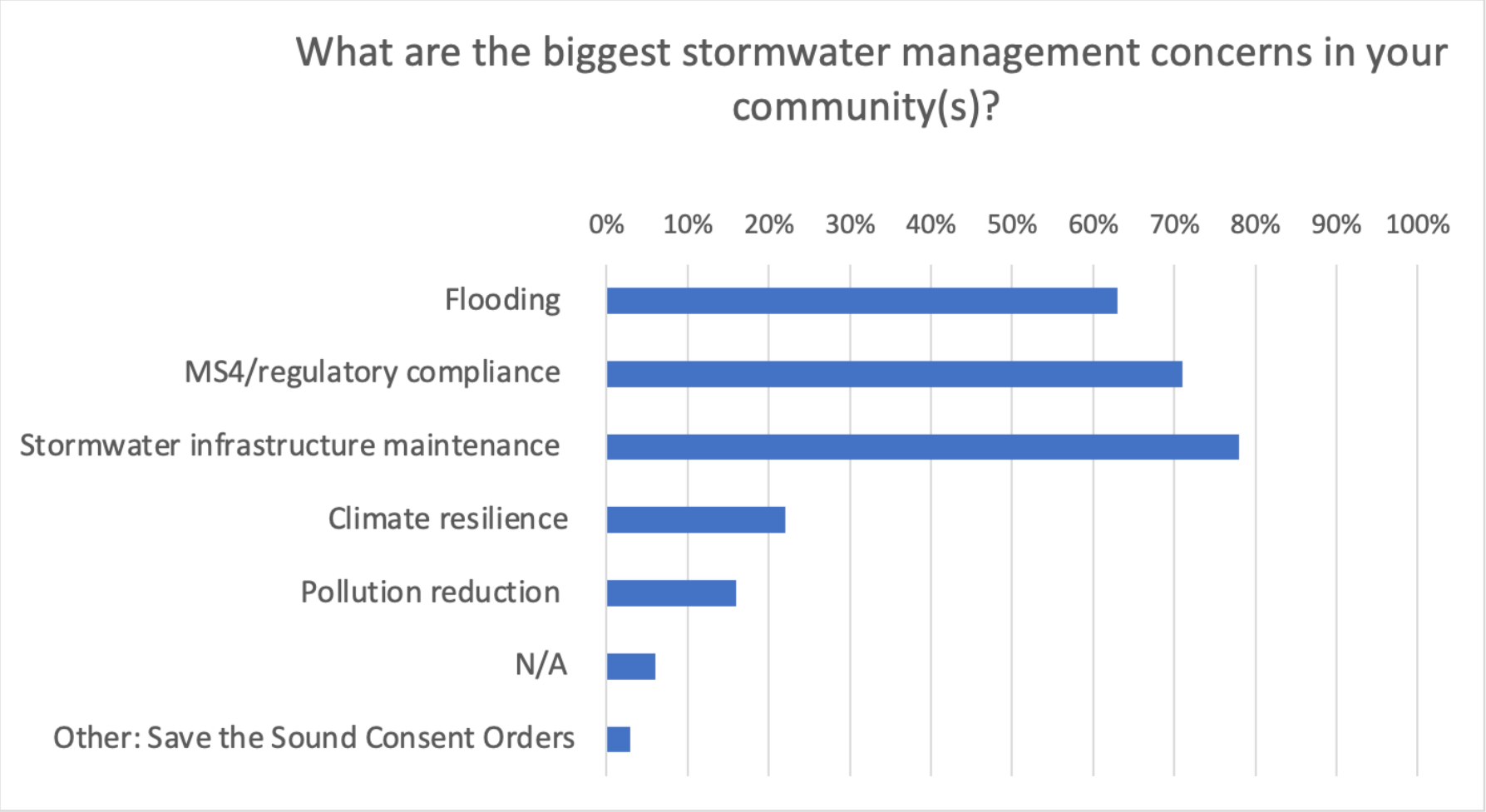
As of 2021:

- 23%: Have not updated land use regulations
- 17%: Have not completed formal employee training
- 51%: Have not completed control of other sources of pollutants to MS4
- 48%: Have not completed additional measures for impaired waters
- 18%: Have not completed infrastructure rehab and repair program
- 17%: Have not begun their impaired waters monitoring

MS4 Survey


What area of MS4 compliance has been most costly for your community?
6%
6%
17%
12%
44%
15%
Flooding mitigation / recovery
Impervious area disconnection retrofits
Street Sweeping / catch basin cleaning
Infrastructure repair
IDDE implementation / investigation
Impaired water quality monitoring

MS4 Survey


What are the biggest stormwater management concerns in your community(s)?
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Flooding
MS4/regulatory compliance
Stormwater infrastructure maintenance
Climate resilience
Pollution reduction
N/A
Other: Save the Sound Consent Orders

Flow Path

- MS4 Permit Updates
- New CT Stormwater Quality Manual Updates
- Stormwater Utilities
- Watershed Assessment Tool
- New & Noteworthy

Adoption Timeline

9/30/23

Manual is published

- Get familiar with new Manual
- Update local regulations

3/31/24

Effective Date
(with grace period for projects which have completed preliminary design)

- Adopt updated guidance
- If grace period is applicable, communicate this to review authority. Permit must be completed before grace period ends.

9/30/24

Grace period ends

- Adopt updated guidance

Navigating the Manual

BACKGROUND

- Ch. 1: Introduction
- Ch. 2: Stormwater Impacts
- Ch. 3: Preventing and Mitigating Stormwater Impacts

DESIGN & IMPLEMENT

- Ch. 4: Stormwater Management Standards and Performance Criteria
- Ch. 5: Low Impact Development Site Planning and Design Strategies
- Ch. 6: Source Control Practices and Pollution Prevention
- Ch. 7: Overview of Structural Stormwater Best Management Practices
- Ch. 8: Selection Considerations for Stormwater BMPs
- Ch. 9: Stormwater Retrofits
- Ch. 10: General Design Guidance for Stormwater Infiltration Systems
- Ch. 11: Proprietary Stormwater BMPs
- Ch. 12: Stormwater Management Plan
- Ch. 13: Structural Stormwater BMP Design Guidance

DESIGN

Pathway of utilizing Low Impact Development (LID) first and foremost, followed by guidance and criteria for structural stormwater BMPs

Chapter 4:
Updated stormwater management ***standards and criteria*** *for all development & redevelopment*

→

Chapters 5/6:
Using ***LID site planning & design*** *(****non-structural)*** *first to reduce stormwater impacts and* ***source protections*** *prevent pollutants in stormwater*

→

Chapters 7/8:
Selection of ***structural stormwater BMPs*** *after low impact development has been considered / implemented where possible*

→

Chapter 9:
Guidance on selecting stormwater BMPs for ***retrofitting sites*** *which are already developed*

Chapters 10/11:
Guidance on considering ***infiltration and pretreatment*** *stormwater BMPs*

→

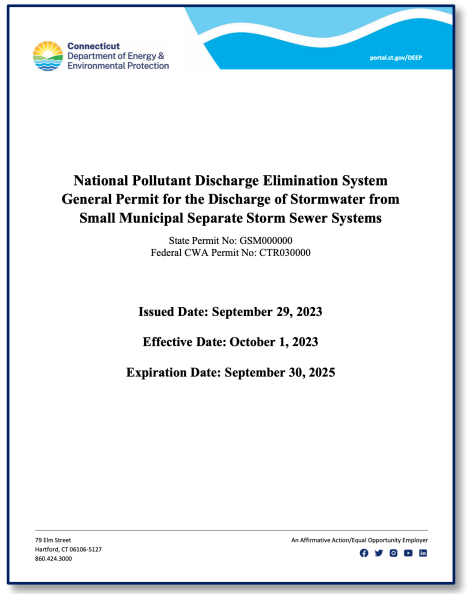
Chapter 12:
Updated site ***Stormwater Management Plan*** *guidance/outline reflecting changes*

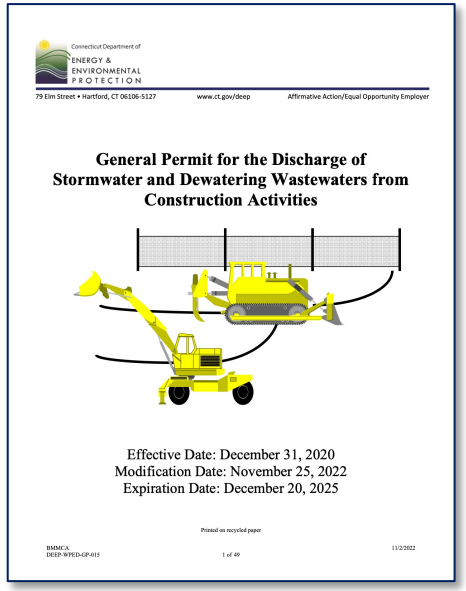
→

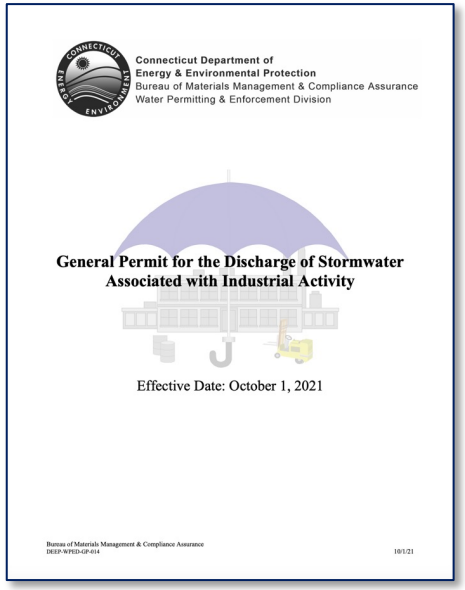
Chapter 13:
The 'nuts and bolts' of implementing a structural stormwater BMP – design, construction, maintenance, etc.

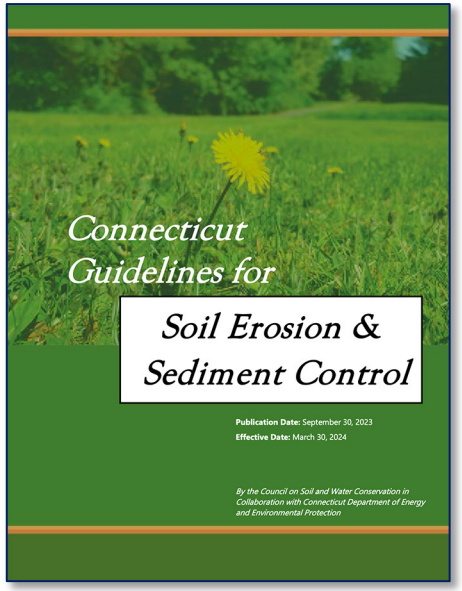
Objectives of the Update

- Improve consistency with the CT DEEP General Stormwater permits
    - MS4, Construction, Industrial
- Improve consistency with Guidelines for Soil Erosion and Sediment Control



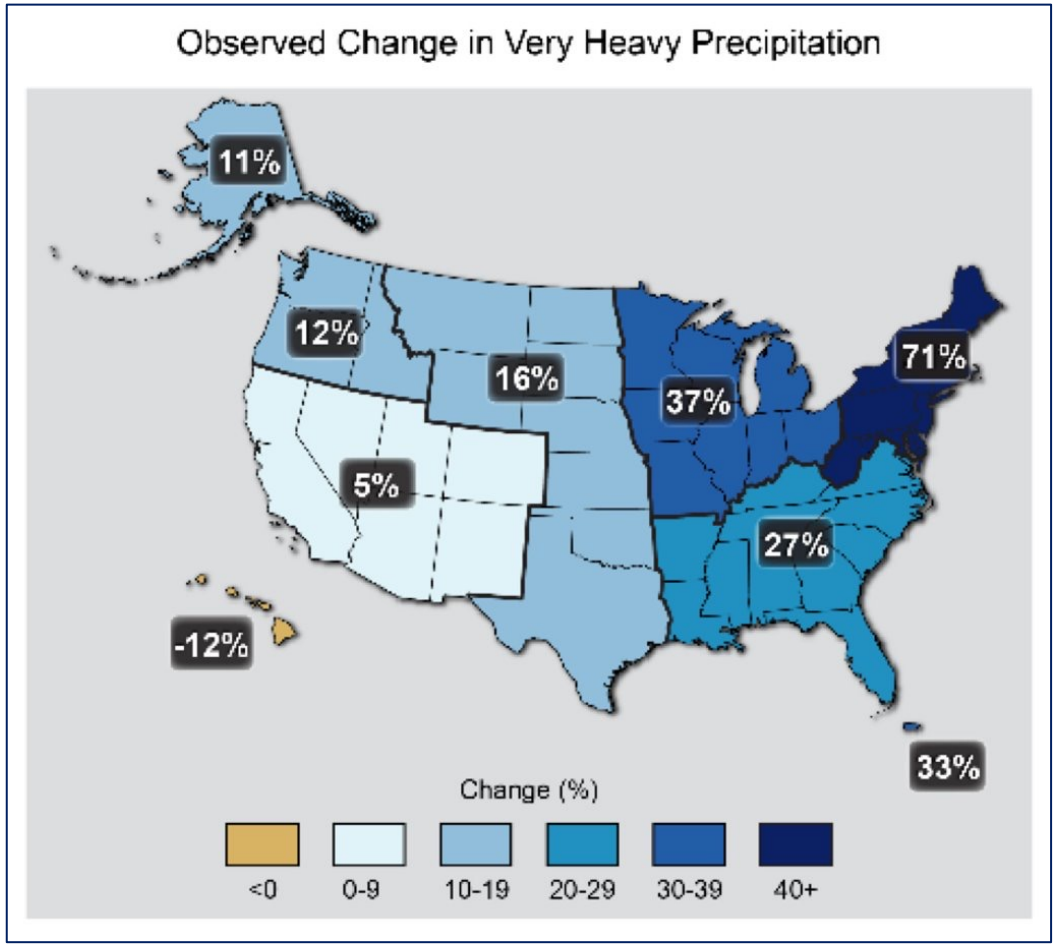






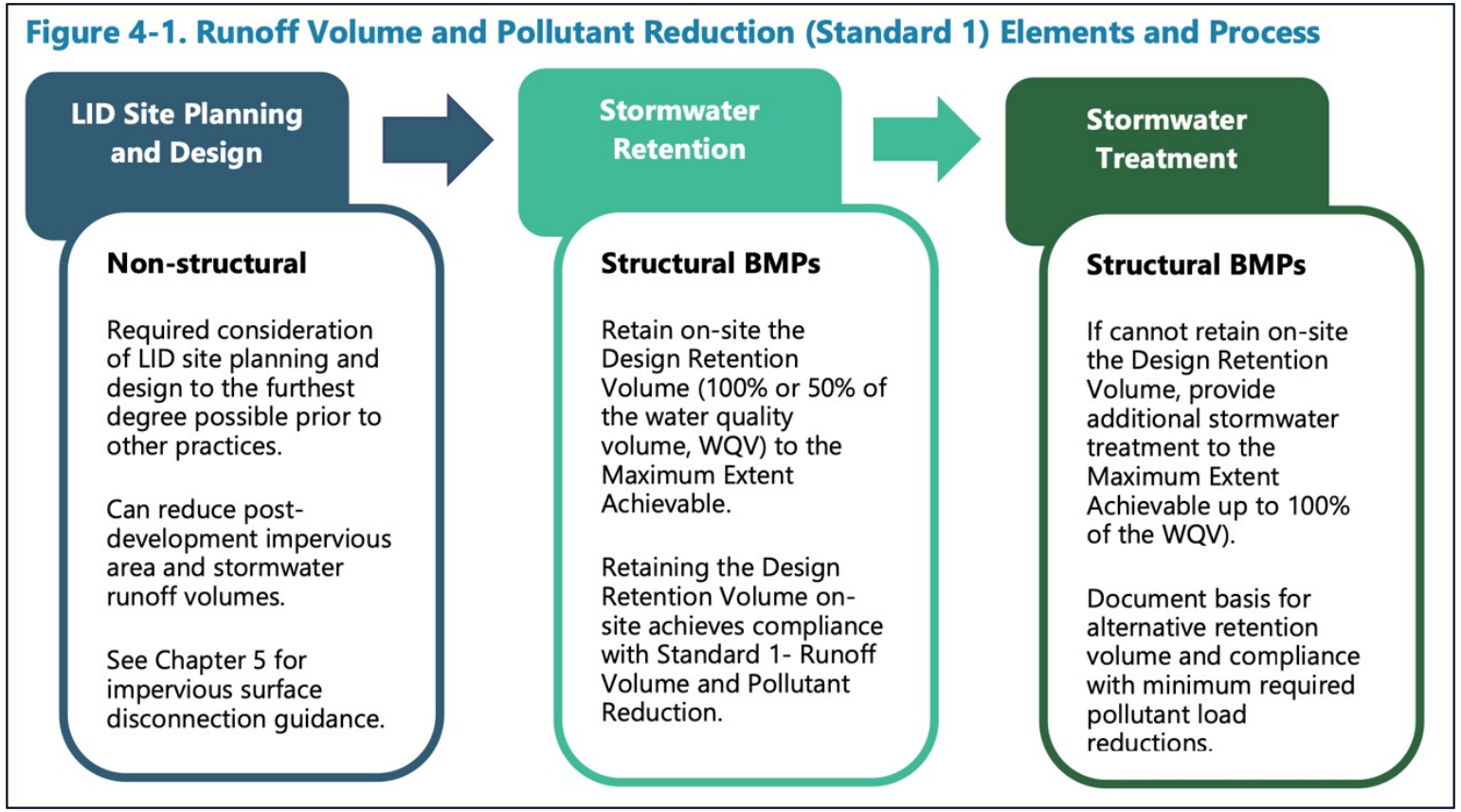
Objectives of the Update

- Incorporations of climate resiliency considerations
  - Adapting for larger rain events using new data from National Weather Service
  - Updated water quality storm variable within water quality volume equation



Objectives of the Update

- Emphasis on Low Impact Development FIRST



Ch. 4: Stormwater Management Standards and Performance Criteria

Standard 1: Runoff Volume and Pollutant Reduction

- New and Redevelopment with DCIA < 40% =
  - Retain 100% of WQV
- Redevelopment with DCIA > 40% =
  - Retain 50% of WQV

Type of Project or Activity	Required Retention Volume (RRV)[1]	Additional Treatment Volume Required[1]	
		If Volume Retained Meets or Exceeds RRV	If Volume Retained Does Not Meet RRV
➢ New development[2] ➢ Redevelopment[3] or retrofit of sites that are currently developed with existing DCIA[4] of less than 40% ➢ Any new stormwater discharges located within 500 feet of tidal wetlands, which are not fresh-tidal wetlands, to avoid dilution of the high marsh salinity and encouragement of the invasion of brackish or upland wetland species	100% of site's WQV	None	(100% of site's WQV) – (Volume Retained)
➢ Redevelopment or retrofit of sites that are currently developed with existing DCIA[4] of 40% or more	50% of site's WQV	None	(100% of site's WQV) – (Volume Retained)

Ch. 4: Stormwater Management Standards and Performance Criteria

2004 Manual Water Quality Volume Equation

Description	Post-Development Storm Magnitude
Water Quality Volume (WQV) Volume of runoff generated by one inch of rainfall on the site WQV = (1")(R)(A)/12 WQV = water quality volume (ac-ft) R = volumetric runoff coefficient = 0.05+0.009(I) I = percent impervious cover A = site area in acres	First one inch of rainfall

Updated Manual Water Quality Volume Equation

$$WQV = \frac{(P)(R)(A)}{12}$$

where:

WQV = water quality volume (cubic feet)
P = 1.3 inches (90th percentile rainfall event)
R = volumetric runoff coefficient = 0.05+0.009(I)
I = post- development impervious area (percent) after application of non-structural LID site planning and design strategies and before application of structural stormwater BMPs
A = post-development total drainage area of site or design point (square feet)

‘Water Quality Storm’

Ch. 4: Stormwater Management Standards and Performance Criteria

Water Quality Volume (WQV):

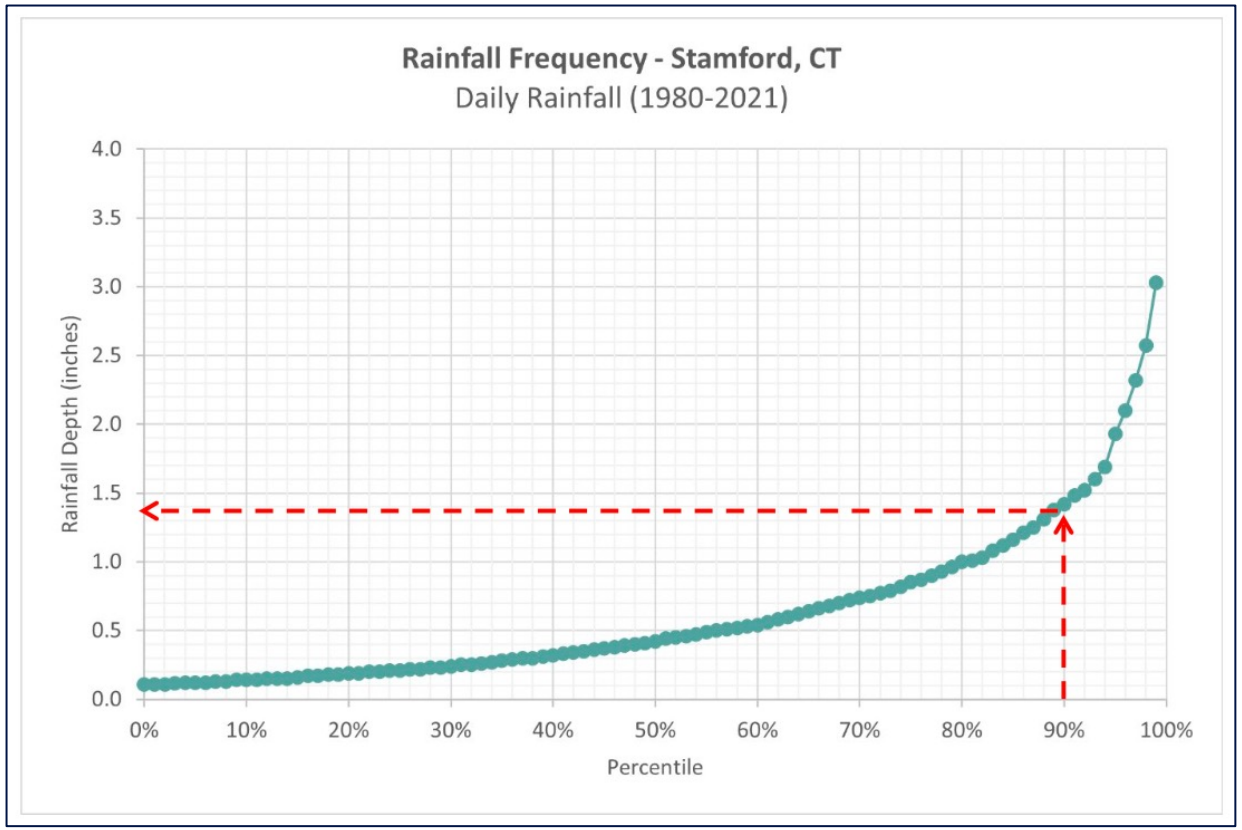
- Volume of runoff generated by Water Quality Storm
  - Calculated using the WQV equation
  - Determines how much retention is needed (standard to meet)
- "First Flush" principle
  - Assumes most pollutants in runoff are conveyed in initial portion of storm event
- Technically unchanged

VS.

Water Quality Storm (WQS):

- Used to generate the Water Quality Volume equation
  - 90th percentile rainfall volume = infiltration in natural condition
    - Amount that should be managed on-site to restore and maintain pre-development hydrology
- Increasing from 1" to 1.3"

Ch. 4: Stormwater Management Standards and Performance Criteria



CT average of past 40 years from National Weather Service data used to calculate new water quality storm. Stanford average shown above.

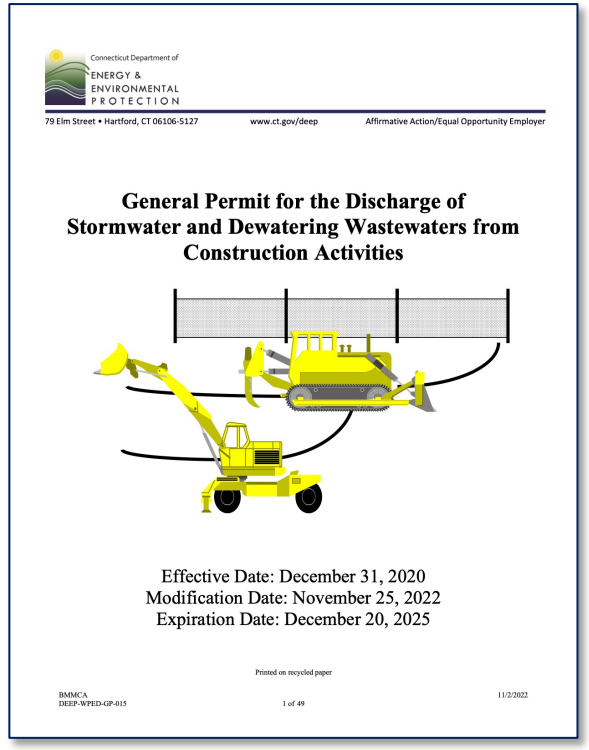
Water Quality Storm (WQS):

- Used to generate the Water Quality Volume equation
  - 90th percentile rainfall volume = infiltration in natural condition
    - Amount that should be managed on-site to restore and maintain pre-development hydrology
- Increasing from 1” to 1.3”

Ch. 4: Stormwater Management Standards and Performance Criteria

What does this mean for Construction?

- Construction stormwater permit = sites disturbing 1+ acres (Unless you have land use commission approval for 1-5 acres for locally approved sites)
    - New and Redevelopment with DCIA < 40% =
        - Water Quality Volume = 100%
        - New Water Quality storm variable
    - Redevelopments with DCIA > 40% =
        - Water Quality Volume = 50%
        - New Water Quality storm variable
    - Additional stormwater treatment for what cannot be retained


Connecticut Department of ENERGY & ENVIRONMENTAL PROTECTION
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General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities

Effective Date: December 31, 2020
Modification Date: November 25, 2022
Expiration Date: December 20, 2025

Printed on recycled paper

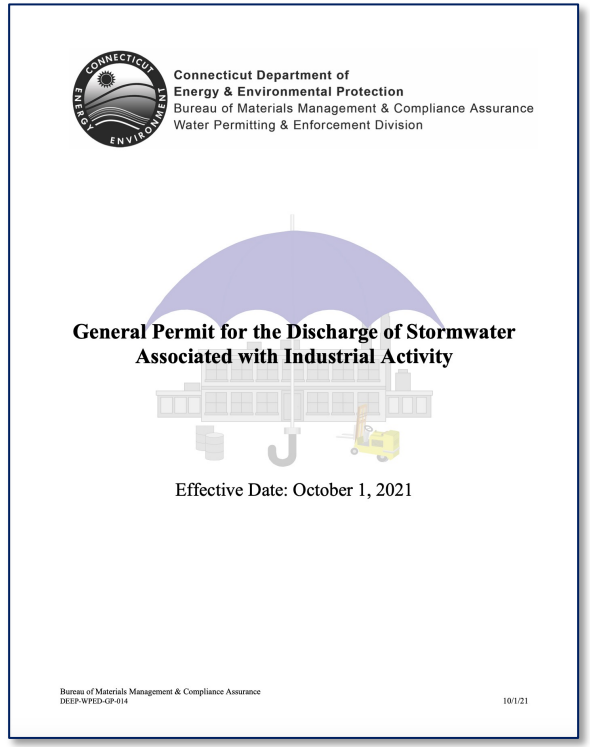
BMMCA DEEP-WPED-GP-015 1 of 49 11/2/2022

Stormwater Pollution Control Plan = adhere to Manual and Soil Guidelines

Ch. 4: Stormwater Management Standards and Performance Criteria

What does this mean for Industrial?

- Industrial stormwater permit = Any person or municipality that initiates, creates, originates, or maintains a discharge specified by the permit
    - Structural and non-structural controls must adhere to Manual
    - Construction activity onsite must adhere to CT DEEP construction permit and Manual


Connecticut Department of
Energy & Environmental Protection
Bureau of Materials Management & Compliance Assurance
Water Permitting & Enforcement Division

General Permit for the Discharge of Stormwater Associated with Industrial Activity

Effective Date: October 1, 2021

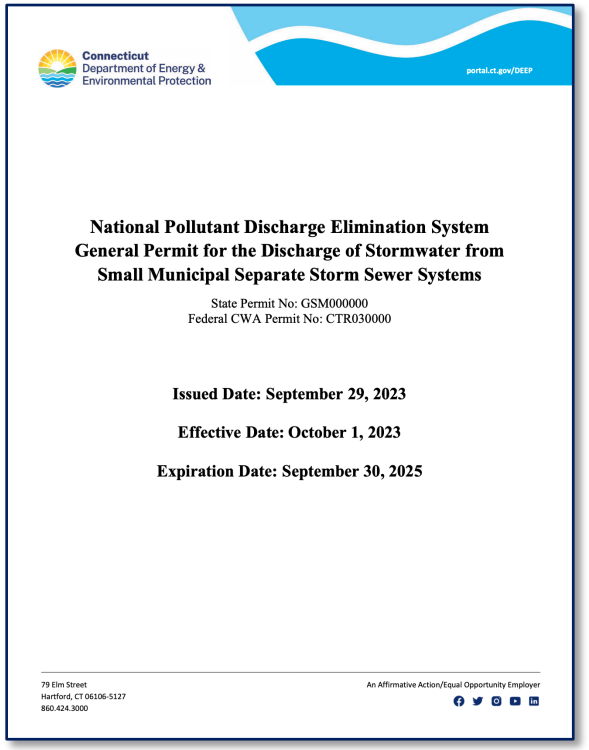
Bureau of Materials Management & Compliance Assurance
DEEP-WPED-GP-014
10/1/21

Stormwater Pollution Prevention Plan = adhere to Manual and Soil Guidelines

Ch. 4: Stormwater Management Standards and Performance Criteria

What does this mean for MS4 ?

- Disconnection:
  - DCIA considered disconnected when 'appropriate portion of WQV has been retained and or treated'
    - Same definition, same equation, new water quality storm variable
      - 100% of WQV for < 40% DCIA; 50% of WQV for > 40% DCIA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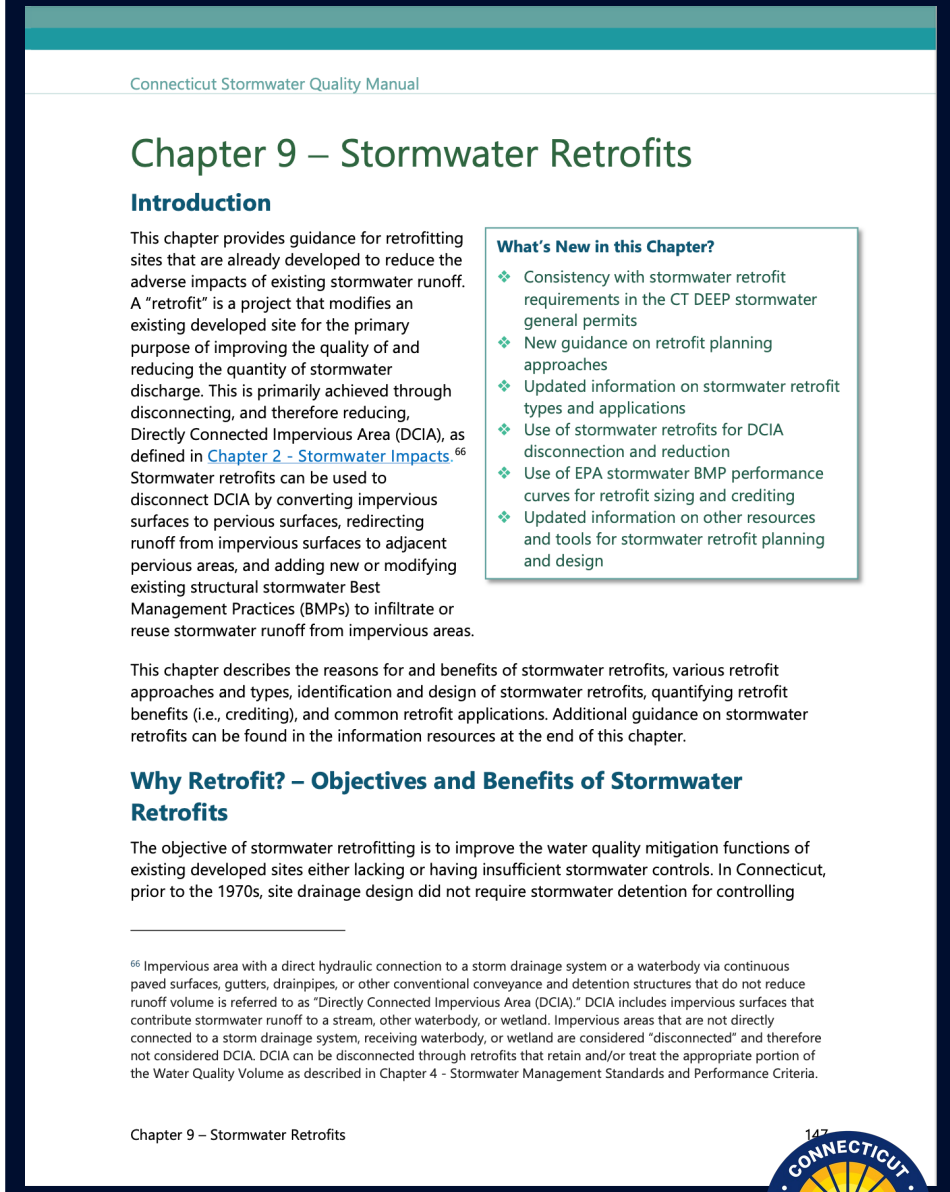
- Updates to Ordinances, Regulations, or Policies
  - MS4 Legal Authority requires consistency with CT Stormwater Quality Manual
    - Any reference to the 2004 Manual should be revised to reference updated Manual
    - Any reference to the old WQV equation or 1 inch retention standard should be revised

Ch. 9: Stormwater Retrofits

- **Purpose / Overview**
  - Consistency with CT DEEP Permits
  - Techniques for retrofitting existing developed sites
  - Conditions for which stormwater retrofits are appropriate
  - Meeting DCIA disconnection goals
- **How to apply it**
  - Further guidance and clarification for retention standards for redevelopment
    - New WQS variable within WQV equation impact what is considered 'disconnected'



Connecticut Stormwater Quality Manual

Chapter 9 – Stormwater Retrofits

Introduction

This chapter provides guidance for retrofitting sites that are already developed to reduce the adverse impacts of existing stormwater runoff. A "retrofit" is a project that modifies an existing developed site for the primary purpose of improving the quality of and reducing the quantity of stormwater discharge. This is primarily achieved through disconnecting, and therefore reducing, Directly Connected Impervious Area (DCIA), as defined in Chapter 2 - Stormwater Impacts.[66] Stormwater retrofits can be used to disconnect DCIA by converting impervious surfaces to pervious surfaces, redirecting runoff from impervious surfaces to adjacent pervious areas, and adding new or modifying existing structural stormwater Best Management Practices (BMPs) to infiltrate or reuse stormwater runoff from impervious areas.

What's New in this Chapter?

- Consistency with stormwater retrofit requirements in the CT DEEP stormwater general permits
- New guidance on retrofit planning approaches
- Updated information on stormwater retrofit types and applications
- Use of stormwater retrofits for DCIA disconnection and reduction
- Use of EPA stormwater BMP performance curves for retrofit sizing and crediting
- Updated information on other resources and tools for stormwater retrofit planning and design

This chapter describes the reasons for and benefits of stormwater retrofits, various retrofit approaches and types, identification and design of stormwater retrofits, quantifying retrofit benefits (i.e., crediting), and common retrofit applications. Additional guidance on stormwater retrofits can be found in the information resources at the end of this chapter.

Why Retrofit? – Objectives and Benefits of Stormwater Retrofits

The objective of stormwater retrofitting is to improve the water quality mitigation functions of existing developed sites either lacking or having insufficient stormwater controls. In Connecticut, prior to the 1970s, site drainage design did not require stormwater detention for controlling

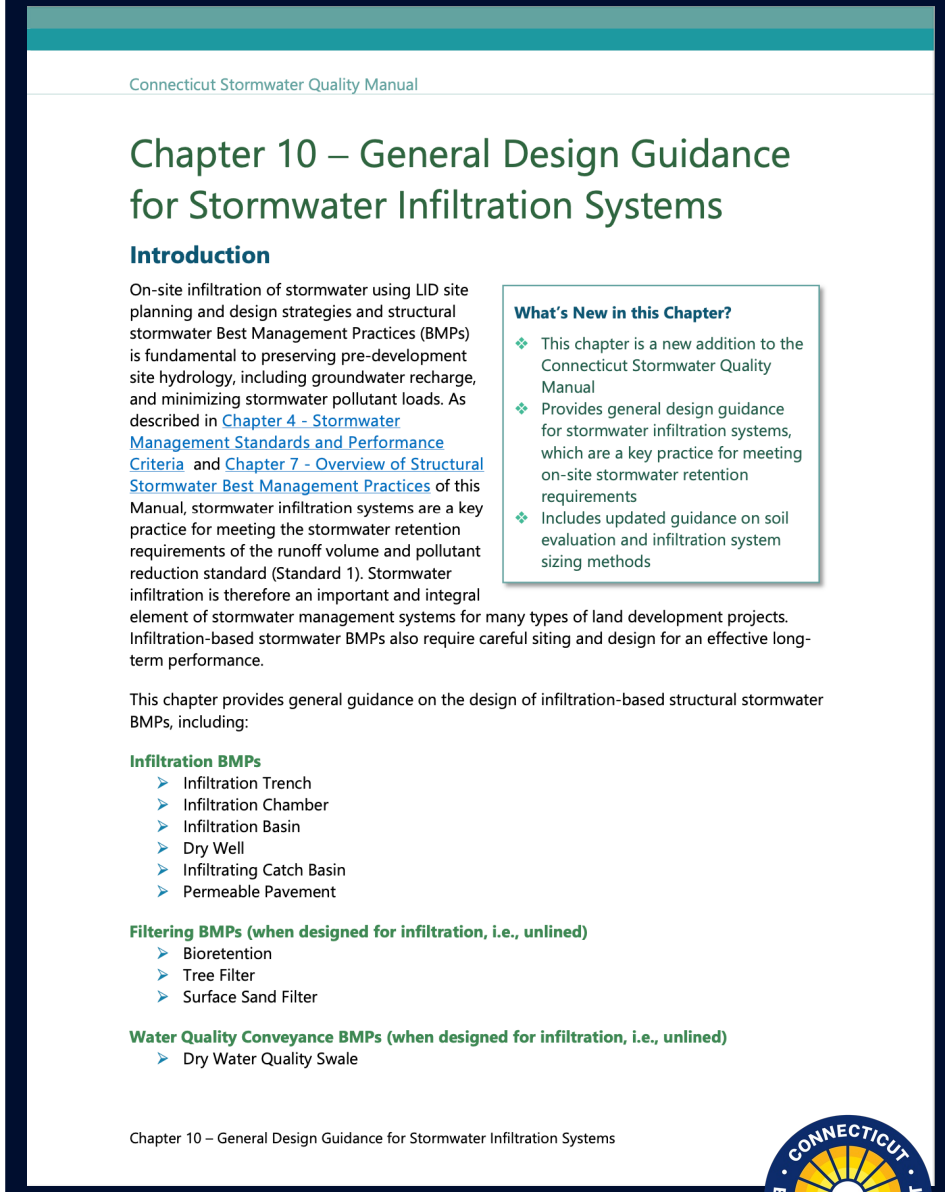
[66] Impervious area with a direct hydraulic connection to a storm drainage system or a waterbody via continuous paved surfaces, gutters, drainpipes, or other conventional conveyance and detention structures that do not reduce runoff volume is referred to as "Directly Connected Impervious Area (DCIA)." DCIA includes impervious surfaces that contribute stormwater runoff to a stream, other waterbody, or wetland. Impervious areas that are not directly connected to a storm drainage system, receiving waterbody, or wetland are considered "disconnected" and therefore not considered DCIA. DCIA can be disconnected through retrofits that retain and/or treat the appropriate portion of the Water Quality Volume as described in Chapter 4 - Stormwater Management Standards and Performance Criteria.

Chapter 9 – Stormwater Retrofits 147

Ch. 10: General Design Guidance for Stormwater Infiltration

New chapter to the Manual

- **Purpose / Overview**
  - Guidance on selecting & designing stormwater **infiltration systems**
    - e.g., dry wells, perv. pavements, bioretention, swales, tree filters
  - Site **suitability**
    - Soil evaluation methods
    - Sizing methods
    - Placement
- **How to apply it**
  - Site evaluation & planning for infiltration practices



Connecticut Stormwater Quality Manual

Chapter 10 – General Design Guidance for Stormwater Infiltration Systems

Introduction

On-site infiltration of stormwater using LID site planning and design strategies and structural stormwater Best Management Practices (BMPs) is fundamental to preserving pre-development site hydrology, including groundwater recharge, and minimizing stormwater pollutant loads. As described in Chapter 4 - Stormwater Management Standards and Performance Criteria and Chapter 7 - Overview of Structural Stormwater Best Management Practices of this Manual, stormwater infiltration systems are a key practice for meeting the stormwater retention requirements of the runoff volume and pollutant reduction standard (Standard 1). Stormwater infiltration is therefore an important and integral element of stormwater management systems for many types of land development projects. Infiltration-based stormwater BMPs also require careful siting and design for an effective long-term performance.

What's New in this Chapter?

- This chapter is a new addition to the Connecticut Stormwater Quality Manual
- Provides general design guidance for stormwater infiltration systems, which are a key practice for meeting on-site stormwater retention requirements
- Includes updated guidance on soil evaluation and infiltration system sizing methods

This chapter provides general guidance on the design of infiltration-based structural stormwater BMPs, including:

Infiltration BMPs

- Infiltration Trench
- Infiltration Chamber
- Infiltration Basin
- Dry Well
- Infiltrating Catch Basin
- Permeable Pavement

Filtering BMPs (when designed for infiltration, i.e., unlined)

- Bioretention
- Tree Filter
- Surface Sand Filter

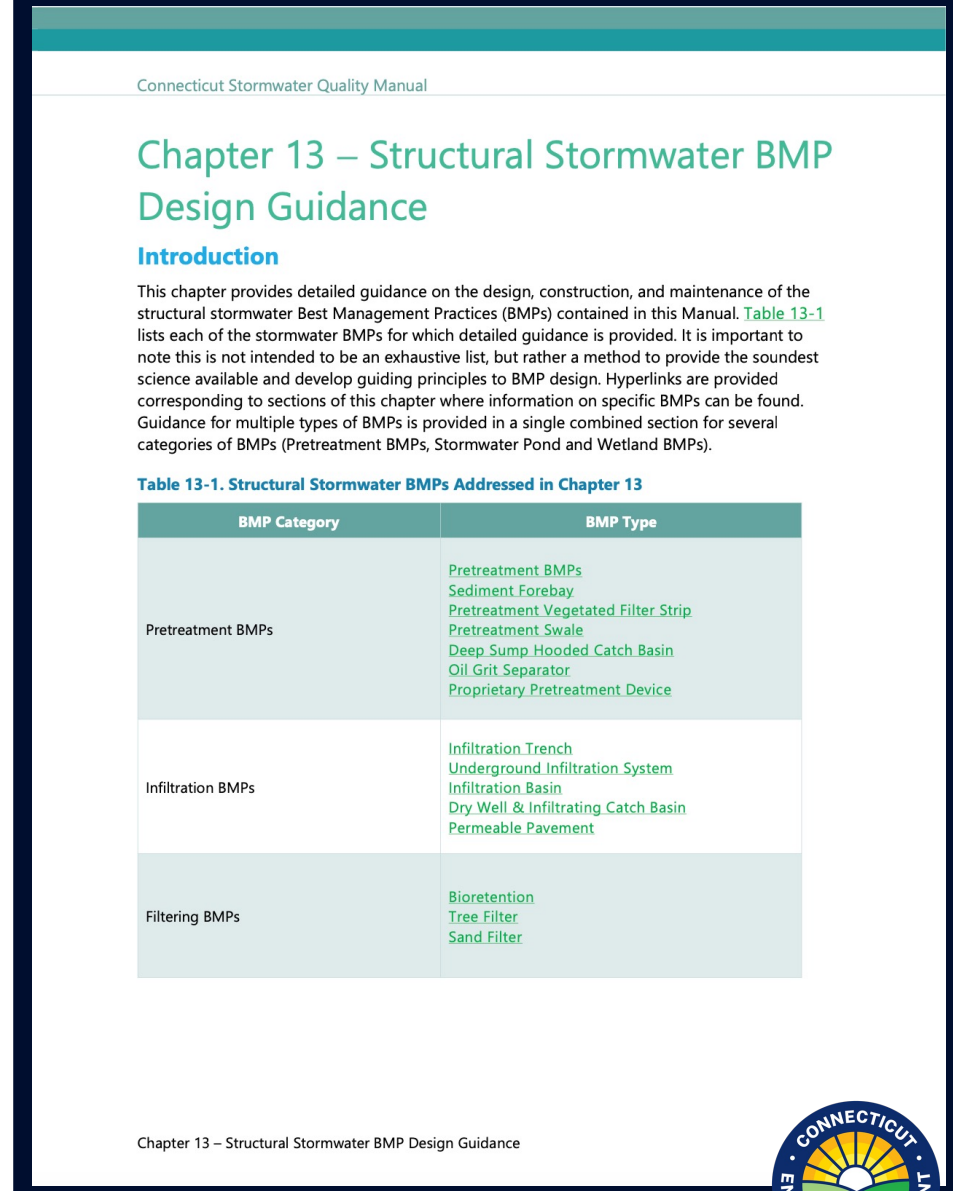
Water Quality Conveyance BMPs (when designed for infiltration, i.e., unlined)

- Dry Water Quality Swale

Chapter 10 – General Design Guidance for Stormwater Infiltration Systems

Ch. 13: Structural Stormwater BMP Design Guidance

- **Purpose / Overview**
  - Detailed technical design guidance for each of the structural stormwater BMPs
  - Guidance on the selection, design, construction, and maintenance
  - Advantages & limitations
  - Drawings & photos
- **How to apply it**
  - Technical design, construction and maintenance of individual stormwater BMPs



Connecticut Stormwater Quality Manual

Chapter 13 – Structural Stormwater BMP Design Guidance

Introduction

This chapter provides detailed guidance on the design, construction, and maintenance of the structural stormwater Best Management Practices (BMPs) contained in this Manual. Table 13-1 lists each of the stormwater BMPs for which detailed guidance is provided. It is important to note this is not intended to be an exhaustive list, but rather a method to provide the soundest science available and develop guiding principles to BMP design. Hyperlinks are provided corresponding to sections of this chapter where information on specific BMPs can be found. Guidance for multiple types of BMPs is provided in a single combined section for several categories of BMPs (Pretreatment BMPs, Stormwater Pond and Wetland BMPs).

Table 13-1. Structural Stormwater BMPs Addressed in Chapter 13

BMP Category	BMP Type
Pretreatment BMPs	Pretreatment BMPs Sediment Forebay Pretreatment Vegetated Filter Strip Pretreatment Swale Deep Sump Hooded Catch Basin Oil Grit Separator Proprietary Pretreatment Device
Infiltration BMPs	Infiltration Trench Underground Infiltration System Infiltration Basin Dry Well & Infiltrating Catch Basin Permeable Pavement
Filtering BMPs	Bioretention Tree Filter Sand Filter

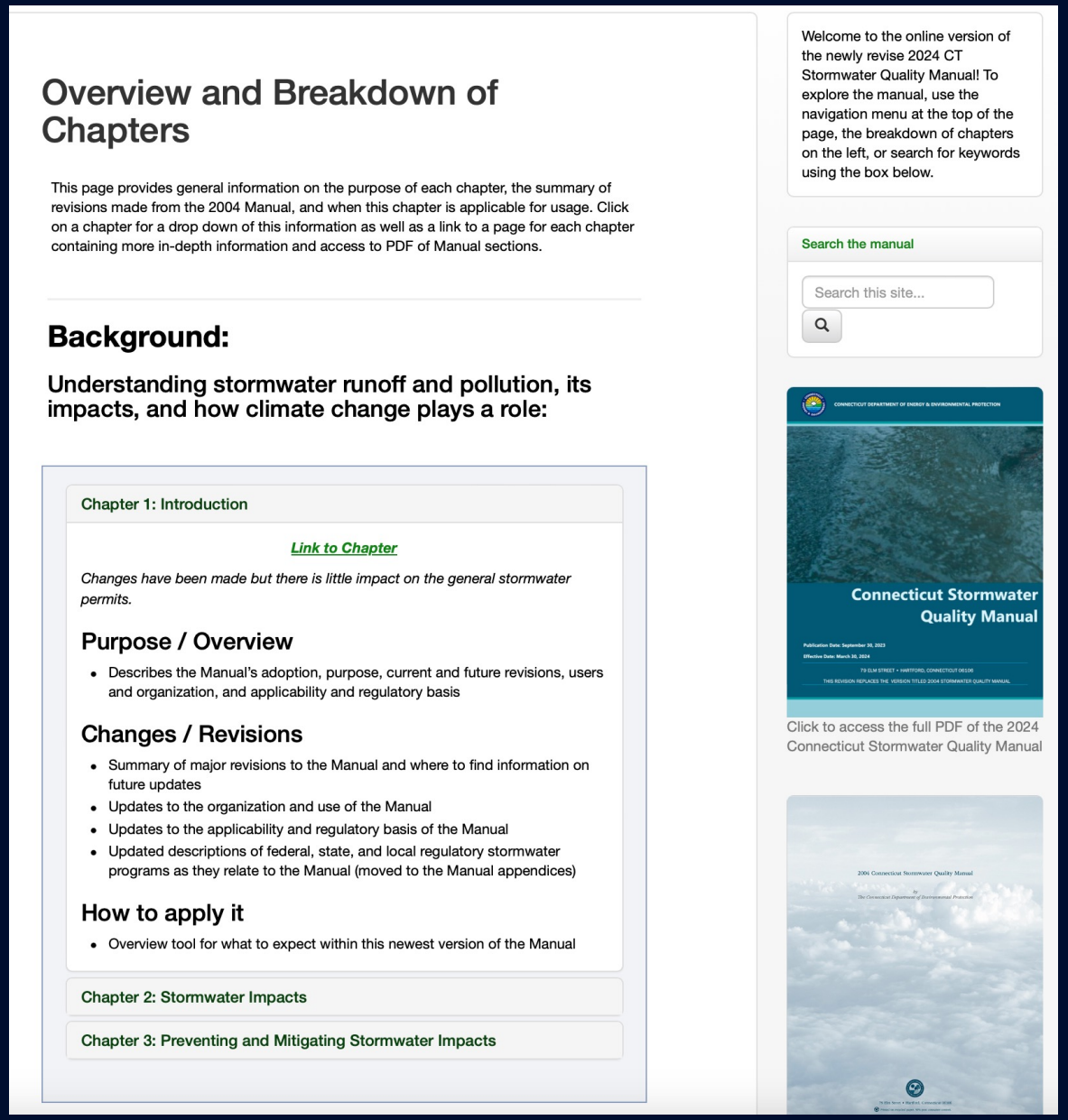
Chapter 13 – Structural Stormwater BMP Design Guidance

Navigating the Manual

Website

- Broken down by chapter and usage
- Breakdown of revisions and impacts

ctstormwatermanual.nemo.uconn.edu



Overview and Breakdown of Chapters

This page provides general information on the purpose of each chapter, the summary of revisions made from the 2004 Manual, and when this chapter is applicable for usage. Click on a chapter for a drop down of this information as well as a link to a page for each chapter containing more in-depth information and access to PDF of Manual sections.

Background:

Understanding stormwater runoff and pollution, its impacts, and how climate change plays a role:

Chapter 1: Introduction

Link to Chapter

Changes have been made but there is little impact on the general stormwater permits.

Purpose / Overview

- Describes the Manual's adoption, purpose, current and future revisions, users and organization, and applicability and regulatory basis

Changes / Revisions

- Summary of major revisions to the Manual and where to find information on future updates
- Updates to the organization and use of the Manual
- Updates to the applicability and regulatory basis of the Manual
- Updated descriptions of federal, state, and local regulatory stormwater programs as they relate to the Manual (moved to the Manual appendices)

How to apply it

- Overview tool for what to expect within this newest version of the Manual

Chapter 2: Stormwater Impacts

Chapter 3: Preventing and Mitigating Stormwater Impacts

Welcome to the online version of the newly revise 2024 CT Stormwater Quality Manual! To explore the manual, use the navigation menu at the top of the page, the breakdown of chapters on the left, or search for keywords using the box below.

Search the manual

Search this site...

Click to access the full PDF of the 2024 Connecticut Stormwater Quality Manual

Flow Path

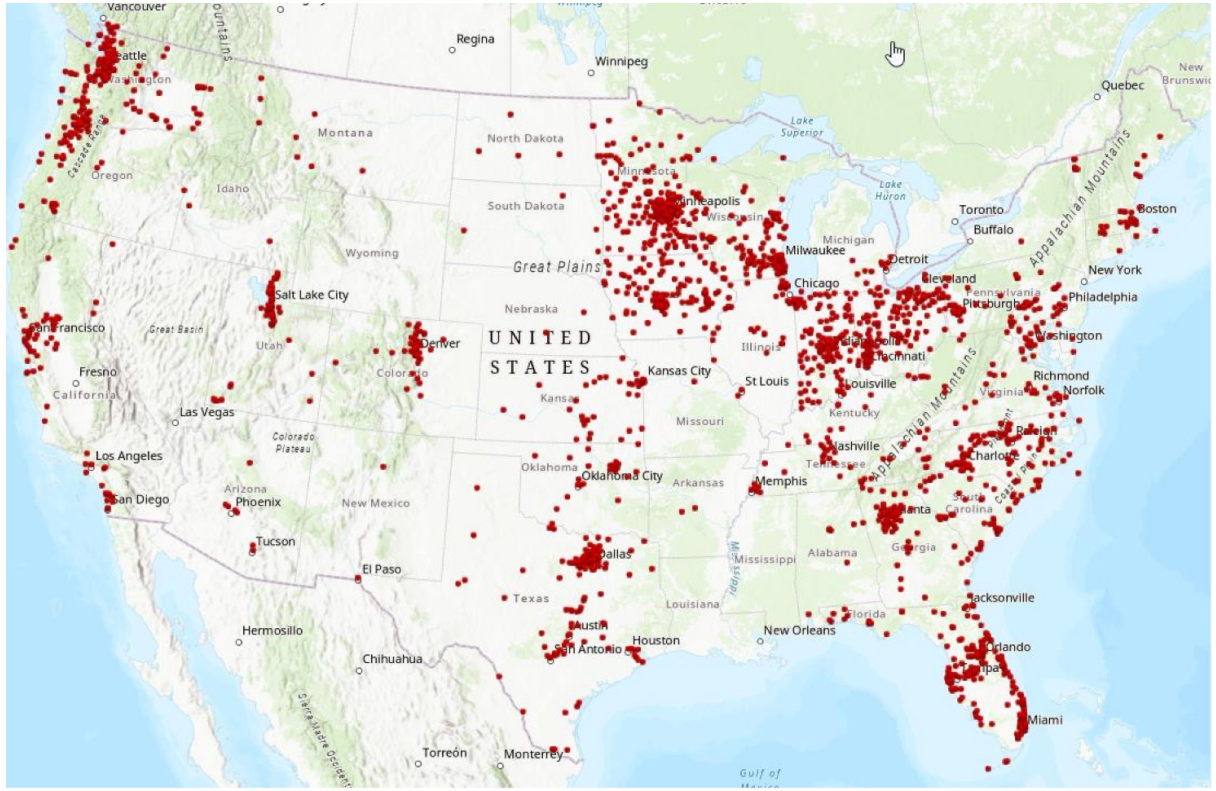
- MS4 Permit Updates
- New CT Stormwater Quality Manual Updates
- Stormwater Utilities
- Watershed Assessment Tool
- New & Noteworthy

What is a stormwater utility?

- Entity that collects fees which generate funding for stormwater management/resilience
  - Funds are dedicated to stormwater management, not diverted to other needs
  - Can be adjusted as community needs change
- More equitable funding source than property taxes
  - Based on runoff generated (IC amount) not property value
  - Includes tax exempt organizations (universities, hospitals, government agencies, etc.)
- Function the same as other utilities, such as water and sewage

Increasingly Popular

- Over 2,000 utilities in 41 states
  - In 2007, there were around 800
- No size limit
  - Largest: Los Angeles County (10 million)
  - Smallest: Indian Creek Village, FL (88)
  - Average: 16,500
- Avg fee for single family home $6.00/month
- 2 in CT: New London; New Britain

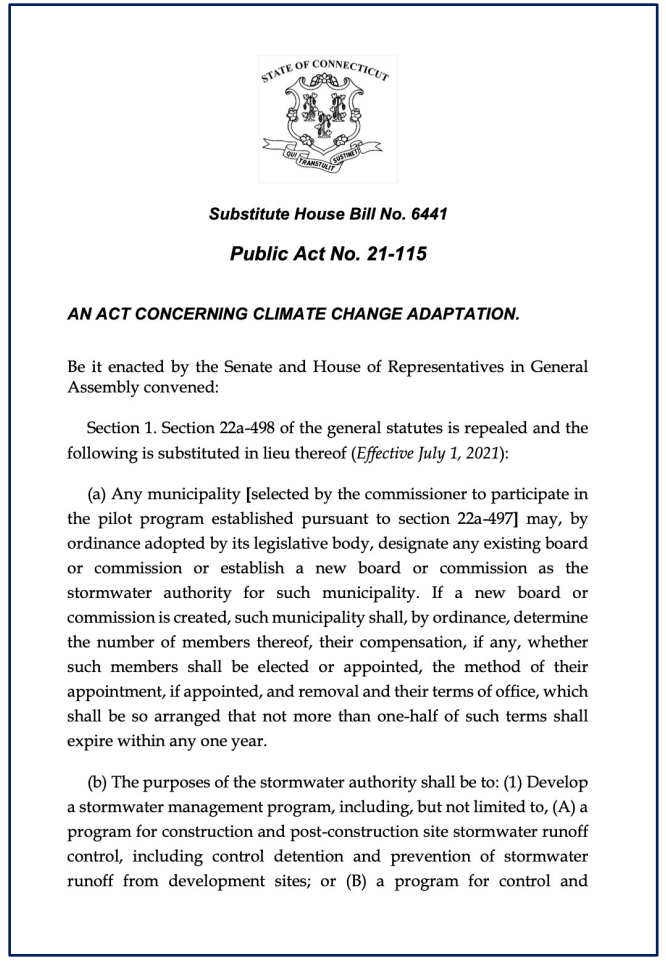


Credit: Dr. Warren Campbell, Western Kentucky University

CT-PA 21-115

Effective July 1st, 2021…

Any municipality may, by ordinance adopted by its legislative body, designate any existing board or commission or establish a new board or commission as the stormwater authority for such municipality.



STATE OF CONNECTICUT

Substitute House Bill No. 6441

Public Act No. 21-115

AN ACT CONCERNING CLIMATE CHANGE ADAPTATION.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. Section 22a-498 of the general statutes is repealed and the following is substituted in lieu thereof (*Effective July 1, 2021*):

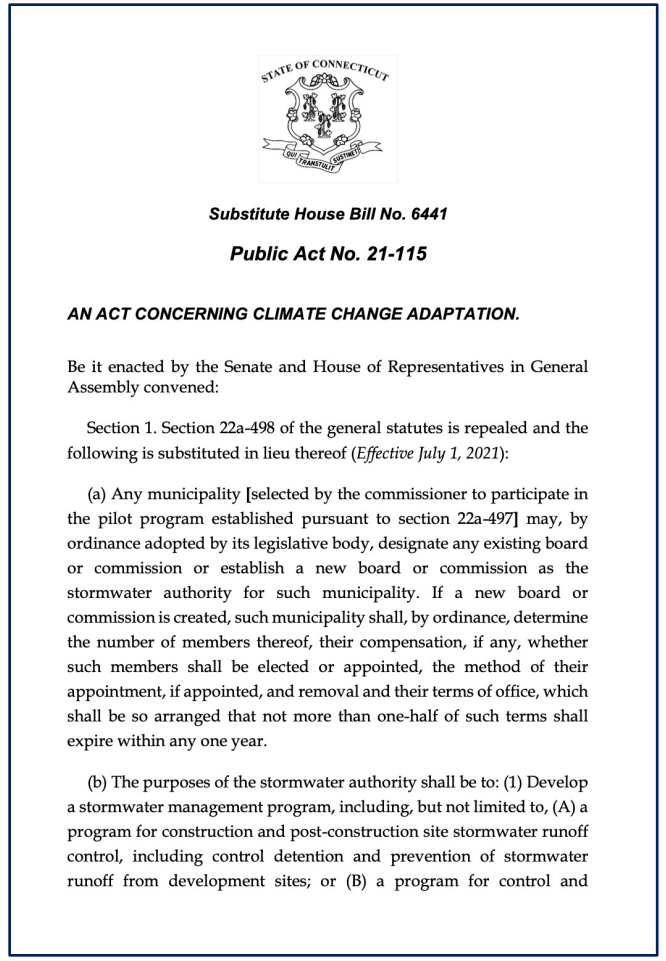
(a) Any municipality **[**selected by the commissioner to participate in the pilot program established pursuant to section 22a-497**]** may, by ordinance adopted by its legislative body, designate any existing board or commission or establish a new board or commission as the stormwater authority for such municipality. If a new board or commission is created, such municipality shall, by ordinance, determine the number of members thereof, their compensation, if any, whether such members shall be elected or appointed, the method of their appointment, if appointed, and removal and their terms of office, which shall be so arranged that not more than one-half of such terms shall expire within any one year.

(b) The purposes of the stormwater authority shall be to: (1) Develop a stormwater management program, including, but not limited to, (A) a program for construction and post-construction site stormwater runoff control, including control detention and prevention of stormwater runoff from development sites; or (B) a program for control and

What can a stormwater utility do?

Establish stormwater management program to:

- *Control construction and post construction runoff*
- *Control and abate stormwater pollution*
- *Illicit discharge detection & elimination*
- *Public education & outreach*
- *Establish boundaries of district*
- *Administration of the program*
- *Recommend fees to carry out above*



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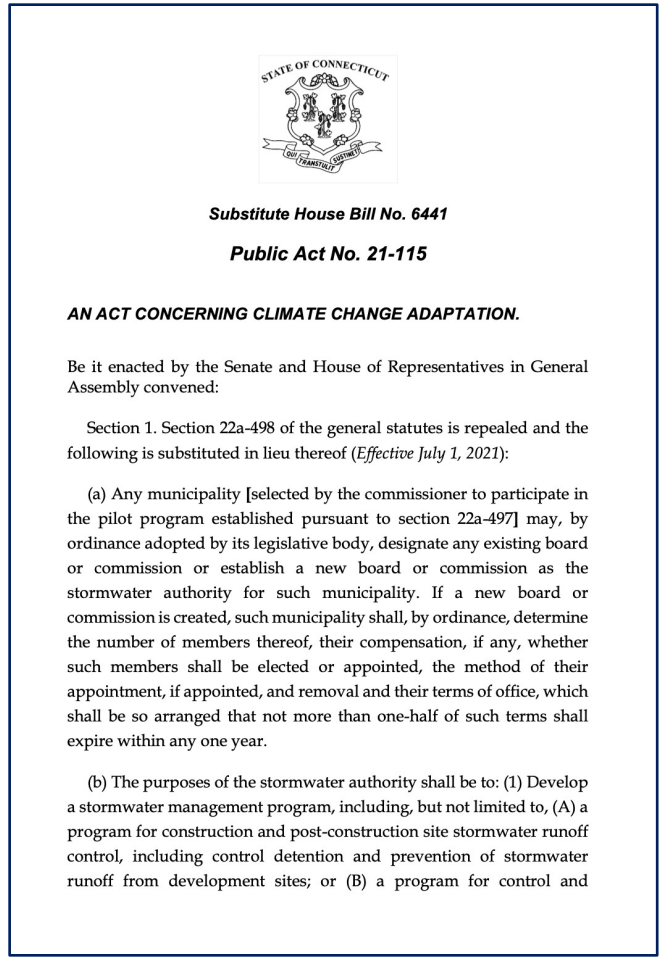
Setting fees

In setting fees, shall at least consider:

- *area of property containing impervious surfaces*
- *land use types (i.e. generate more or less runoff)*
- *property values*



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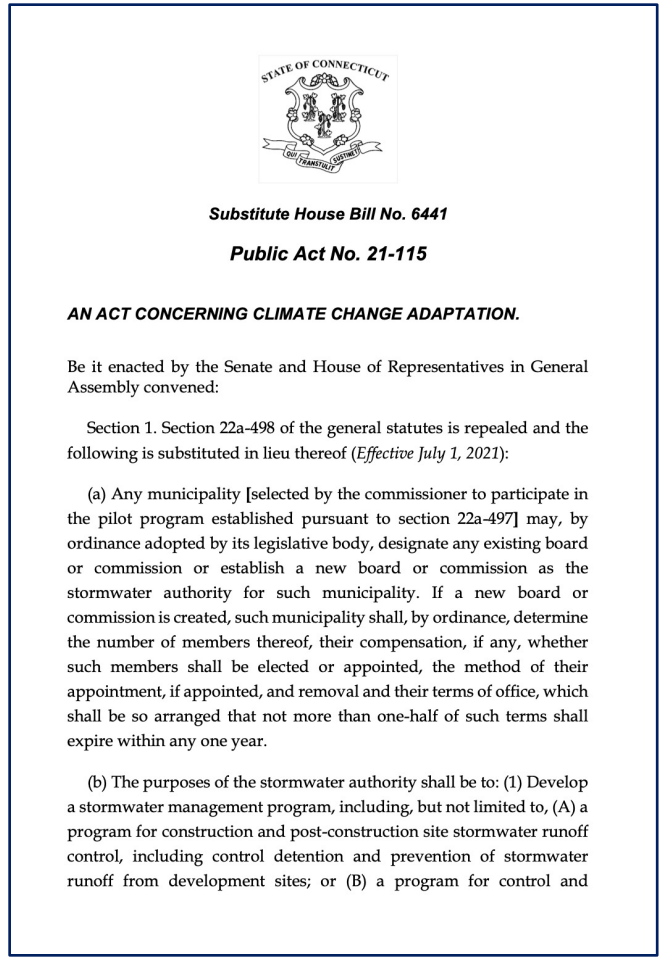
Limits on fees

- *No more than 15% of total fees collected can come from hospitals (can also be exempted)*
- *For farms, forests, open space, or State property, can only levy fee on IC that drains to a municipal separate storm sewer system (MS4)*
- *Must offer partial fee reduction credit for onsite BMPs that reduce, retain, treat stormwater on **any** property*



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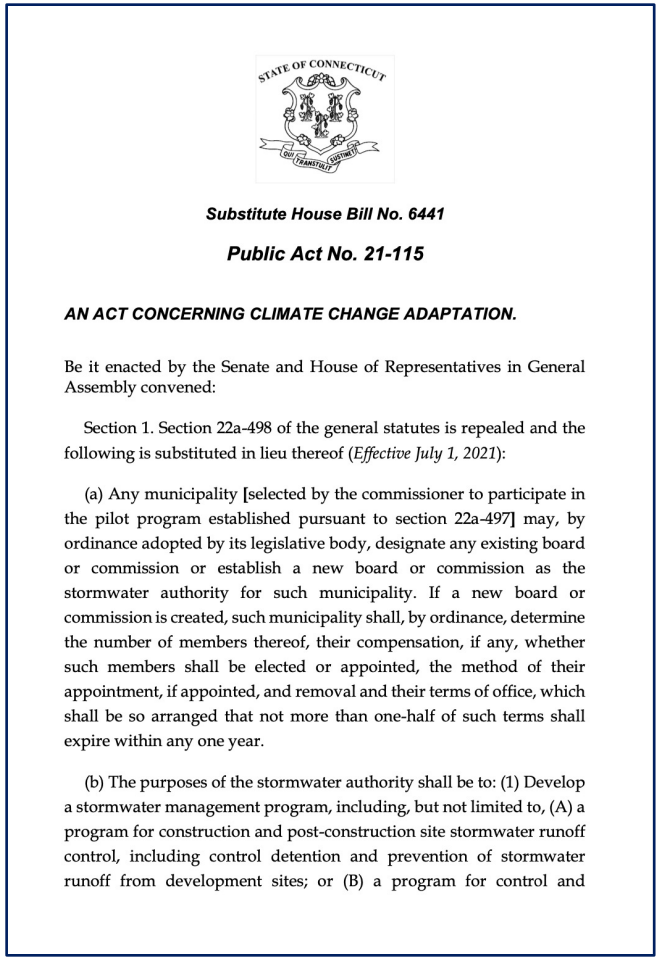
Regionalization

- *The stormwater utility can (subject to the commissioner's approval) enter into contract with any municipal or regional entity to accomplish the purposes of the stormwater utility*



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Regional Examples: WVSA

Wyoming Valley Sanitary Authority

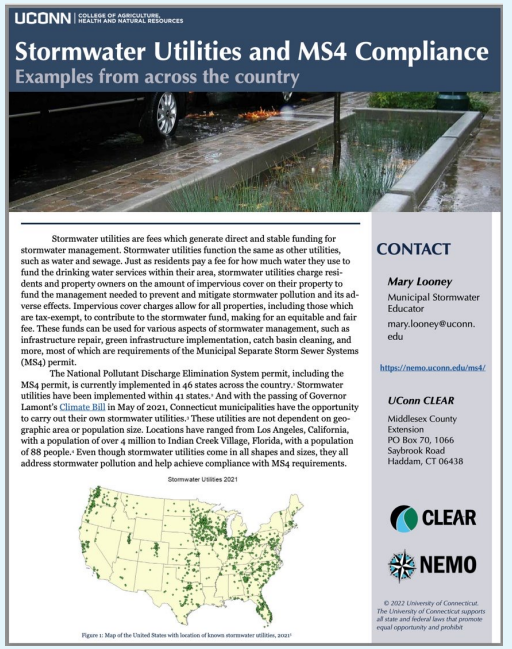
- *1962:* formed regionally to address wastewater
- *2017:* regional stormwater management
  - MS4 Administrator for 31 towns
- *2019:* implement stormwater utility fee
  - Tier system: avg = $4.80/month

- 455 individual sw projects = total $69 million
  - Combined to 65 larger scale
    - Total $12 million
- Municipalities = savings accounts built on fees
  - Money allocated solely for smaller scale projects

Stormwater Utility guides and case studies

Website with breakdown of what stormwater utilities are, fee systems, credits systems, and more

Stormwater Utility Webinar Series ft. Vermont, New Hampshire, and Western Kentucky University



Stormwater Utility and MS4 Compliance Factsheet

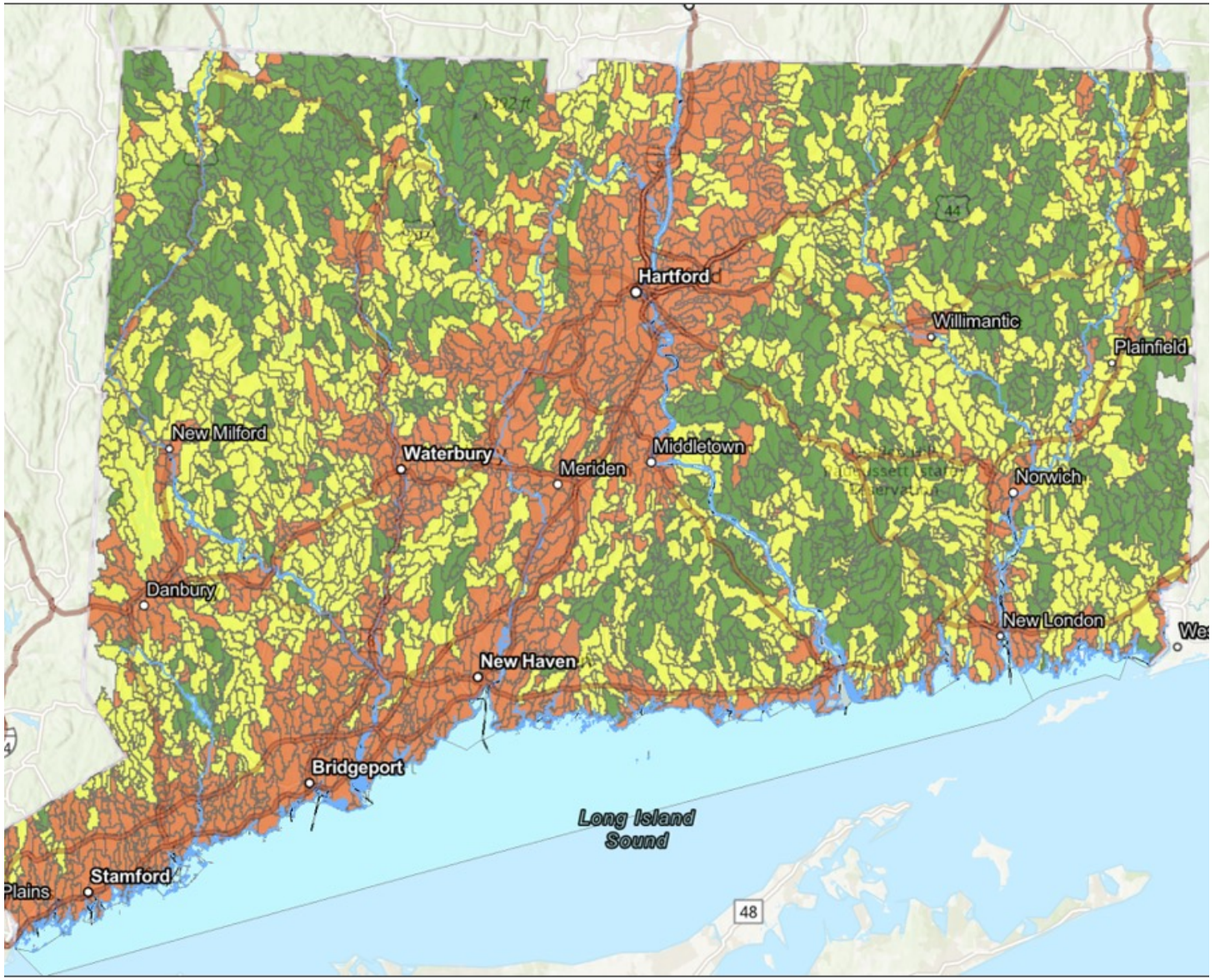
nemo.uconn.edu/stormwater-utilities

Flow Path

- MS4 Permit Updates
- New CT Stormwater Quality Manual Updates
- Stormwater Utilities
- Watershed Assessment Tool
- New & Noteworthy

Watershed Assessment Tool

- Effort to assess the health of small watersheds in CT based on high resolution (1M) land cover in watershed & riparian areas
- Conservation, mitigation, recovery
- Scenario tool to gauge impacts of changes

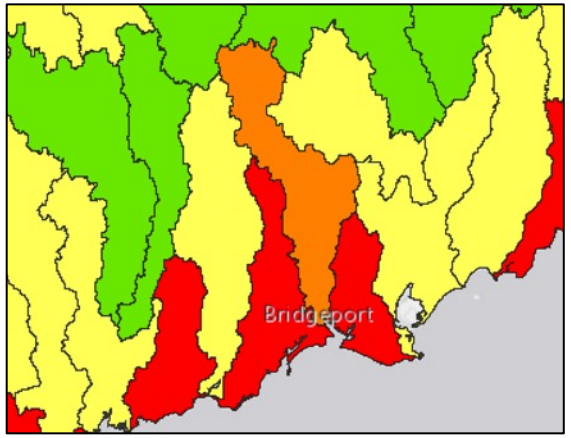


Land cover indicators of watershed health

The literature points to the critical role that various land cover factors have in watershed health

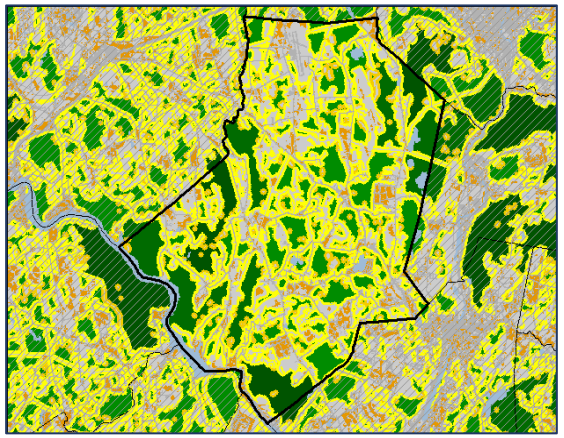
Generally, these indicators are more accurate at smaller watershed sizes

Impervious Cover

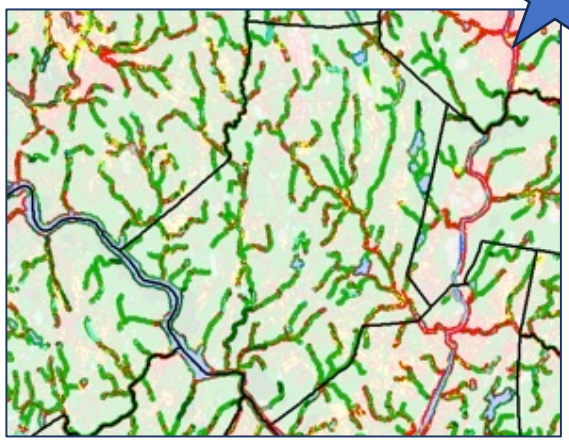


Forest Cover

Core Forest



Riparian Corridors



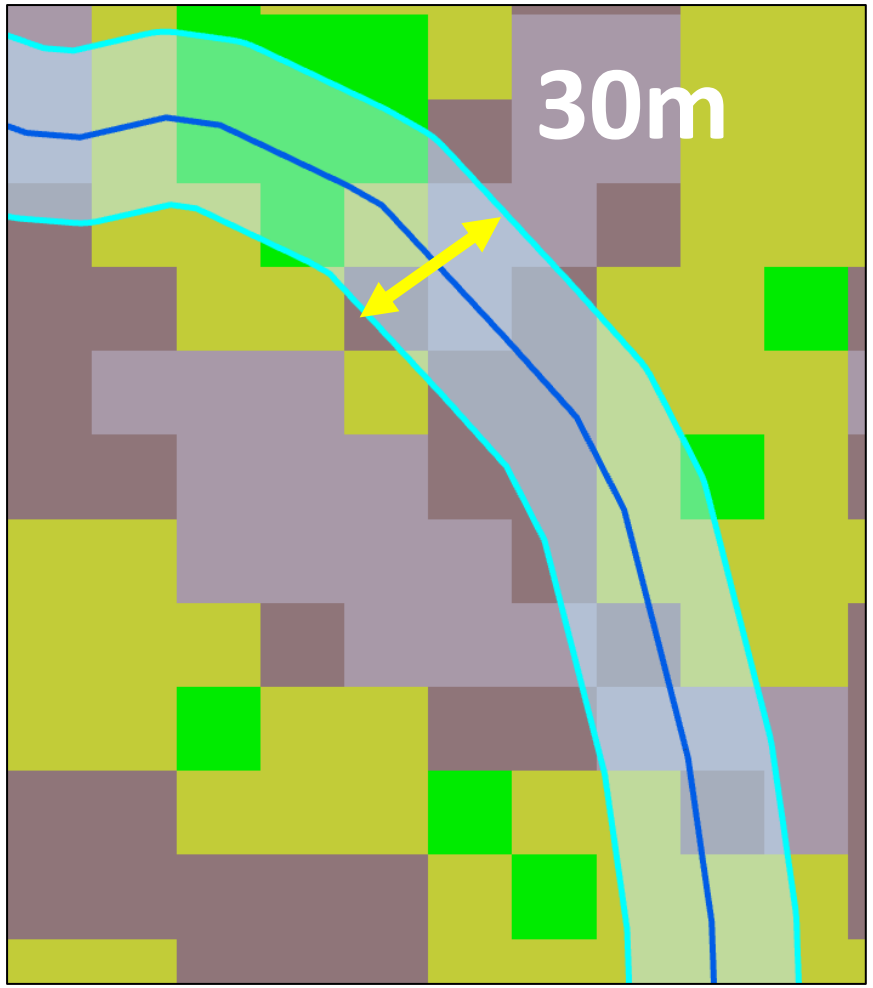
Riparian buffer services

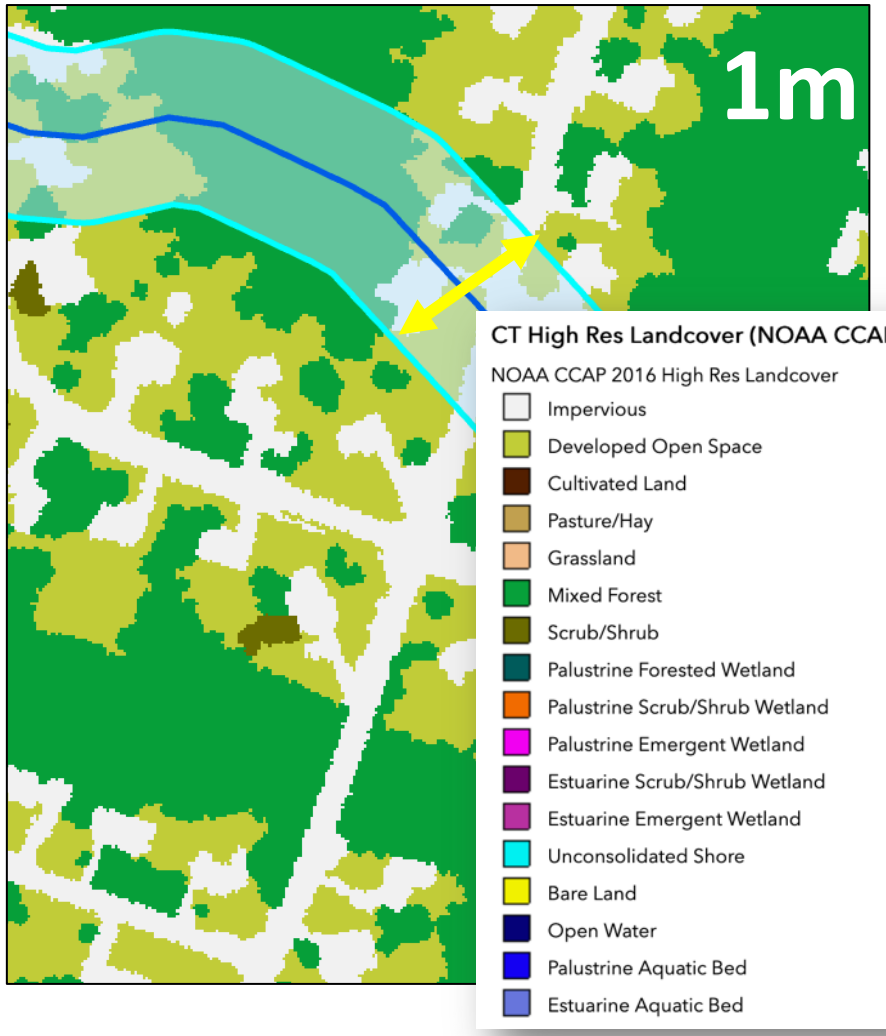
first line of defense against the impacts of development

- slow runoff
- protect shorelines from erosion
- aid in flood control
- filter or trap pollutants
- provide habitat and corridors for wildlife
- shade waters for fisheries enhancement

2020: a leap in land cover resolution

*New **1m resolution** NOAA C-CAP land cover dataset (based on 2016 imagery*



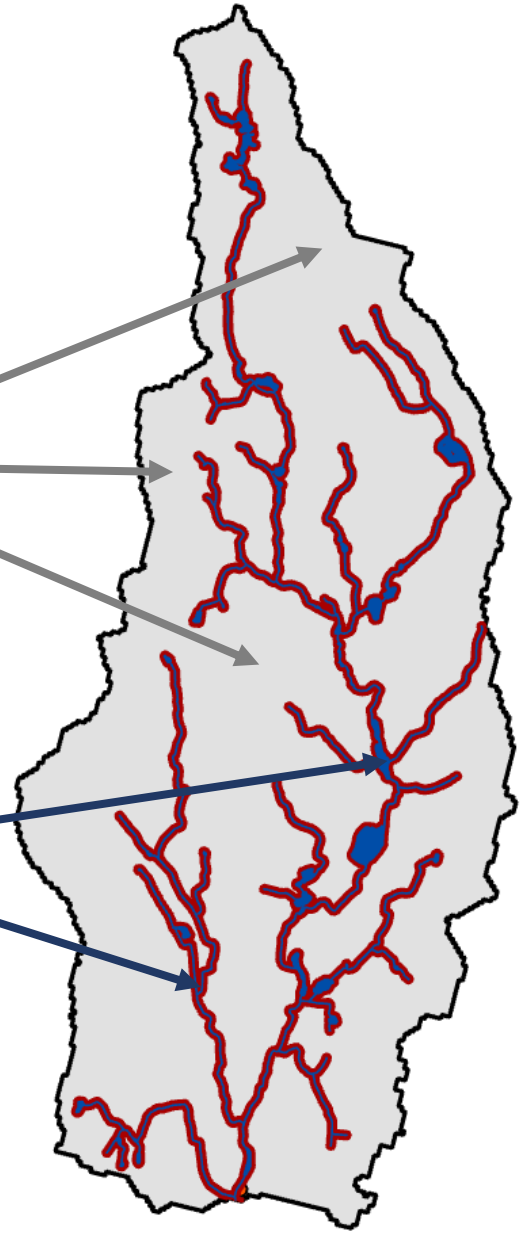


A Combined Condition Index (CCI)
(black box version)

1. Divide a watershed into
   - upland watershed (everything outside the buffer)
   - 100’ riparian buffer

WCI
Pressures from watershed land use

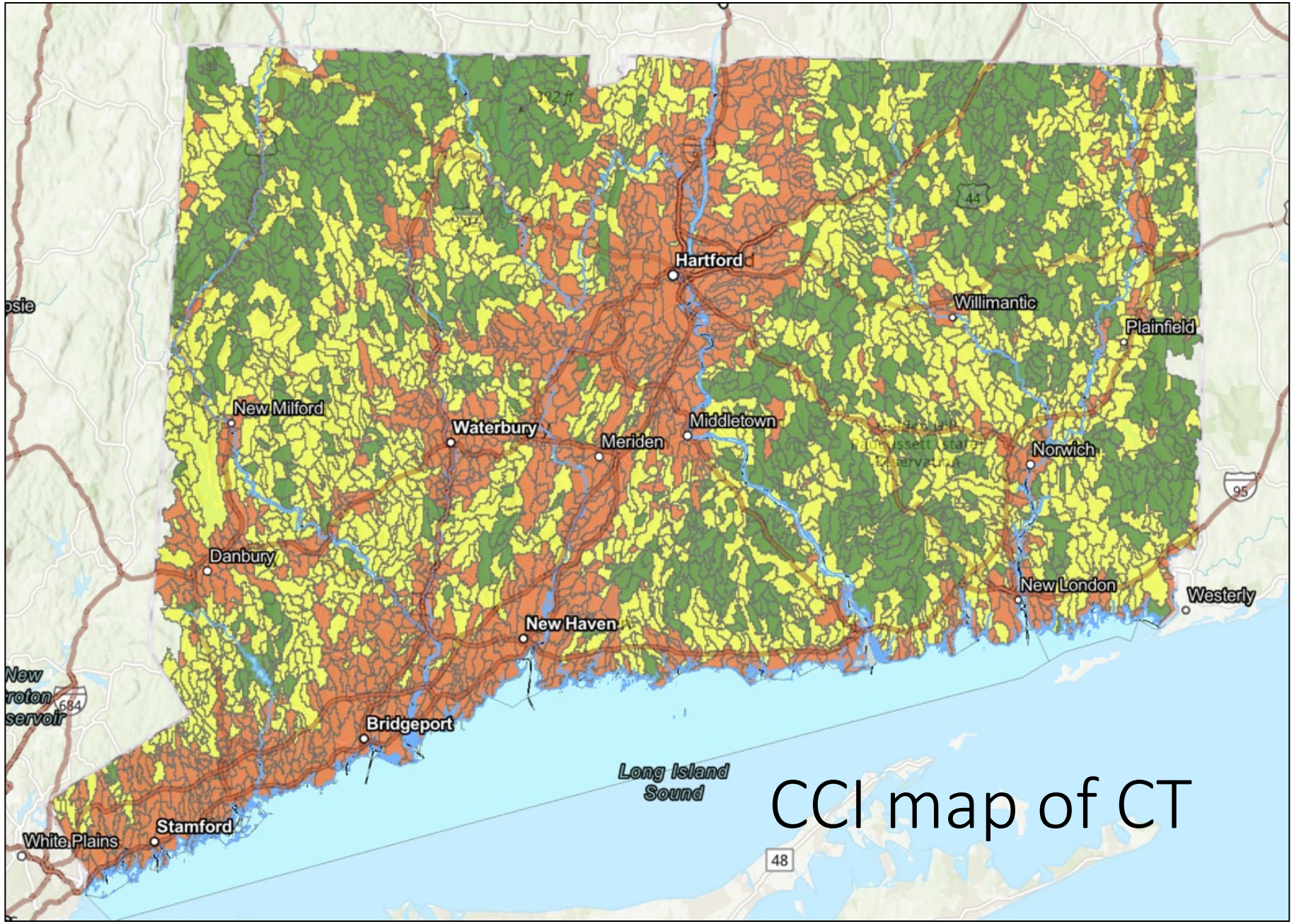
BCI
Mitigative effects of buffer



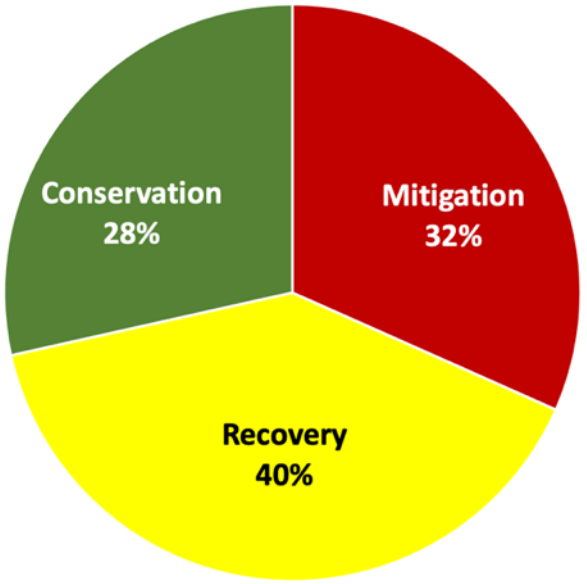
2. Compute weighted land cover makeup of the two zones.

3. Combine the two:

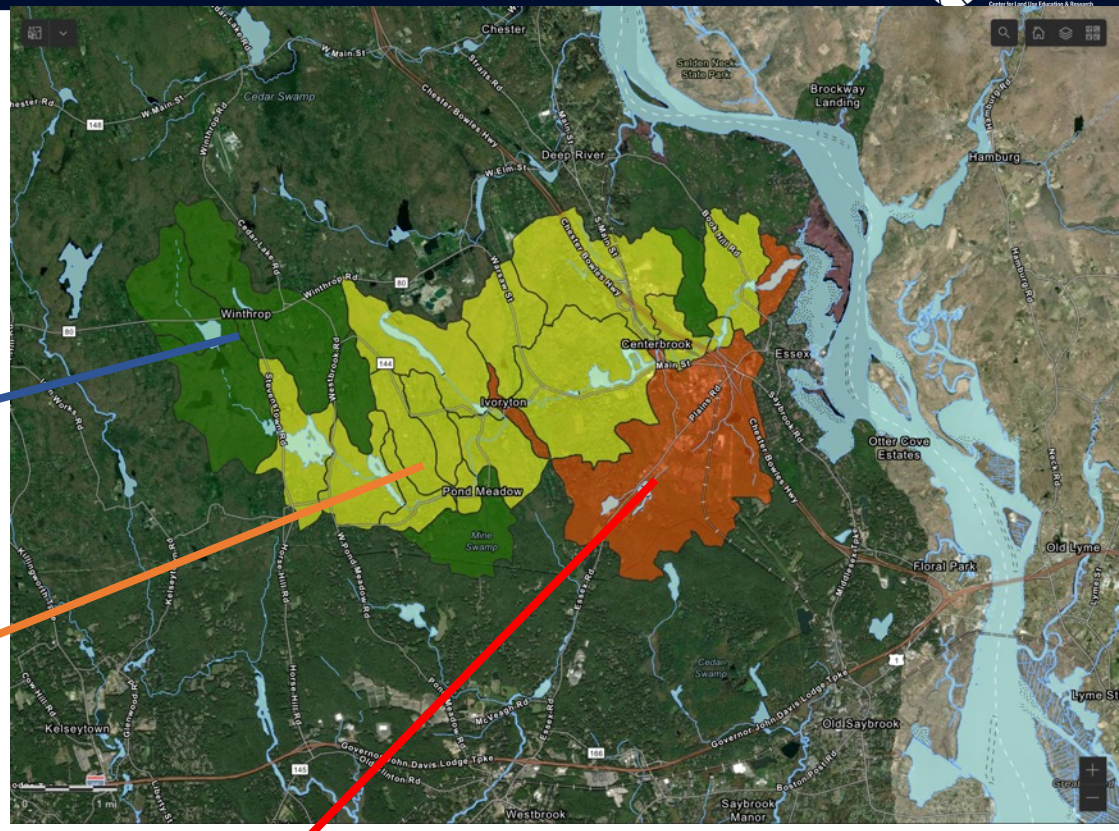
WCI + BCI = CCI


Hartford
Willimantic
Plainfield
New Milford
Waterbury
Meriden
Middletown
Norwich
Danbury
New London
Westerly
New Haven
Bridgeport
Long Island Sound
Stamford
White Plains
44
95
48
684

CCI map of CT


Conservation 28%
Mitigation 32%
Recovery 40%

CCI Management Category indicates the state of, and suggested land use strategies for, a local basin



Conservation

protective strategies

Recovery

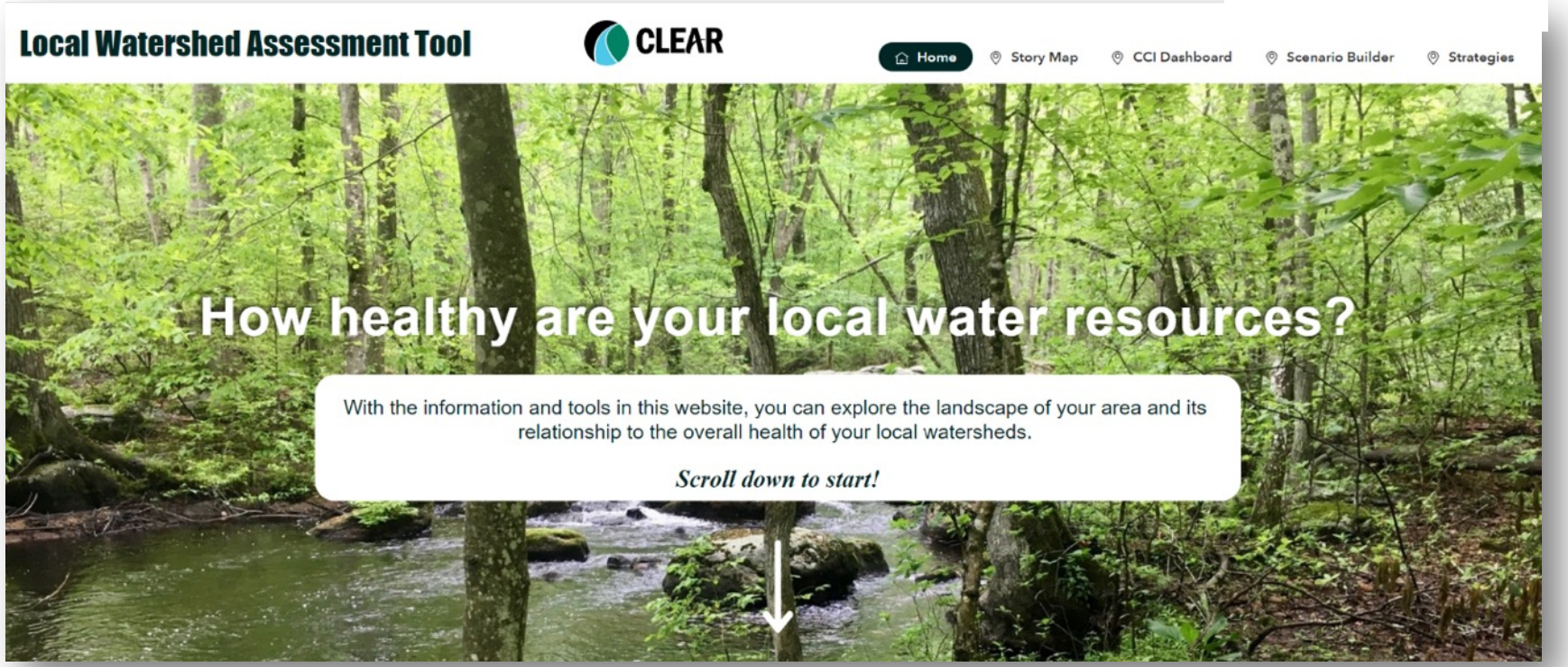
reforesting, riparian protection, mitigation (GSI)

Mitigation

riparian restoration, urban tree canopy initiatives, GSI

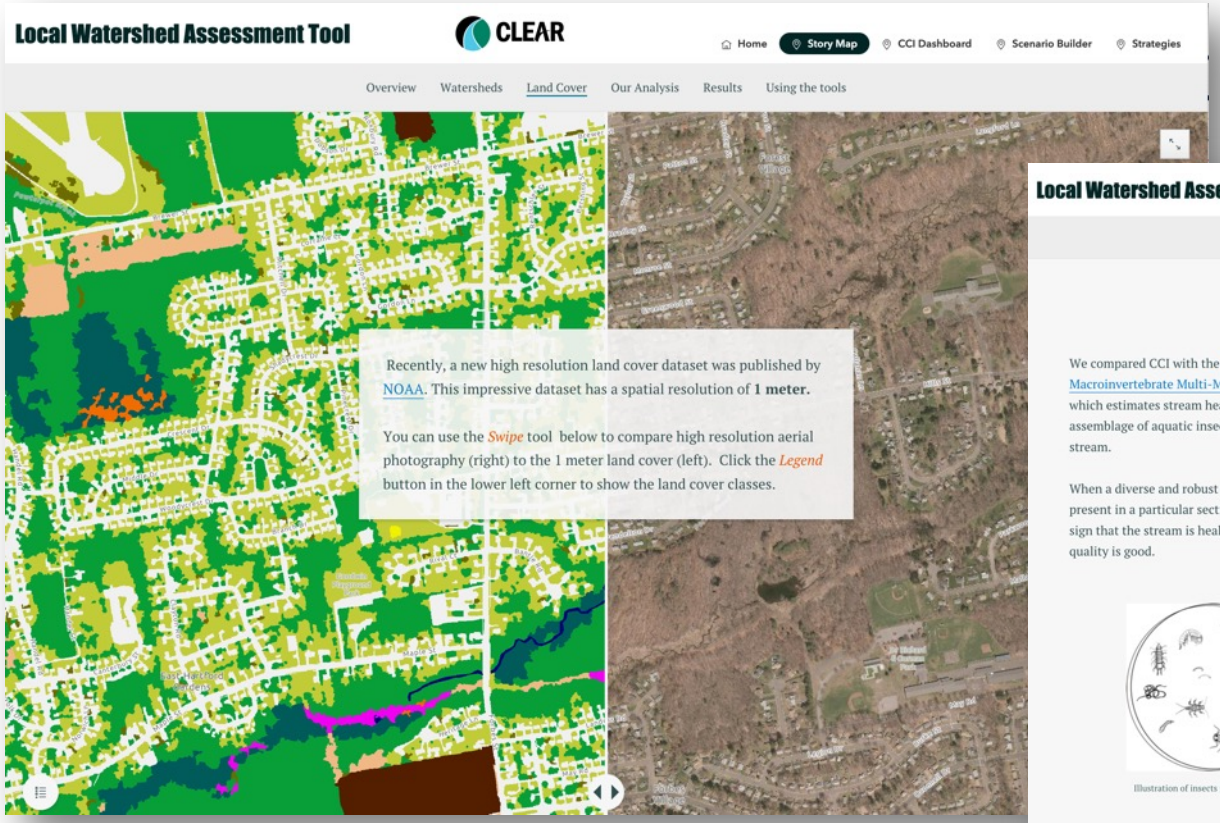
Local Watershed Assessment Tool

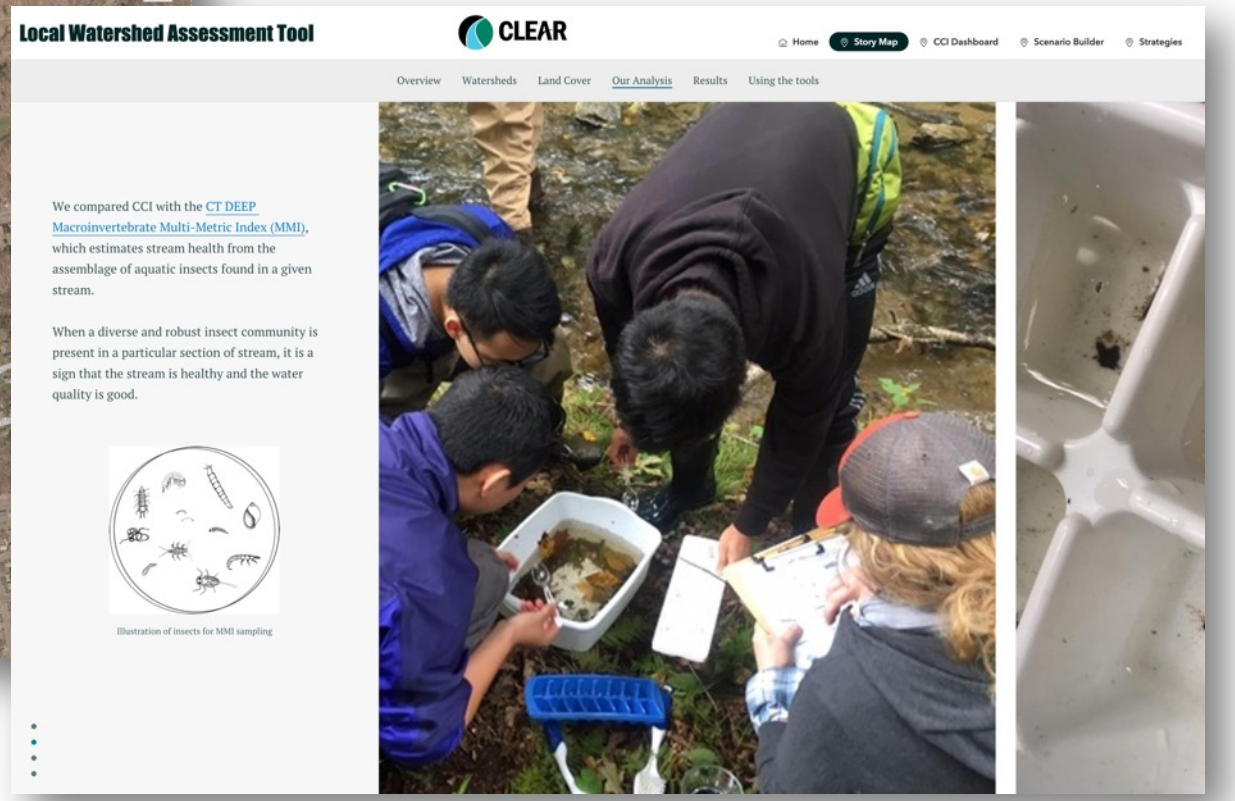
- https://s.uconn.edu/wshedtool
- integrates a Story Map, Dashboard, and Scenario Builder



Story Map

Overview | Watersheds | Land Cover | Our Analysis | Results | Using the tools





UCONN | COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

CCI Dashboard

Local Watershed Assessment Tool

CLEAR

Home | Story Map | CCI Dashboard | Scenario Builder | Strategies

How Healthy is My Watershed?

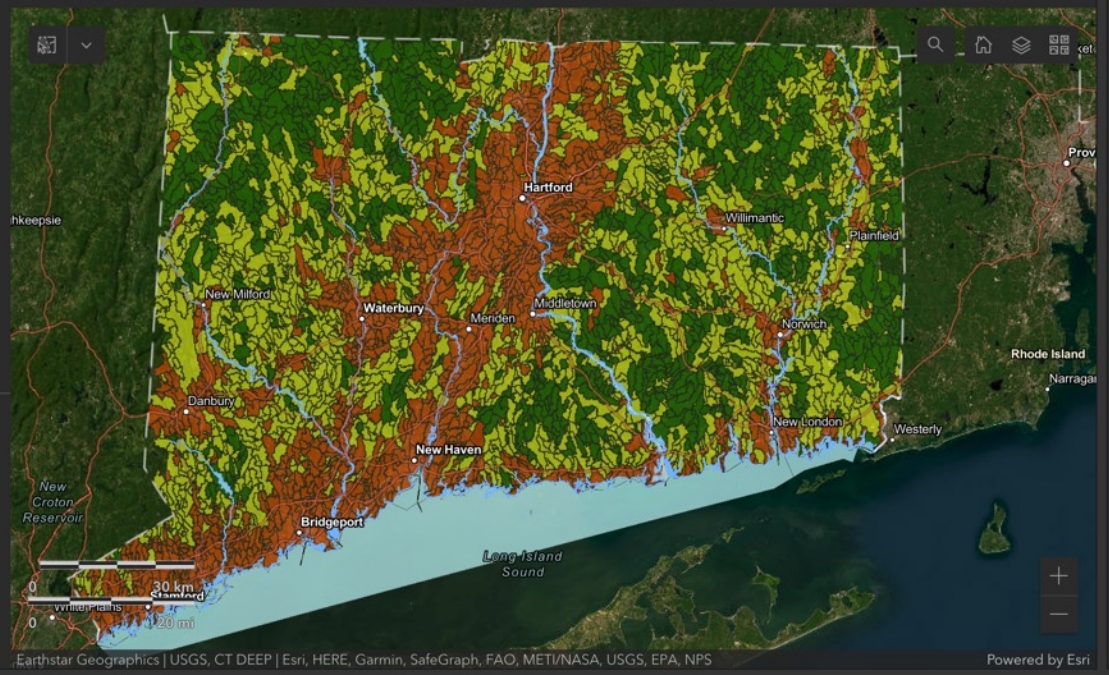
select your basin/town to get key stats.

by Basin | by Town

CT Hydrography

- Hydrography
  - Hydrography Line 1
    - Water
    - Shore
    - Drainage Ditch
    - Intermittent Water
    - Dam
    - Dredged Channel
    - Aqueduct
  - Hydrography Poly 1

TO GET INFORMATION FOR SPECIFIC BASIN(s) Click the **Select** tool (upper left corner of the map) and then zoom in on the map to select basin(s) of your interest. The selected basin(s) will be highlighted in **blue** and the information about the basin(s) will appear in the charts below and the box on the right. The box and charts will be interatively updated for the selected basin(s). You can use the layer botton to turn layers on/off.



Combined Condition Index by Basin

What is Combined Condition Index?

Combined Condition Index (CCI) is an index that describes the probable health of a watershed. CCI of a watershed is calculated by the ratios of **natural**, **impervious**, and **agriculture-like** land cover based on C-CAP High Resolution Land Cover dataset for 100-ft riparian zone and upland area within the watershed. CCI ranges between 0 and 1. A CCI of 0.75 or above is a sign of healthy watershed.

1 of 4363

Basin 1000-00

Combined Condition Index: 0.3

Recovery Category: Mitigation

Enrichment Factor: **6.97**

Acre: **3,217.76**

Sub-Region: **Pawcatuck River**

Region: **Pawcatuck Main Stem**

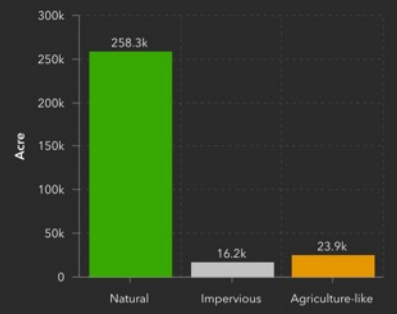
Major: **Pawcatuck**

What is Recovery Category?

Recovery Category indicates the suggested land use strategy for a watershed based on the current CCI value. Recovery Category is designated:

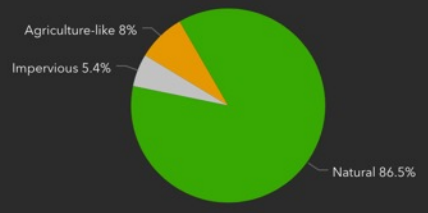
- Conservation if CCI >= 0.75. This means that the health of the watershed is likely to be good, and should be protected by land conservation and riparian protection strategies.
- Recovery if 0.43 <= CCI < 0.75. This means the health of the watershed is likely to be impaired but could be improved with conservation and

Land Cover Area within Riparian Zone



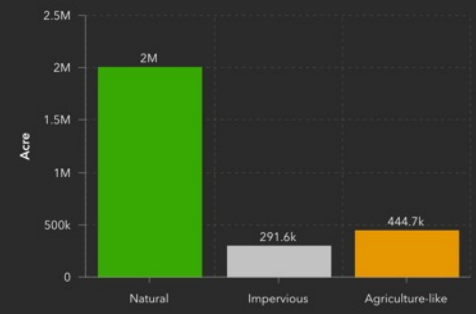
This bar chart represents **total** acreage of each land cover within **riparian zone** for selected basin(s).

Land Cover Percent within Riparian Zone



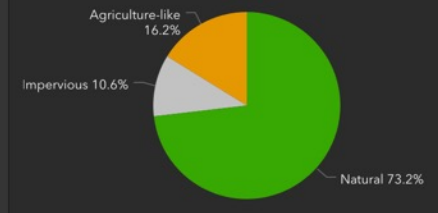
This pie chart represents **average** percent area of each land cover within **riparian zone** for selected basin(s).

Land Cover Area within Upland Watershed



This bar chart represents **total** acreage of each land cover within **upland watershed** for selected basin(s).

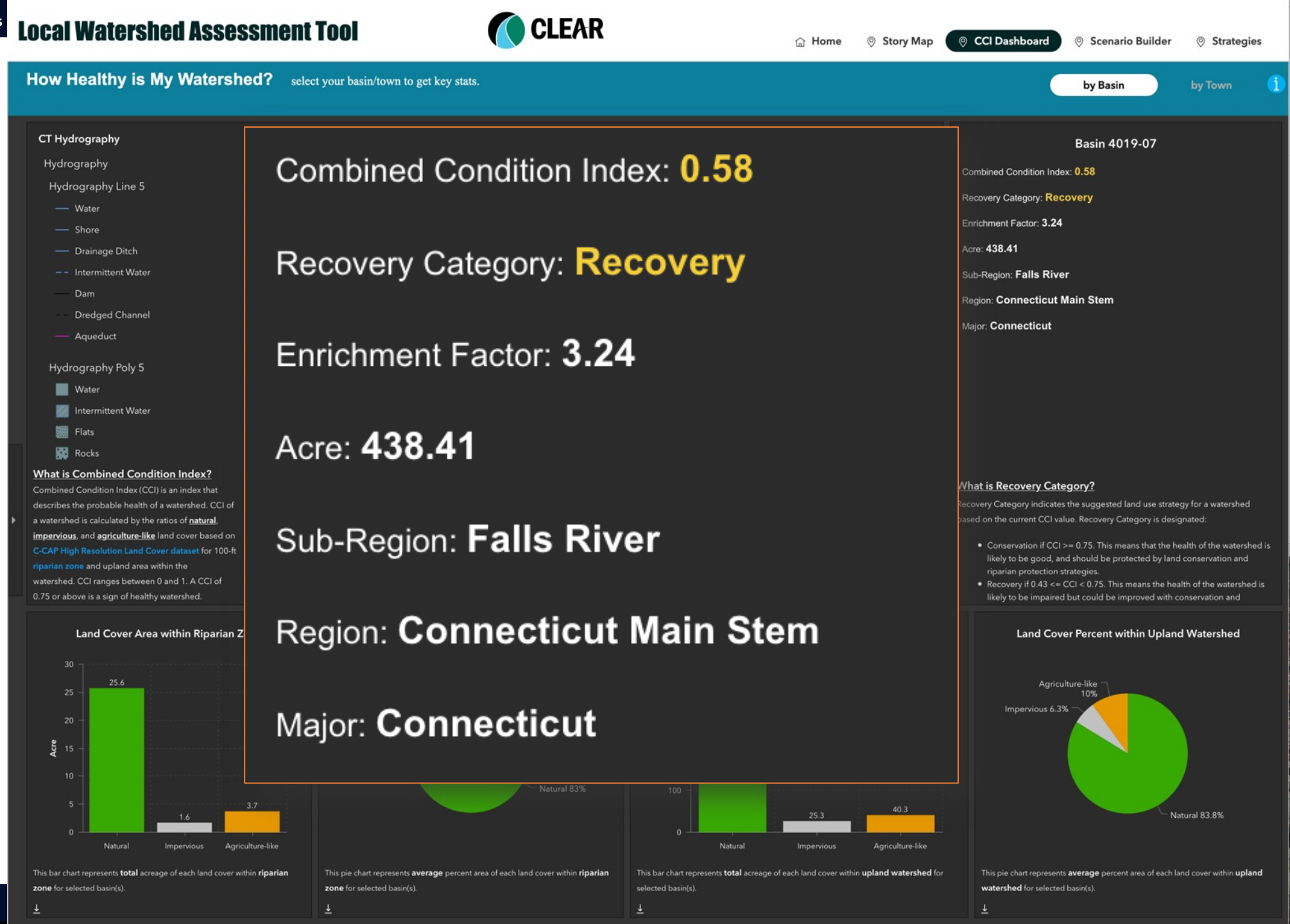
Land Cover Percent within Upland Watershed



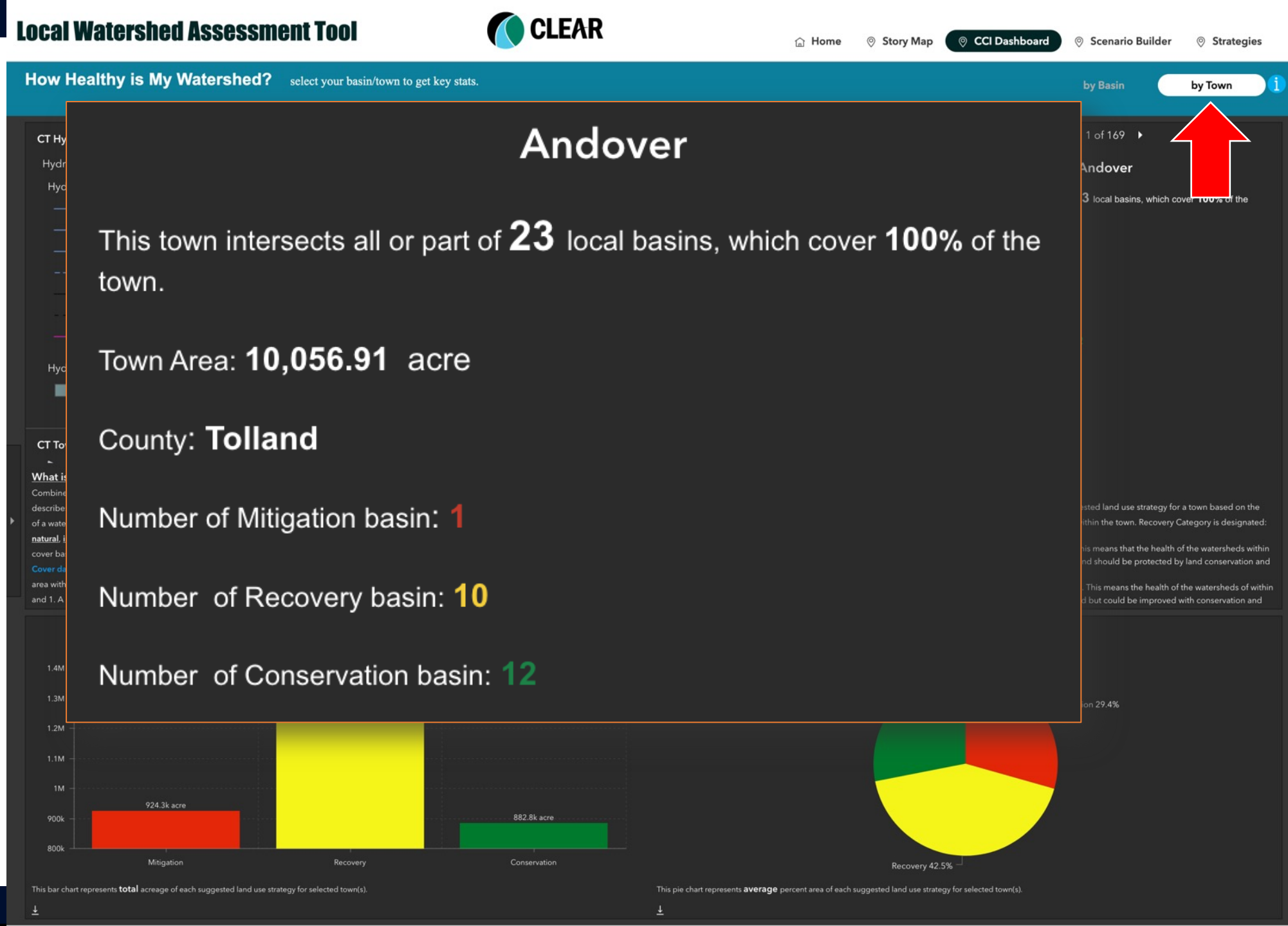
This pie chart represents **average** percent area of each land cover within **upland watershed** for selected basin(s).

NEMO

Selecting Local Basin of Interest



Town-specific information



Local Watershed Assessment Tool

CLEAR

Home | Story Map | CCI Dashboard | Scenario Builder | Strate

Scenario Builder

Change your land cover to see the effects on basin health

2023-02-03 at 7.44.14 AM

Input | Output

Zoom in on the map and then click on the marker icon (below left) to place a pin within a watershed of your interest. Click on the clear icon (red trash can) to remove the pin and start again.*

What is your desired category for the watershed? A watershed is considered Conservation if CCI >= 0.75, Recovery if 0.43 <= CCI < 0.75, and Mitigation if CCI < 0.43. You can only choose a category better than or equal to your current category. Click on the watershed and use the pop-up window for reference.*

Conservation

Use the form to change key land cover parameters for your watershed, and click RUN to get the results. Enter a value for Increase(+) or Decrease(-) in area (acres) in Impervious within Upland Watershed.*

-25

Enter a value for Increase(+)/Decrease(-) in area (acres) in Agriculture-like within Upland Watershed

-15

Find address or place

Gildersleeve, Portland, Middletown, Riverdale, Cobalt, Middle Haddam, Maromas, East Hampton, Westchester, Colchester Ave, Middletown Ave, Day Pond State Park, Haddam Meadow State Park

Basin 4000-00-6+R30

Combined Condition Index: 0.7
Recovery Category: Recovery
Enrichment Factor: **2.33**
Area (acre): **1,193.10**
Sub-Region: **Connecticut River**
Region: **Connecticut Main Stem**
Major: **Connecticut**
Within Upland Watershed (acre)
Natural: **803.43**
Impervious: **66.11**
Ag-like: **56.30**
Within Riparian Zone (acre)
Natural: **51.65**
Impervious: **1.58**
Ag-like: **1.58**
Zoom to

Comparison Before and After Land Use Change

OBJECTID	Basin ID	Sub Region	Regional	Major	Acre	Current Recovery Category	Managed Recovery Category	Target Recovery Category	Current CCI	Managed CCI	Deviation from Target CCI	Current Enrichment Factor	Managed Enrichment Factor
1	4000-00-6+R3	Connecticut River	Connecticut Main Stem	Connecticut	1193.1	Recovery	Conservation	Conservation	0.7	0.79	0.04	2.33	1.82

-72.658096 41.590843 Degrees

State of Connecticut, Earthstar Geographics | USGS, CT DEEP | Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, ME...

Now the real work begins…

- CT Sea Grant riparian education project (protect & restore)
- Interest in adapting the project in NY & MA
- NOAA interest in C-CAP wide adaptation

High school students evaluate riparian corridors for the Essex (CT) Land Trust

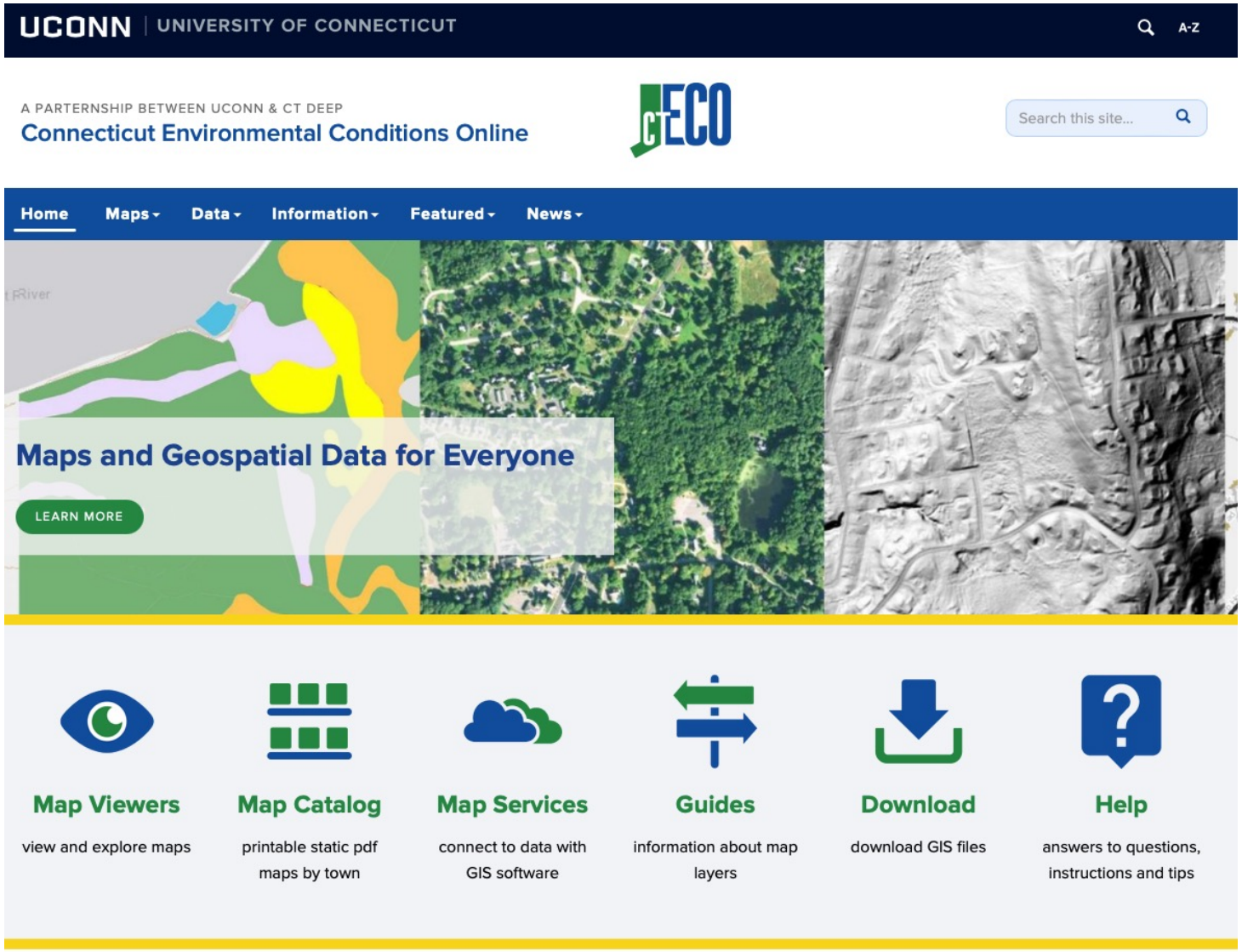
https://s.uconn.edu/wshedtool

Flow Path

- MS4 Permit Updates
- New CT Stormwater Quality Manual Updates
- Stormwater Utilities
- Watershed Assessment Tool
- New & Noteworthy

New data coming soon . . .

- 2023 high resolution imagery & 1’ contours(early 2024)
- 2026 high resolution imagery & 1’ contours (early 2027)
- = CHANGE!
- Riparian buffer land cover map (early 2024)
- Improved hydrography data layer (2025?)

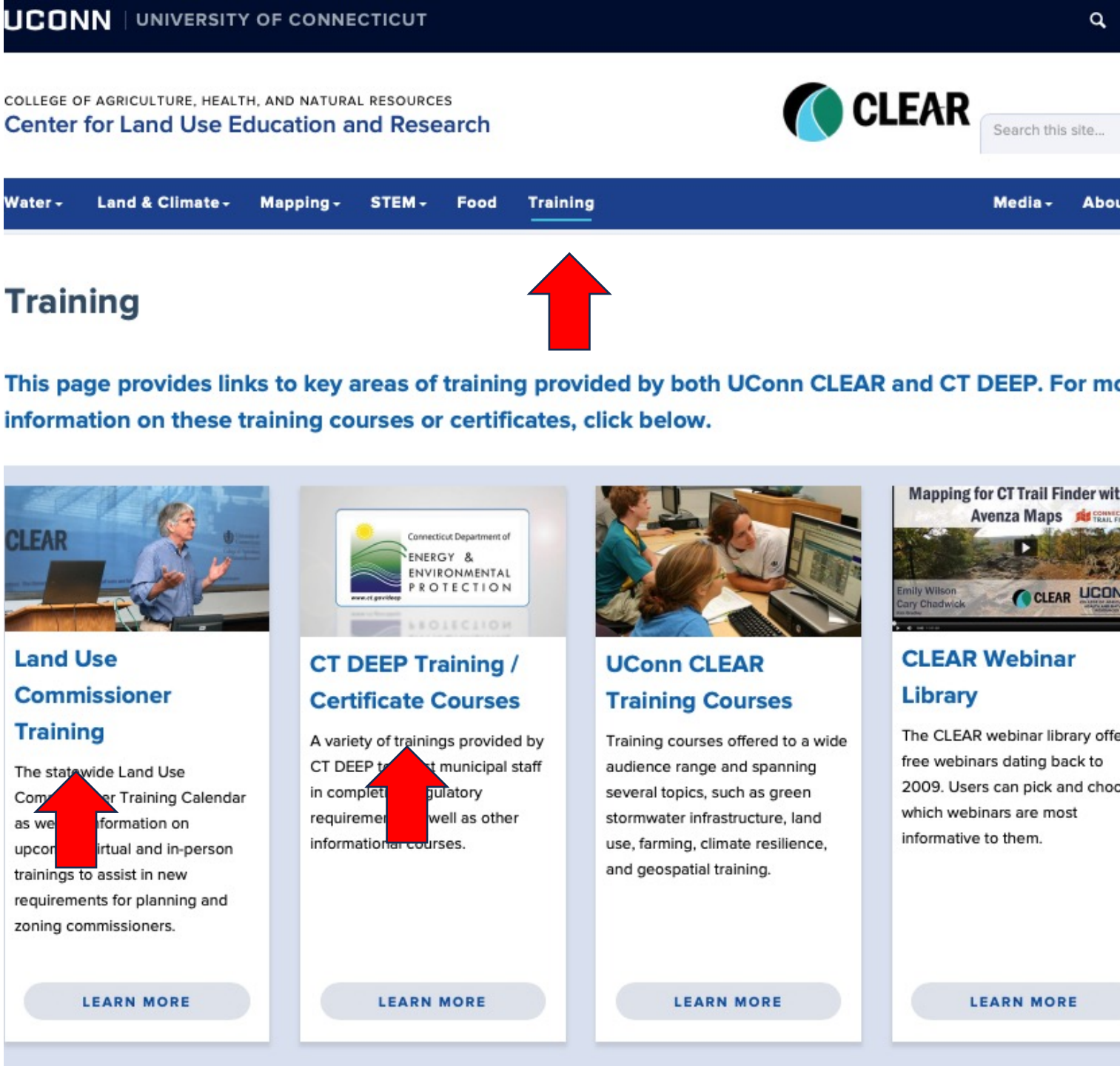


https://cteco.uconn.edu

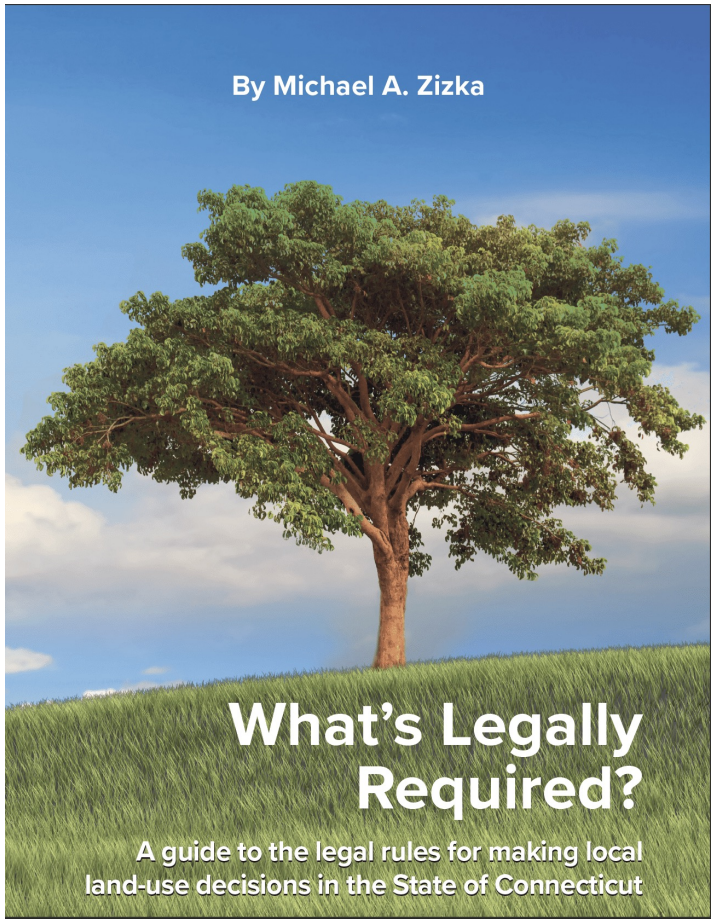
Land Use Commissioner Training

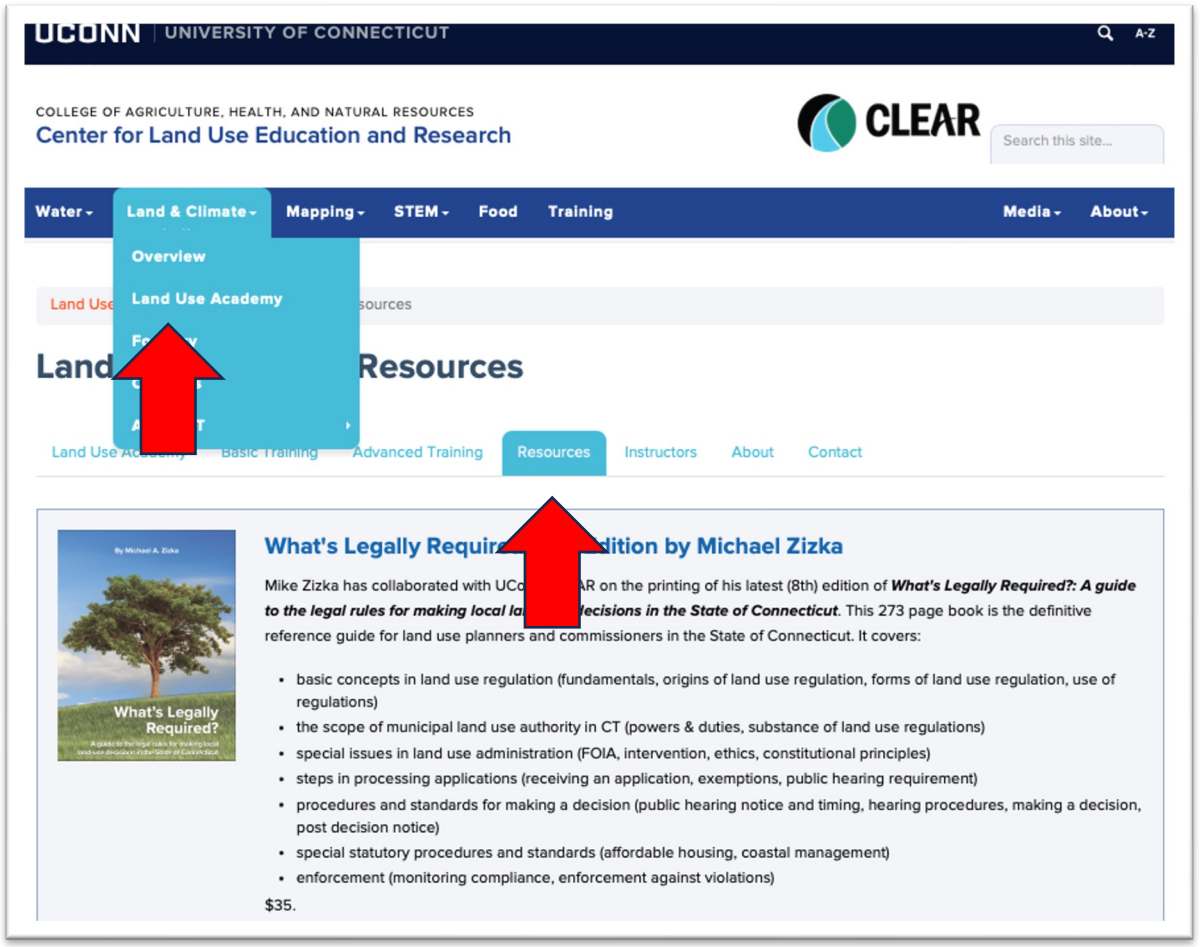
- Inland Wetlands: one person per town (commissioner or staff)
- 4 hours of training for planning, zoning & ZBA commissioners by end of year (1 hr on fair & affordable housing) & every 4 years

https://clear.uconn.edu/training



What's Legally Required? 8th edition





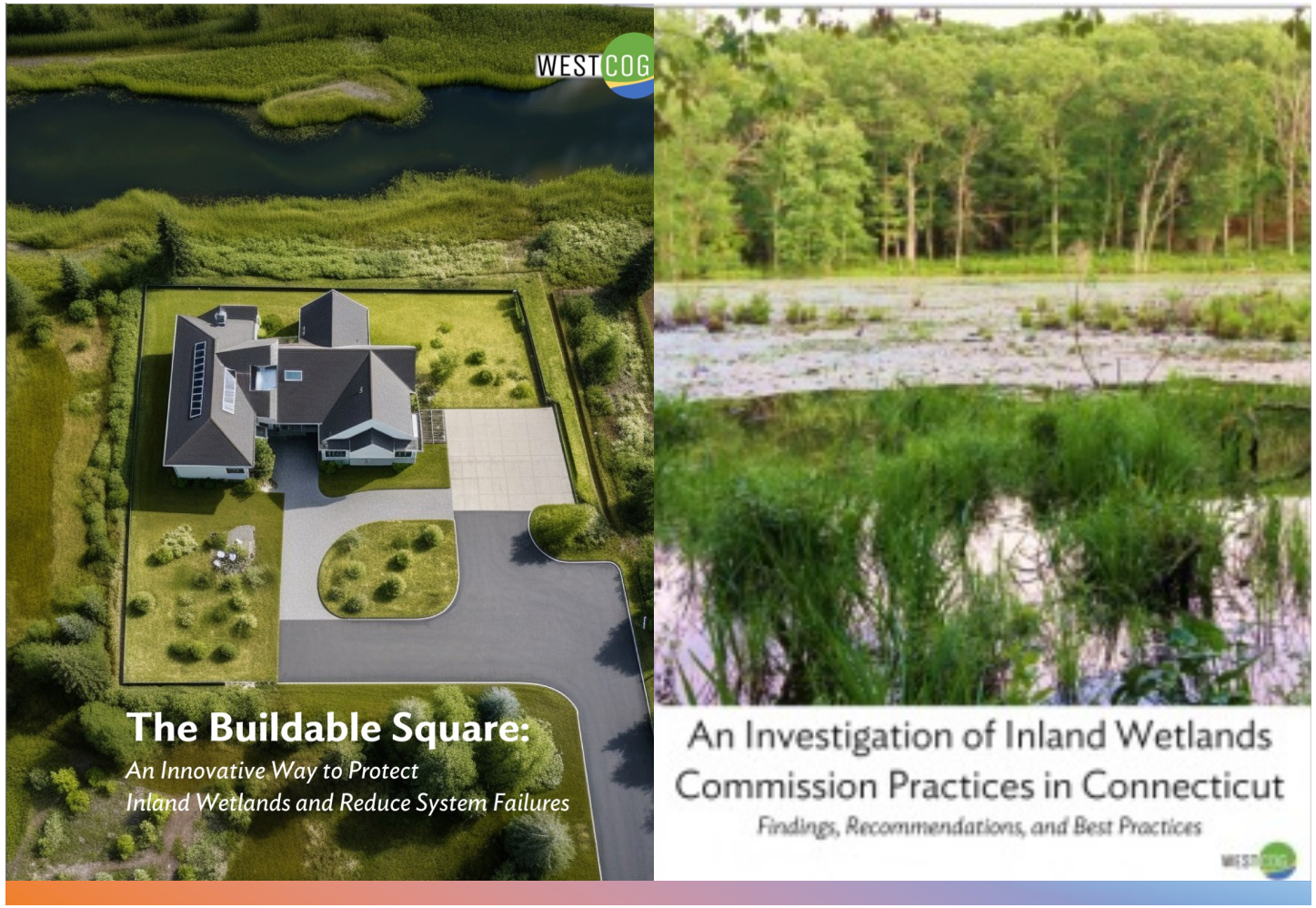
https://clear.uconn.edu/lua/resources/

2 New Studies from WestCOG

- Protecting wetlands though zoning requirements

  (remove wetlands, floodplains, steep slopes from the buildable area)

- Inland Wetland Commission practices
  - Review 60 towns
  - Recommendations for improving protection



https://westcog.org

Center for Land Use, Education, and Research

Mission: provide information and assistance to land use decision makers and other audiences in support of better land use decisions, healthier natural resources, and more resilient communities

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UConn CLEAR
clear.uconn.edu

CT MS4 Guide
nemo.uconn.edu/ms4

CT NEMO
nemo.uconn.edu