Protecting Inland Wetlands & Watercourses

The Role of Connecticut's Zoning Commissions

Provided by: Western Connecticut Council of Governments

Instructors:

Charles Vidich, Senior Project Manager

Kristin Floberg, Senior Planner

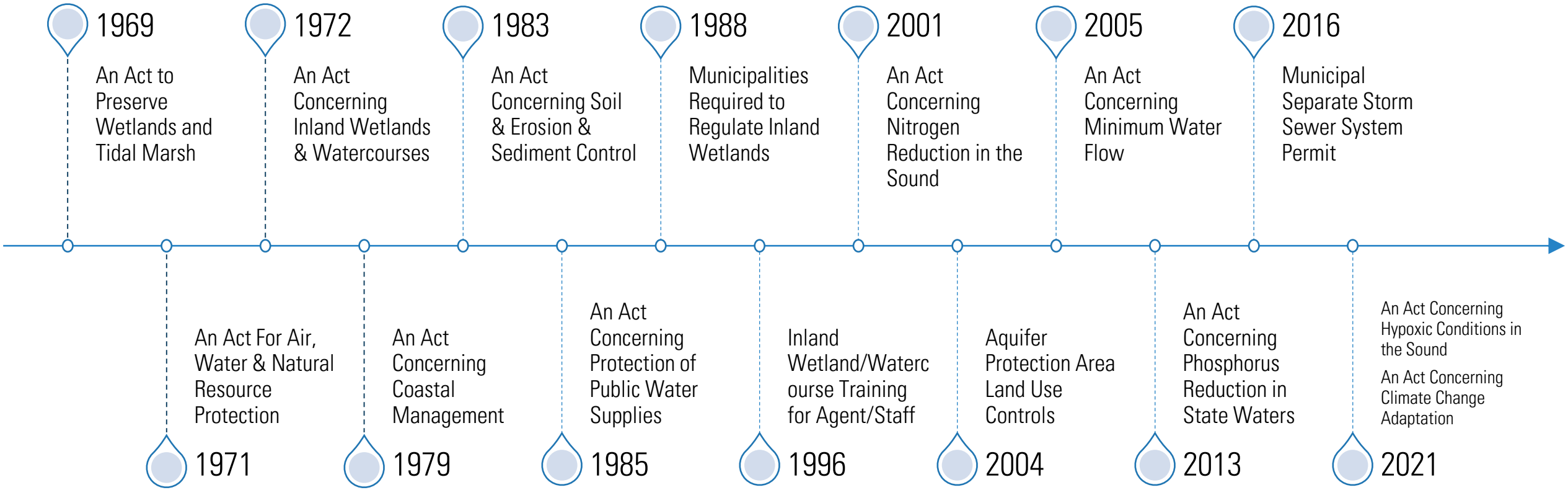
Date: December 14, 2023

Training: 1.5 credit-hours for C.G.S. §8-4c

Overview:

- ❑ Timeline of Relevant Laws
- ❑ Why are Wetlands Important
- ❑ Three Wetland Protection Roles for Zoning
  - ❑ Riparian Corridor Protections
  - ❑ Buildable Square: Excluding Wetlands
  - ❑ Low Impact Development
- ❑ Review of Course Findings
- ❑ Course Reference Information

Connecticut Environmental Laws Bearing on Inland Wetlands Protection



Why Are Wetlands Important?

Wetland Functions and Values

Habitat Value

- Support for Plants and Animals
- Migratory Pathways for Terrestrial and Aquatic Species
- Soil Formation

Hydrologic Functions

- Velocity Reduction
- Floodwater Storage/ Peak Flood Reduction
- Shoreline Erosion Protection
- Stream Flow Maintenance

Water Quality

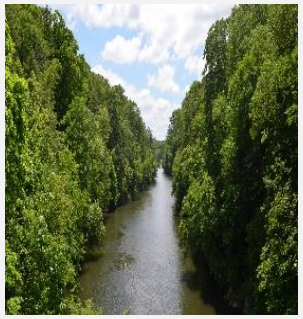
- Sediment Trapping
- Biochemical Processes: Uptake of Phosphorus and Nitrogen
- Water Purification

How Zoning Commissions Can Protect Wetlands

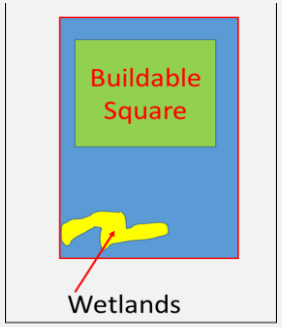
Comparison of Regulatory Authorities Impacting Inland Wetlands	Zoning Commissions	Inland Wetlands Commissions
Require Setbacks from Wetlands	Yes	No
Exclude Non-Buildable Land (e.g., Wetlands)	Yes	No
Limit Specific Land Uses Near Wetlands	Yes	No
Exclude Wetlands from Buildable Square	Yes	No
Exclude Development in 100 Year Floodplain	Yes	No
Require Low Impact Development	Yes	No
Require Riparian Corridor Setbacks	Yes	No
Limit Impervious Cover Development	Yes	No
Exclude Wetlands from Subdivided Land	Yes	No
Require Stormwater Management	Yes	Yes
Require Erosion & Sediment Controls	Yes	Yes
Regulate Non-point Sources of Pollution	Yes	No
Authorize Wetland Filling	No	Yes

Not all Connecticut Municipalities Exercise These Statutory or Case Law Zoning Authorities

Three Wetland Protection Roles for Zoning



Riparian Corridor Protections



Buildable Square: Excludes Wetlands

Low Impact Development

RIPARIAN CORRIDOR PROTECTIONS

Emergence of Riparian Corridor Protections

- The Riparian Buffers serve critical water quality protection functions
- Upland Review Area is not a Protected Area – merely regulated
- The result has been a loss of this critical buffer function:
  - Increased Discharges of Nitrogen, Phosphorus and Total Suspended Solids
  - Loss of Migratory Pathways for terrestrial and aquatic species
  - Loss of Flood storage

Why Protect Riparian Corridors?

Federal, State, and Local Governments each Play a Role

Point Source Regulations

- State Stormwater Management regulations govern point source discharges
- Municipal mandate: Address discharges from **Municipal Separate Storm Sewer Systems** (MS4)

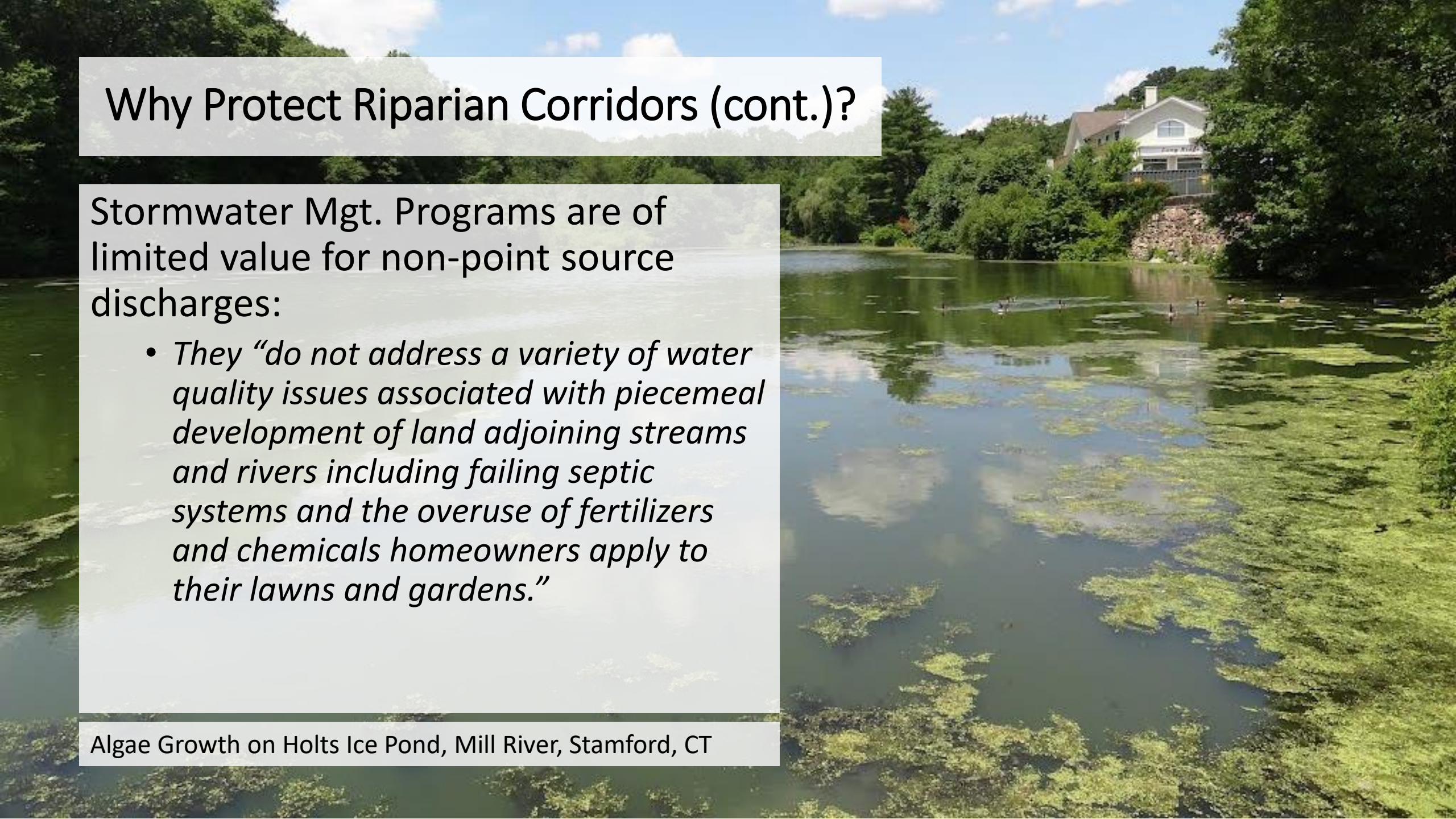
Non-Point Source Regulations

- Prior 2021, Local efforts to protect Riparian Corridors were discretionary in nature except for the state's 24 coastal municipalities
- Public Act 21-29: Mandates **ALL** Zoning Commissions to address land use practices influencing the hypoxic conditions in Long Island Sound.

Why Protect Riparian Corridors (cont.)?

Stormwater Mgt. Programs are of limited value for non-point source discharges:

- *They "do not address a variety of water quality issues associated with piecemeal development of land adjoining streams and rivers including failing septic systems and the overuse of fertilizers and chemicals homeowners apply to their lawns and gardens."*



Algae Growth on Holts Ice Pond, Mill River, Stamford, CT

Development along CT's Riparian Corridors

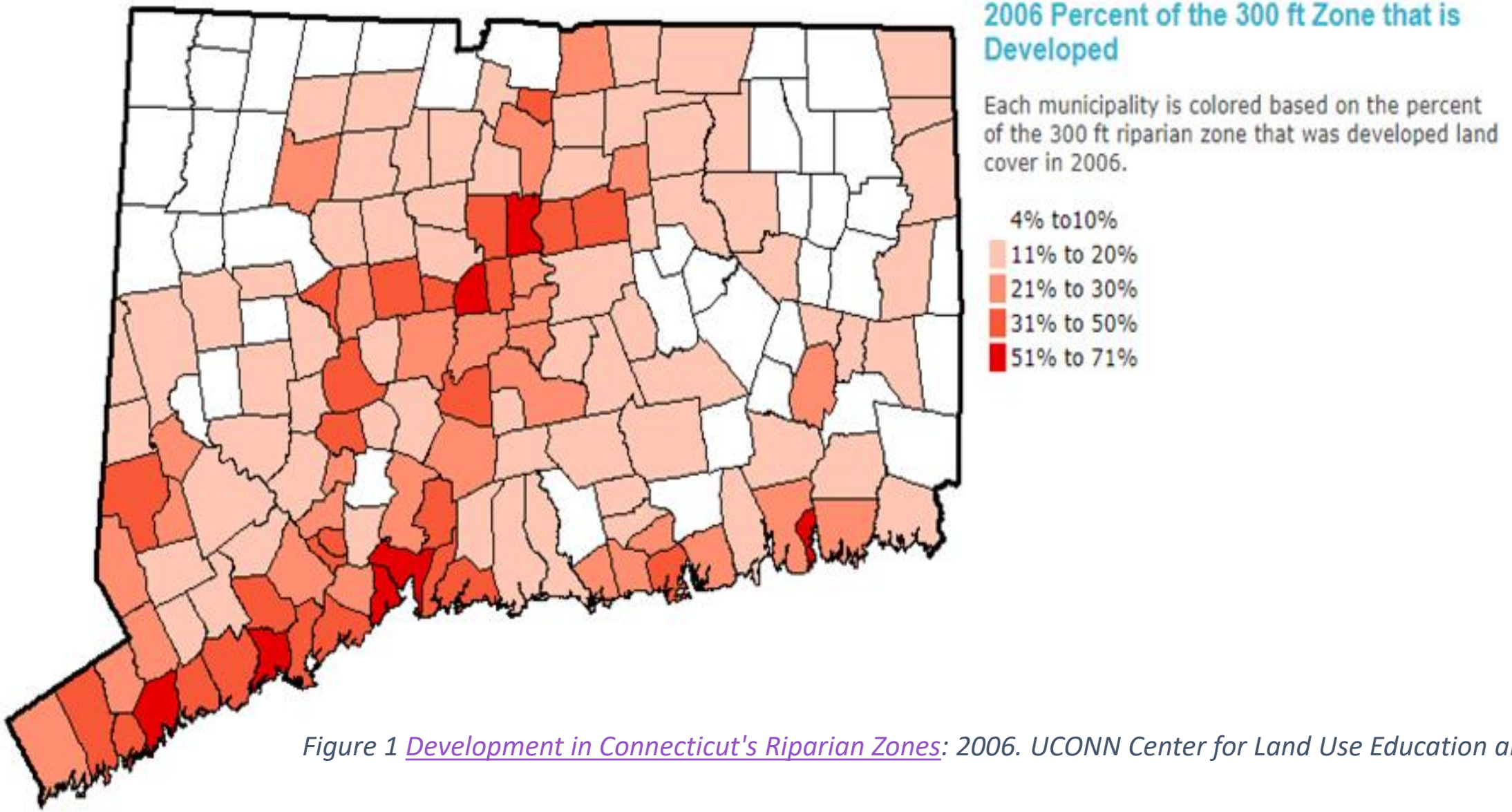
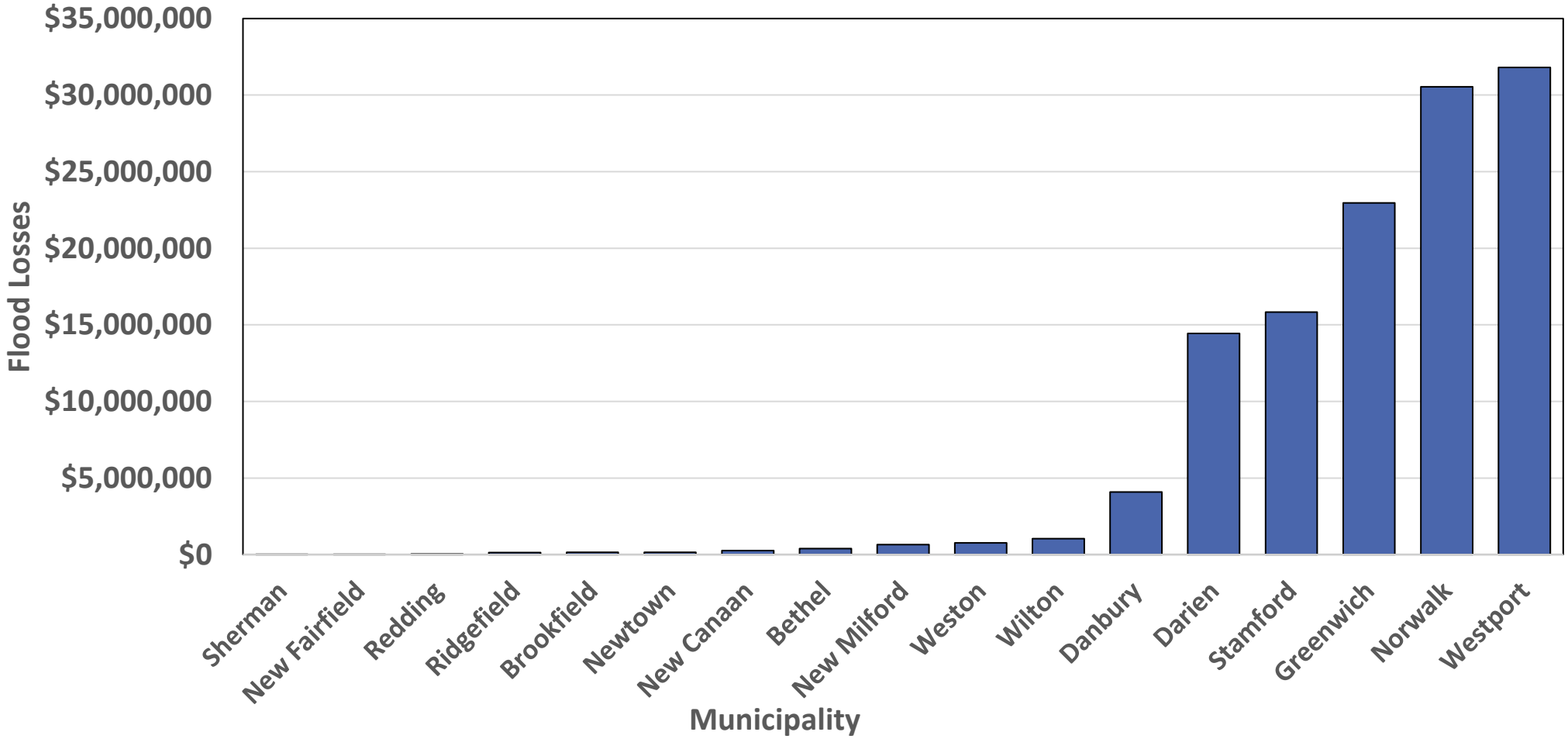


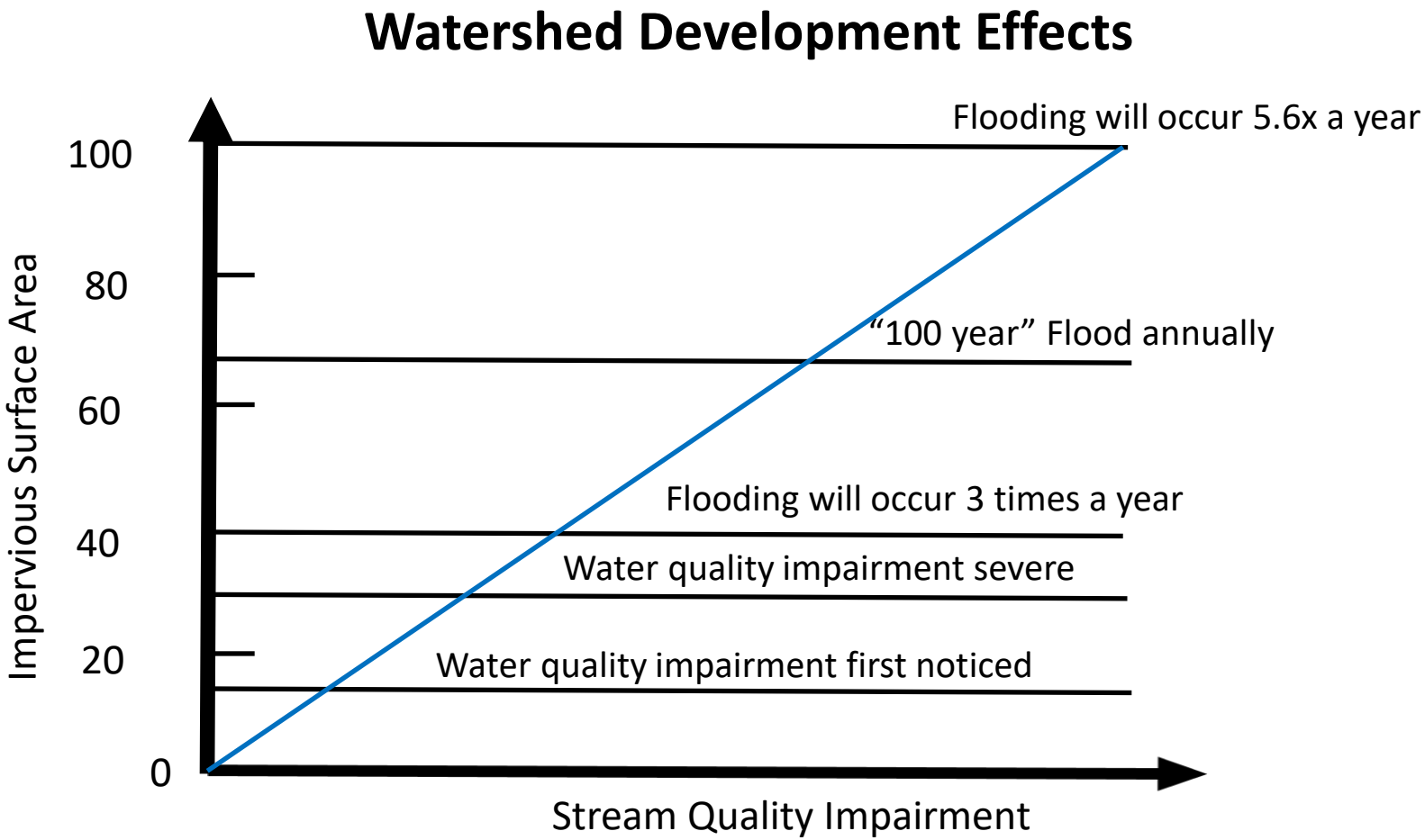
Figure 1 Development in Connecticut's Riparian Zones: 2006. UCONN Center for Land Use Education and Research.

Consequences of Development in Western CT

Figure 2: Flood Insurance Losses in Municipalities of Western Connecticut: 1984 to 2019



Watershed Development – Impacts to Stream Quality and Flooding



Source: Richard D. Klein, Urbanization and Stream Quality Impairment, Water Resources Bulletin, American Water Resources Association, Vol. 15, No. 4, August 1979.

Figure 3 Watershed Development – Impacts to Stream Quality and Flooding

The Role of Navigable Waters

Public Act 21-29 Links Hypoxia to Navigable Waters

- Zoning regulations adopted pursuant to Section 8-2 of CT General Statutes shall: “In any municipality that is contiguous to or on a navigable waterway draining to Long Island Sound,

  A) be made with reasonable consideration for the **restoration and protection of the ecosystem and habitat of Long Island Sound**;

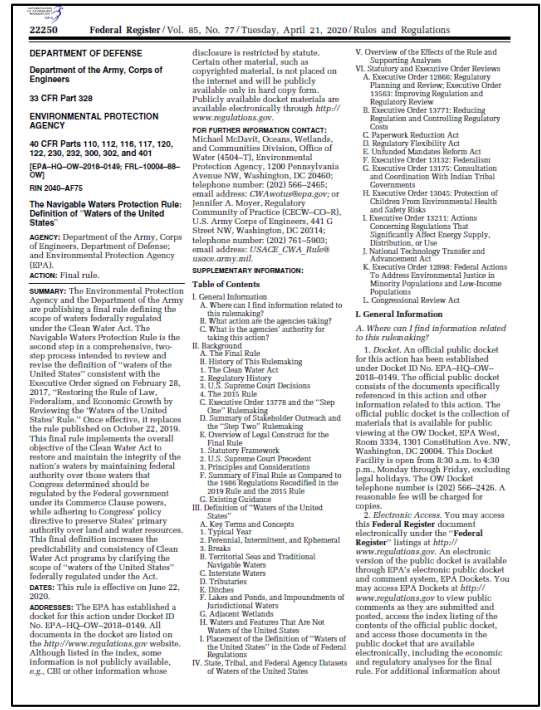
  B) be designed to **reduce hypoxia, pathogens, toxic contaminants** and floatable debris on Long Island Sound; and

  C) provide that such municipality's zoning commission consider the environmental impact on Long Island Sound coastal resources, as defined in section 22a-93, of any proposal for development.”

The Role of Navigable Waters

Does Your Municipality Discharge Pollutants to Navigable Waterways draining to Long Island Sound?

- The Answer Lies in Recent U.S. Supreme Court and EPA Rulings
  - Recent Supreme Court decisions and a 2020 EPA rule have narrowly strengthened Clean Water Act authority over tributaries of navigable waters when it can be shown that they are **hydrologically connected to downstream river systems** and are the cause of pollution of the waters of the United States.
- **Hypoxia is a Federal Water Compliance Issue** – the ultimate Court arbiter of hypoxic conditions in the Sound is EPA and Federal Courts.



22250 Federal Register / Vol. 85, No. 77 / Tuesday, April 21, 2020 / Rules and Regulations

DEPARTMENT OF DEFENSE

Department of the Army, Corps of Engineers

33 CFR Part 328

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 110, 112, 116, 117, 120, 122, 230, 232, 300, 302, and 401

[EPA–HQ–OW–2018–0149; FRL–10004–88–OW]

RIN 2040–AF75

The Navigable Waters Protection Rule: Definition of "Waters of the United States"

AGENCY: Department of the Army, Corps of Engineers, Department of Defense; and Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency and the Department of the Army are publishing a final rule defining the scope of waters federally regulated under the Clean Water Act. The Navigable Waters Protection Rule is the second step in a comprehensive, two-step process intended to review and revise the definition of "waters of the United States" consistent with the Executive Order signed on February 28, 2017, "Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the 'Waters of the United States' Rule." Once effective, it replaces the rule published on October 22, 2019. This final rule implements the overall objective of the Clean Water Act to restore and maintain the integrity of the nation's waters by maintaining federal authority over those waters that Congress determined should be regulated by the Federal government under its Commerce Clause powers, while adhering to Congress' policy directive to preserve States' primary authority over land and water resources. This final definition increases the predictability and consistency of Clean Water Act programs by clarifying the scope of "waters of the United States" federally regulated under the Act.

DATES: This rule is effective on June 22, 2020.

ADDRESSES: The EPA has established a docket for this action under Docket ID No. EPA–HQ–OW–2018–0149. All documents in the docket are listed on the *http://www.regulations.gov* website. Although listed in the index, some information is not publicly available, *e.g.*, CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the internet and will be publicly available only in hard copy form. Publicly available docket materials are available electronically through *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Michael McDavit, Oceans, Wetlands, and Communities Division, Office of Water (4504–T), Environmental Protection Agency, 1200 Pennsylvania Avenue NW, Washington, DC 20460; telephone number: (202) 566–2465; email address: *CWAwotus@epa.gov*; or Jennifer A. Moyer, Regulatory Community of Practice (CECW–CO–R), U.S. Army Corps of Engineers, 441 G Street NW, Washington, DC 20314; telephone number: (202) 761–5903; email address: *USACE_CWA_Rule@usace.army.mil*.

SUPPLEMENTARY INFORMATION:

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I. General Information

A. Where can I find information related to this rulemaking?

1. *Docket.* An official public docket for this action has been established under Docket ID No. EPA–HQ–OW–2018–0149. The official public docket consists of the documents specifically referenced in this action and other information related to this action. The official public docket is the collection of materials that is available for public viewing at the OW Docket, EPA West, Room 3334, 1301 Constitution Ave. NW, Washington, DC 20004. This Docket Facility is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The OW Docket telephone number is (202) 566–2426. A reasonable fee will be charged for copies.

2. *Electronic Access.* You may access this **Federal Register** document electronically under the "**Federal Register**" listings at *http://www.regulations.gov*. An electronic version of the public docket is available through EPA's electronic public docket and comment system, EPA Dockets. You may access EPA Dockets at *http://www.regulations.gov* to view public comments as they are submitted and posted, access the index listing of the contents of the official public docket, and access those documents in the public docket that are available electronically, including the economic and regulatory analyses for the final rule. For additional information about

Federal Register, April 21, 2020

Non-Regulated Wetlands Activities

As of Right Activities Include:

- Grazing, farming*, nurseries, gardening and harvesting of crops and farm ponds of three acres or less essential to the farming operation;
- Activities conducted by, or under the authority of, CTDEEP for the purposes of wetland or watercourse restoration or enhancement or mosquito control;
- Boat anchorage or mooring;
- Outdoor recreation not disturbing wetlands;
- Withdrawal of water for fire emergency purposes & installation of dry hydrants by fire department.

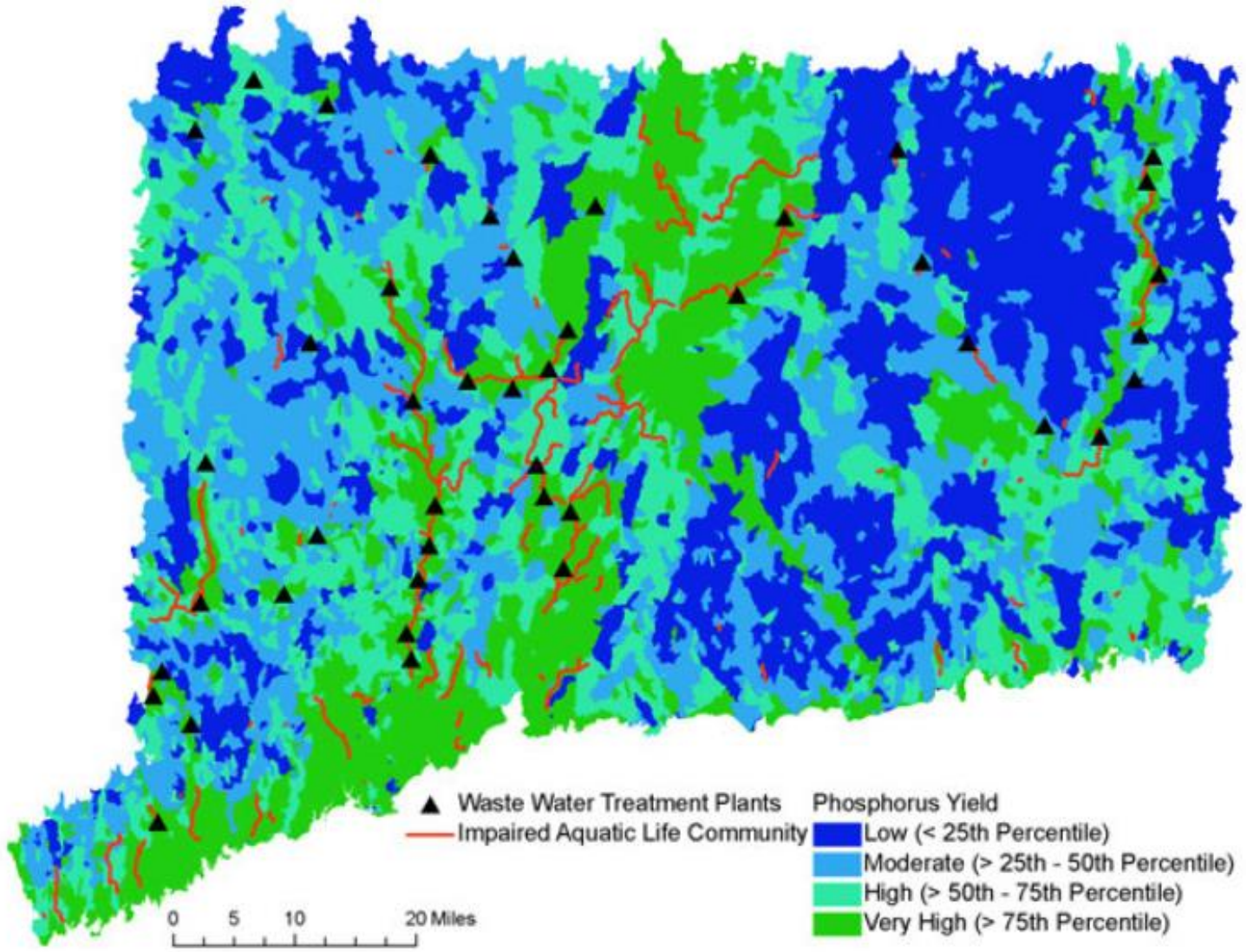
Caveats to As of Right Activities:

- Road construction or the erection of buildings not directly related to the farming operation;
- Relocation of watercourses with continual flow, filling or reclamation of wetlands or watercourses with continual flow;
- Clear cutting of timber except for the expansion of agricultural crop land;
- Mining of topsoil, peat, sand, gravel or similar material from wetlands or watercourses for the purposes of sale.

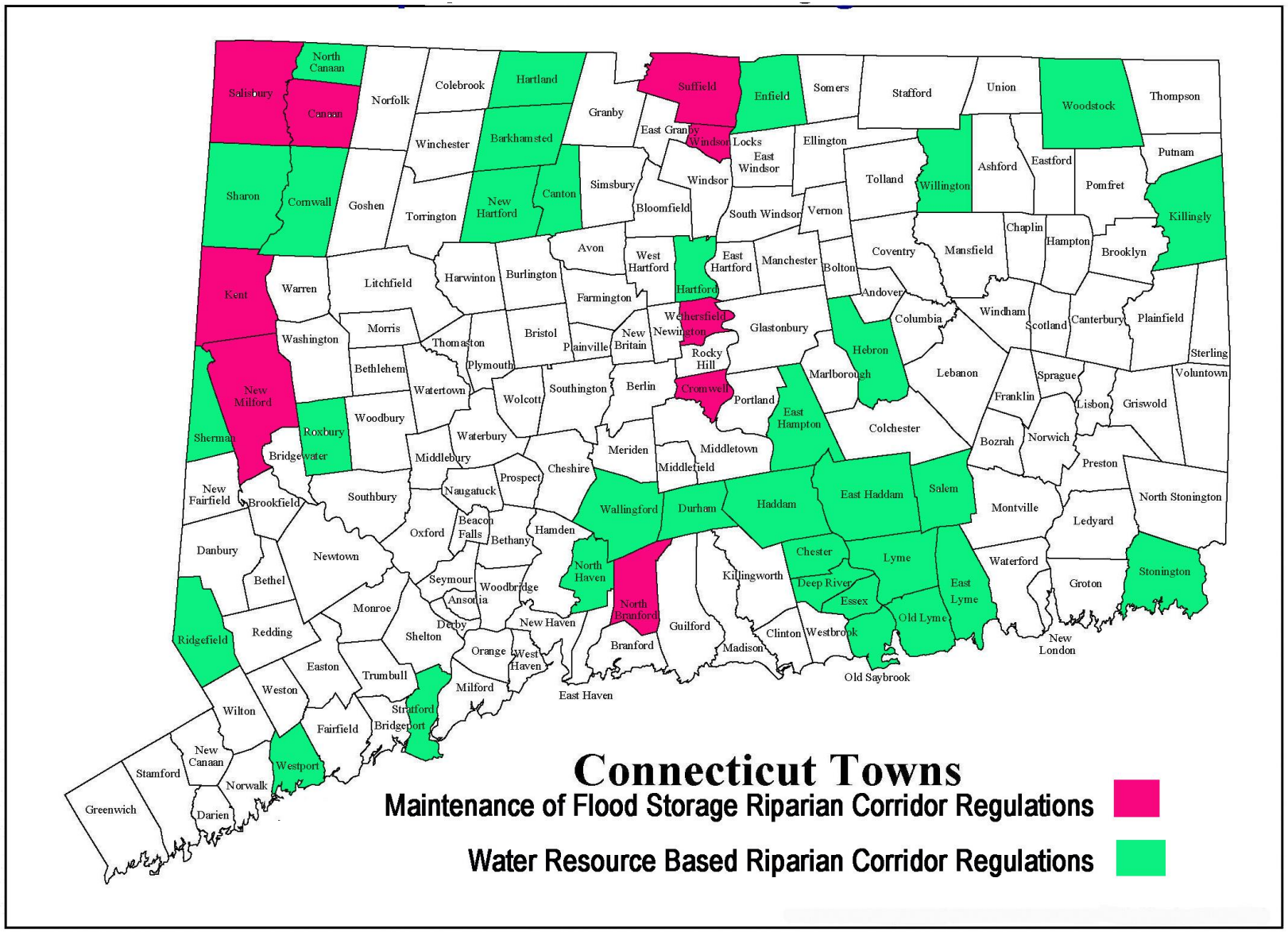
*See last slide for a detailed definition of what constitutes agriculture in Connecticut

Statewide Phosphorus Yields

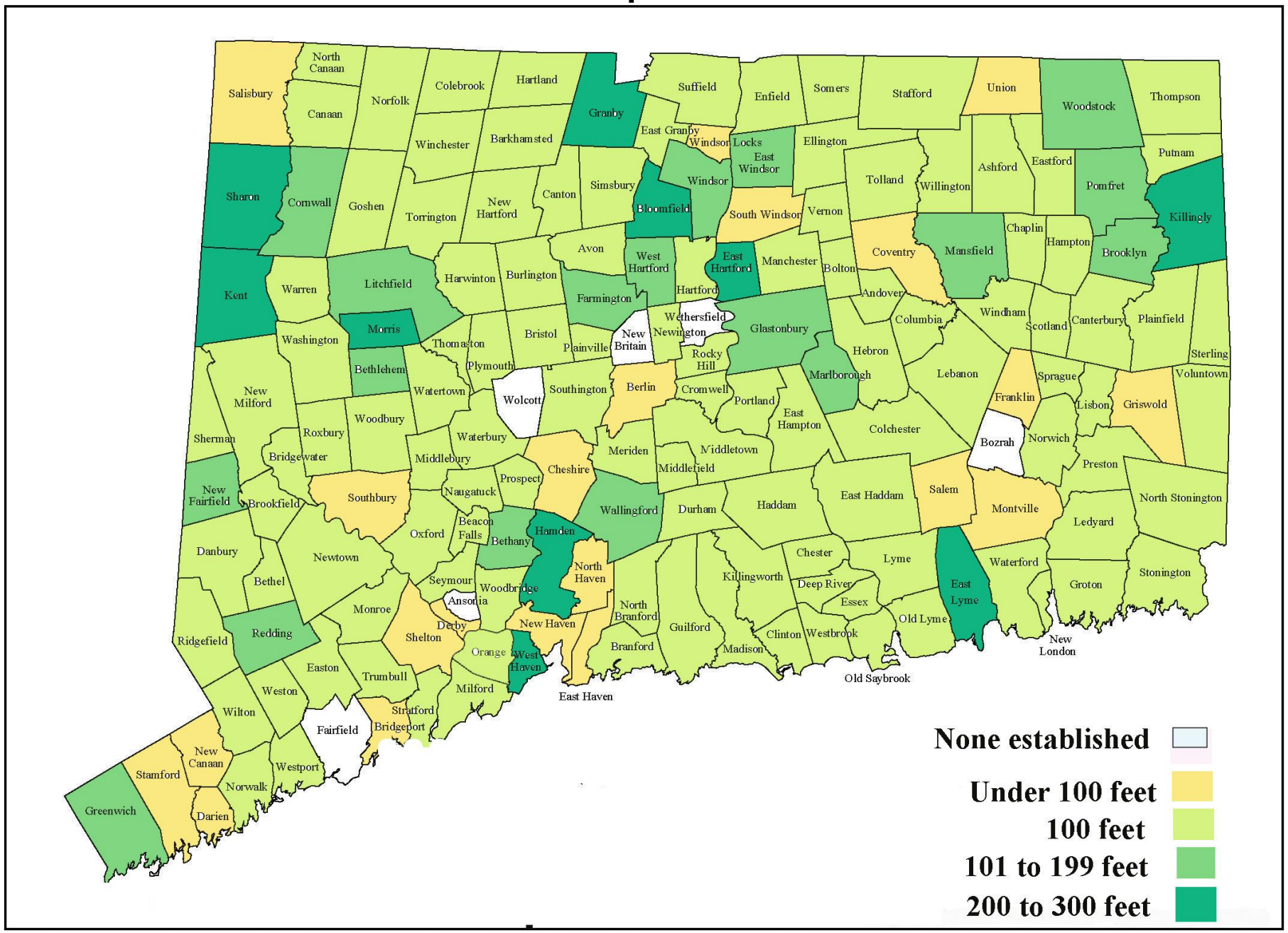
- ***Figure 7****: Statewide Phosphorus Yields based on using Sparrow (Moore, et.al. 2011). Aquatic life impairment based on assessment for the 2012 impaired waters list. Source: Connecticut DEEP, Recommendations for Phosphorus Strategy Pursuant to PA 12-155, February 16, 2017, Appendix B p. 2.*



Status of Riparian Corridor Regulations:2023



Size of Watercourse Upland Review Area: 2021



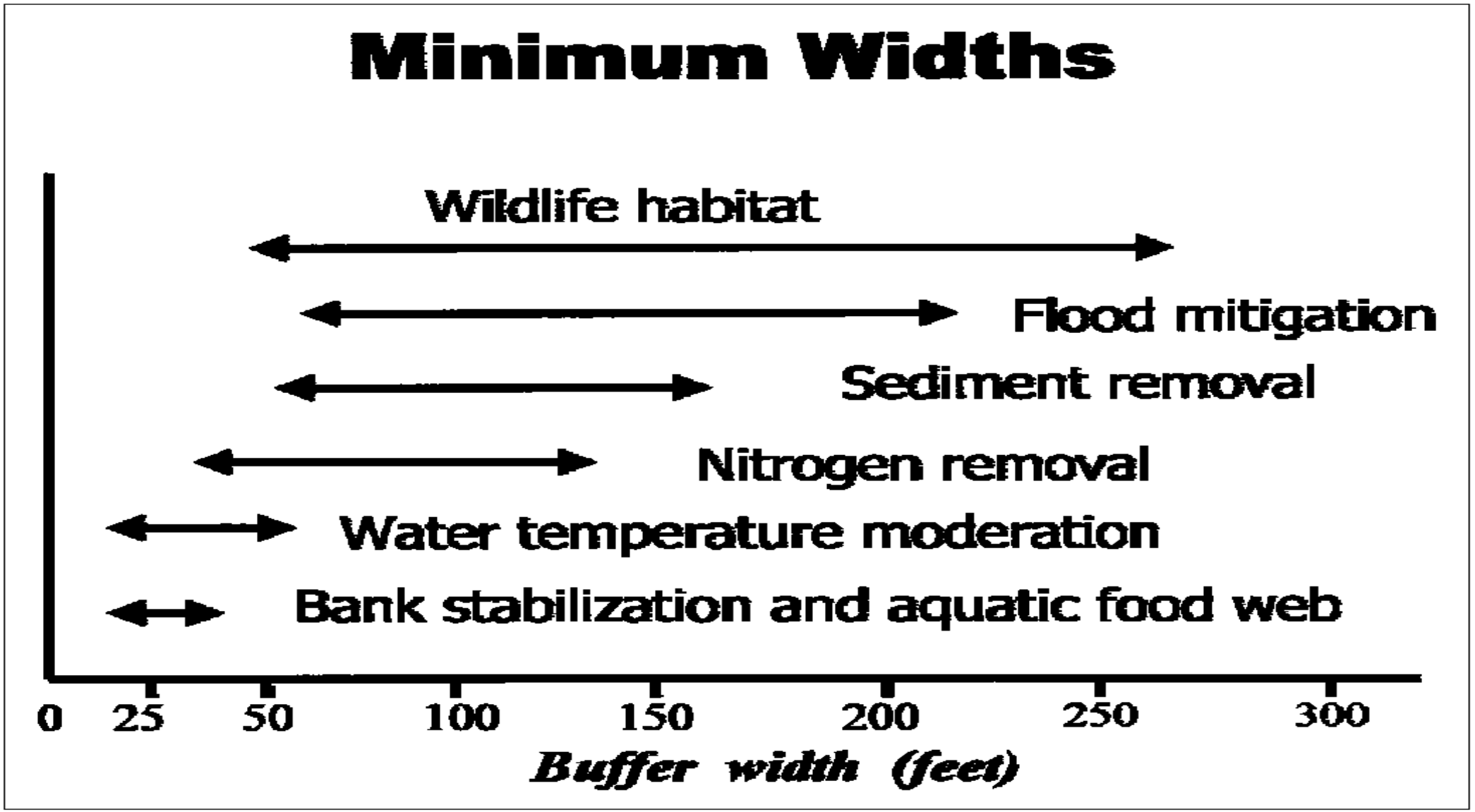
Note: Fairfield Upland Review Area varies by river

Benefits of Forested Riparian Corridors

Table 4: Effect of Different Size Buffer Zones on Sediment & Nutrient Reduction from Surface Runoff						
Item	Buffer Zone			Reduction: 100 x (input-output/input)		
#	Width (meters)	Width (Feet)	Plant Cover	Sediment %	Nitrogen %	Phosphorus %
1	4.6	15	Grass	61	4	28.5
2	9.2	30	Grass	74.6	22.7	24.2
3	19	62	Forest	89.8	74.3	70
4	23.6	77	Grass/Forest	96	75.3	78.5
5	28.2	93	Grass/Forest	97.4	80.1	77.2
Item 4: Width comprises 4.6 meters grass buffer plus 19 meters of trees						
Item 5: Width comprises 9.2 meters of grass buffer plus 19 meters of trees						

Source: Richard Lowrance, et. al., Water Quality Functions of Riparian Forest Buffer Systems in the Chesapeake Bay Watershed, August 1995, p. 30

Figure 8: Minimum Riparian Buffer Widths Vary with Desired Ecosystem Services



Source: Palone, Roxane, S, and Albert H. Todd, eds. Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers, pp. 6-8.

Riparian Corridor Protections

Purpose:

Maintain buffer along rivers and streams to attenuate stormwater impacts and reduce pollutants discharges.

Benefits:

Dramatic reductions in phosphorus, nitrogen and total suspended particulates when buffers are at least 100 feet wide

Techniques:

Buffers include tree canopy protection, minimize impervious cover, maintain ground cover and limit soil compaction

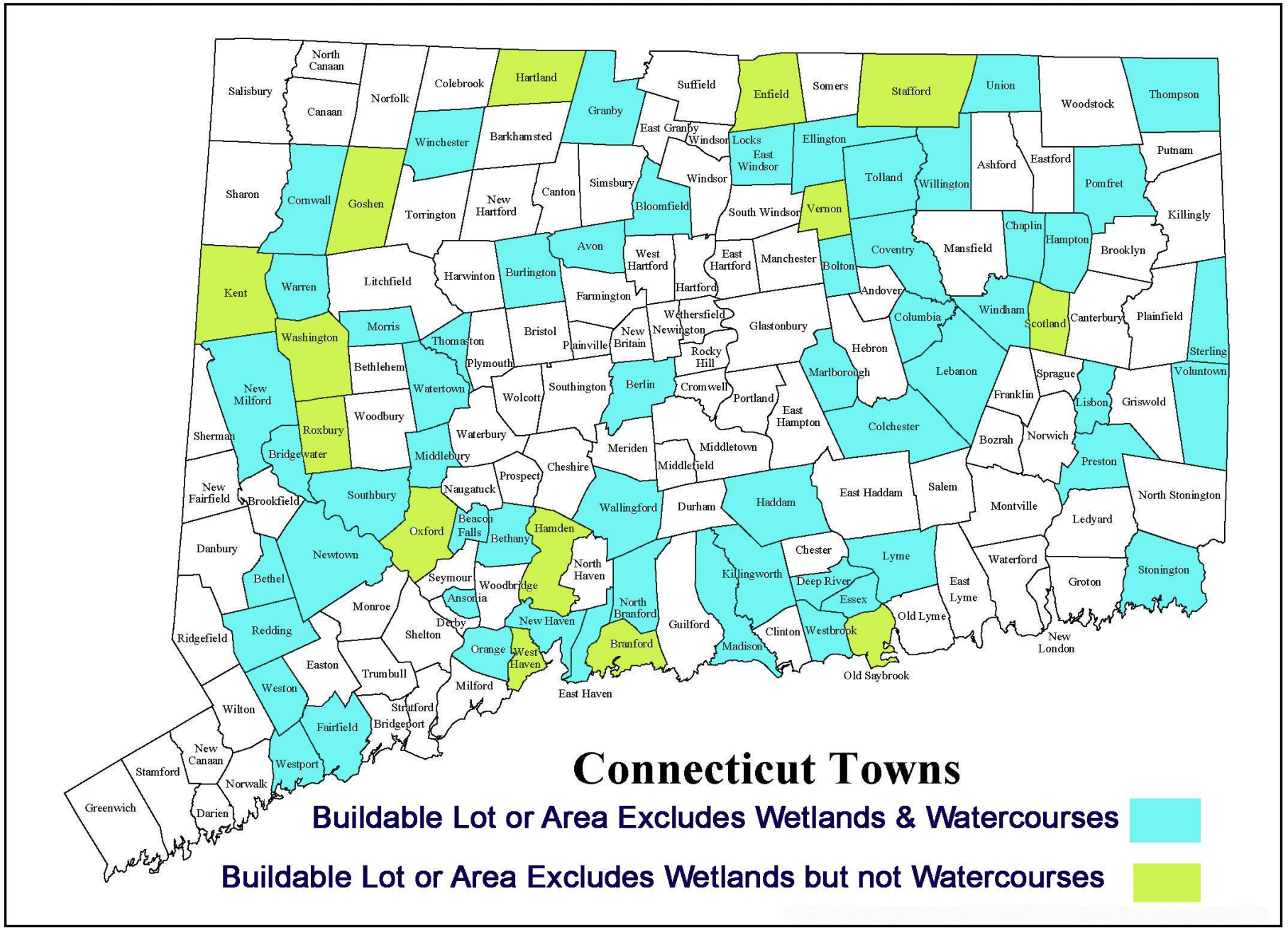
Municipal Best Practices:

Salem, Essex, Haddam, Willington

BUILDABLE SQUARE

Excludes Wetlands

Wetlands & Watercourses Excluded from Buildable Lot: 2023



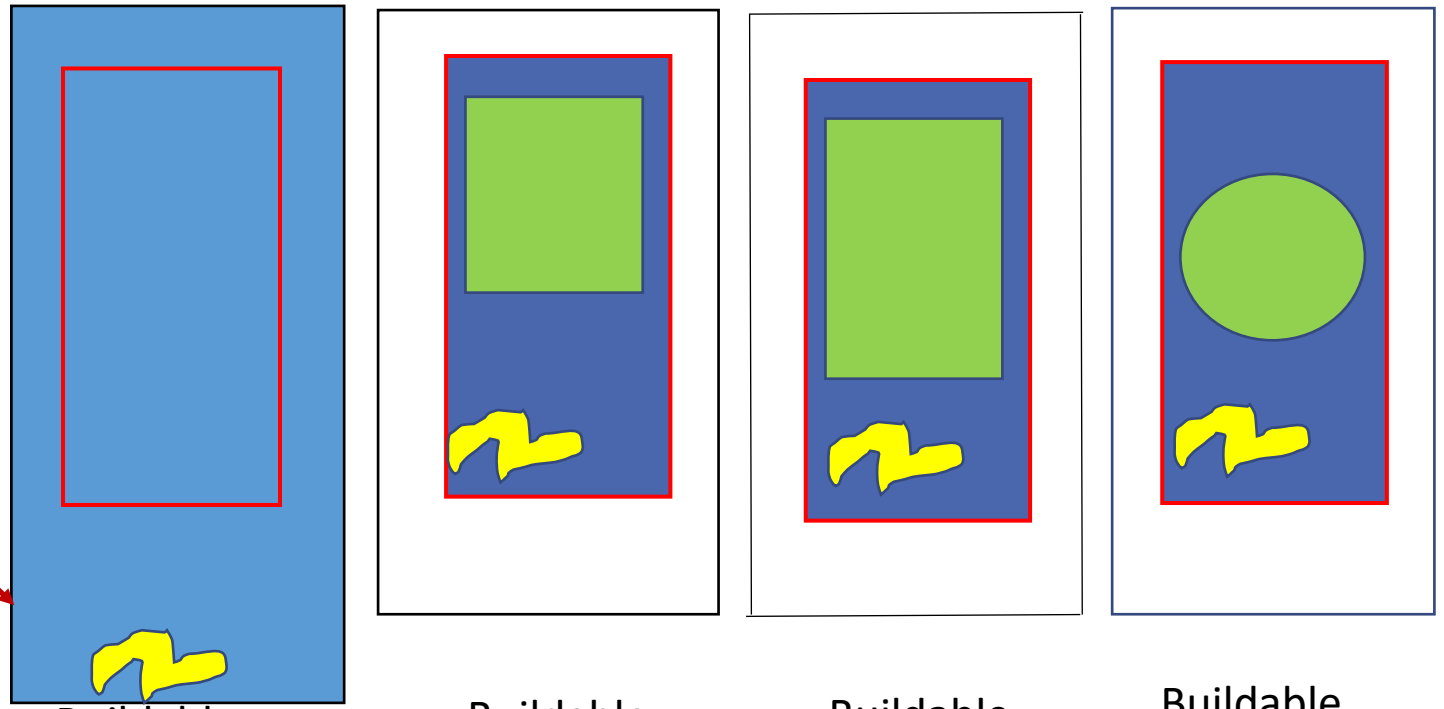
Buildable Lots vs. Buildable Squares

- Buildable Lots are defined as lots meeting:
  - Minimum size
  - Proper shape
  - Minimum setbacks
  - Free of specified environmental constraints
- Buildable Squares are defined as **Buildable Portions of Lots** meeting:
  - Minimum size
  - Proper shape
  - Minimum setbacks
  - Free of septic environmental constraints

These concepts are designed to precisely define portions of the lot needed for long term septic system functioning

Buildable Land Approaches Used in Connecticut

Requiring buildable lot free of wetlands increases minimum lot size



Buildable Lot

Buildable Square

Buildable Rectangle

Buildable Circle

Buildable Lot excludes wetlands =

Minimum Buildable Square =

Wetland Soils =

Traditional Buildable Lot: Land Inside Setback Lines =

Why Have Buildability Concepts Emerged?

- Septic systems do not last forever: 27-year half life
  - Pollution becomes the next generations nightmare
  - Leaching field failure rate affected by lack of maintenance
  - Failure rate aggravated by intense storm events
- Eutrophication of lakes, streams and rivers
- Hypoxic conditions in Long Island Sound – wastewater driven
- Consent agreement with EPA to resolve water quality degradation
- Connecticut Supreme Court: Zoning Can Regulate Buildable Lot
  - Cimino v. Zoning Board of Appeals, Decided October 13, 2009

Buildable Lot Regulations - Examples

- The area of the minimum square required for each lot shall be exclusive of wetlands, watercourses, conservation easements or any other restriction other than setbacks which would prevent actual house construction within the square. - Fairfield, CT Zoning Regulations.
- In order to facilitate lot development and lessen the risk of post-development problems, such as septic system failures, poor drainage, and erosion, each lot must contain a sufficient area of buildable land such that all State and Town codes, regulations, and ordinances pertaining to driveways, septic systems, wells, and inland wetlands and watercourses may be satisfied. - Bridgewater, CT Zoning Regulations.

Buildable Lot Regulations - Examples

- **Minimum Square**- a square each side of which is the length prescribed for the zone in which the lot is situated and which is capable of being drawn entirely within the lot's boundaries and behind the minimum front setback line of a lot in said zone. No more than 20% of the minimum square shall be classified as inland wetlands as determined by field survey. – Newtown, CT Zoning Regulations.
- **7.02.110** Any new lot created after September 16, 2002 shall contain an area of land at least equal to the minimum lot area in acres for the zone in which it is located exclusive of wetlands, watercourses, vernal pools, FEMA 100-year flood plains, and natural slopes of twenty-five percent (25%) or greater. - Newtown, CT Zoning Regulations.

Buildable Lot Regulations - Examples

- Lot Area: The total horizontal area within the lot lines. In determining compliance with the minimum lot area requirements of these regulations, areas consisting of wetlands, watercourses, natural slopes in excess of 25%, portions of the lot less than 25 feet wide, or the private right-of-way leading to the rear lot shall not be included. (*Effective: February 26, 2000*) –New Milford, CT Zoning Regulations.

Buildable Lot Regulations - Examples

- **Parts of Lot Not Counted Toward Minimum Area Requirements:** No part of any lot reserved for or used as a road, right-of-way or access way shall be counted as part of the required minimum lot area. Land subject to easements for above-ground utilities which forbid buildings or structures within the area of the easement shall not be included as part of minimum lot area, nor shall any easement which grants exclusive surface use of the property to other than the owner, except drainage easements. Land under water, and soils defined as “very poorly drained” in the National Cooperative Soils Survey, as may be amended from time to time, of the Soil Conservation Service of the United States Department of Agriculture may be used to satisfy no more than twenty (20%) percent of the minimum lot area requirement. (Amended 7/1/86) - Weston, CT Zoning Regulations.

Buildable Lot Regulations That Include Wetland Protection Criteria

Wetland Controls through Buildable Lot Standards	Code	Number
Minimum Buildable Area Uniformly Applied	**MBA**	**25**
Minimum Buildable Area Varies by Zone	**MBAV**	**22**
Minimum Buildable Area Equal Minim Lot Size	**MBALOT**	**12**
Minimum Buildable Square Uniformly Applied	**MBS**	**4**
Minimum Buildable Rectangle Uniformly Applied	**MBR**	**3**
Minimum Dimensional Square Varies by Zone	**MDSV**	**3**
Minimum Buildable Rectangle Varies by Zone	**MBRV**	**2**
Minimum Buildable Square Varies by Zone	**MBSV**	**1**
Minimum Dimensional Square Uniformly Applied	**MDS**	**1**
Minimum Buildable Circle Varies by Zone	**MBCV**	**0**
	Grand Total	**73**

Buildable Square
Excludes Wetlands

Purpose:

Create sufficient wetland free land within a buildable lot for proper functioning of septic system and leach fields.

Benefits:

Exclude wetlands from buildable square ensures sufficient distance between leach fields and wetland resources, reducing risk of water contamination.

Techniques:

Buildable square should be 27,000 square feet for leach field functioning. Size of “Square” varies with number of bedrooms.

Municipal Best Practices:

New Milford, Haddam, Old Lyme

LOW IMPACT DEVELOPMENT

Key Elements of Low Impact Development

Protective Strategies	• Protect tree canopy cover • Protect wetlands and watercourses • Reduce impervious cover
Low Impact Strategies	• Use vegetative filter strips along roadways • Install rain barrels or gravel filter beds • Use porous pavement or gravel driveways
Detention or Retention Basins	• Stormwater detention or retention basins • Dry swales • Below ground cisterns

Why Have Low Impact Development Regulations Emerged?

Federal, State, and Local Governments each Play a Role

Point Source Regulations

- State Stormwater Management regulations govern point source discharges
- Municipal mandate: Address discharges from **Municipal Separate Storm Sewer Systems** (MS4) including LID.

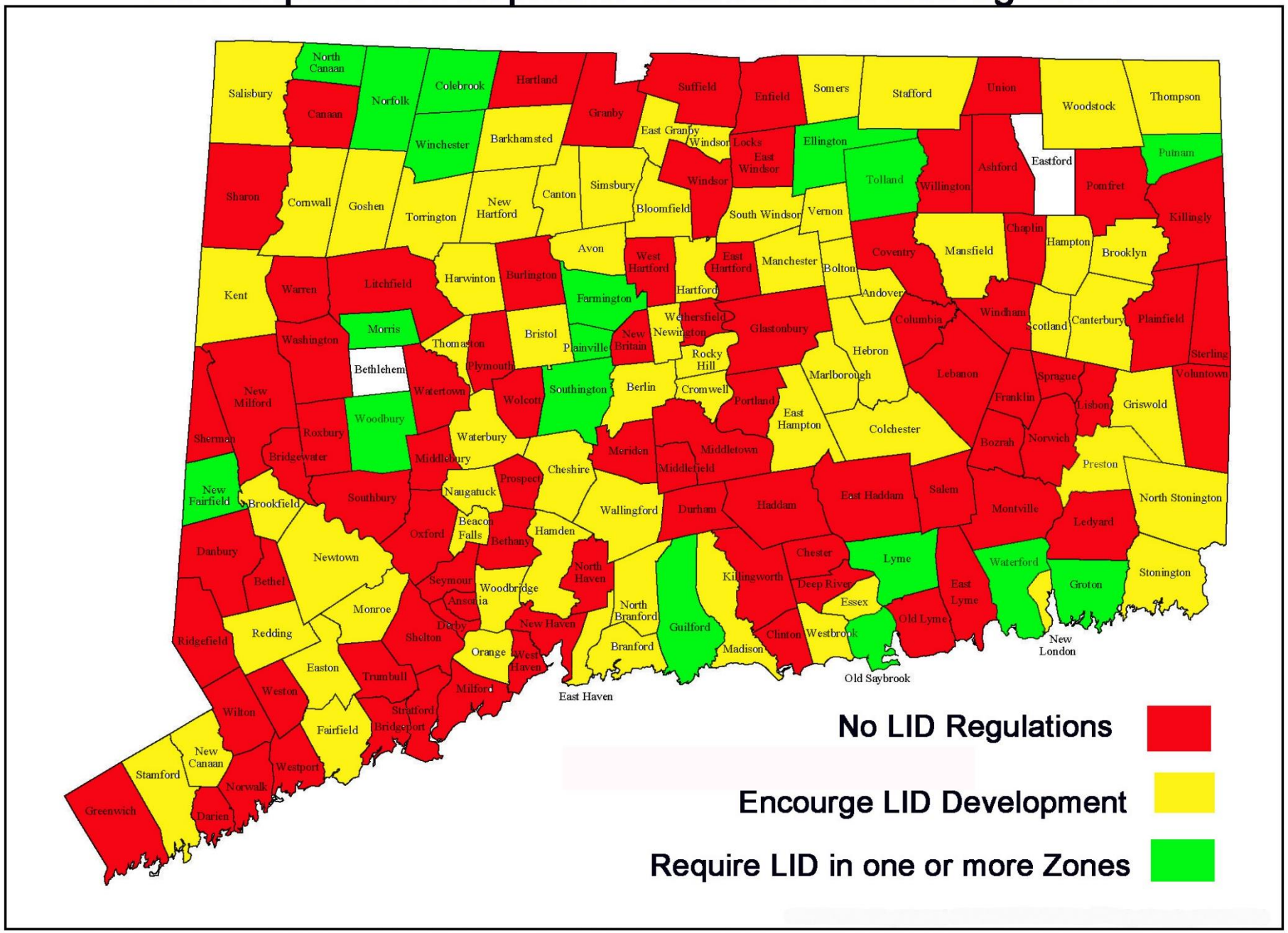
Non-Point Source Regulations

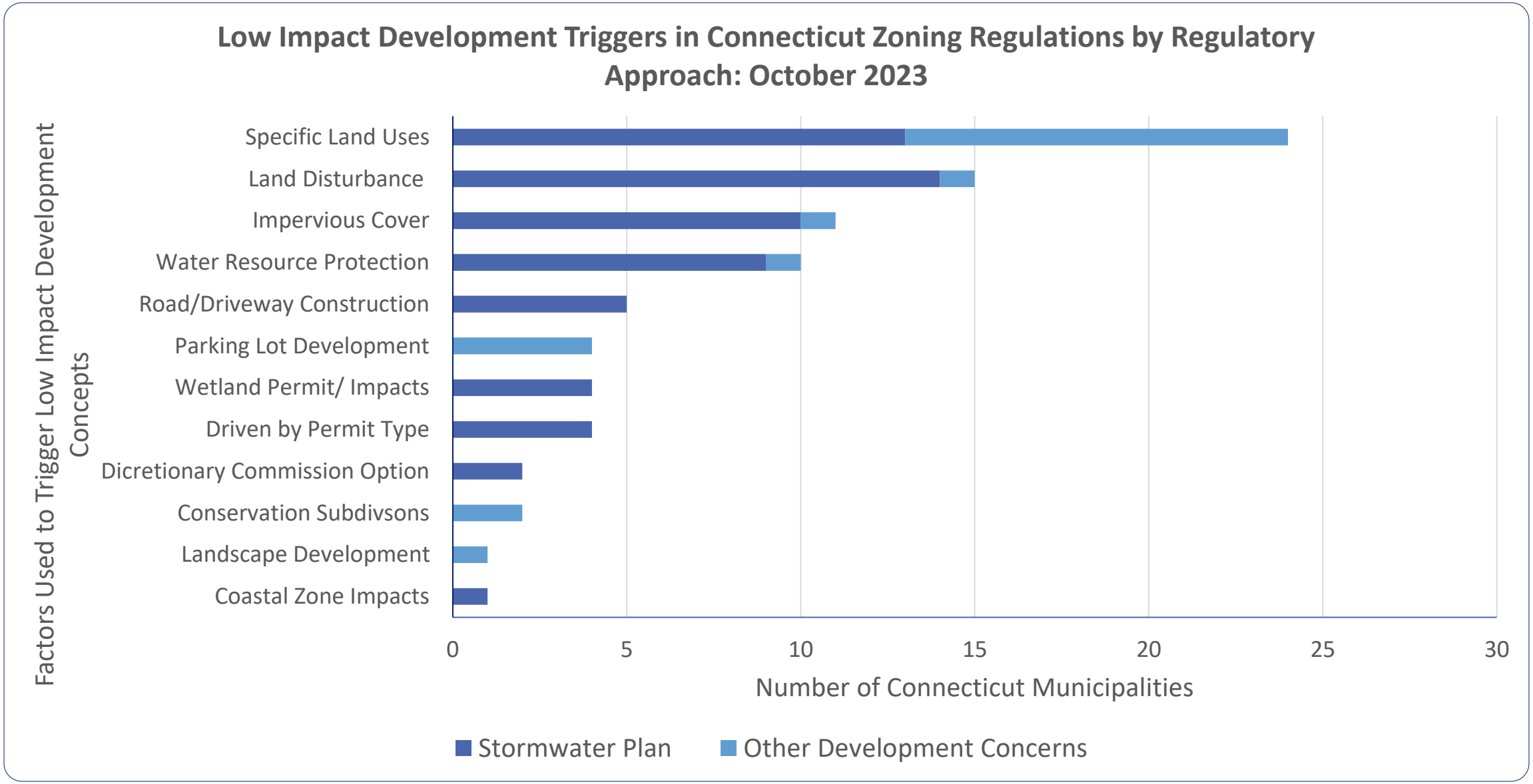
- MS4 General Permit Mandates LID Regulations
- Public Act 21-29: Mandates **ALL** Zoning Commissions to address land use practices influencing the hypoxic conditions in Long Island Sound.

MS4 General Permit Municipal Requirement

- *"The permittee **shall establish** an ordinance, bylaw, regulation, standard condition of approval or other appropriate legal authority that requires, to the Maximum Extent Practicable (MEP), that a developer or contractor seeking the permittee's approval shall consider the use of low impact development ("LID") and runoff reduction site planning and development practices prior to the consideration of other practices in the permittee's land use regulations, guidance or construction project requirements **to meet or exceed those LID and runoff reduction practices identified in the Stormwater Quality Manual**."*
  - CTDEEP, General Permit for MS4, p. 27

Low Impact Development Standards in Zoning: 2023




Low Impact Development Triggers in Connecticut Zoning Regulations by Regulatory Approach: October 2023
Factors Used to Trigger Low Impact Development Concepts
Specific Land Uses
Land Disturbance
Impervious Cover
Water Resource Protection
Road/Driveway Construction
Parking Lot Development
Wetland Permit/ Impacts
Driven by Permit Type
Dicretionary Commission Option
Conservation Subdivsons
Landscape Development
Coastal Zone Impacts
0
5
10
15
20
25
30
Number of Connecticut Municipalities
Stormwater Plan
Other Development Concerns

Purpose:

Site design strategies to maintain or replicate predevelopment hydrology using small scale controls to manage runoff as close to its source as possible.

Benefits:

Reduced pollution of wetlands and watercourses and reduced flooding.

Low Impact Development

Techniques:

Use of natural systems such as rain gardens, green-roof concepts, grass swales, and avoidance of permeable land cover.

Municipal Best Practices:

Morris, Winchester, Guilford, New Fairfield

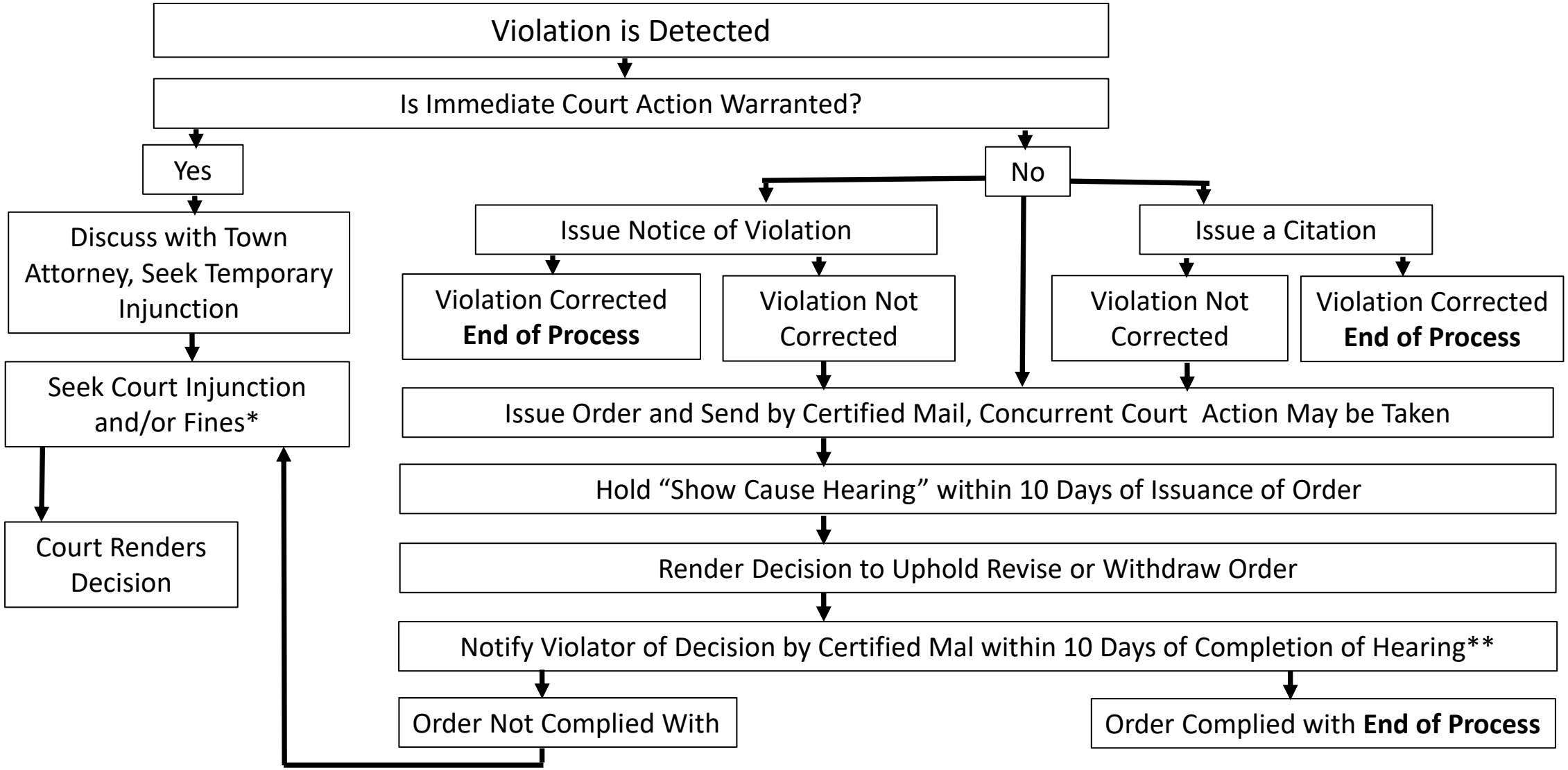
Violations and Enforcement

- **Entrance onto Private Property** – Designated agent may enter public or private property, except a private residence, for purpose of inspection and investigation of possible violations of wetland regulations.
- **Penalties** – Anyone violating the wetland regulations shall be subject to penalties which may include cease and desist orders and revocation of any permits issues due to deception or inaccurate information.
- **Use of Fees as Fines** – Numerous municipalities impose higher permit fees for wetland permits triggered by illegal wetland fillings, disturbance or corrective actions compared to applicants without such violations. 50% of WestCOG municipalities use this approach.

Enforcement Practices

- Role of designated inland wetlands agent is critical
  - Wide variation in enforcement practices across Connecticut
    - Active routine inspections versus wait for neighbors to complain
  - Not all municipalities have an Inland Wetland Agent
  - Not all agents work full-time.
  - Many agents are also the town's Zoning Enforcement Officer
  - Many agents are not properly trained even by CTDEEP Standards

Sample Enforcement Flow Chart (CGS Sec. 22a-42g and 22a-44)



*Complete DEEP Statewide IWW Activity Reporting Form. Submit no later than the 15th Day of the month following month action was taken.

** Although not required by statute, it is good practice to publish a notice of the decision in the newspaper.

Review of Course Findings

- Zoning Commissions have authority to protect wetlands
- Three wetland protection techniques include:
  - Protection of riparian corridors
  - Establishing buildable square concept
  - Adopt low impact development standards
- Federal and State authority granted to protect wetlands
  - MS4 General Permit, PA 21-29 and Supreme Court Case Law
- Benefits: Reduced flooding & improved water quality
  - Supported by the three wetland protection techniques

Further Readings on Wetland Protection

- WestCOG, *The Buildable Square: An Innovative Way to Protect Inland Wetlands and Reduce System Failures*, August 9, 20223
- WestCOG, *The Case for Riparian Corridor Protections: Zoning Strategies to Reduce Pollution of Inland Waters and Resultant Hypoxia of Long Island Sound*, August 10, 2021
- WestCOG, An Investigation of Inland Wetlands Commission Practices in Connecticut: Findings, Recommendations and Best Practices, August 9, 2023
- U.S. Department of Housing & Urban Development, *The Practice of Low Impact Development*, July 2003
- Trinkhaus Engineering LLC, *Low Impact Sustainable Development and Stormwater Design Manual*, prepared for the Town of Morris, January 1, 2018
- CTDEEP, Connecticut Stormwater Quality Manual, Effective March 30, 2024

Questions?

Definition of Agriculture – Construction of Statutes – Section 1.1(q)

- Except as otherwise specifically defined, the words “agriculture” and “farming” include cultivation of the soil, dairying, forestry, raising or harvesting any agricultural or horticultural commodity, including the raising, shearing, feeding, caring for, training and management of livestock, including horses, bees, the production of honey, poultry, fur-bearing animals and wildlife, and the raising or harvesting of oysters, clams, mussels, other molluscan shellfish or fish; the operation, management, conservation, improvement or maintenance of a farm and its buildings, tools and equipment, or salvaging timber or cleared land of brush or other debris left by a storm, as an incident to such farming operations; the production or harvesting of maple syrup or maple sugar, or any agricultural commodity, including lumber, as an incident to ordinary farming operations or the harvesting of mushrooms, the hatching of poultry, or the construction, operation or maintenance of ditches, canals, reservoirs or waterways used exclusively for farming purposes; handling, planting, drying, packing, packaging, processing, freezing, grading, storing or delivering to storage or to market, or to a carrier for transportation to market, or for direct sale any agricultural or horticultural commodity as an incident to ordinary farming operations, or, in the case of fruits and vegetables, as an incident to the preparation of such fruits or vegetables for market or for direct sale. The term “farm” includes farm buildings, and accessory buildings thereto, nurseries, orchards, ranges, greenhouses, hoophouses and other temporary structures or other structures used primarily for the raising and, as an incident to ordinary farming operations, the sale of agricultural or horticultural commodities. The terms “agriculture” and “farming” do not include the cultivation of cannabis, as defined in section 21a-420. The term “aquaculture” means the farming of the waters of the state and tidal wetlands and the production of protein food, including fish, oysters, clams, mussels and other molluscan shellfish, on leased, franchised and public underwater farm lands. **Nothing herein shall restrict the power of a local zoning authority under chapter 124.**

LID Benefits: 2024 Stormwater Quality Manual

- LID provides a number of benefits and advantages over traditional development and stormwater management approaches. Some of these benefits and advantages include:
- **Reduced consumption of land for stormwater management**. LID practices rely upon the natural capacity of undisturbed land to absorb precipitation thus reducing the need for structural stormwater controls that often require significant land area. When structural controls are still needed, they are typically small, close to the source of runoff, and can be integrated into the areas of the site that are typically not used for stormwater management.
- **Reduced development costs**. Traditional stormwater management can require substantial land clearing, earthwork, structural drainage systems, and structural stormwater controls. LID approaches involve more compact design with less land clearing and earthwork, less impervious area, and the use of natural flow paths and vegetated conveyances instead of catch basins and pipes. This results in reduced reliance on drainage infrastructure, smaller stormwater controls, and reduced need for excavation and construction materials, which translates into cost savings to developers.
- **Increased property values**. In addition to reduced development costs, sites that employ LID can have increased property values by improving the quality of building lots and increasing their marketability (e.g., greater sense of community cohesion and character, more attractive landscape, and more open space for conservation and recreation).
- **More aesthetically pleasing development**. Traditional stormwater management tends to incorporate the use of large, unnatural looking practices such as detention ponds that take up valuable space on a site. When neglected, these practices may present safety and mosquito concerns. LID can result in a more aesthetically pleasing and naturally attractive landscape.

LID Benefits: 2024 Stormwater Quality Manual

- **Reduced maintenance**. Most LID site planning and design techniques require little or no maintenance. LID structural practices generally require less maintenance and similar or lower maintenance costs that traditional drainage systems. Much of the maintenance that is required can be accomplished by the average landowner or contracted landscape maintenance companies.
- **Preserved site hydrology**. LID management mimics natural site hydrology and relies on the ability of undisturbed land to retain and absorb runoff from impervious surface. Runoff that is absorbed recharges groundwater and stream baseflow and does not need to be managed or controlled by a structural stormwater practice.
- **Reduced pollutant loads and improved water quality**. LID approaches reduce the loading of sediments, nutrients, and pathogens to streams and other waterbodies because. Landscapes that utilize LID practices minimize discharge and often retain all runoff from events smaller than the 2-year, 24-hour design storm. The runoff volume reduction benefits of LID result in significantly reduced pollutants loadings compared to structural stormwater BMPs that rely on pollutant removal through treatment alone.
- **Preservation of natural systems**. LID preserves large portions of contiguous land in an undisturbed, natural state, which preserves the chemical, biological, and ecological integrity of natural systems.
- **Enhanced climate and community resilience**. Improved land use strategies contribute to community resiliency and can help mitigate impacts from climate change. For example, LID can help avoid or reduce increases in runoff volumes and peak flows to existing urban infrastructure that is, in many cases, already undersized due to past development and vulnerable to more intense and frequent storms. Maintaining existing site vegetation, minimizing and disconnecting impervious surfaces, and using small-scale controls that rely on vegetation can also provide shading and cooling of runoff from impervious surfaces, mitigating increased temperatures.