The Science and Regulation of Wetlands

Josh Wilson, MESc, PWS

May 17, 2025

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NORTHEAST HIGHLANDS & COASTAL BIOREGION

AGENDA

1. Introduction
2. What Are Wetlands and Watercourses?
3. Why Are Wetlands and Watercourses Important?
4. How Are Wetlands and Watercourses Assessed?
5. What Do We Actually Regulate?
6. Resources & Discussion

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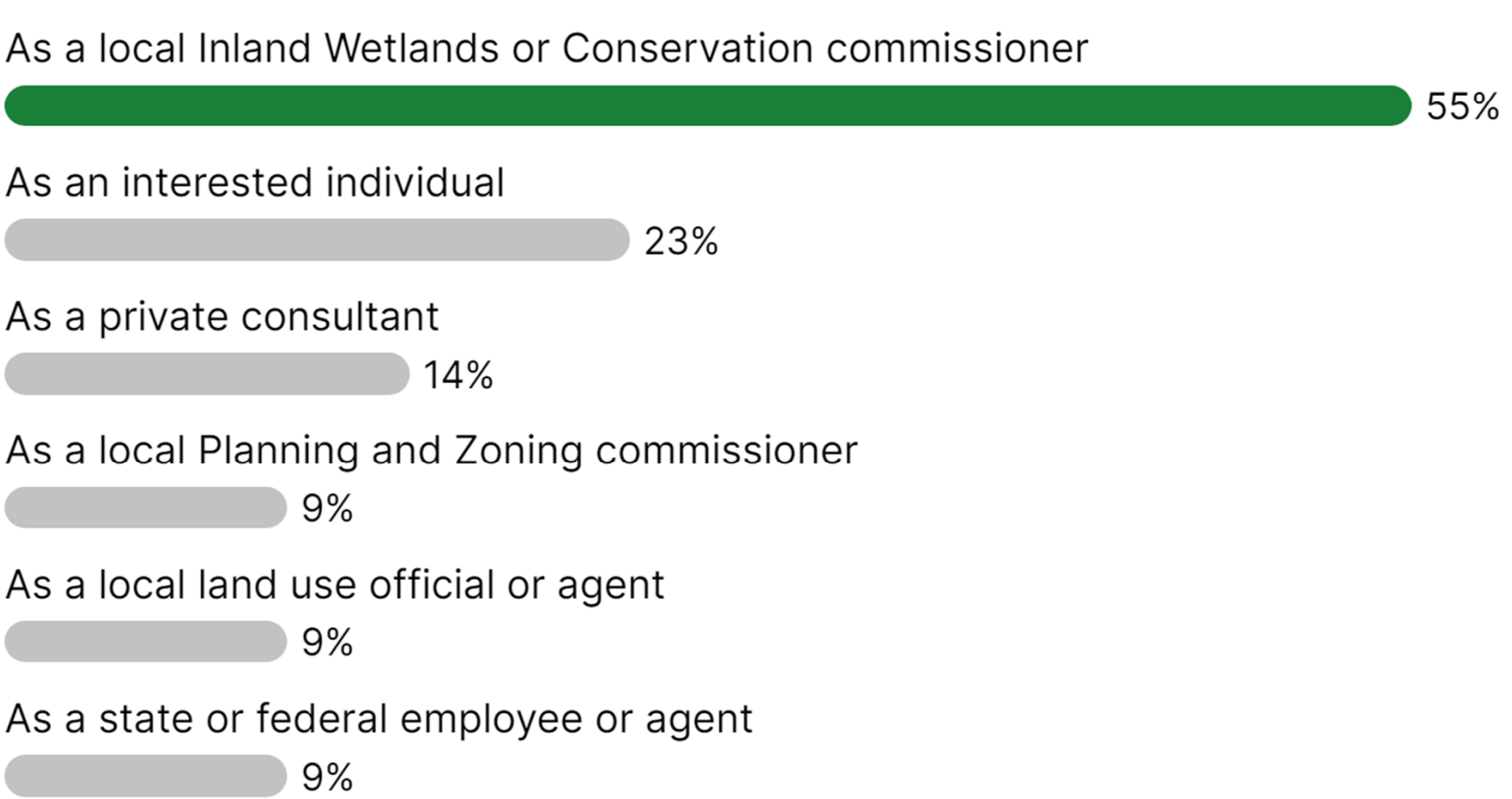
Active poll 22

How do you come to this workshop?



From May 17, 2025 Workshop

INTRODUCTION – OBJECTIVES

- ✓ Explore both the science of wetlands and the regulation of development related to wetlands in CT.
- ✓ Discuss the scientific and ecological issues that Wetland Commissioners should know.

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Josh Wilson, MESc, PWS

- Senior Wetland Ecologist & Restoration Ecologist
- 25 years of experience in inland and coastal wetland ecology
  - Mapping and Delineations
  - Ecological Surveys and Assessment
  - Land Development Guidance and Review
  - Dam Removal
  - Wetland and Stream Restoration
  - Local, State, and Federal Permitting
- 23 years serving on East Hampton Inland Wetlands & Watercourses Agency
  - 15 years as Vice-Chairman
  - 4 years as Chairman

Email: jwilson@biohabitats.com

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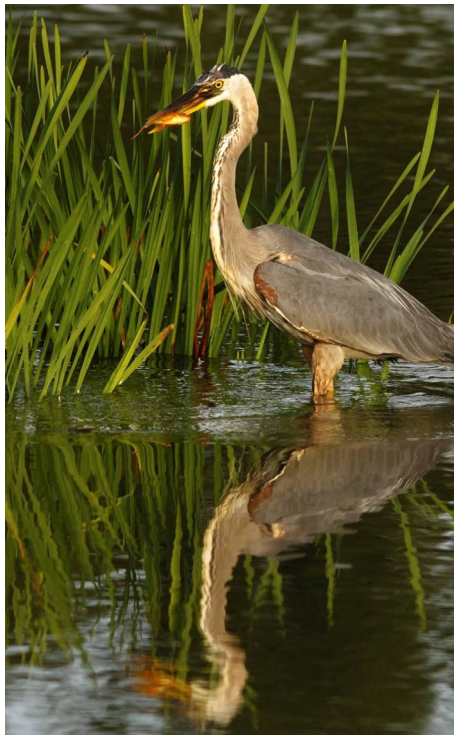
Ecological Planning, Design, & Construction

An integrated practice of…

- Landscape architects
- Engineers
- Ecologists
- Hydrologists
- Arborists
- Soil Scientists
- Fluvial Geomorphologists
- CAD and GIS Practitioners



Conservation Planning

Ecological Design

Construction

Envision a world where the earth's complex living systems are intricately linked and delicately balanced with their surroundings. Where your actions conserve critical habitat; where your project restores ecological processes; or where your footprint regenerates natural systems.

Just. Certified B Corporation Biohabitats

What are Wetlands and Watercourse?

Scientific vs. Regulatory Definitions

Word Association:

Wetlands and Watercourses

WHAT ARE WETLANDS & WATERCOURSES?

Active poll 28

What words come to mind when we say, "Wetlands or Watercourses?"

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Sinister and Foreboding?

This woeful stream forms the marsh called Styx, when it has fallen to the foot of the grey malignant walls. And I who stood there, intent on seeing, saw muddy people in the fen, naked, and all with the look of anger…So we covered a large arc of the loathsome swamp, between the dry bank and its core, our eyes turned towards those who swallow its filth – Dante: The Divine Comedy, Inferno Canto VII:100-130

Word Association “Wetland”

Marsh
Swamp
Bog
Quagmire
Slough
Moor
Morass
Peatlands

Muck
Peat
Water
Mud
Mosquitos
Frog
Ducks
Trash

Waterfowl
Amphibians
Turtles
Beaver
Dragonflies
Sulfur
Herons
Plants

Word Association “Watercourse”

River
Stream
Creek
Brook
Kill
Ditch
Swale
Canal

Lake
Pond
Vernal Pool
Flowing
Riffle & Pools
Cascade
Fish
Discharge

Tributary
Amphibians
Turtles
Beaver
Dragonflies
Rapids
Waterfowl
Wading Birds

WHAT ARE WETLANDS & WATERCOURSES?

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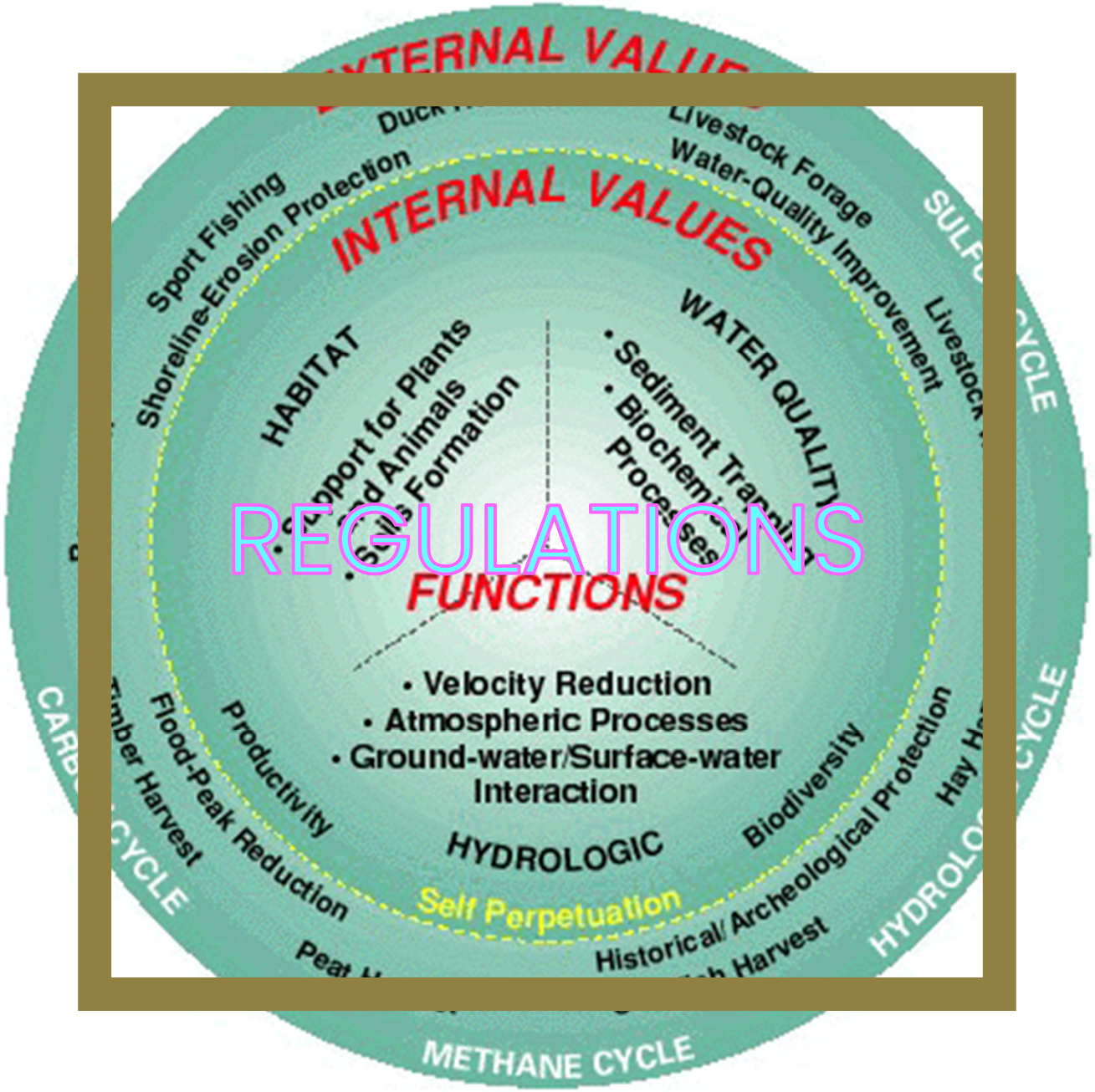

Graphic courtesy of USGS, Novitzki et al. 1997

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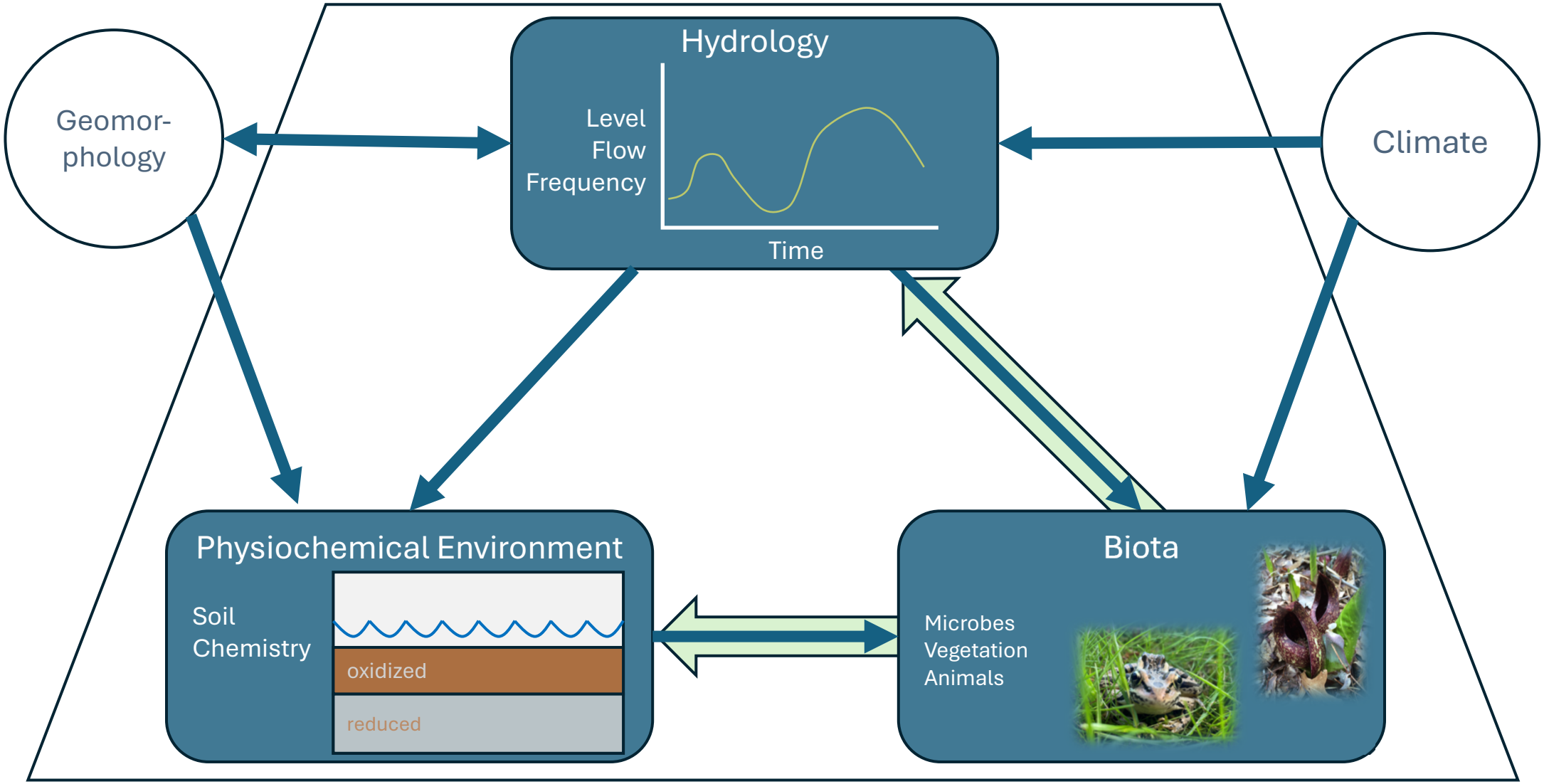
WHAT ARE WETLANDS & WATERCOURSES?



Direct Effects

Bio-feedback

Based on Mitsch & Gosselink 2015

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Wetlands are…

Federal

Wetlands are areas that are **inundated or saturated by surface or ground water** at a frequency and duration sufficient to support, and that under normal circumstances do support, **a prevalence of vegetation typically adapted** for life in **saturated soil conditions**. Wetlands generally include swamps, marshes, bogs, and similar areas. - *Definition of wetlands as used by the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) since the 1970s for regulatory purposes.* MZ

Connecticut

Land, including submerged land, not regulated pursuant to sections 22a-28 to 22a-35, inclusive, which consists of any of the **soil types designated as poorly drained, very poorly drained, alluvial, and floodplain** by the National Cooperative Soils Survey, as may be amended from time to time, of the Natural Resources Conservation Service of the United States Department of Agriculture. – *Connecticut General Statues 22a-38(15)*

Areas which border on or lie beneath **tidal waters**, such as, but not limited to banks, bogs, salt marsh, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all, of the following: [List of 78 Species] – *Connecticut General Statues 22a-29(2)*

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Watercourses are…

Federal

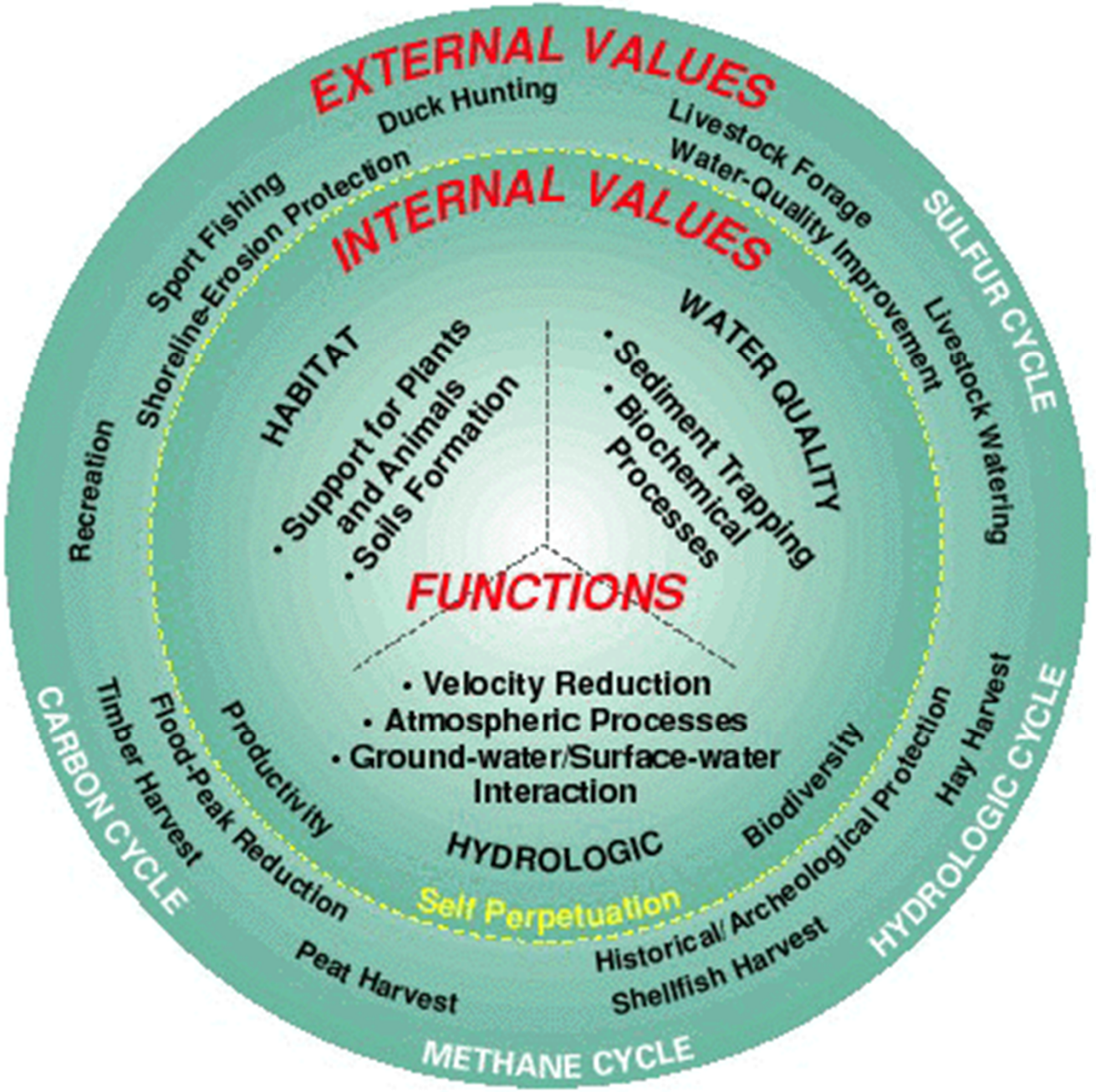
Waters of the United States (WOTUS) . . . Consult an attorney! MZ

Connecticut

Rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent, public or private, which are contained within, flow through or border upon this state or any portion thereof, not regulated pursuant to sections 22a-28 to 22a-35, inclusive. **Intermittent watercourses** shall be delineated by a defined permanent channel and bank and the occurrence of two or more of the following characteristics: (A) Evidence of scour or deposits of recent alluvium or detritus, (B) the presence of standing or flowing water for a duration longer than a particular storm incident, and (C) the presence of hydrophytic vegetation – *Connecticut General Statues 22a-38(15)*

Why are Wetlands and Watercourse Important?

WHAT ARE WETLANDS & WATERCOURSES?



Graphic courtesy of USGS, Novitzki et al. 1997

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WHY ARE WETLANDS* IMPORTANT?

* (AND WATERCOURSES)

Wetlands: Natures Kidneys

Naturally Filter Water

Sequester Carbon

Remove Pollutants

Collect and Convert Nutrients

Moderate Temperatures

Replenish Water Supply

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WHY ARE WETLANDS* IMPORTANT?

Wetlands: Natures Nursery

Support Multiple Trophic Levels: Producers through Consumers

Provide Shelter and Protection

Offer Nesting Habitat

Support Critical Life Cycles

Generate Food Sources for Internal and External Consumers, including humans

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WHY ARE WETLANDS* IMPORTANT?

Wetlands: Culturally Significant

Agrarian societies flourished around rivers and their deltas

Provide important forage food for indigenous communities

Generate food for community and commercial sale

Provide valuable recreational and commercial resources

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WHY ARE WETLANDS* IMPORTANT?

Connecticut Inland Wetlands & Watercourses Act - Legislative Finding C.G.S. 22A-36

The inland wetlands and watercourses of the state of Connecticut are an indispensable and irreplaceable but fragile natural resource with which the citizens of the state have been endowed. The wetlands and watercourses are an interrelated web of nature essential to an adequate supply of surface and underground water; to hydrological stability and control of flooding and erosion; to the recharging and purification of groundwater; and to the existence of many forms of animal, aquatic and plant life. Many inland wetlands and watercourses have been destroyed or are in danger of destruction because of unregulated use by reason of the deposition, filling or removal of material, the diversion or obstruction of water flow, the erection of structures and other uses, all of which have despoiled, polluted and eliminated wetlands and watercourses. Such unregulated activity has had, and will continue to have, a significant, adverse impact on the environment and ecology of the state of Connecticut and has and will continue to imperil the quality of the environment thus adversely affecting the ecological, scenic, historic and recreational values and benefits of the state for its citizens now and forever more. The preservation and protection of the wetlands and watercourses from random, unnecessary, undesirable and unregulated uses, disturbance or destruction is in the public interest and is essential to the health, welfare and safety of the citizens of the state. It is, therefore, the purpose of sections 22a-36 to 22a-45, inclusive, to protect the citizens of the state by making provisions for the protection, preservation, maintenance and use of the inland wetlands and watercourses by minimizing their disturbance and pollution; maintaining and improving water quality in accordance with the highest standards set by federal, state or local authority; preventing damage from erosion, turbidity or siltation; preventing loss of fish and other beneficial aquatic organisms, wildlife and vegetation and the destruction of the natural habitats thereof; deterring and inhibiting the danger of flood and pollution; protecting the quality of wetlands and watercourses and their conservation, economic, aesthetic, recreational and other public and private uses and values and protecting the state's potable fresh water supplies from the dangers of drought, overdraft, pollution, misuse and mismanagement by providing an orderly process to balance the need for the economic growth of the state and the use of its land with the need to protect its environment and ecology in order to forever guarantee to the people of the state, the safety of such natural resources for their benefit and enjoyment and for the benefit and enjoyment of generations yet unborn.

WHY ARE WETLANDS* IMPORTANT?

Connecticut Inland Wetlands & Watercourses Act - Legislative Finding

The **inland wetlands and watercourses** of the state of Connecticut **are an indispensable and irreplaceable but fragile natural resource** with which the citizens of the state have been endowed.

Essential to:

- **adequate supply of surface and underground water;**
- **hydrological stability and control of flooding and erosion;**
- **he recharging and purification of groundwater;**
- **the existence of many forms of animal, aquatic and plant life.**

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making provisions for the protection, preservation, maintenance and use by:

- **minimizing their disturbance and pollution;**
- **maintaining and improving water quality**
- **preventing damage from erosion, turbidity or siltation;**
- **preventing loss of fish and other beneficial aquatic organisms, wildlife and**
- **deterring and inhibiting the danger of flood and pollution;**
- **protecting for conservation, economic, aesthetic, recreational uses and values;**
- **protecting the state's potable fresh water supplies**

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[The Act provides] an orderly process to forever guarantee [these] natural resources for their benefit and enjoyment and for the benefit and enjoyment of generations yet unborn.

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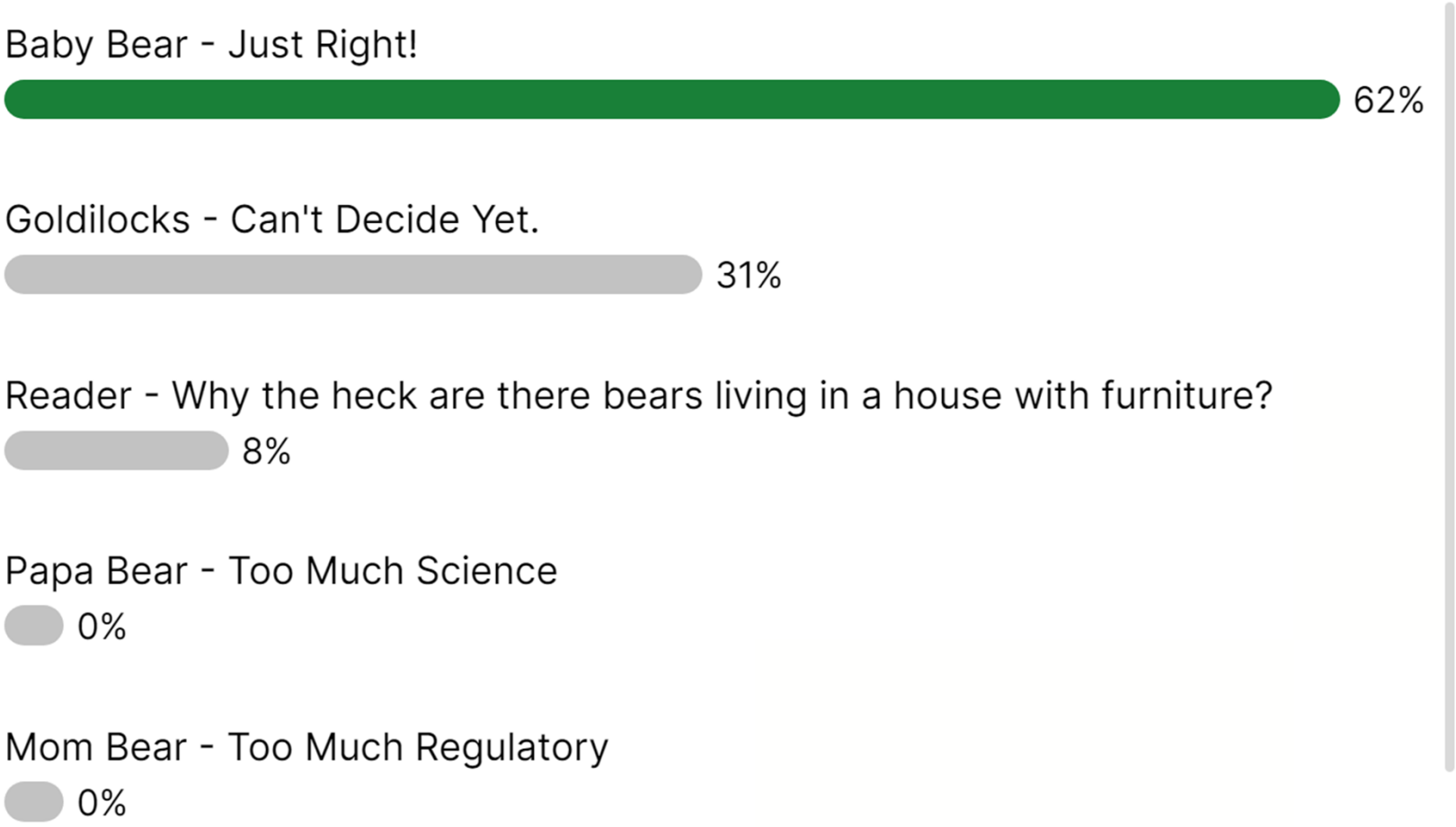
TIME OUT

Active poll 26

Pause for the Pulse - How are we feeling about all this so far?



From May 17, 2025 Workshop

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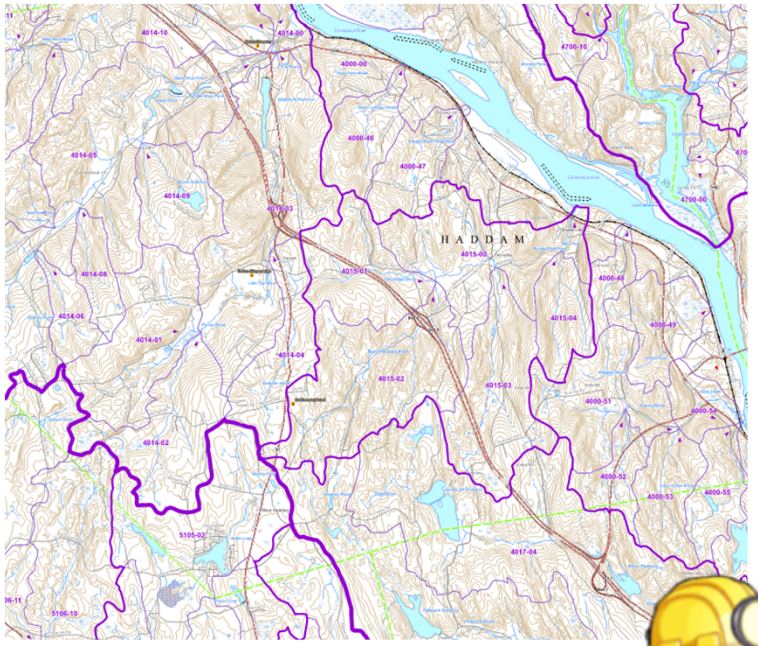
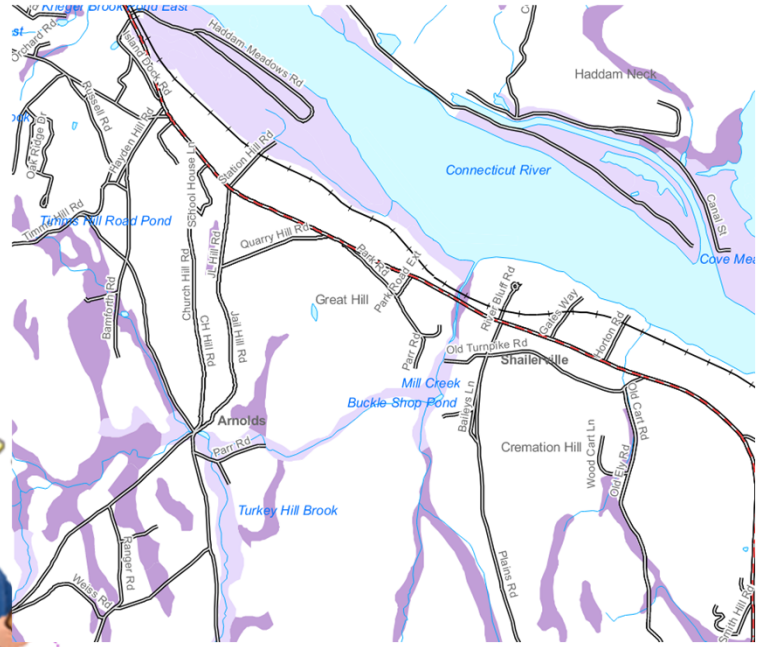
How are Wetlands and Watercourse Assessed?

HOW ARE WETLANDS* ASSESSED?

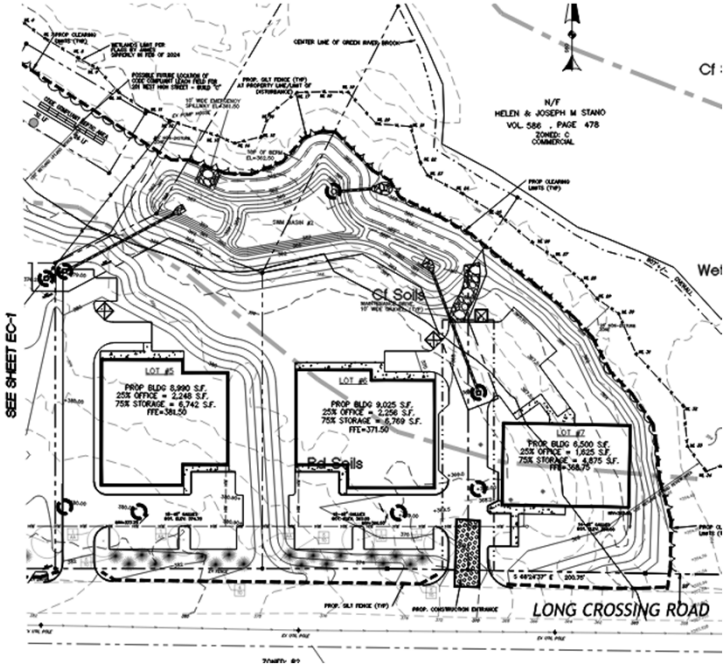
Landscape Scale



Local Scale



Site Scale



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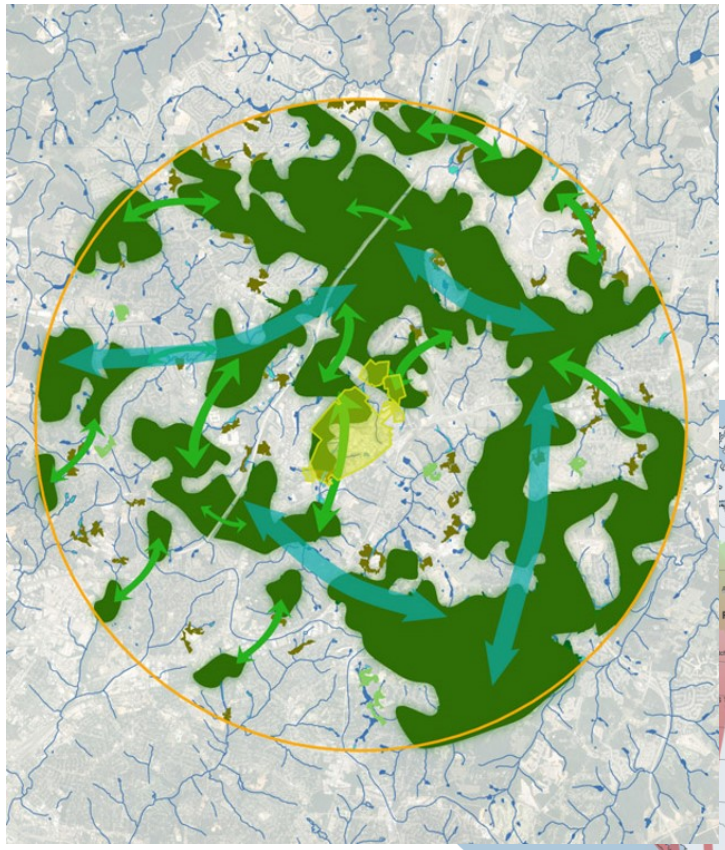
HOW ARE WETLANDS* ASSESSED?

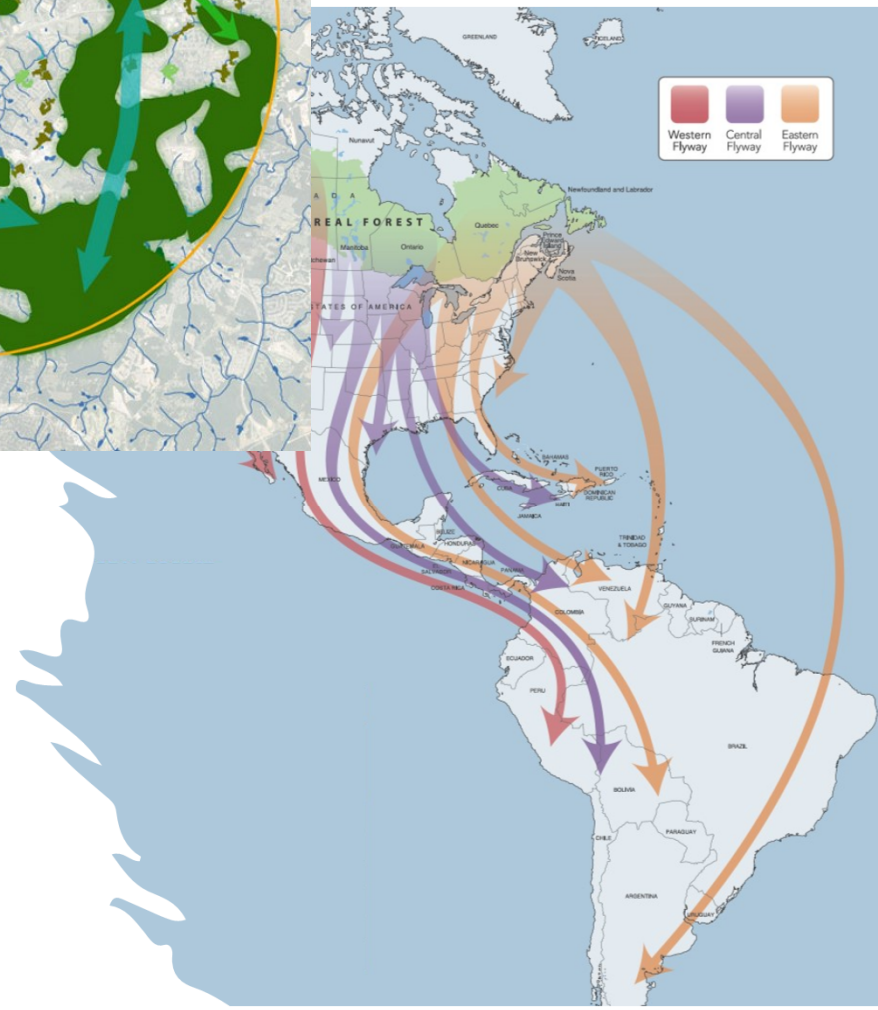
Landscape-Scale Considerations

Consider that wetland and watercourse exist as part of a larger network of aquatic and terrestrial resources. Ecological function at a site requires an understanding of the ecology of the surrounding landscape and broader region.

This includes:

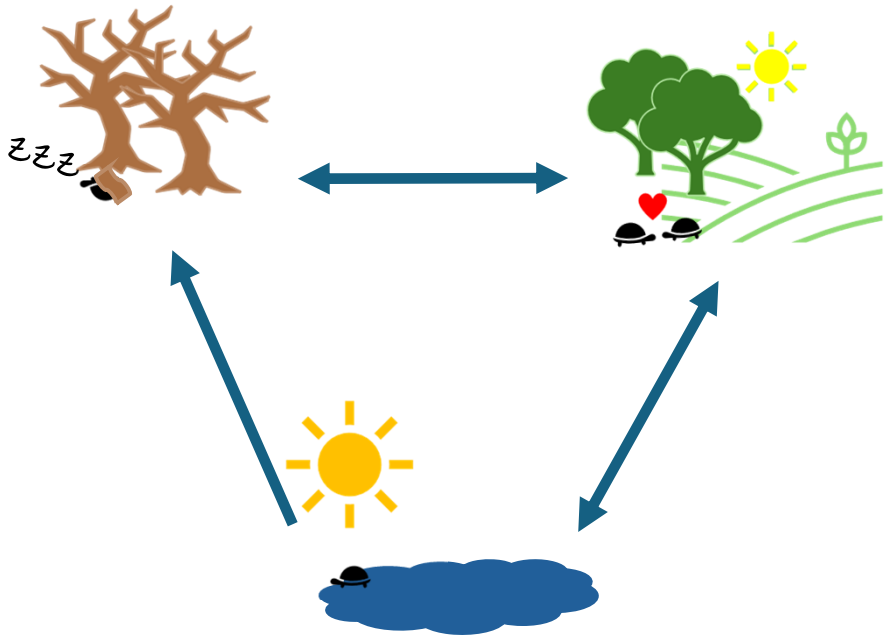
- The spatial pattern or structure of landscapes, ranging from wilderness to development
- The relationship between pattern and process in landscapes (e.g., wildlife movement, time of year conditions, etc.)
- The relationship of human activity to landscape pattern, process, and change
- The effect of scale and disturbance on the landscape

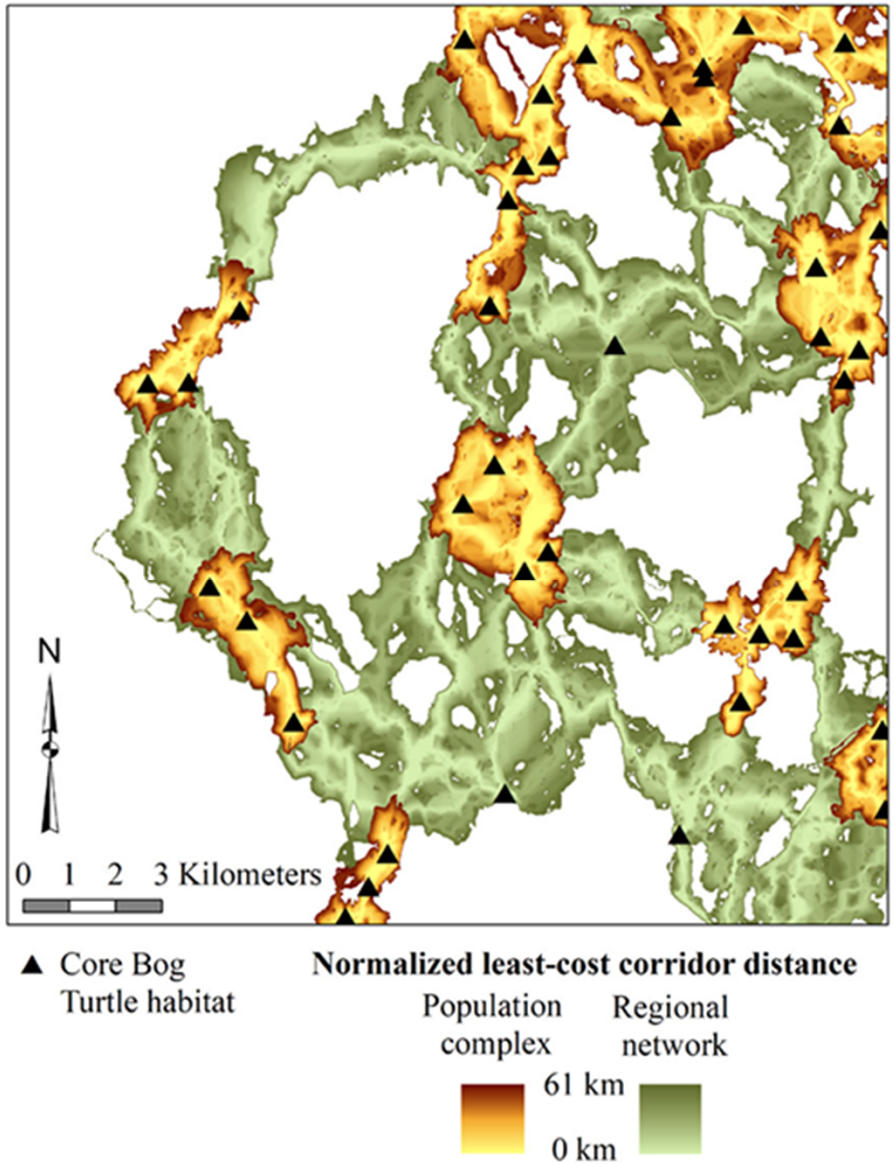




HOW ARE WETLANDS* ASSESSED?

Landscape-Scale Considerations





Travis et al., 2018

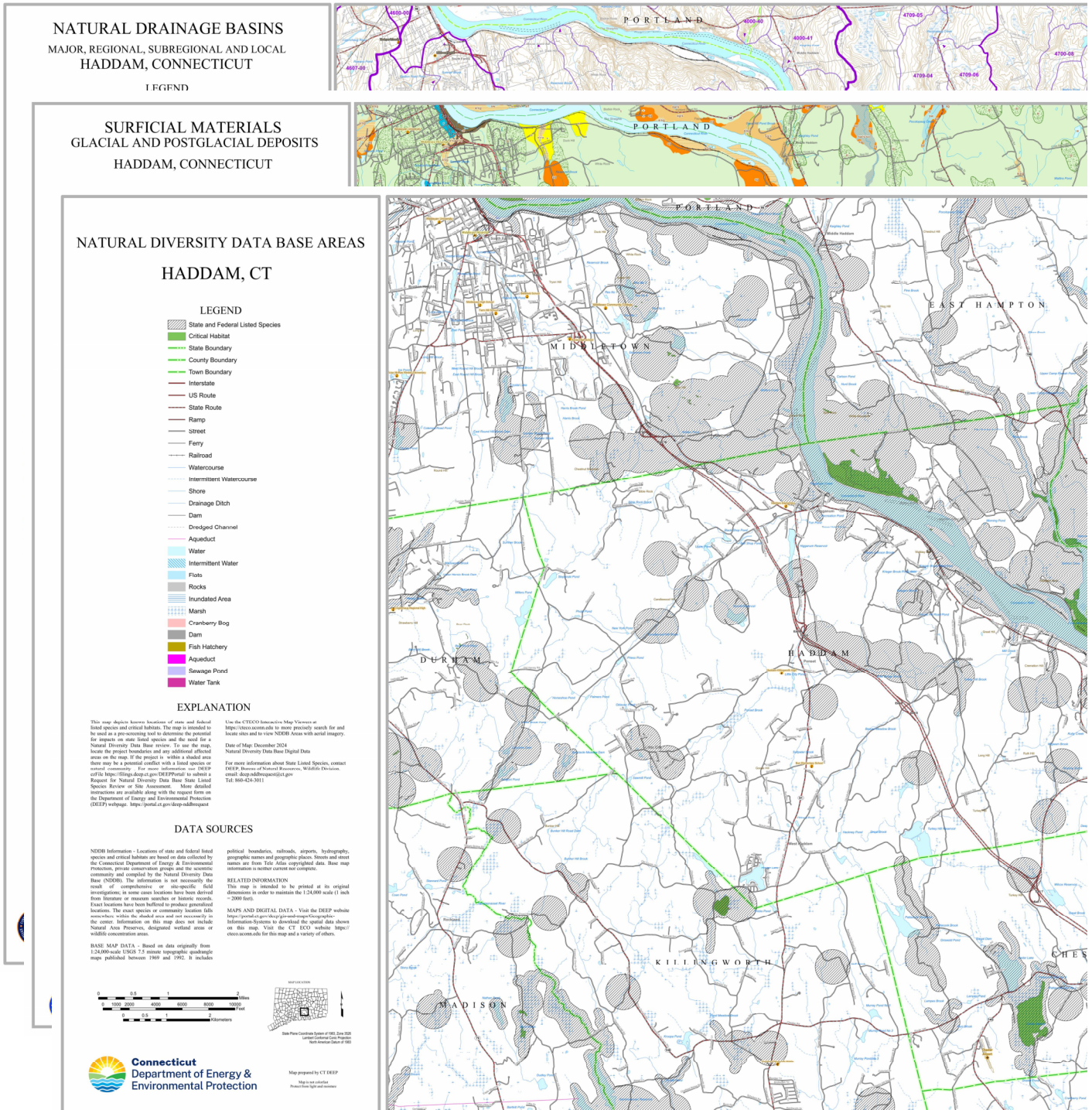
HOW ARE WETLANDS* ASSESSED?

Landscape Scale Considerations

Topography and Drainage

Geology and Soils

Wildlife Patterns & Movement



HOW ARE WETLANDS* ASSESSED?

Local Scale Considerations

Topography and Drainage

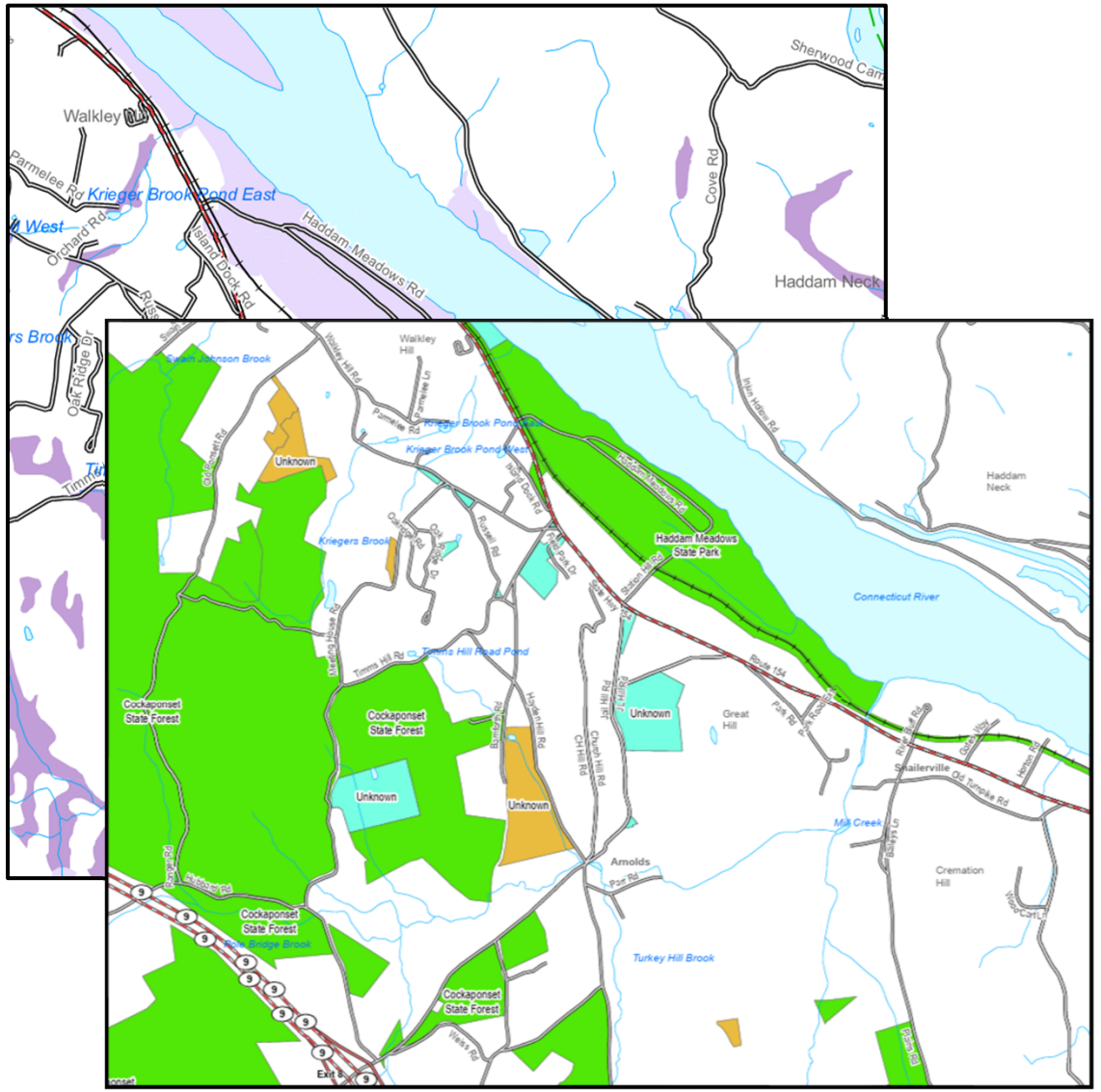
Geology and Soils

Wildlife Patterns and Movement

Wetlands and Soil

Hydrology (natural)

Open Space



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HOW ARE WETLANDS* ASSESSED?

Site Scale Considerations

Topography and Drainage
Geology and Soils
Wildlife Patterns and Movement
Soil
Hydrology (patterns)
Open Space

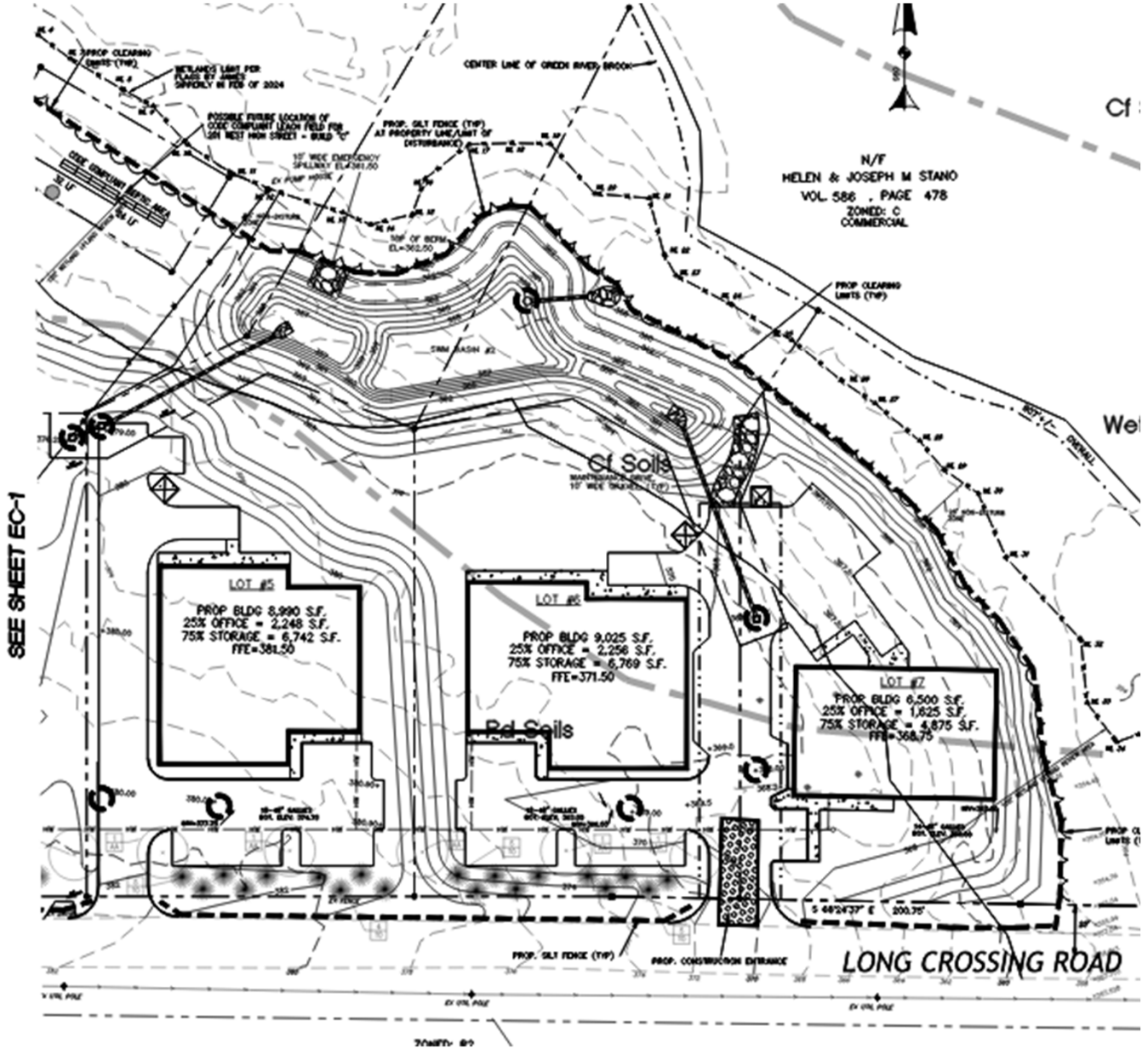
Delineated Wetland Soils

Local Hydrology

- Groundwater v. Surface water
- Features (e.g., vernal pools)
- Stormwater drainage

Wetland Functions & Values

Wildlife



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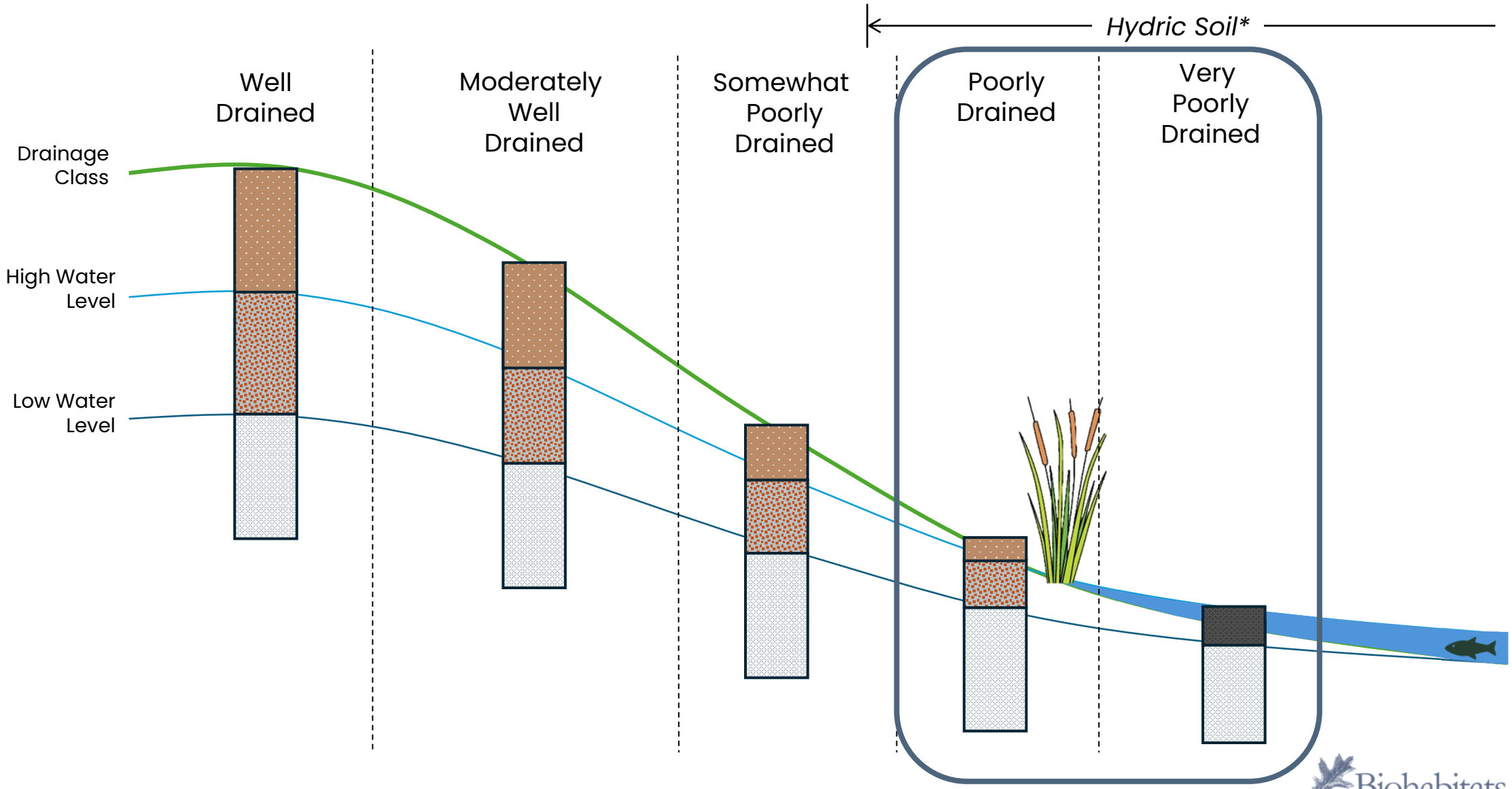
HOW ARE WETLANDS* ASSESSED?

Soil Drainage Classes



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** Hydric Soil is the term used in Federal wetland delineations and based on hydrology, soil, and plants*

HOW ARE WETLANDS* ASSESSED?

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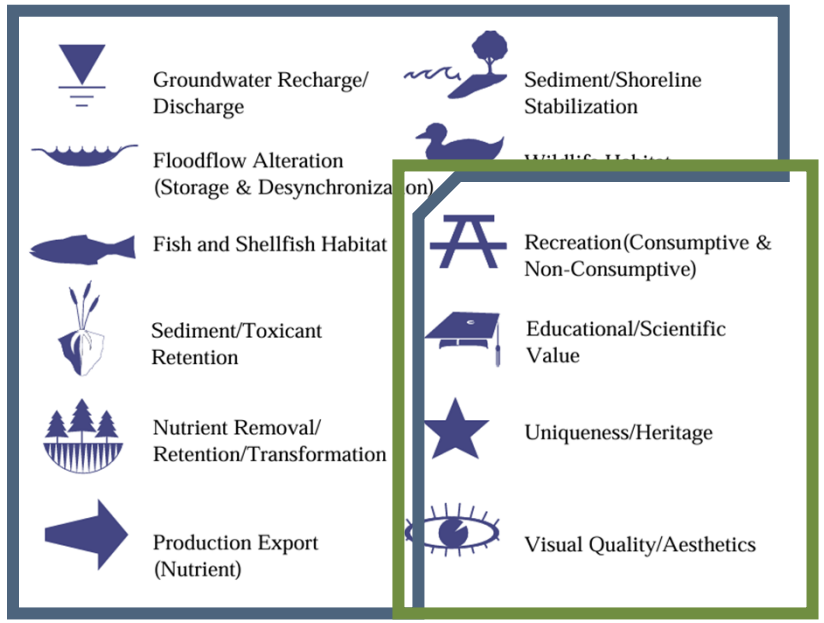
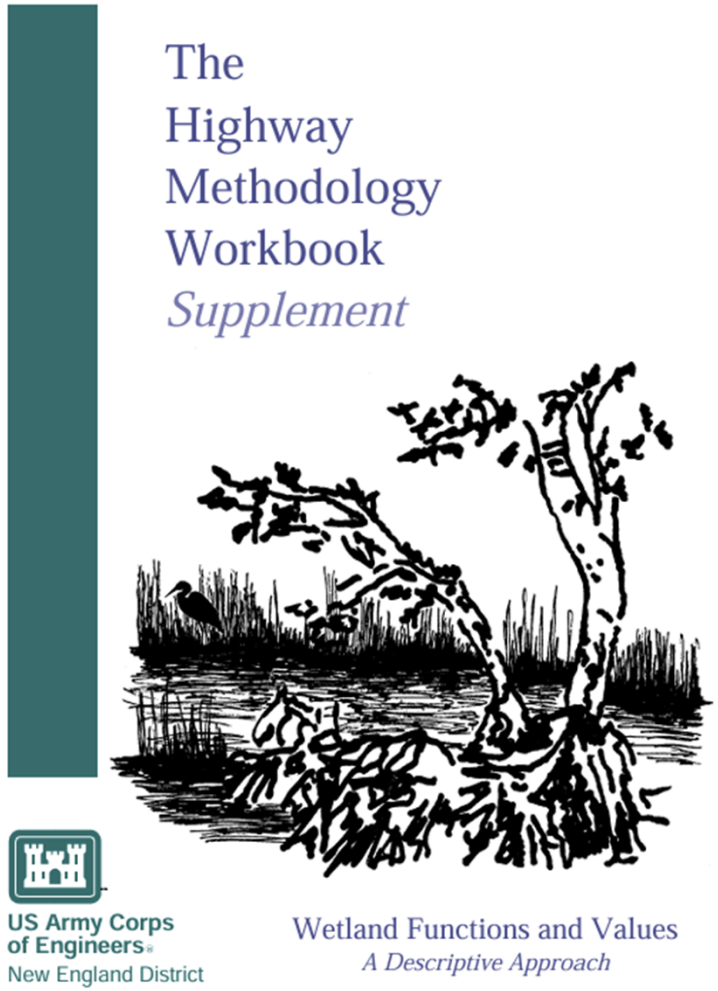
HOW ARE WETLANDS* ASSESSED?

Functions v. Values

Functions: Self-sustaining properties of a wetland ecosystem that exist in the absence of society. These are the hydrological and ecological services provided by a wetland.





Values: Benefits that are derive from either one or more functions and the physical characteristics associated with a wetland.

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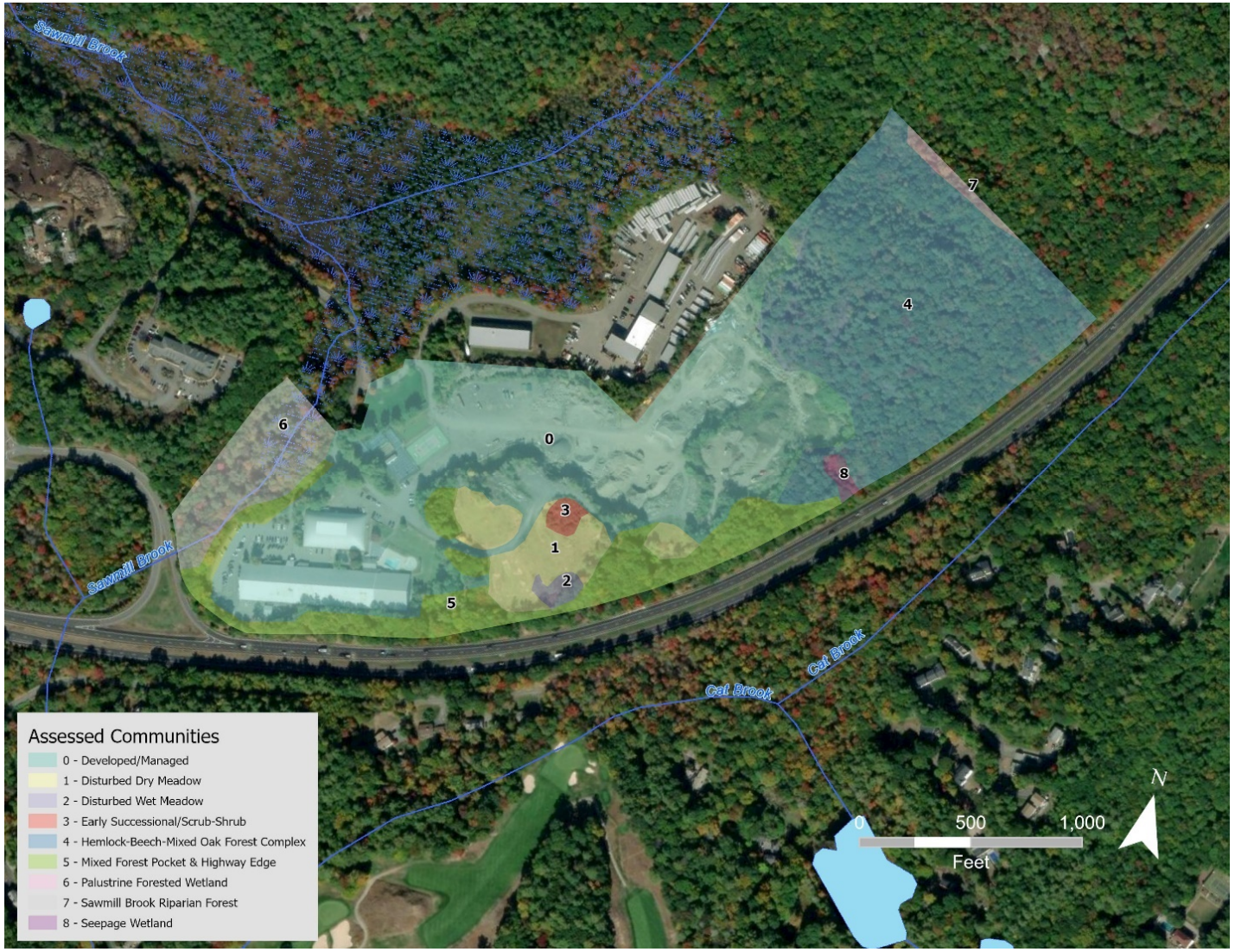
HOW ARE WETLANDS* ASSESSED?



Wetland & Watercourse Assessment Report

- Local and regional site description
- Summary of the wetland delineation (soils)
- Summary of the watercourse delineation (hydrology)
- Functions & Value Assessment
- Summary of dominant plant and animals observed or anticipated
- Identification of any potentially rare or unique species
- Mapping and characterization of any unique habitats such as vernal pools
- Supporting maps, figures and/or tables

What Do We ACTUALLY Regulate?

The Role of the Inland Wetlands and Watercourse Commission MZ

WHAT DO WE ACTUALLY REGULATE?

Connecticut Inland Wetlands & Watercourses Act - Legislative Finding

Inland wetlands and watercourses are an indispensable and irreplaceable but fragile natural resource essential to:

- adequate supply of surface and underground water;
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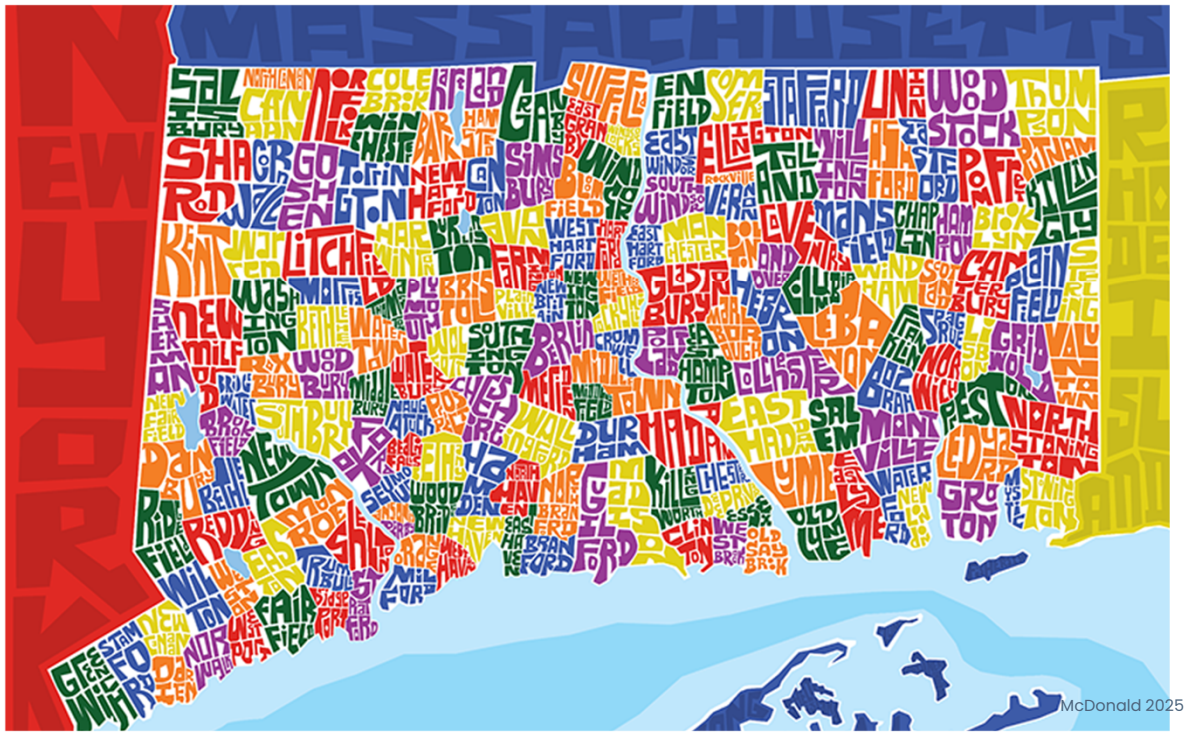
WHAT DO WE ACTUALLY REGULATE?



McDonald 2025

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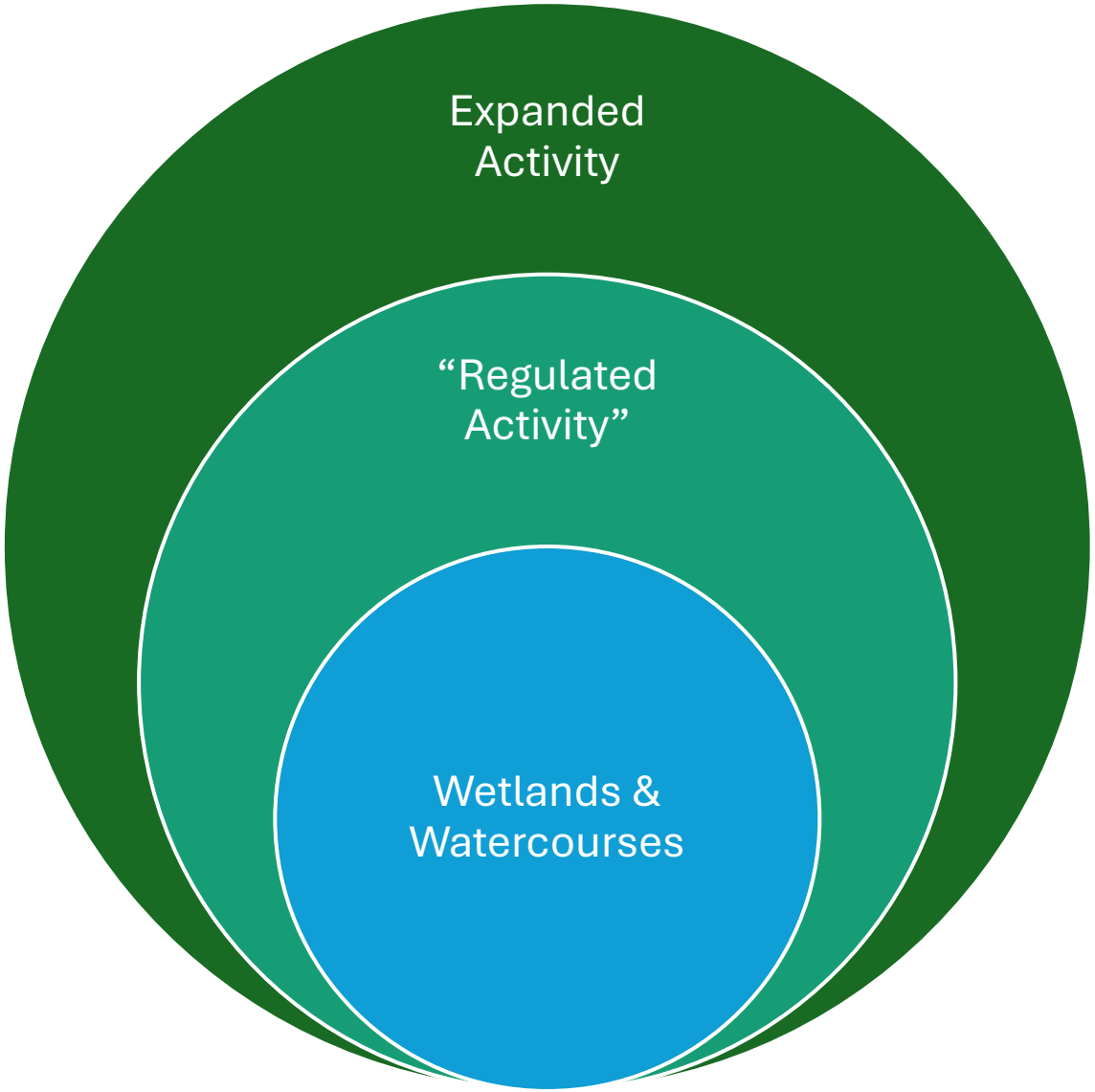
What do agencies ACTUALLY regulate? MZ

Inland Wetlands and Watercourses Act
(C.G.S. 22a-36 to 22a-45, inclusive)

Any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses and any other regulated activity, unless such operation or use is permitted or non-regulated

WHAT DO WE ACTUALLY REGULATE?



Activities that have direct or indirect impacts on regulated area either presently or inevitably MZ

Defined extent, including an **Upland Review Area** determined by the local agency

Regulated Areas where soil types designated as **poorly drained**, **very poorly drained, alluvial,** and **floodplain**

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Direct Wetland Impacts

Actions or activities that occur within wetlands and watercourses and alter the physical or chemical structure of the resource ultimately affecting the function and values of the wetland or watercourse. Examples include:

- Filling
- Draining
- Dredging
- Surface or groundwater extraction
- Mining
- Point-source discharges

Top: Wetland Filling (Stewart 2003), Bottom: Temporary constriction matting in river (Wilson 2017)

Indirect Wetland Impacts

Actions or activities that occur outside of a wetland or watercourse but within the surrounding environment (e.g., watershed) that alter the physical or chemical structure of the resource ultimately affecting the function and values of the wetland or watercourse.

- Erosion
- Water diversion
- Groundwater extraction
- Habitat degradation, loss and fragmentation
- Loss of vegetative cover
- Non-point-source discharges

Erosion control measures along a wetland (Wilson 2023)

WHAT DO WE ACTUALLY REGULATE?

Long-term Considerations

Permanent filling or alteration

Changes to hydrology (volume & flow)

Changes to water quality

- Point sources
- Non-point sources
- Canopy coverage

Future land use MZ

Wildlife impacts MZ

Short-term Considerations

Temporary filling/grading

Soil erosion and sedimentation

Hydrology

- Increased runoff
- Decreased storage

Existing Conditions

As a commission look for or ask an applicant for:

- Description of local and regional site conditions including hydrology and drainage
- Delineation of wetlands (local soils)
- Delineation of watercourses (local hydrology)
- Assessment of wetland and watercourse functions & values
- Summary of dominant plant and animals observed or anticipated
- Identification of any potentially rare or unique species
- Mapping and characterization of any unique habitats such as vernal pools

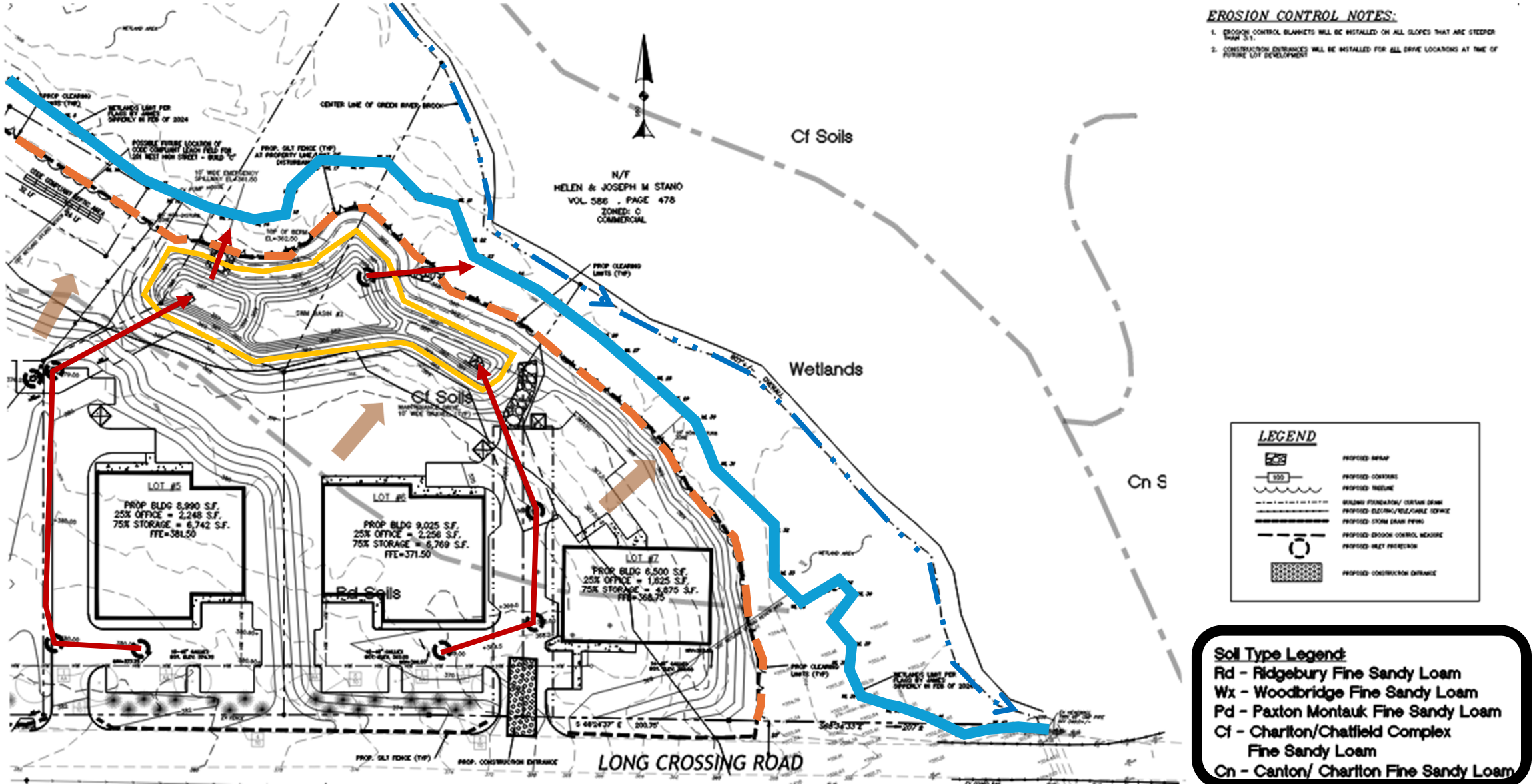
WHAT DO WE ACTUALLY REGULATE?

Proposed Conditions

As a commission look for or ask an applicant for:

- Grading plans
- Direct wetlands, watercourses and regulated activity impacts
- Cut and fill analysis
- Sediment and erosion control measures
- Site stabilization and planting plans
- Invasive species management
- Impervious v. pervious cover calculations
- Stormwater drainage including (rates and volumes)
- Stormwater management systems
  - Traditional catch basin and detention
  - Low Impact or Green Infrastructure design options

HOW ARE WETLANDS* ASSESSED?



When to hire a Wetland Expert
(Soil Scientist and/or Professional Wetland Scientist)

- If you're having a public hearing
- Direct wetland impacts especially wetland or watercourse filling or fragmentation
- Large projects or subdivisions especially with substantial impervious coverage
- Sensitive wetland or watercourse habitats or dependent species
- Public interest or concern

Remember:

- Lawyer ≠ Wetland Expert
- Engineer ≠ Wetland Expert
- Town Staff ≠ Wetland Expert

RESOURCES & DISCUSSION

Resources – State & Academic

Connecticut General Statutes - https://www.cga.ct.gov/current/pub/chap_440.htm

Connecticut Department of Energy & Environmental Protection (DEEP)
https://portal.ct.gov/DEEP/Water/Inland-Wetlands/Inland-Wetlands-and-Watercourses

- Municipal Training- https://portal.ct.gov/DEEP/Water/Inland-Wetlands/Training-for-Inland-Wetlands-Agencies
- Legislation, Regulations and Case Law- https://portal.ct.gov/deep/water/inland-wetlands/legislation-regulations--case-law

University of Connecticut Center for Land Use Education And Research (CLEAR)
https://clear.uconn.edu/

- Environmental Conditions Online (mapping) - https://maps.cteco.uconn.edu/
- Map Catalog (PDFs by town) - https://cteco.uconn.edu/map_catalog.asp
- Training and Webinars Library - https://clear.uconn.edu/training/

Biohabitats

Resources – Professional Groups

Connecticut Association of Wetland Scientists (CAWS)
https://ctwetlands.org/index.html

Soil Science Society of Southern New Enlgand (SSSSNE)
http://nesoil.com/ssssne/index.html

National Association of Wetland Managers
https://www.nawm.org/

Society of Wetland Scientist – New England Chapter
https://members.sws.org/new-england-chapter

RESOURCES & DISCUSSION

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