Conserving Amphibian and Reptile Diversity: A Collective Responsibility

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Introduction….Where are we?

Conservation Challenges are Increasingly Complex:

Climate change is currently acting on populations and amplifying impacts associated with these challenges

Changing environmental conditions favor some species, disfavor others

Municipal commissions have a vital role in building ecological resilience in land use planning and decision-making

TODAY….
We will provide a brief overview of CT “herps” and will introduce key elements that conservation and wetland commissions should consider in addressing climate change resiliency

CT's Amphibian and Reptile Diversity

22-23 Species of Native Amphibians

12* Salamanders

11 Frogs and Toads

23 Species of Native Reptiles

14 Species of Snakes

8 Species of Turtles (not including marine sea turtles)

1 Lizard

4 Nonnative, Established Species

3 Turtles (red-eared slider, spiny softshell, Italian wall lizard)

1* Salamander (mudpuppy)

Species are not Equally Vulnerable to Change
“Generalists” vs. “Specialists”

Pickerel Frog

Northern Leopard Frog

Species Distribution is Driven by Several Factors

Habitat Availability

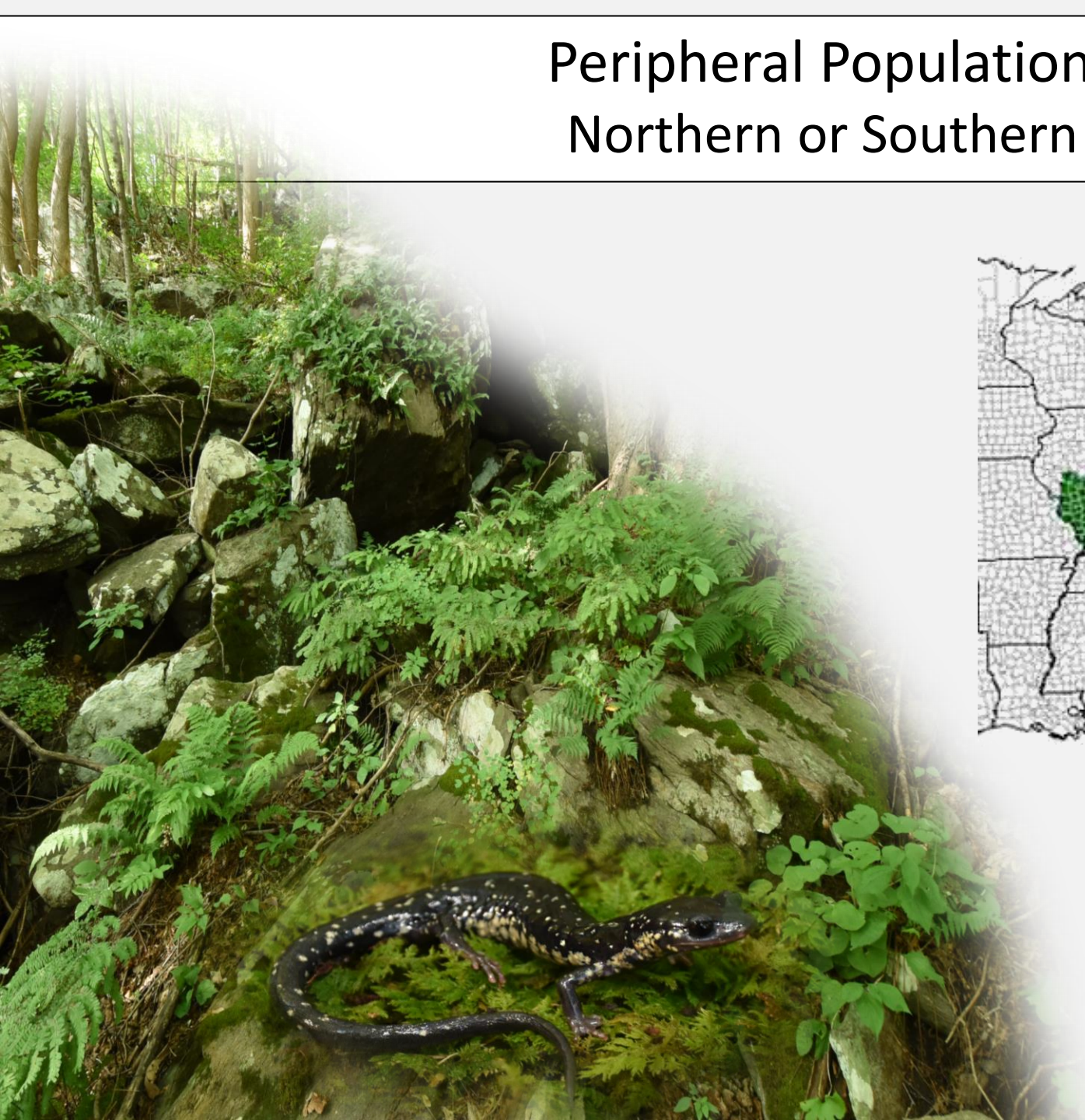
Elevation

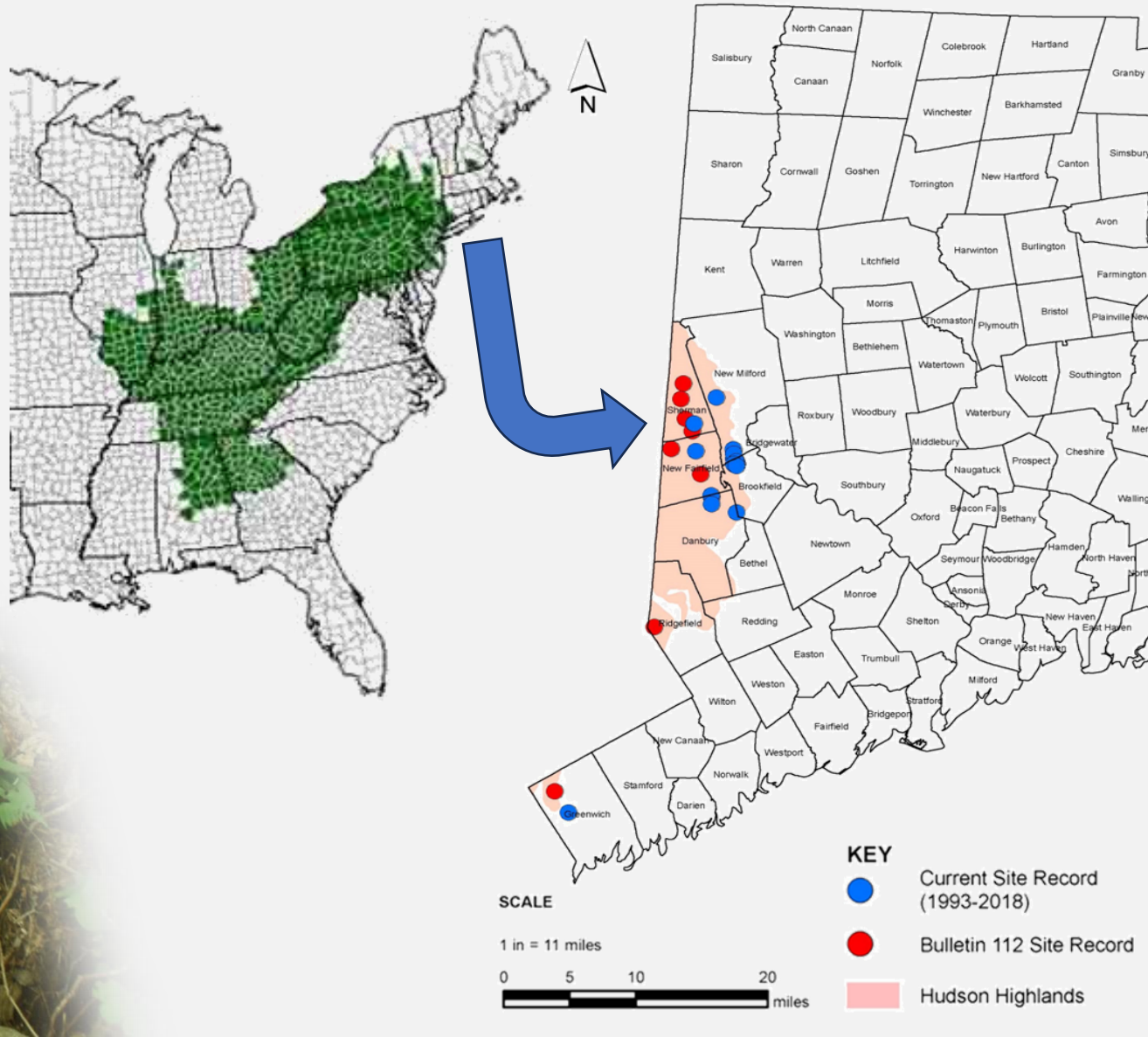
Physiological Tolerances

Interactions with other Species

Land Use

Peripheral Population Species (19)
Northern or Southern Range Limits

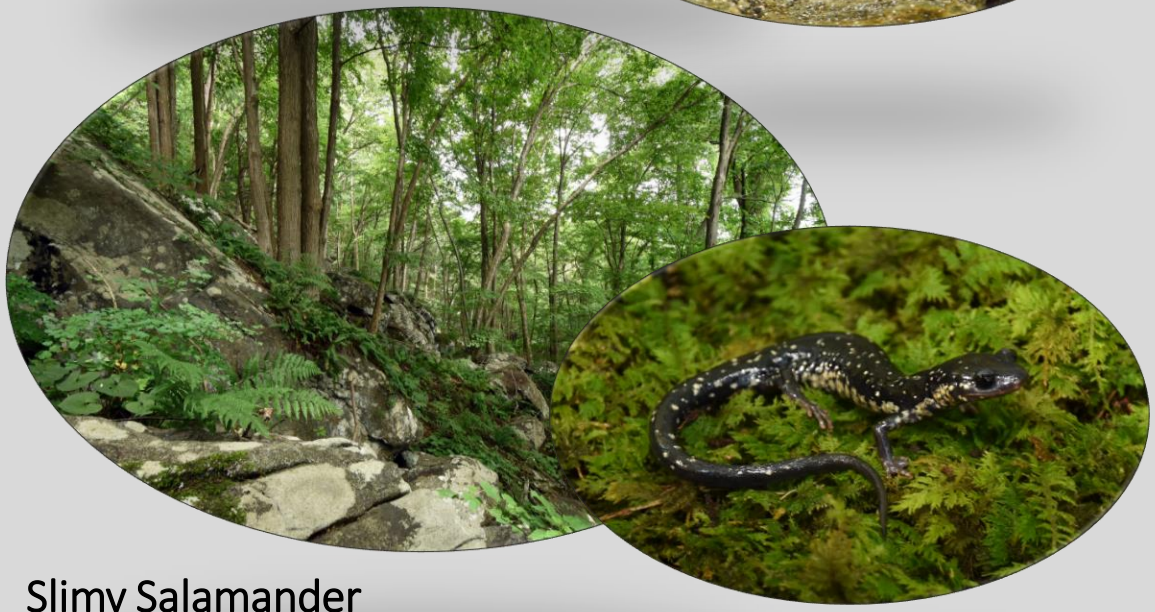




Rare Habitat Dependent Species

Spring Salamander

Bog Turtle



Slimy Salamander

Diamond-backed Terrapin

Early Successional Habitat Dependent Species

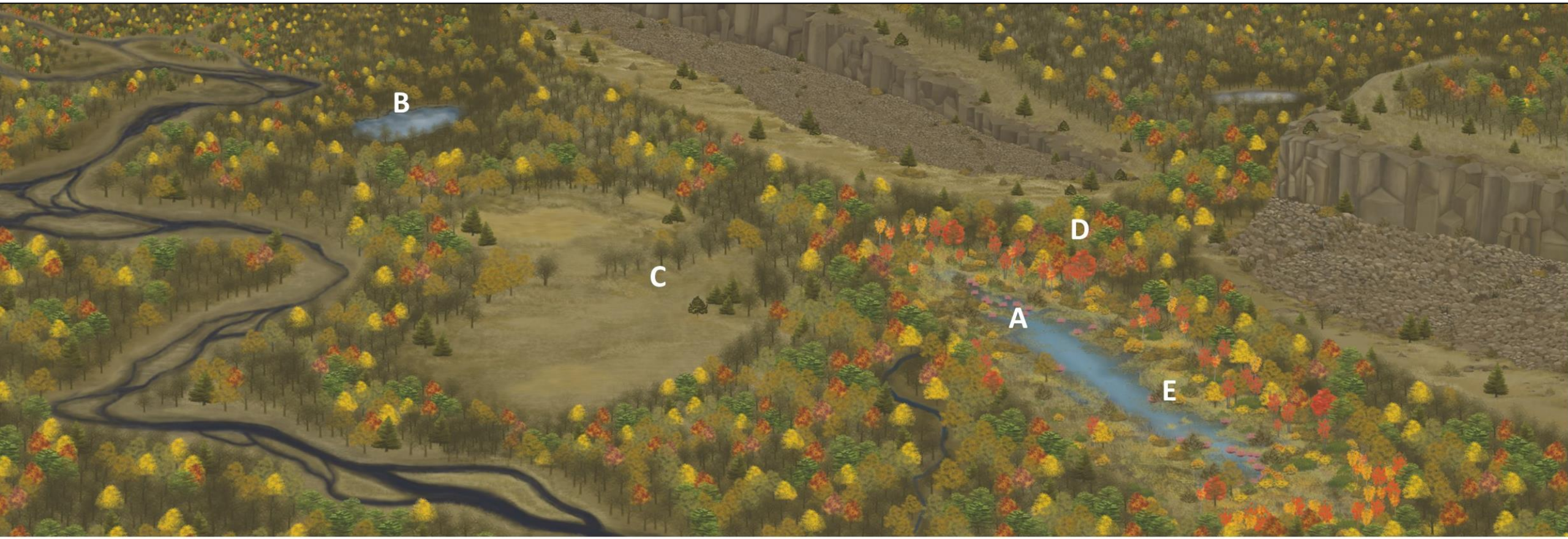
Northern Leopard Frog

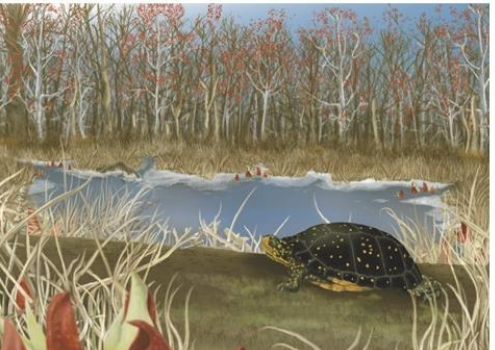
Fowler's Toad

Smooth Greensnake

Five-lined Skink

Habitat Mosaic Dependent Species

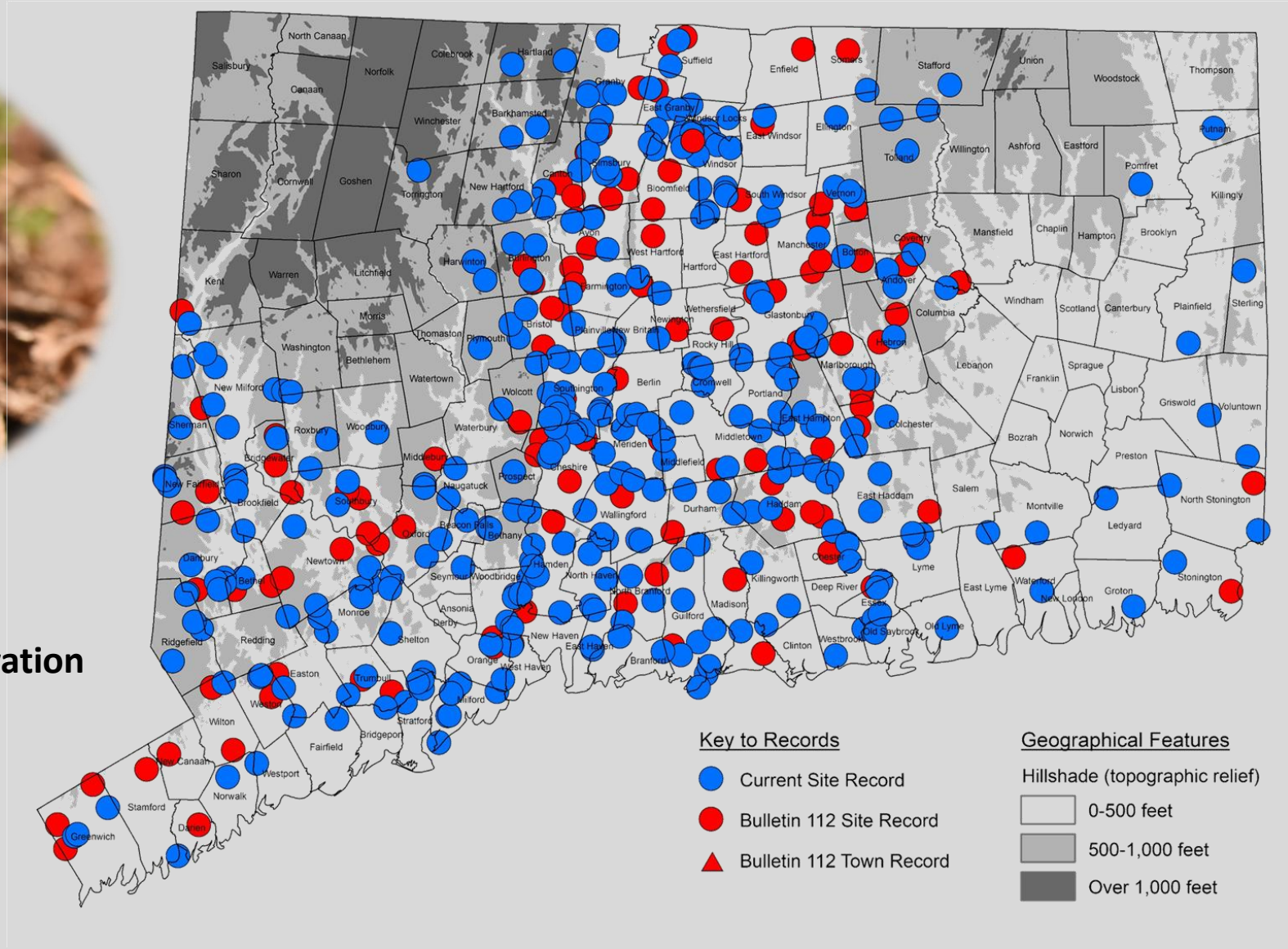




Elevation

Eastern Box Turtle

76% of 456 site records below 500-ft elevation



Projected Climate Change Impacts

Warmer Winters and Summers

- 3.5 °F increase since beginning of 20th century
- 3.5-5.4 °F increase by 2040 under moderate emissions scenario
- 7.74 °F increase by 2100 under high emission scenarios

More Droughts Summer and Fall

Increase in Precipitation and Extreme Events

- 10% increase since 1895
- 70% increase in extreme events since 1958

More Flooding Winter and Spring

Sea Level Rise

- 10-12” already, additional 1-4’ or more by 2100

Mechanisms of Climate Change that Act on Species and Populations*

- **Physiological Limits** (ex. temp. tolerance) increase or decrease in alignment
  - Range retraction in wood turtle populations with increase in projected July/January temps
  - Increase in over-winter survivorship for larval marbled salamanders due to warmer winter temps
- **Habitat or Microhabitat Change in Quality and/or Availability**
  - Hydrological changes to amphibian breeding habitat resulting from changing precipitation patterns
- **Change in Inter-specific Interactions** (beneficial (ex. prey), detrimental (ex. pathogens)
  - Increase in the spread of snake fungal disease as s result of warming temperatures
- **Phenological (seasonal) Changes** (ex. migration)
  - Earlier onset of calling and migration in spring - breeding amphibians
- **Change in Exposure to Non-climate Related Threats**
  - Increase in road mortality of turtles seeking suitable sites to nest in response to warming temperatures

* Adapted from Foden et al 2018

Land Use Change and Amphibians and Reptiles

Climate change is driving the need for species/populations to adapt, or adjust their distribution on the landscape

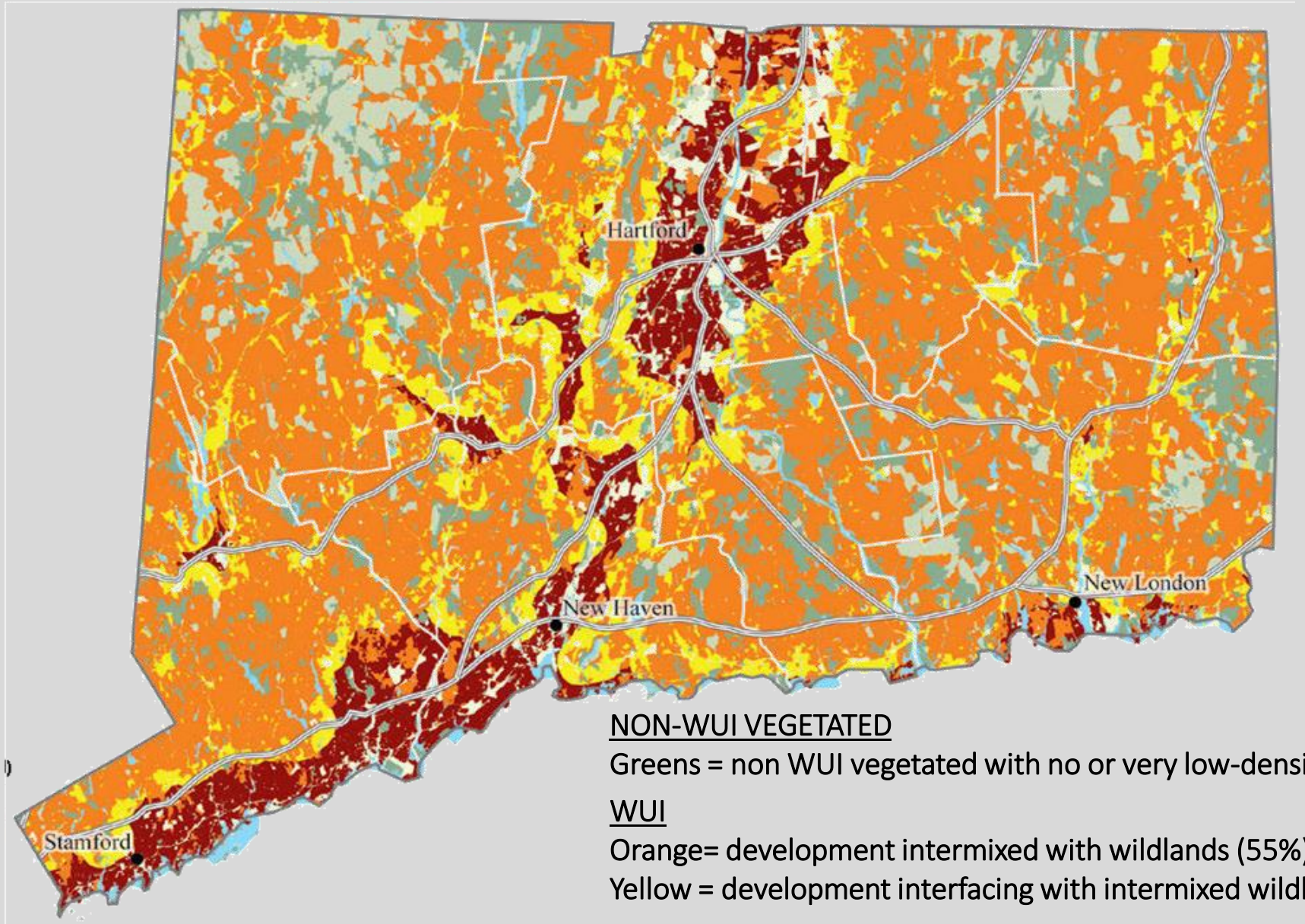
Historically, species have been able to adjust to changing conditions (post-glacial colonization, changes in forest cover 1800's to mid 1900's)

Why is today different?

The rate of change is likely out-pacing the ability of many species to adapt, although there is some evidence for genetic and phenotypic plasticity

The urban-suburban landscape includes many significant barriers to movement

Many populations are currently isolated and under stress from a variety of factors rendering them more vulnerable



NON-WUI VEGETATED

Greens = non WUI vegetated with no or very low-density development (18%)

WUI

Orange= development intermixed with wildlands (55%)

Yellow = development interfacing with intermixed wildlands/wildlands (11%)

NON-VEGETATED

Red = medium-high density development (8%)

White = non vegetated low-density development or agriculture (5%)

Blue= water (3%)

USDA 2010 Wildlands- Urban Interface of the Conterminous U.S. Martinuzzi et al 2015

The Challenge

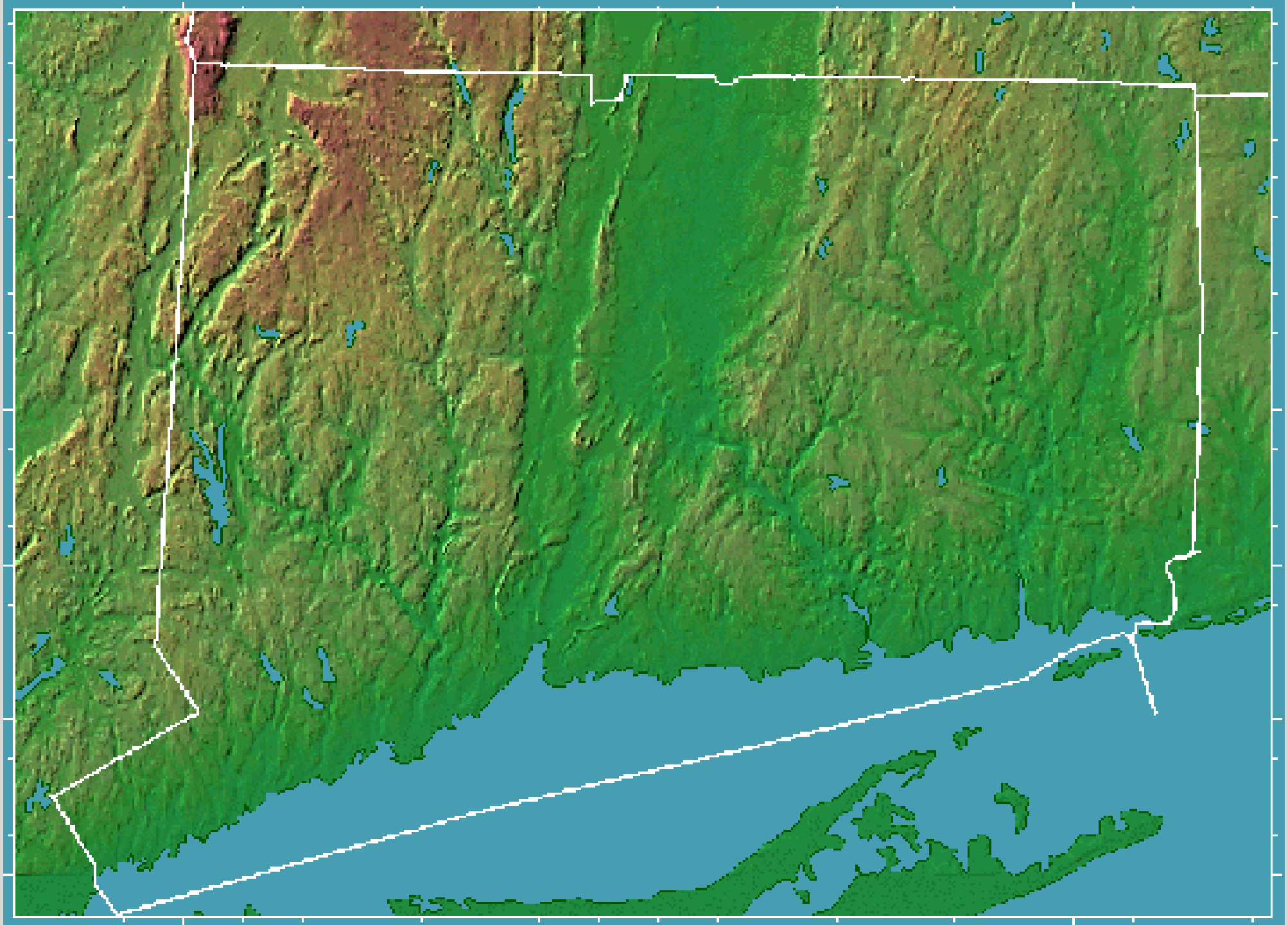
The Wildland Urban Interface

"A place where people and their homes affect the natural environment, contributing to loss of habitat for native species, forest fragmentation, and introduction of exotic species, all trends that will threaten biodiversity if WUI residents and communities are not attentive to the potential harms and active in caring for their environment (Bar Massada et al 2014; Radeloff et al 2005: Syphard et al 2009)."

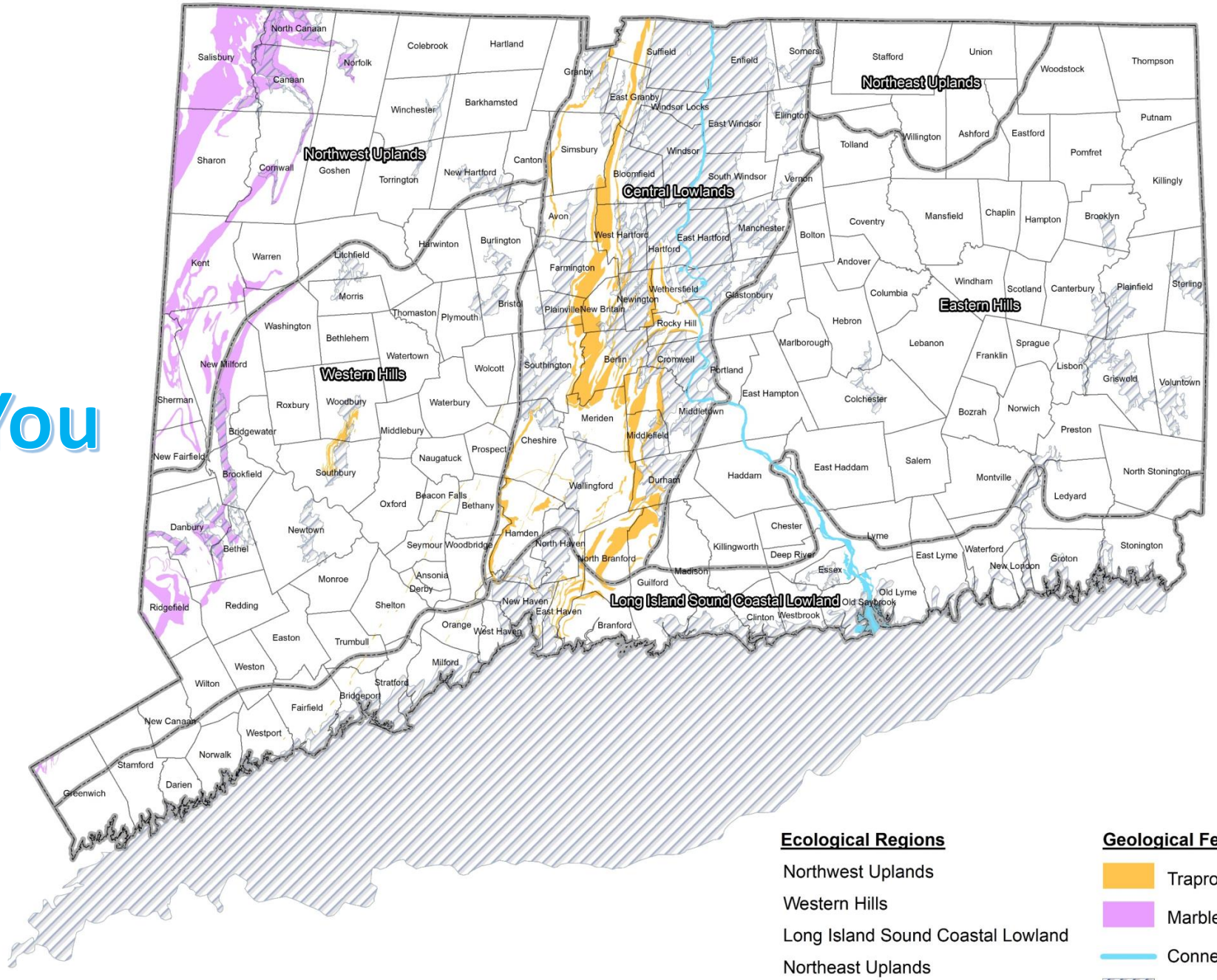
Conservation at the Municipal Level - Where to Begin

1. Where are you located (ecoregion & geology)?

2. What are your natural resources?



Where Are You

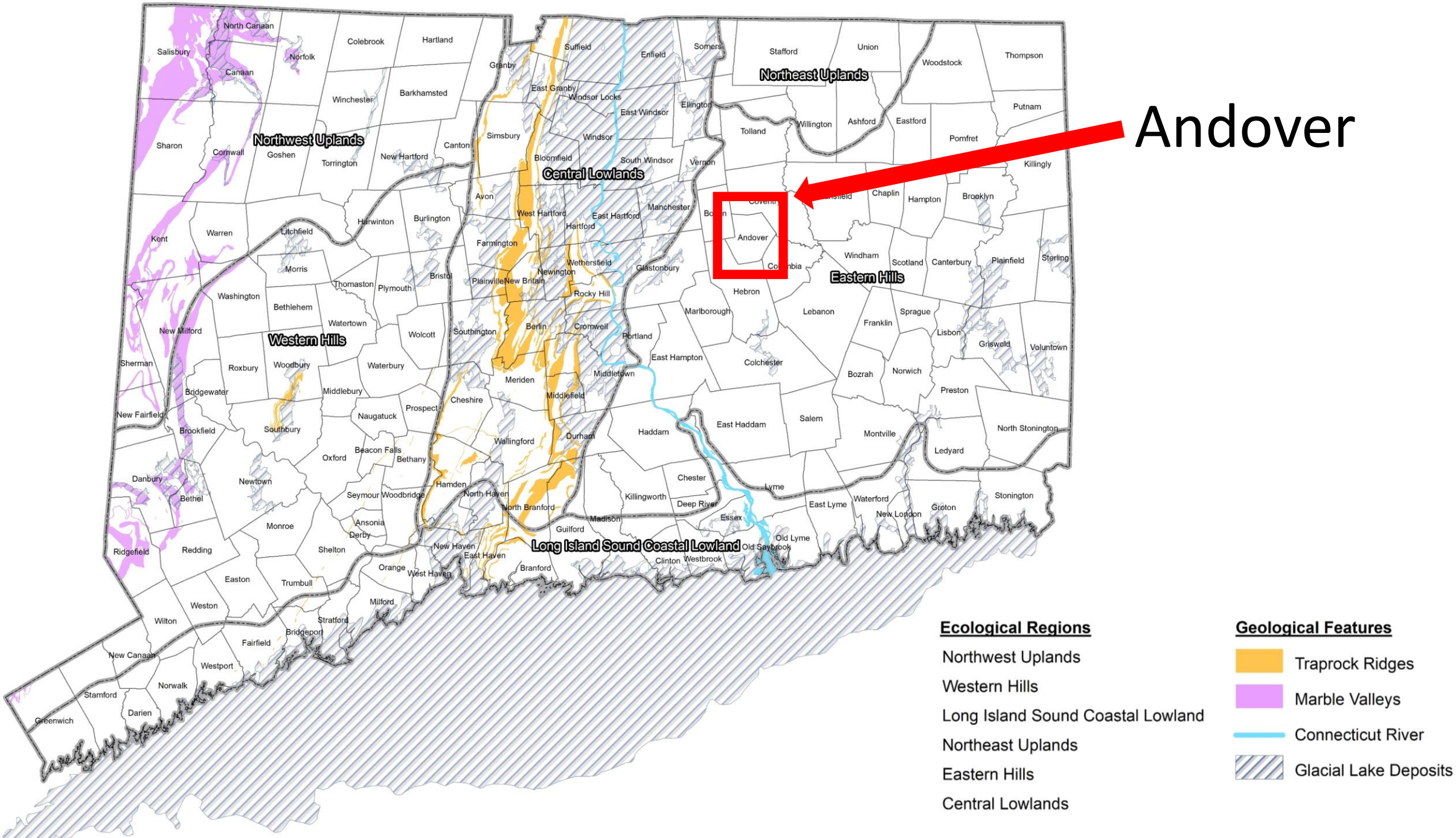


Ecological Regions

- Northwest Uplands
- Western Hills
- Long Island Sound Coastal Lowland
- Northeast Uplands
- Eastern Hills
- Central Lowlands

Geological Features

- Traprock Ridges
- Marble Valleys
- Connecticut River
- Glacial Lake Deposits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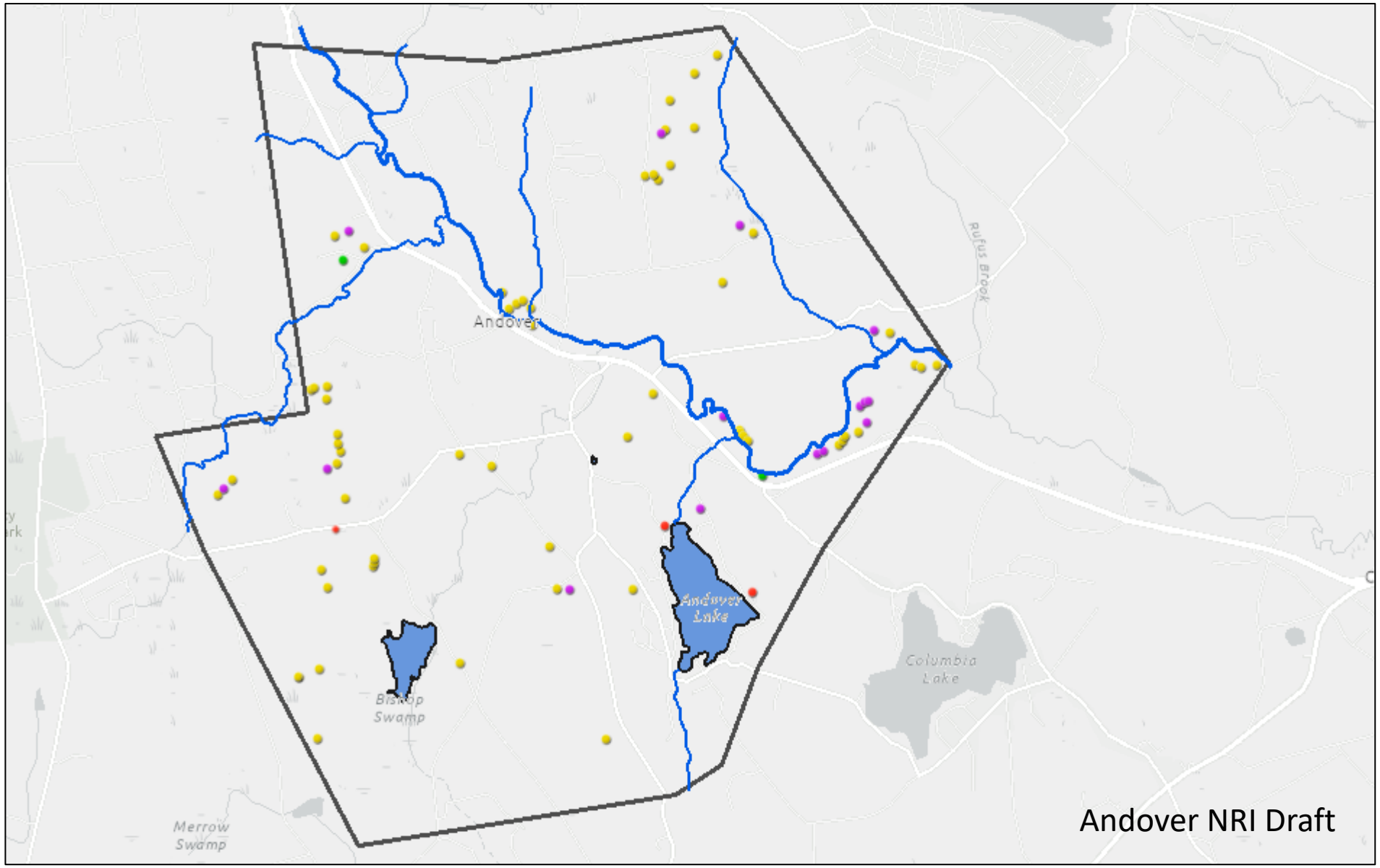
Mapping Your Natural Resources

Vernal Pools

Tier 1
Tier 2
Tier 3

Priority Watercourse

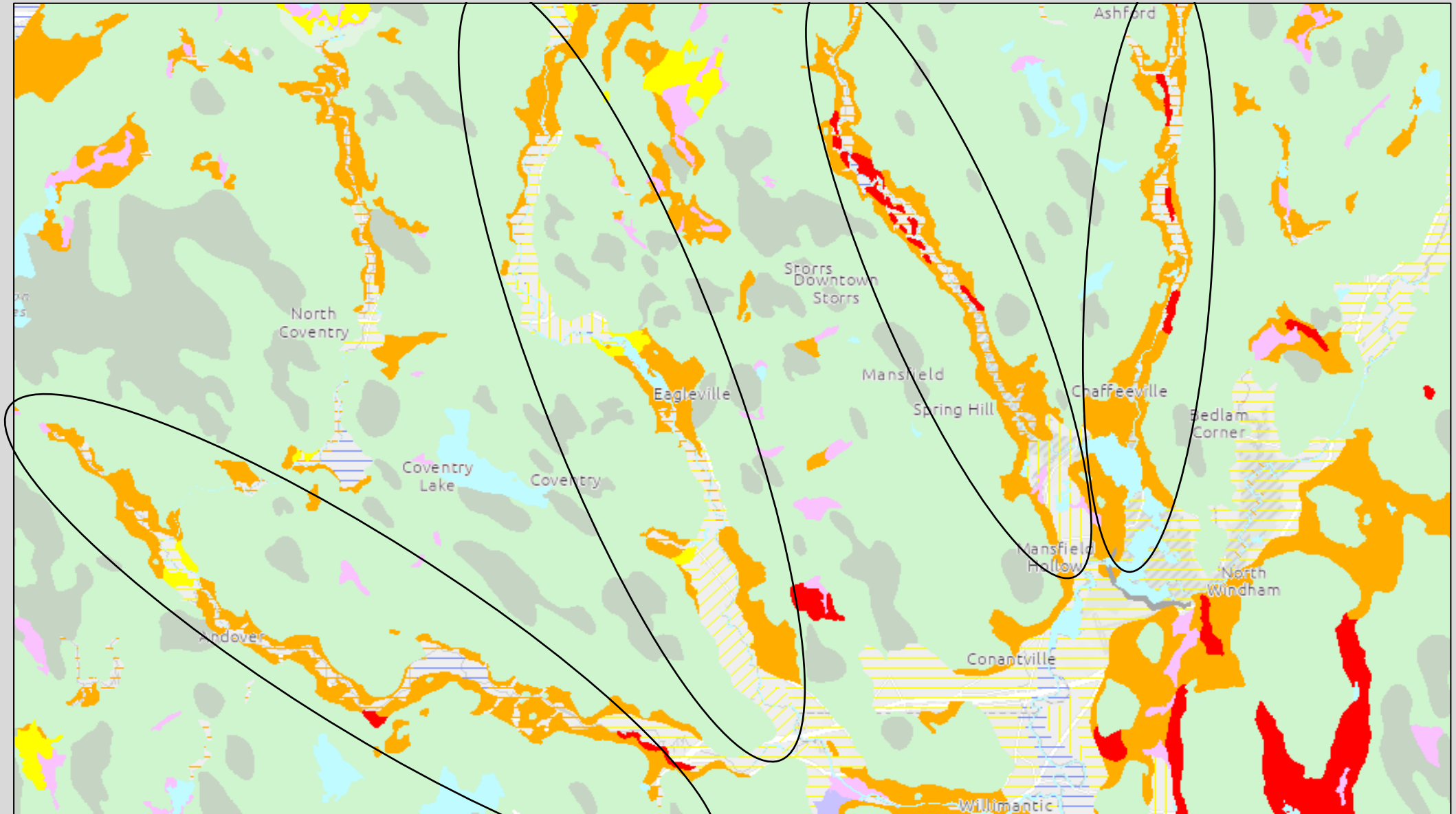


Natural Resource Inventory (NRI) Map and Data Layers

- NWI Wetland
- CTDEEP Cold Water Stream
- Surface Water
- Drainage Basin (local)
- Vernal Pool

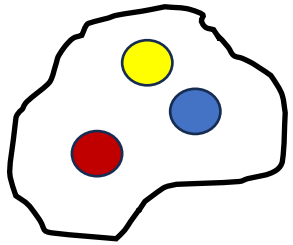
- Core Forest
- NDDB Listed Species
- Surficial Geology
- Farmland Soils
- Topographic
- Protected Open Space Parcels

Using Surficial Geology to Identify Important Herpetological Conservation Areas

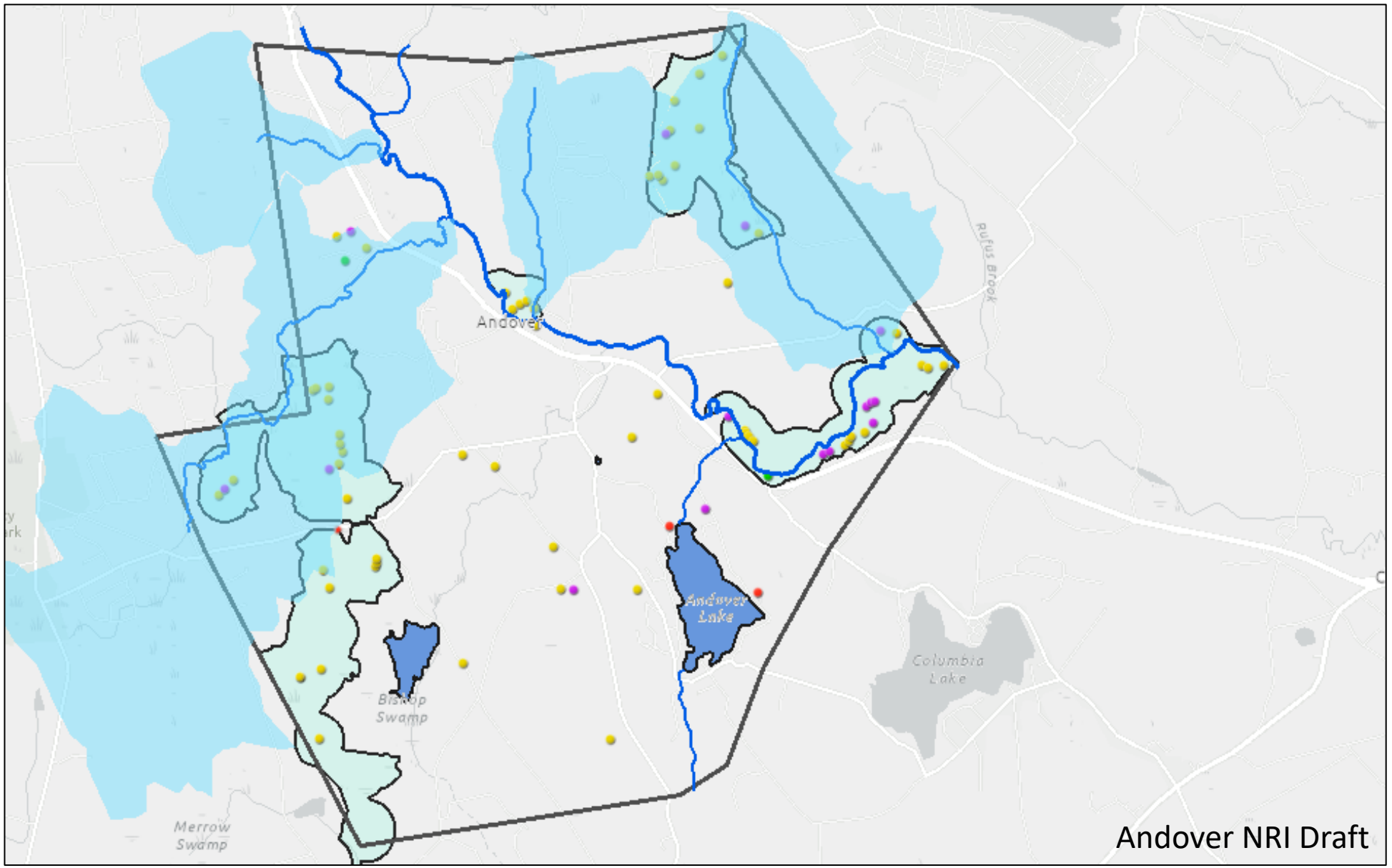


Moving from Site to Landscape

Vernal Pool Conservation Zone



Coldwater Stream Basin



Building Bigger and Connecting

State

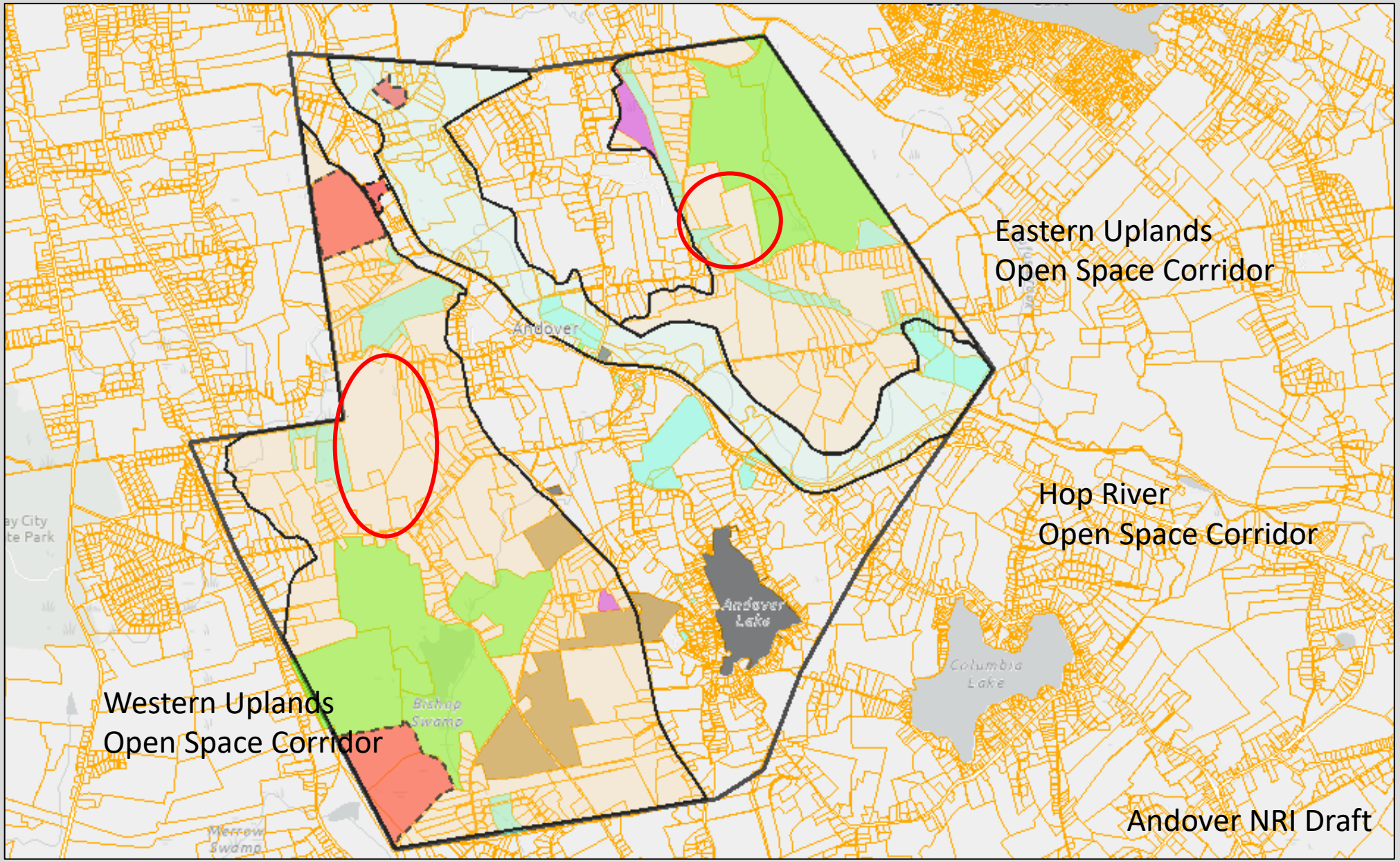
Town

Land Trust

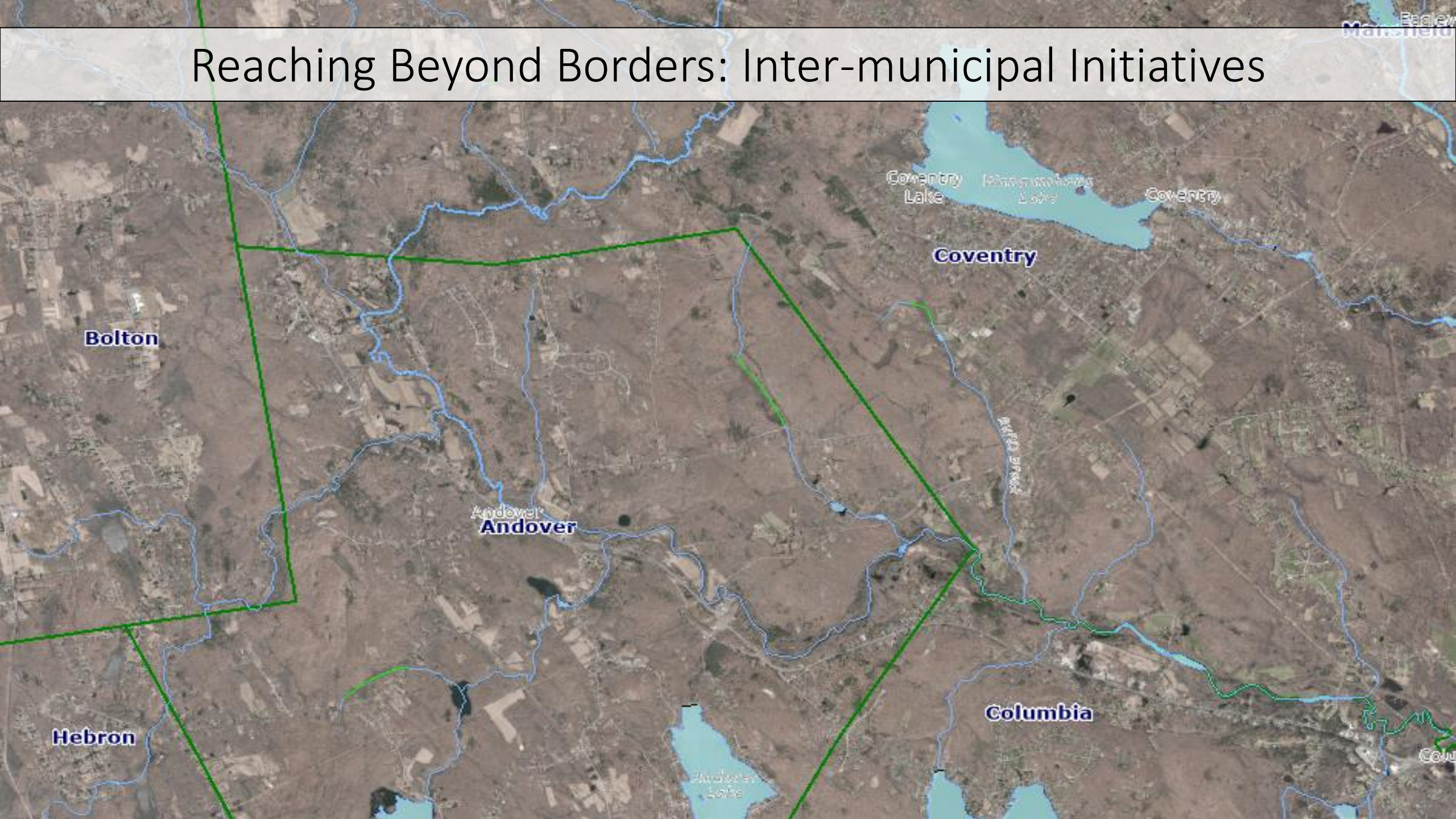
Farmland Program

Private Unknown

Parcel



Reaching Beyond Borders: Inter-municipal Initiatives

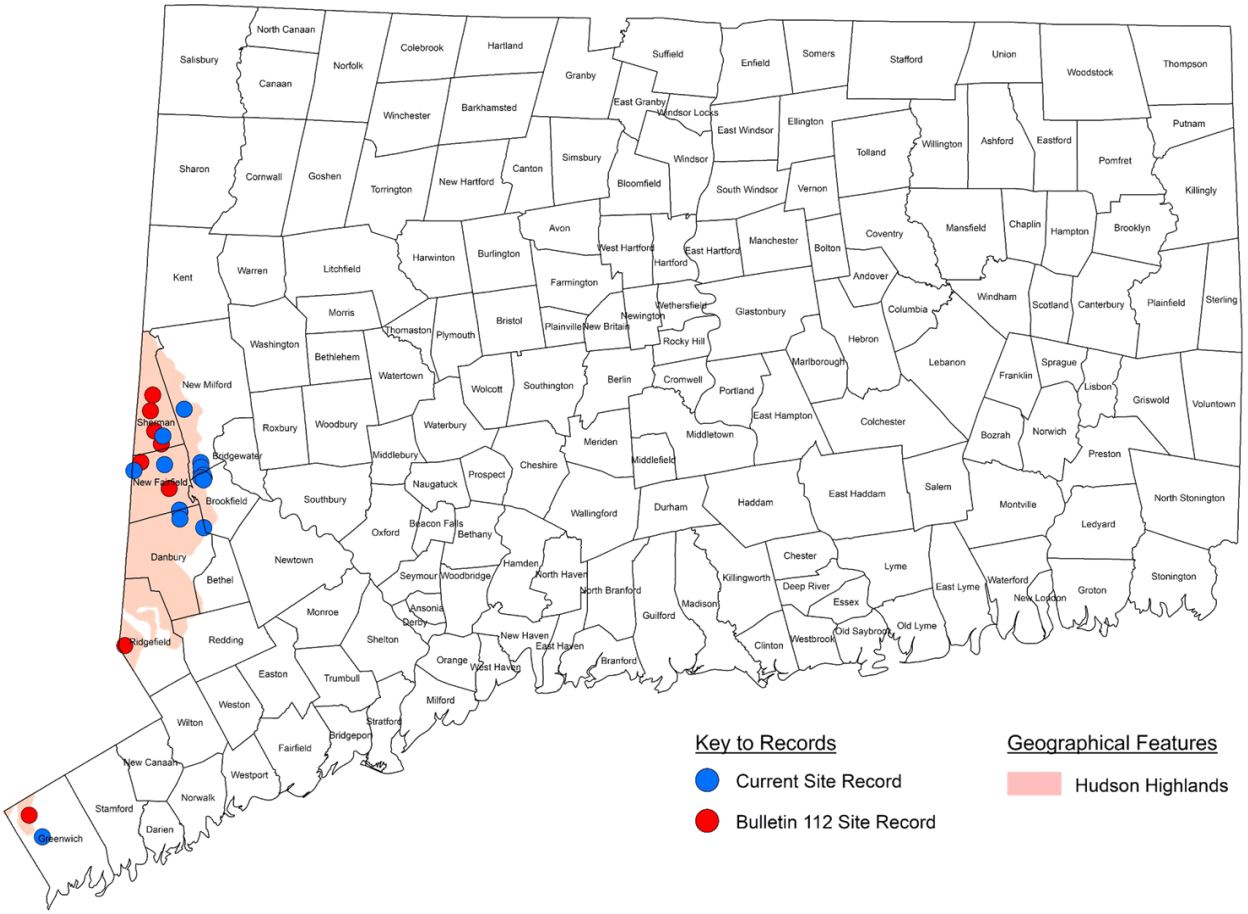


Critical Inter-municipal Responsibility

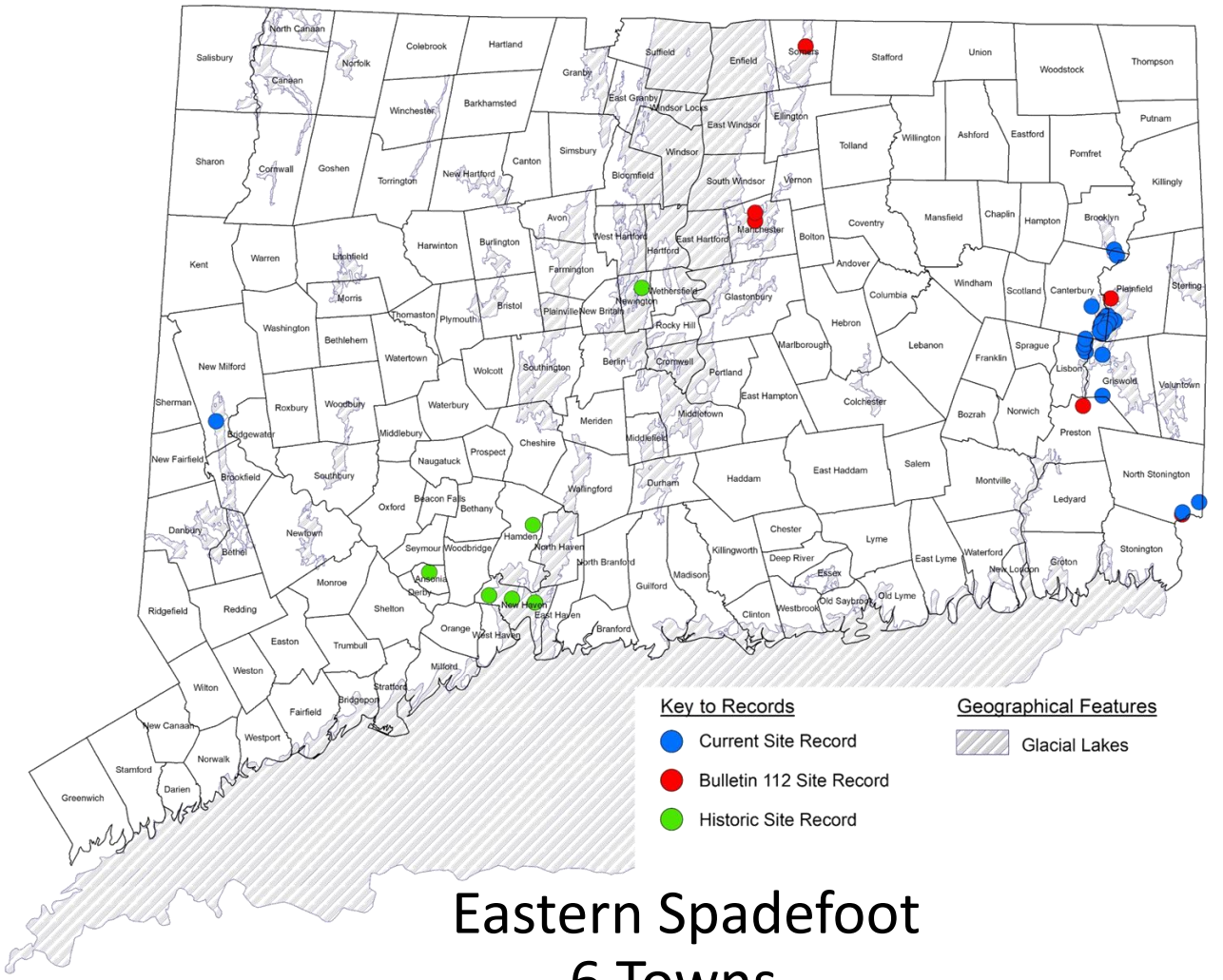
Slimy salamander
Spring salamander
Blue-spotted salamander (diploid)
Spadefoot
Leopard frogs
Five-lined skink
Timber rattlesnake
Wood turtle
Bog turtle
Diamond-backed terrapin

Traprock ridge system

Critical Inter-municipal Responsibility



Northern Slimy Salamander
6 Towns



Eastern Spadefoot
6 Towns

Reaching Beyond Borders: Working Across Commissions and the POCD

PLAN OF CONSERVATION AND DEVELOPMENT

Inland Wetlands

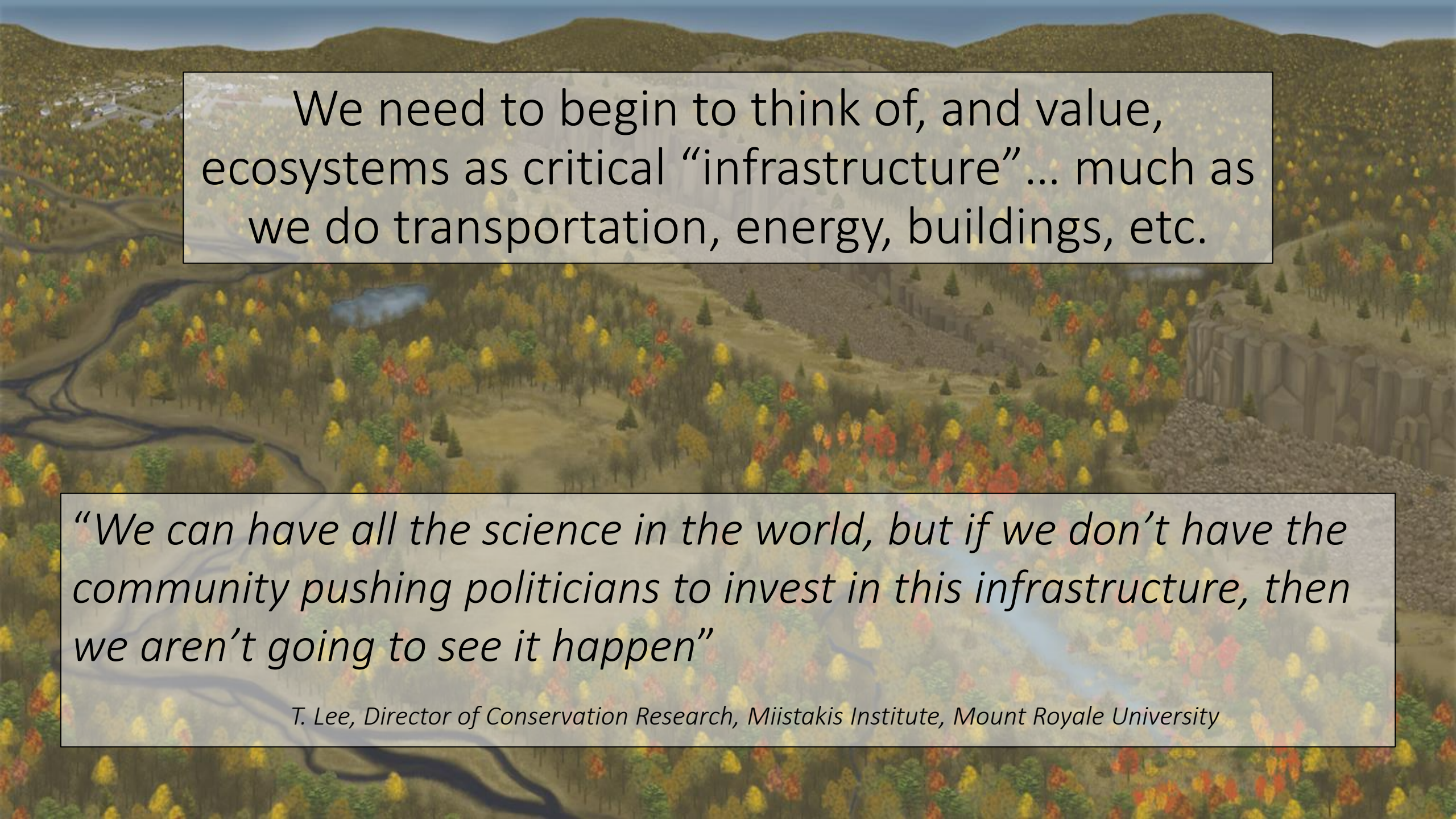
Regulatory

Conservation

Advisory

Planning & Zoning

Regulatory



We need to begin to think of, and value, ecosystems as critical “infrastructure”… much as we do transportation, energy, buildings, etc.

“We can have all the science in the world, but if we don’t have the community pushing politicians to invest in this infrastructure, then we aren’t going to see it happen”

T. Lee, Director of Conservation Research, Miistakis Institute, Mount Royale University

Resources

- ESRI ArcGIS free public account
  - Create account—ArcGIS Online Help | Documentation
- UCONN E-Corps Climate Corps (town and regional projects)
  - For Communities | Adapt CT (uconn.edu)
- CTECO overview of links to GIS maps/data
  - Data Download | Connecticut Environmental Conditions Online (uconn.edu)
- Hank Gruner, grunerhank@gmail.com
- Dennis Quinn, dennis@quinnecological.com

Available for purchase at:

Sessions Woods WMA

Or

Online at the CTDEEP Bookstore

All proceeds from this book go to the Non-harvested game fund to support the conservation of CT's amphibians and reptiles.