Wood-Pawcatuck Watershed Flood Resiliency Management Plan

Community Meeting

October 20, 2016

NFWF

Wood-Pawcatuck Watershed Association

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Meeting Agenda

10:00 – 10:05	Introductions and Meeting Goals
10:05 – 10:15	Project Background and Watershed Planning Process
10:15 – 11:15	Summary of Watershed Conditions
11:15 – 11:20	Next Steps
11:20 – 11:45	Questions and Discussion
11:45 – 12:00	Closing Remarks and Adjourn

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Introductions

Project Team

- Wood-Pawcatuck Watershed Association
- Fuss & O'Neill, Inc.

Project Steering Committee

- Municipal representatives from the most heavily-impacted watershed communities
- State and federal agencies
- Other organizations

Meeting Goals

1. Describe the watershed planning process and work completed to date
2. Summarize study findings and preliminary recommendations
3. Provide a forum for public input and discussion
   - Issues of concern
   - Local priorities
   - Project ideas

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Hurricane Sandy Coastal Resiliency Grant

- U.S. DOI & National Fish and Wildlife Foundation (NFWF) competitive grant program
  - Communities affected by Hurricane Sandy
  - Increase flood resilience
  - Focus on strengthening natural ecosystems that also benefit fish and wildlife

- NFWF Grant awarded to Wood-Pawcatuck Watershed Association in June 2014
  - “Flood Resiliency Management Plan” for the Wood-Pawcatuck watershed
  - $720K grant award and $200K matching funds

What is Flood Resilience or Resiliency?

A community's ability to plan for, respond to, and recover from floods

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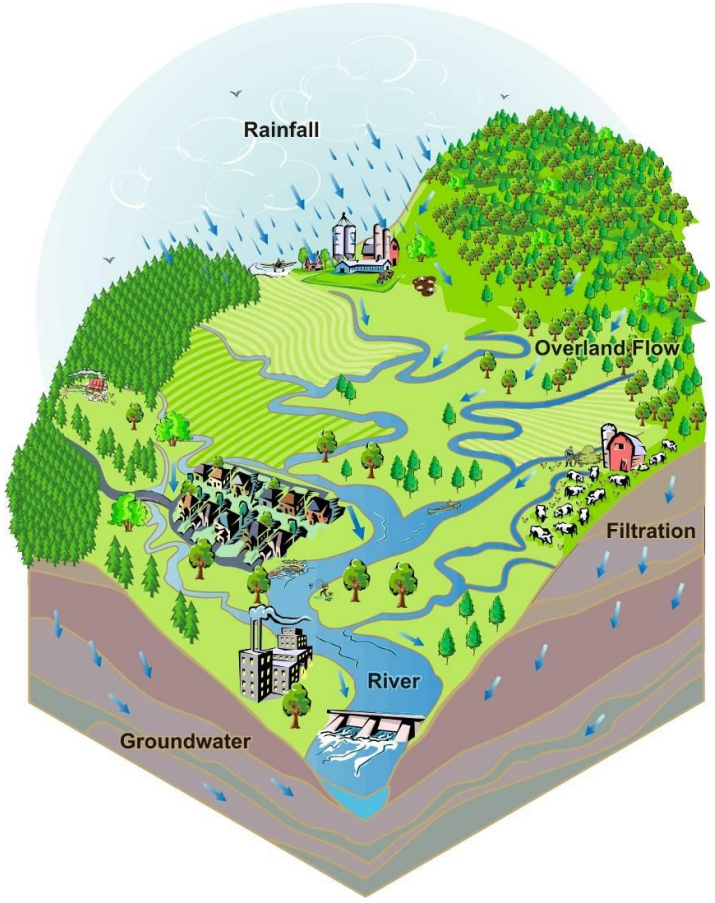
Project Goals

- Assess the vulnerability of the Wood-Pawcatuck Watershed to flooding

- Develop a watershed-based management plan
  - Enhance flood resilience
  - Strengthen natural ecosystems
  - Improve/protect water quality



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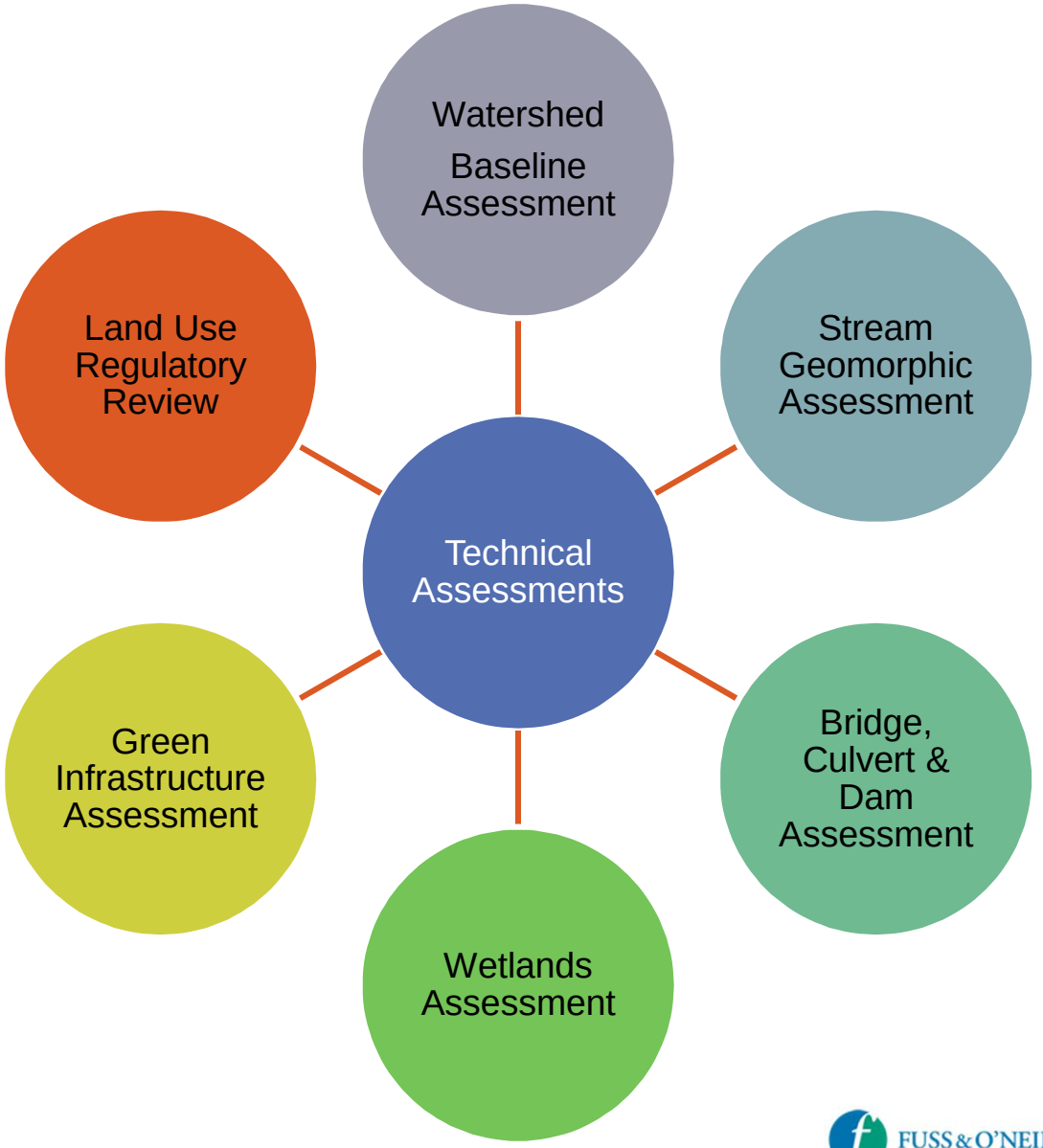
Watershed Planning Process

Technical Assessments

Evaluate current conditions and opportunities for restoration and protection projects that will enhance flood resiliency and provide related benefits



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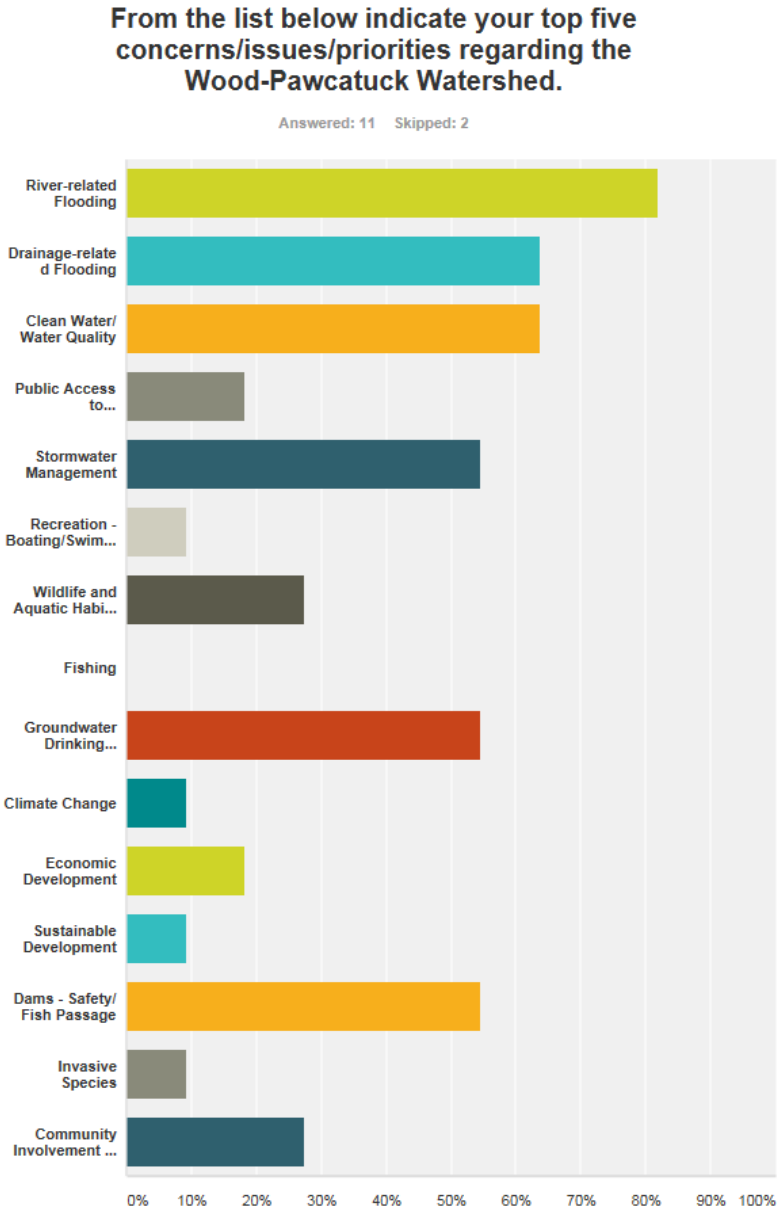
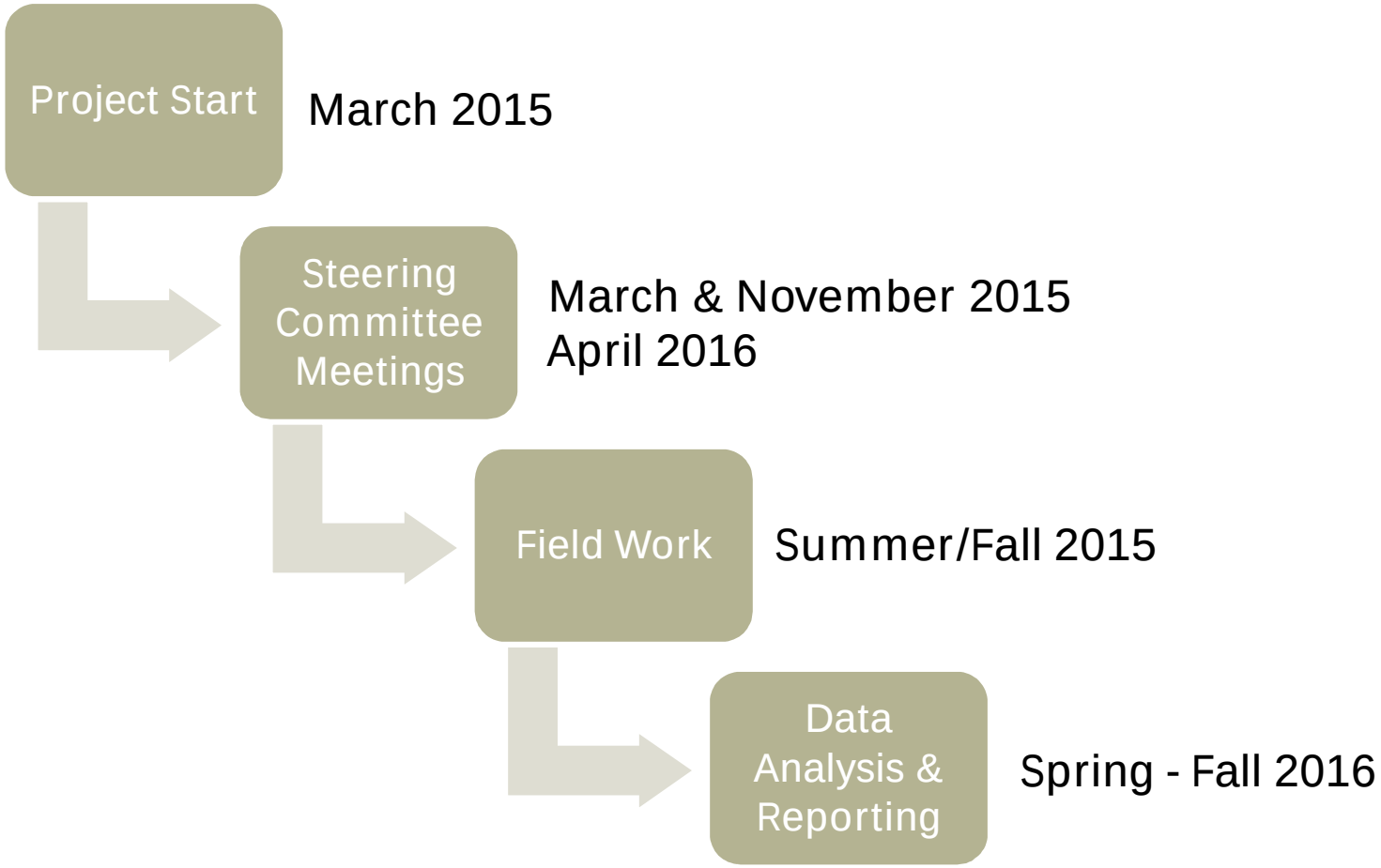
Watershed Planning Process

- Stakeholder and Community Involvement
- Collaborative Process with WPWA and Project Stakeholders
  - Steering Committee Workshop Meetings
  - Watershed Planning Survey
  - Community Meetings
  - Municipal Training and Outreach



Timeline for Work Completed



Watershed Conditions and Issues

Watershed Baseline Assessment

- Document existing watershed conditions
- Build upon previous and ongoing work in the watershed
  - USGS-FEMA Risk MAP Project
  - USACE Pawcatuck River Flood Risk Feasibility Study
  - RI River & Stream Continuity Project
  - Pawcatuck Dam Removals
  - USFWS Wild & Scenic Reconnaissance Survey
  - RIDEM Water Quality Basin Planning
  - Local Hazard Mitigation Planning

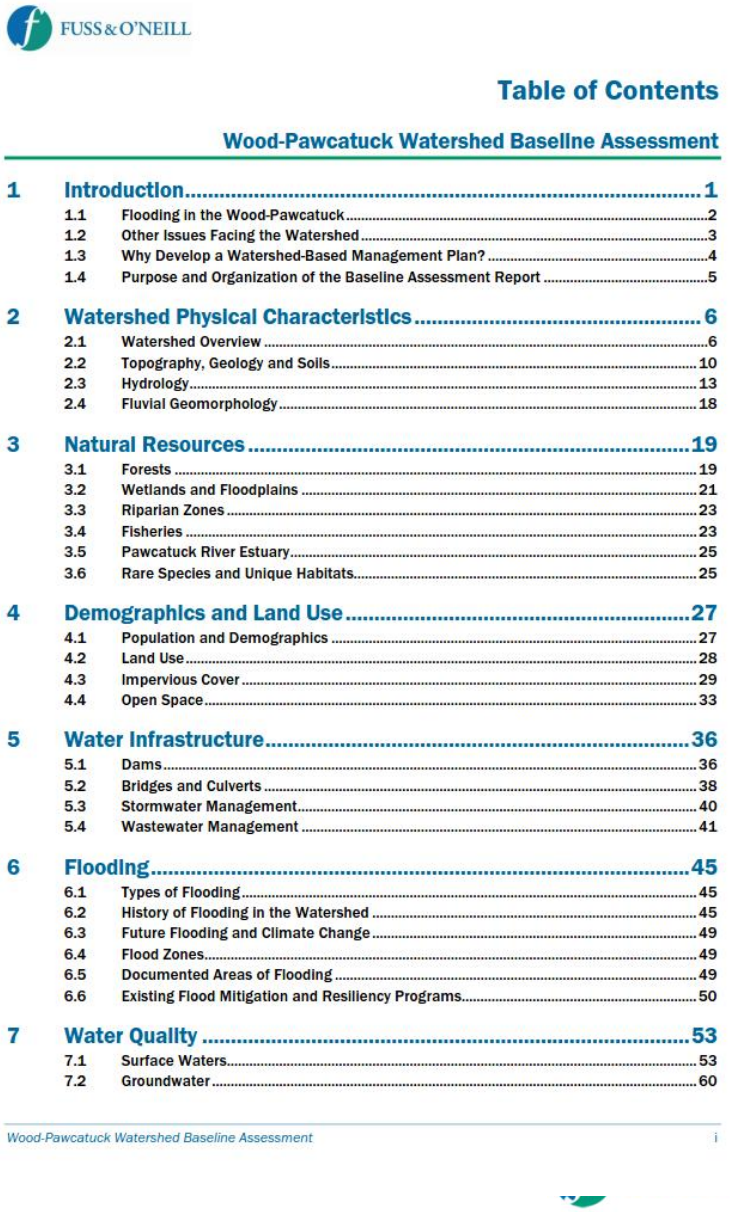


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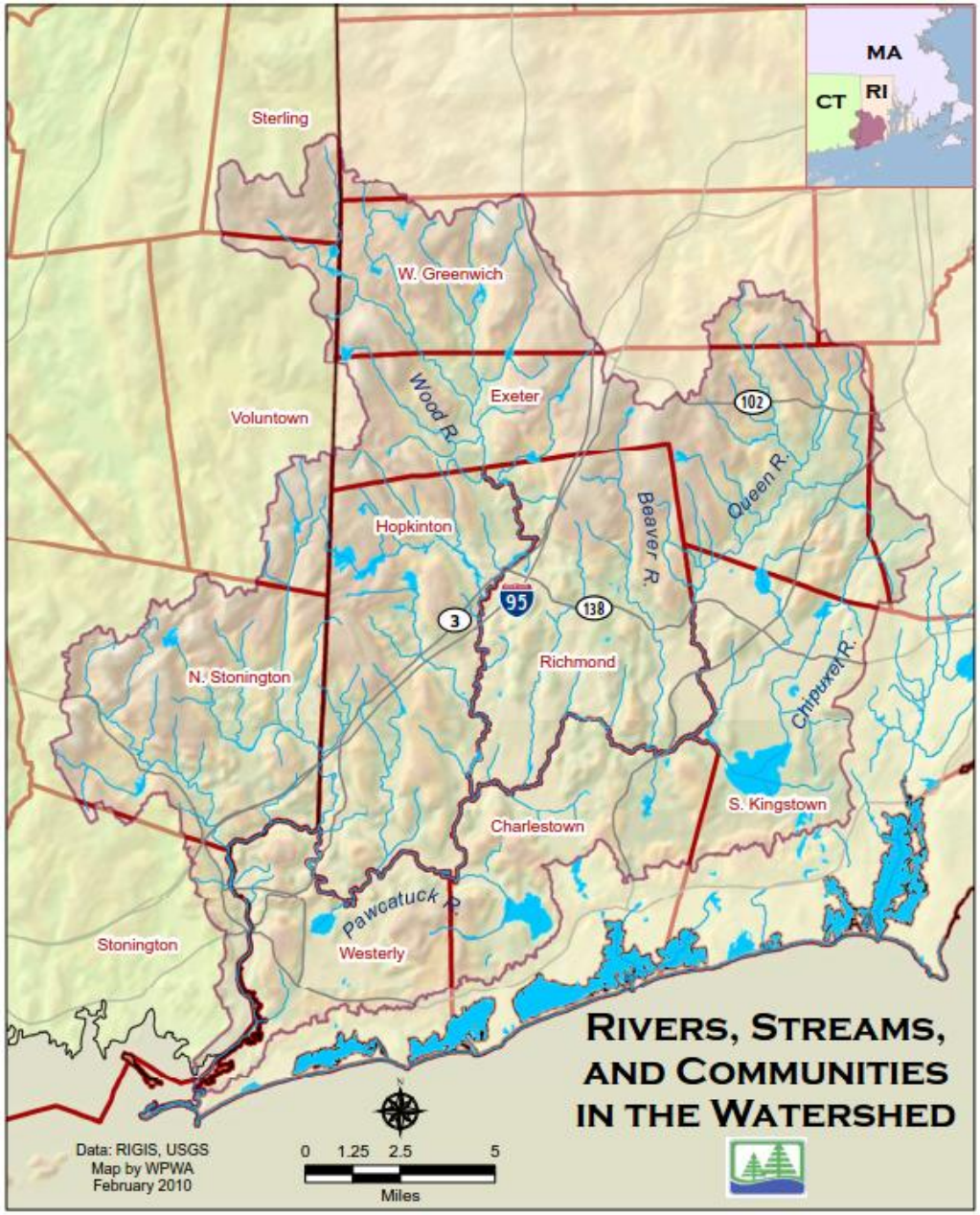
Table of Contents

Wood-Pawcatuck Watershed Baseline Assessment

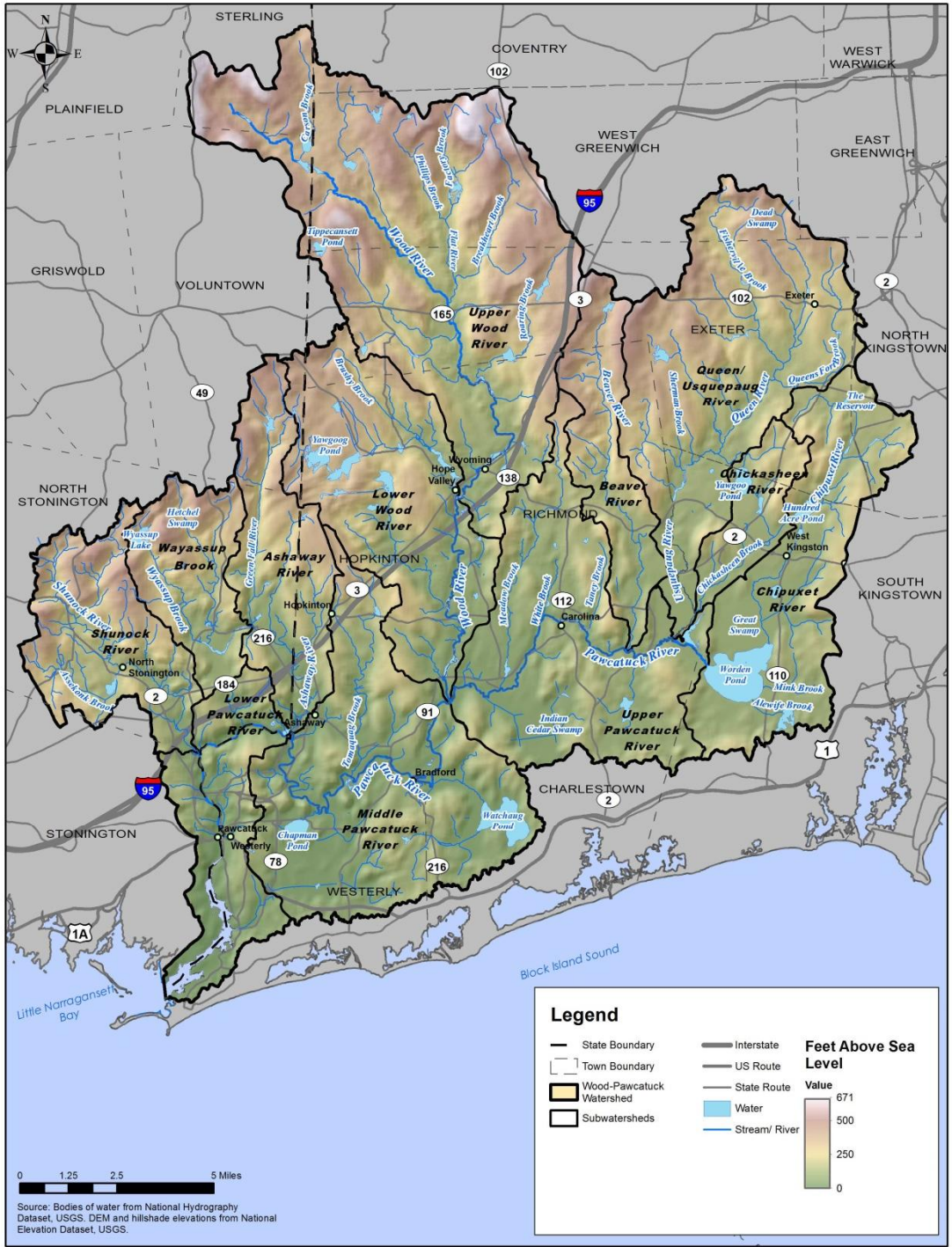
Wood-Pawcatuck Watershed

- 317 square miles in RI and CT
- Major portions of 11 municipalities
- 84,000 population
- 380 stream miles
- Drains to Pawcatuck River Estuary and Little Narragansett Bay



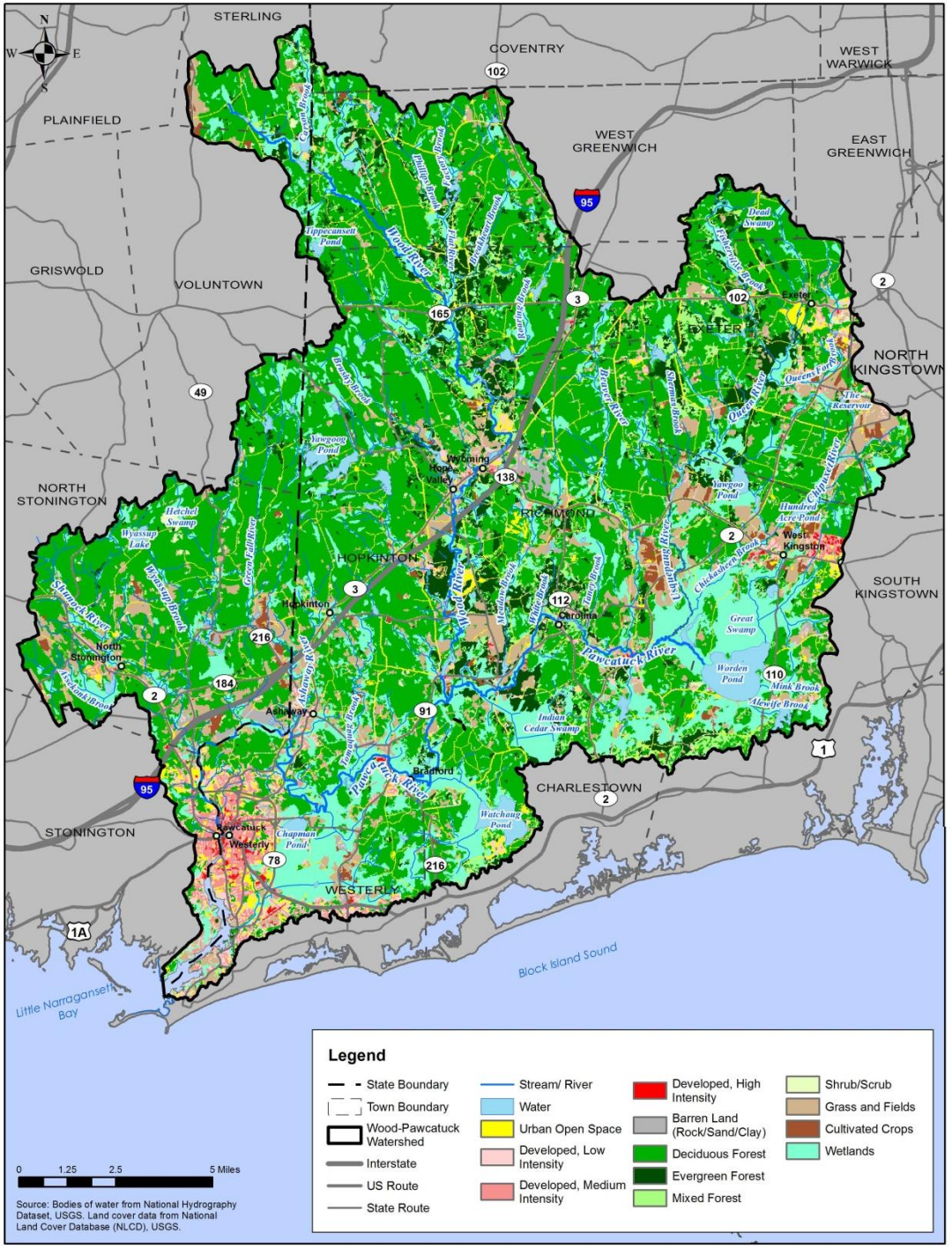
Subwatersheds

- Pawcatuck River
- Wood River
- Beaver River
- Queen-Usquepaug River
- Chickasheen Brook
- Chipuxet River
- Ashaway River
- Wyassup Brook
- Shunock River



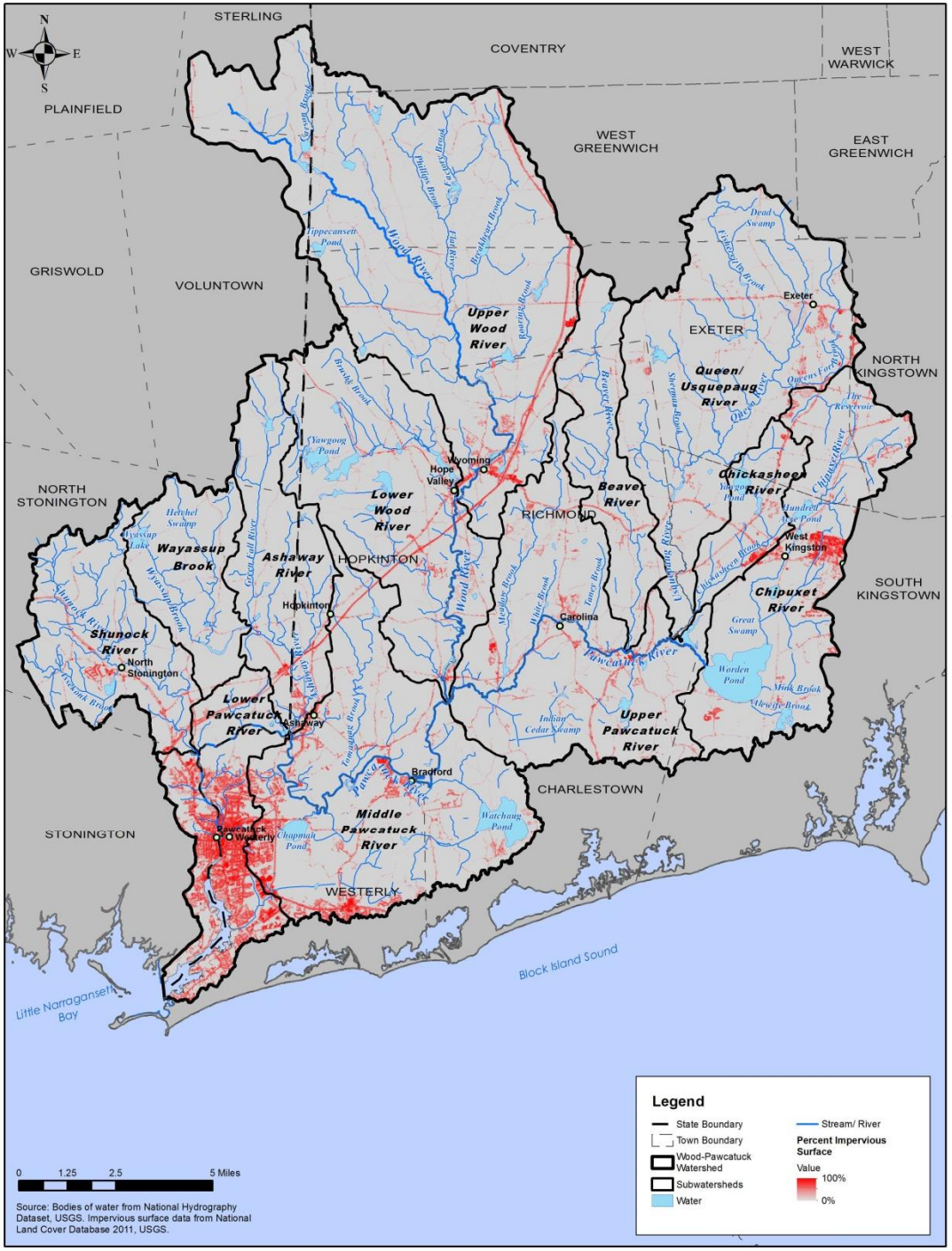
Land Use

- Mostly rural, forested, and agricultural land
- 80% undeveloped
- 60% forested
- Development concentrated in lower watershed and town/village centers



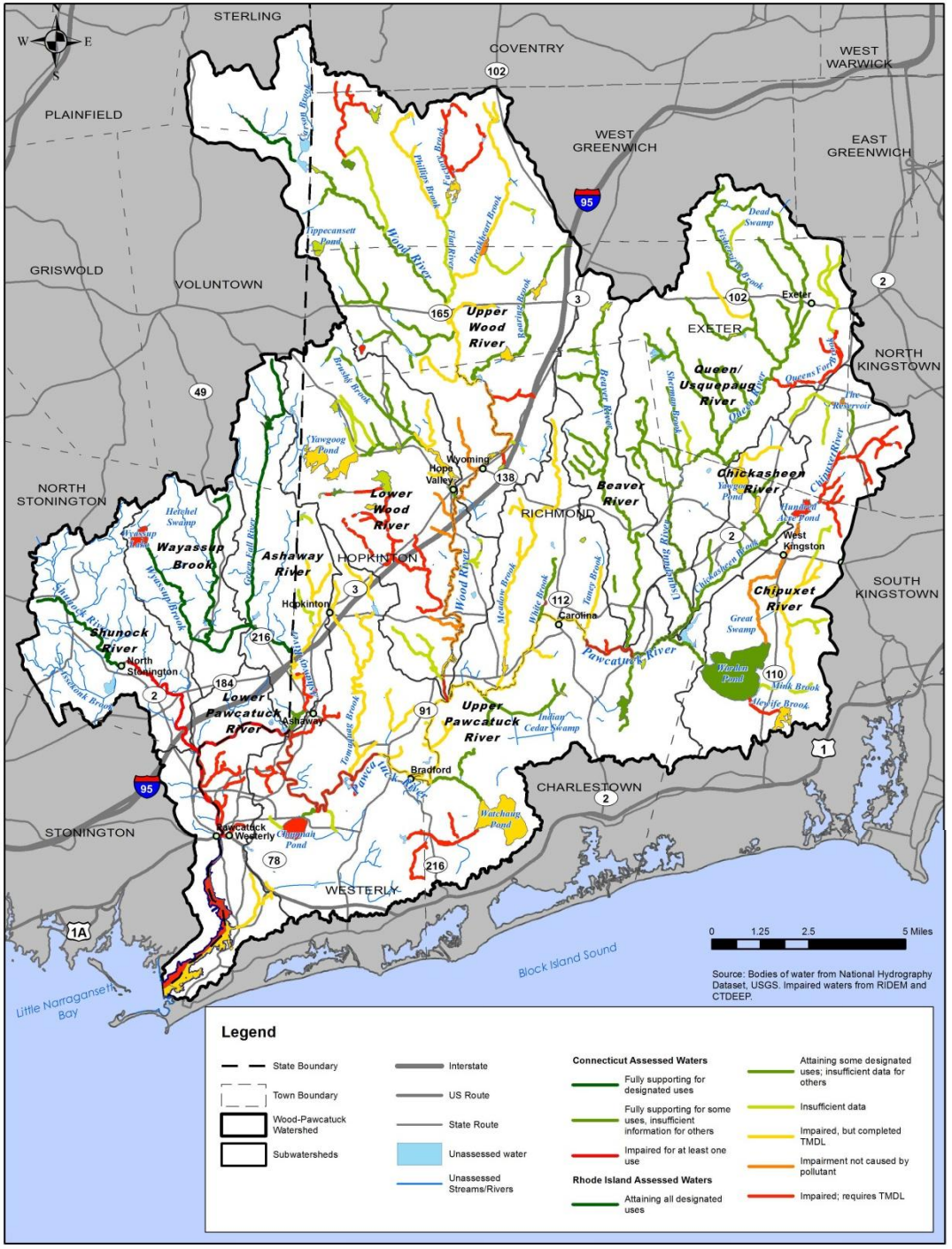
Impervious Cover

- Less than 5% of land area overall
- Indicative of healthy streams and good water quality
- 20% IC in Lower Pawcatuck, water quality issues



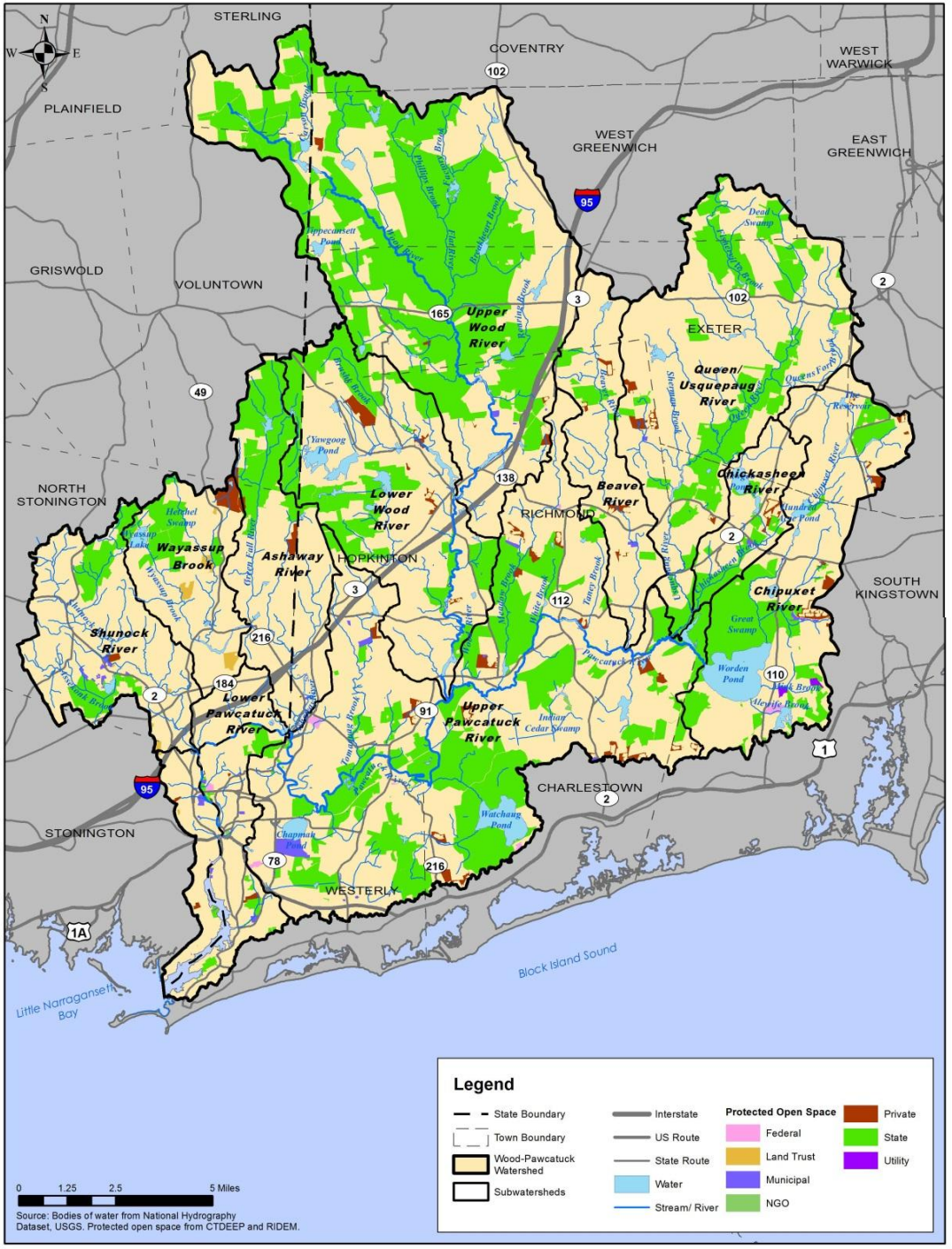
Water Quality

- High Quality Surface and Groundwater
- Supporting Cold-Water River habitat
- Sole Source Aquifer
- Threats from Nonpoint Source Pollution
  - Development potential
  - Stormwater discharges



Natural Resources

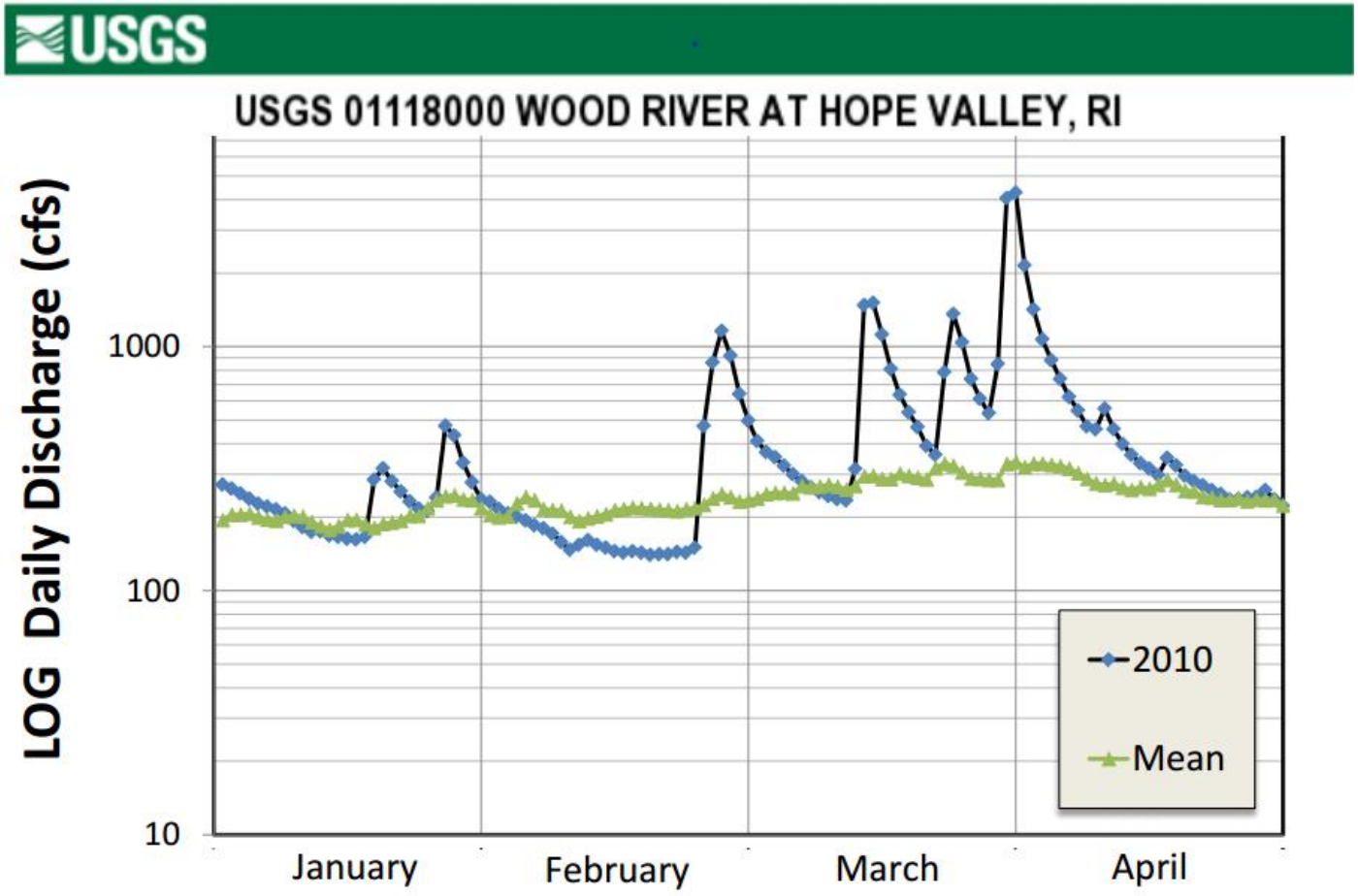
- High diversity of habitat and species
- Intact, unfragmented forests
- Large wetlands (“Great Swamp”)
- Under Study for Wild & Scenic Designation




Wood-Pawcatuck Watershed

Flooding in the Wood-Pawcatuck

- History of flooding in the watershed
- The Great Flood of 2010 (>“500-Year Flood”)



Source: Tom Boving, URI

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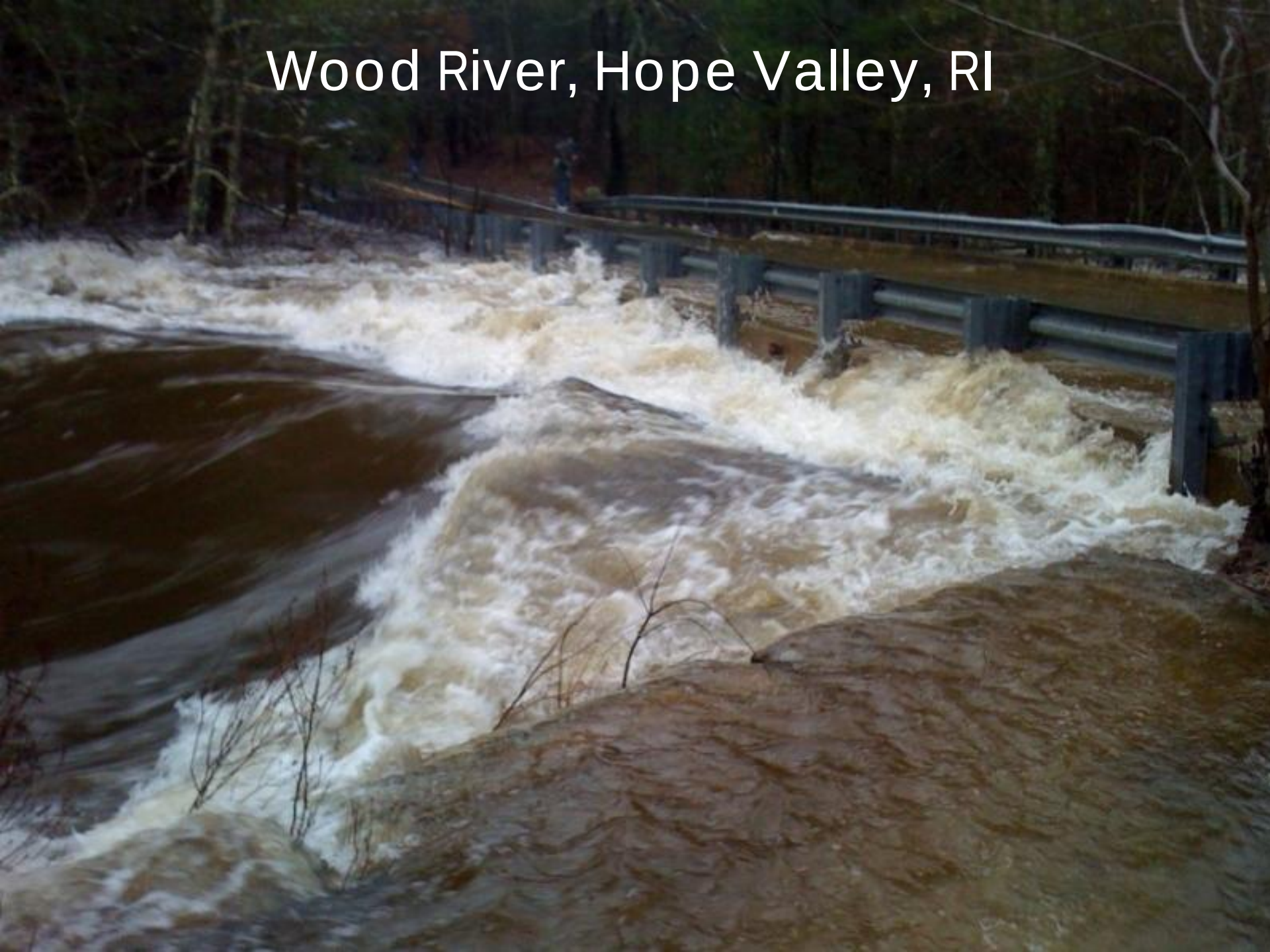
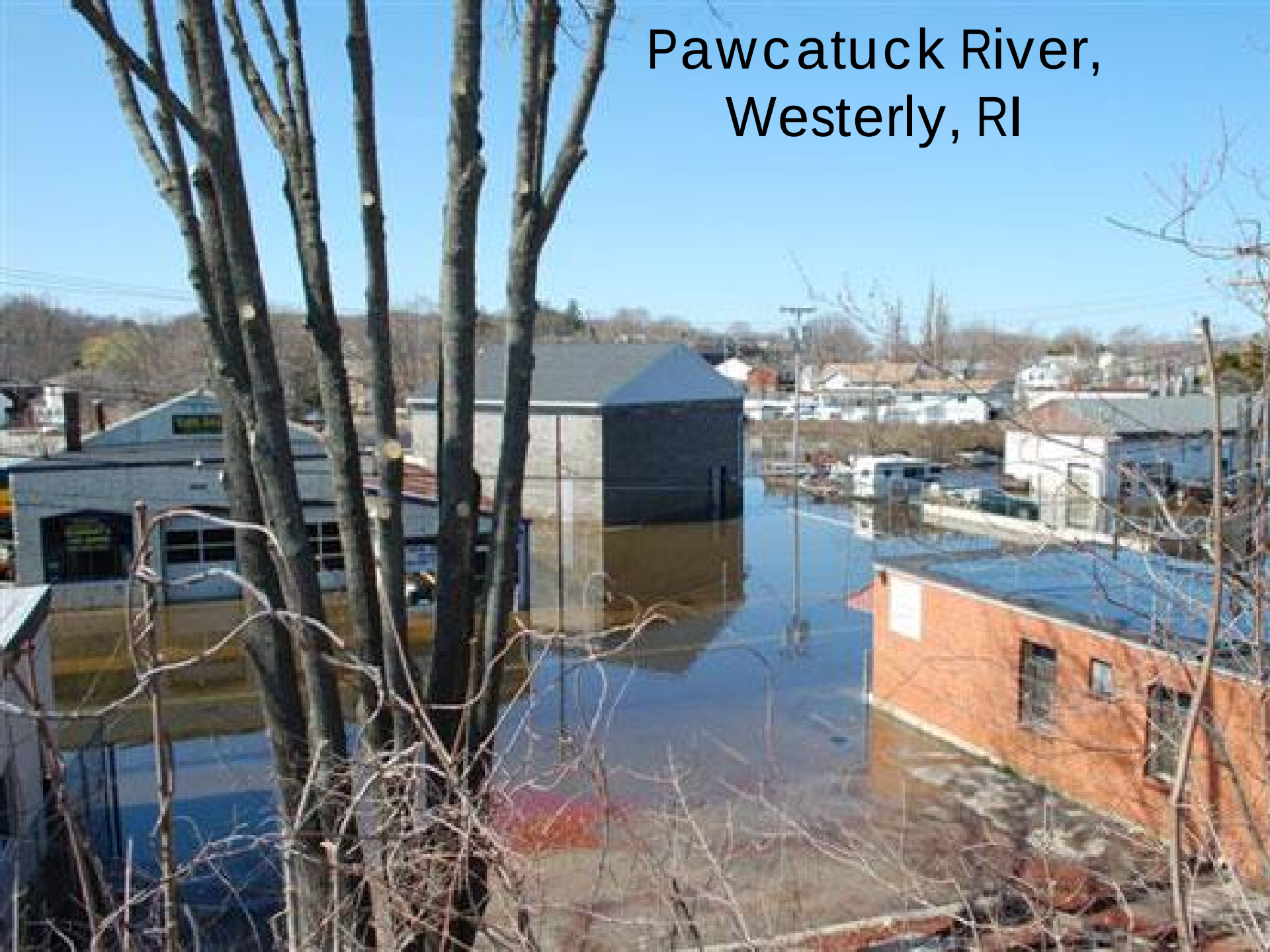
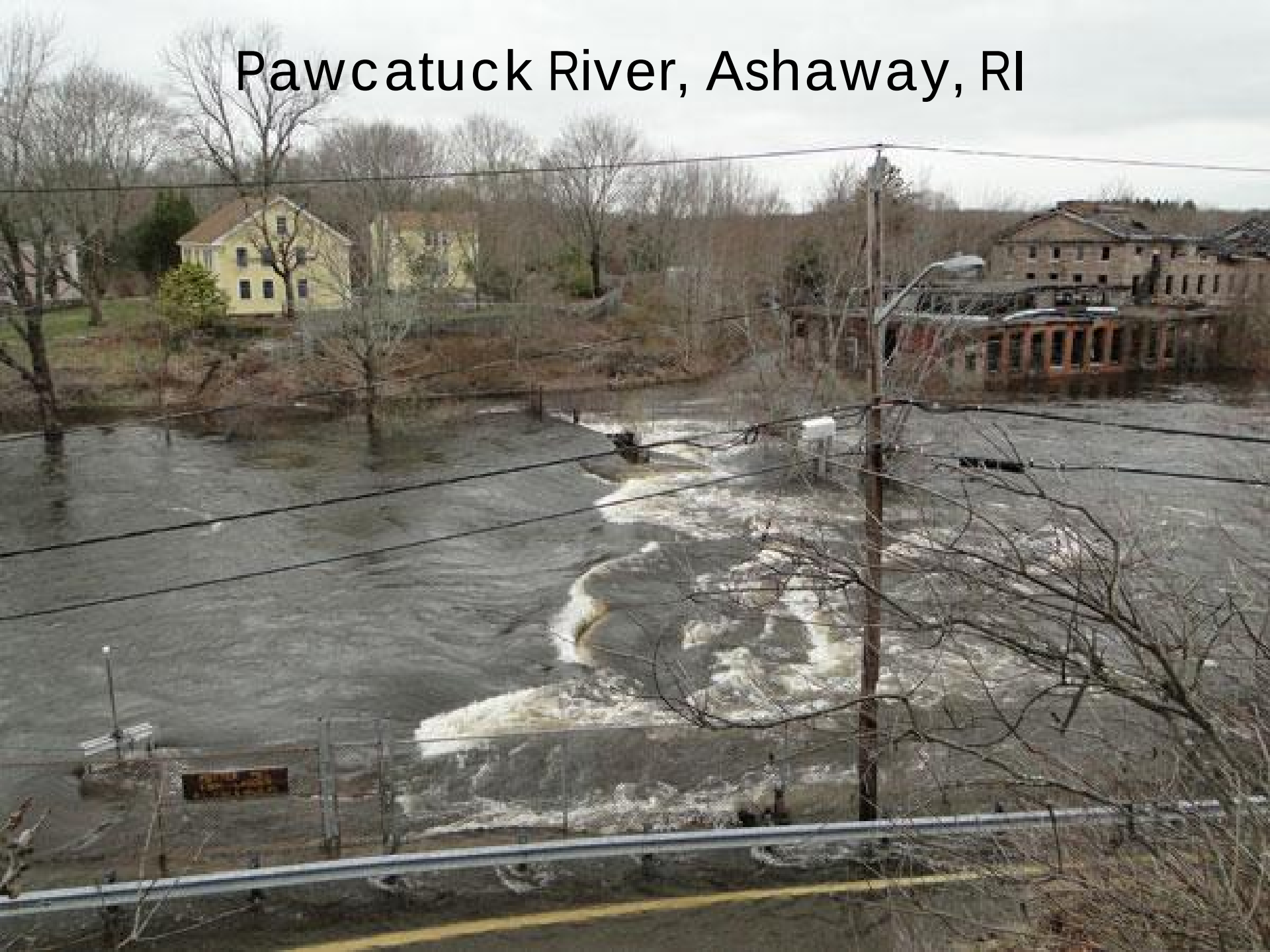

Wood River, Hope Valley, RI

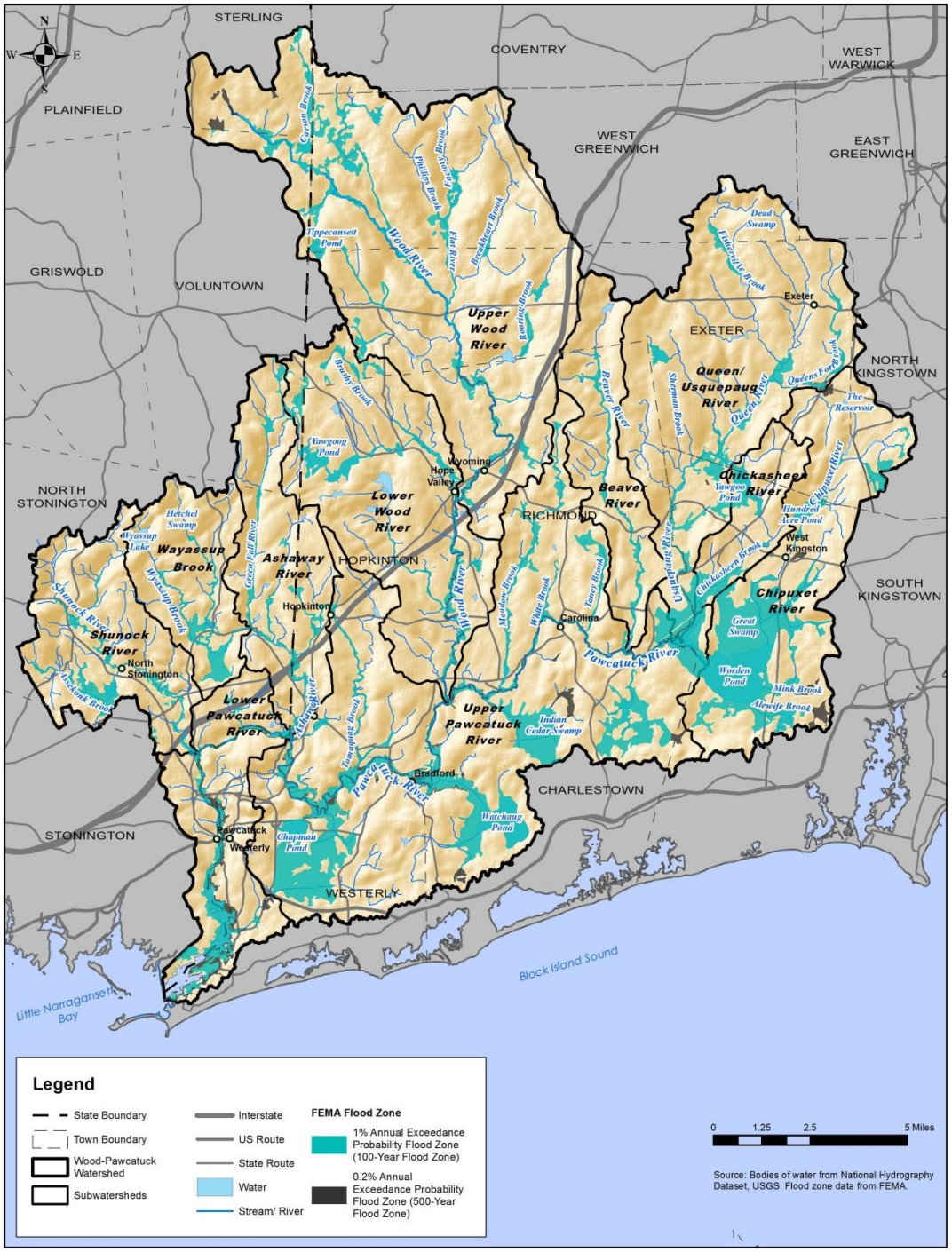

Pawcatuck River,
Westerly, RI

Pawcatuck River, Ashaway, RI



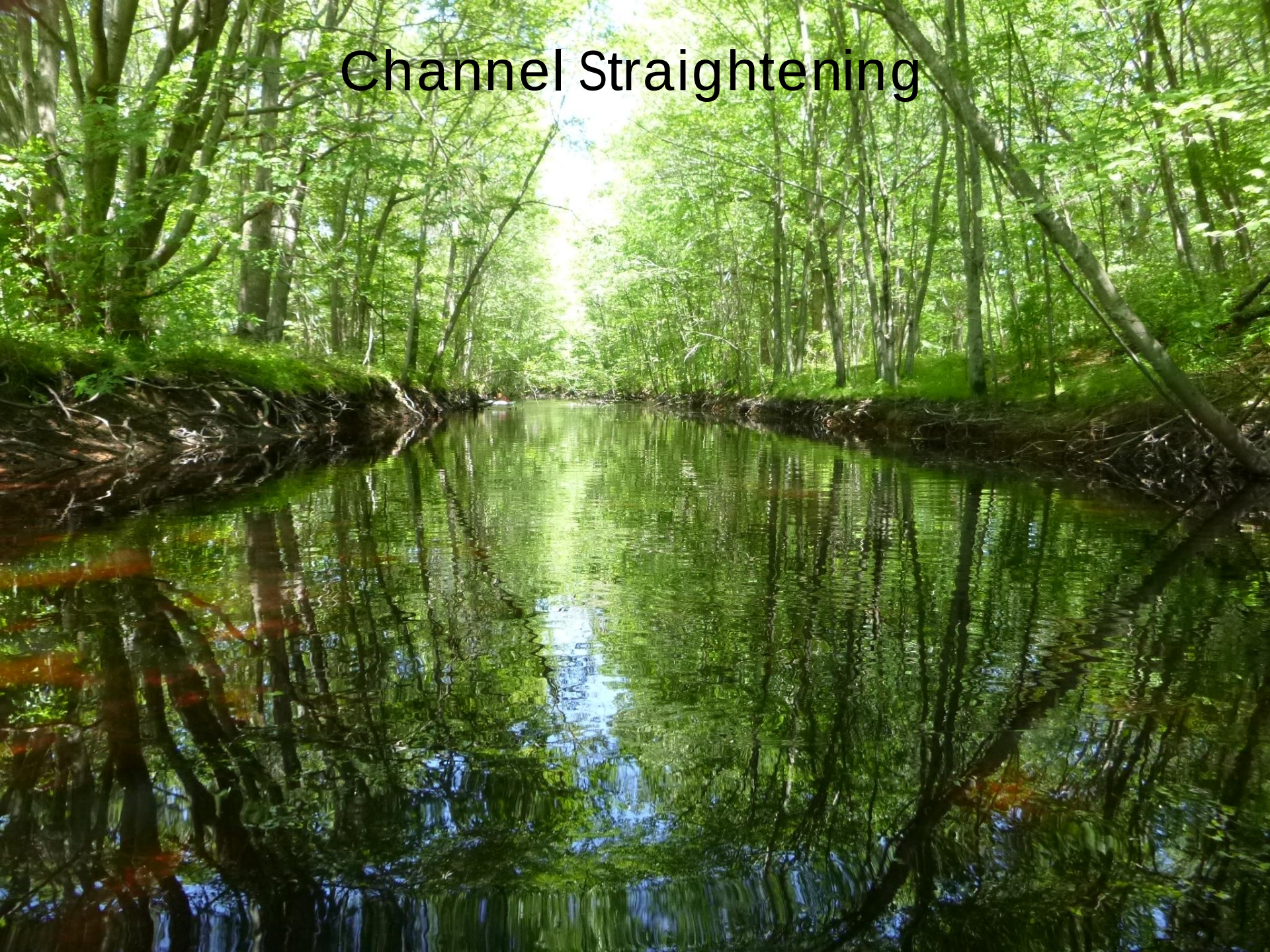
Flooding

- Factors Related to Increased Flooding
  - Floodplain development
  - Channel encroachment (dams, bridges, culverts)
  - Channel straightening
  - Watershed impervious cover
  - Climate change: more frequent and intense storms

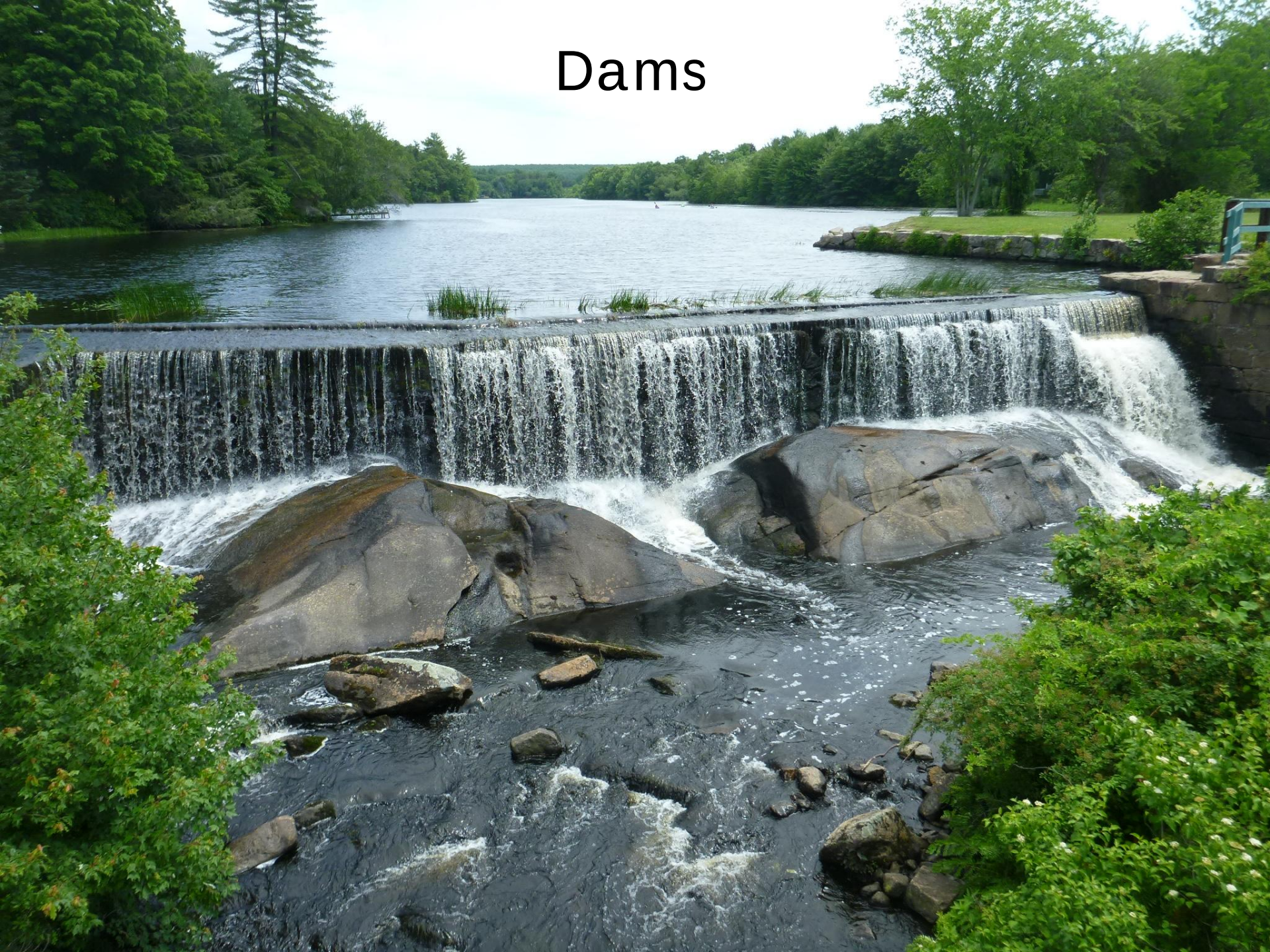


River & Floodplain Development

Channel Straightening



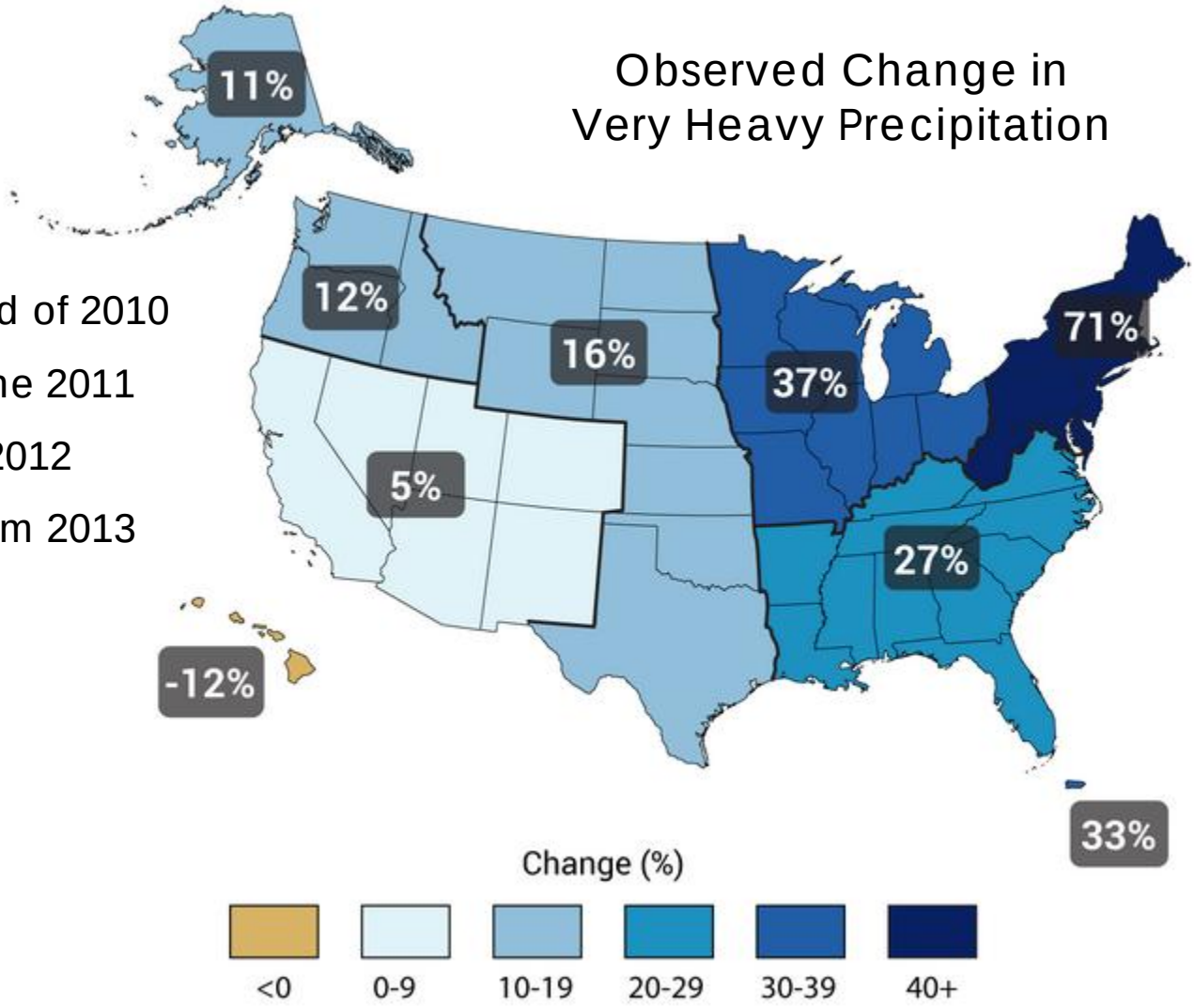
Dams



Undersized Stream Crossings

More Frequent Extreme Storms

- Rhode Island Flood of 2010
- Tropical Storm Irene 2011
- Hurricane Sandy 2012
- Severe Winter Storm 2013
- 2015 Blizzard



Source: Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009

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Problems with Road Stream Crossings

Hydrologic/Flooding

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Problems with Road Stream Crossings

Geomorphic

- Sediment
- Woody debris
- Culvert blockage/failure
- Channel adjustment

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Problems with Road Stream Crossings

Ecological

- Barriers to physical passage by aquatic organisms
  - Perched culverts
  - Excessive velocities
  - Insufficient water depths
  - Inadequate openness

Source: The North Atlantic Aquatic Connectivity Collaborative, S. Jackson

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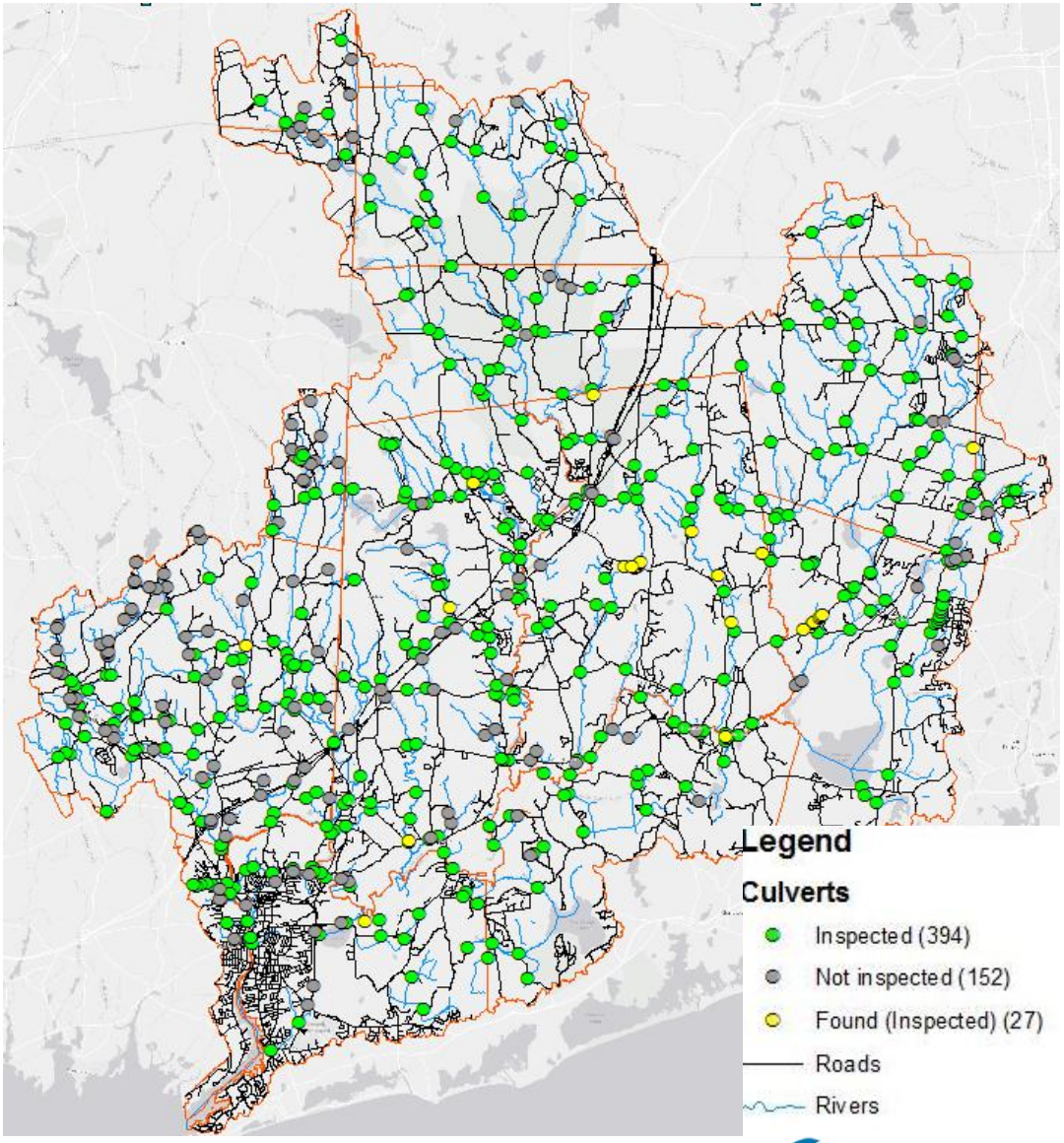
Bridges and Culverts – Analysis

How can decision-makers prioritize the repair and replacement of stream crossing infrastructure to increase flood resiliency and enhance aquatic organism passage?

Wood-Pawcatuck Bridges and Culverts

- 573 structures identified using GIS
  - Intersected roads, rails, and trails with mapped streams
  - Reviewed aerial imagery
  - RI Stream Continuity Project
- 421 structures were inspected (May – September 2015)



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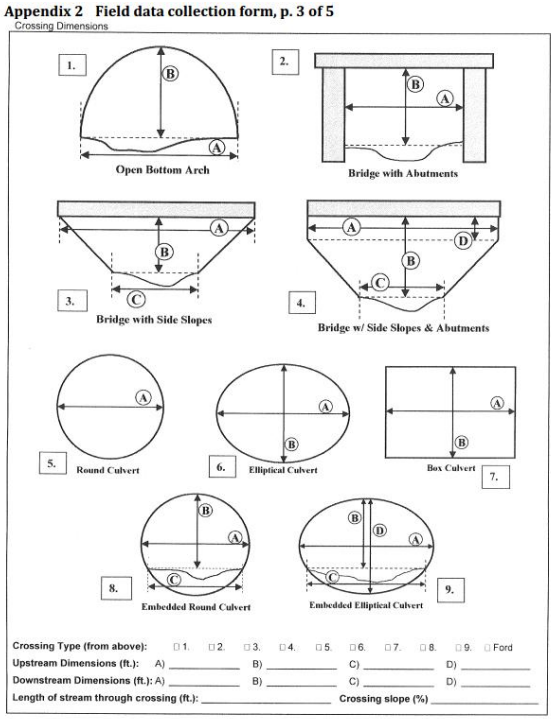
Bridges & Culverts Assessment Approach

- Adapted from Vermont's Stream Geomorphic Protocols and others used in the Northeast
- Information gathered
  - Site characteristics (e.g. sketch, street name, stream name)
  - Structure dimensions needed to assess hydraulic capacity
  - Deficiencies and condition of the structure
  - Upstream and downstream geomorphic conditions



VERMONT AGENCY OF NATURAL RESOURCES

UMASS AMHERST

North Atlantic Aquatic Connectivity Collaborative NAACC

The Nature Conservancy Protecting nature. Preserving life.

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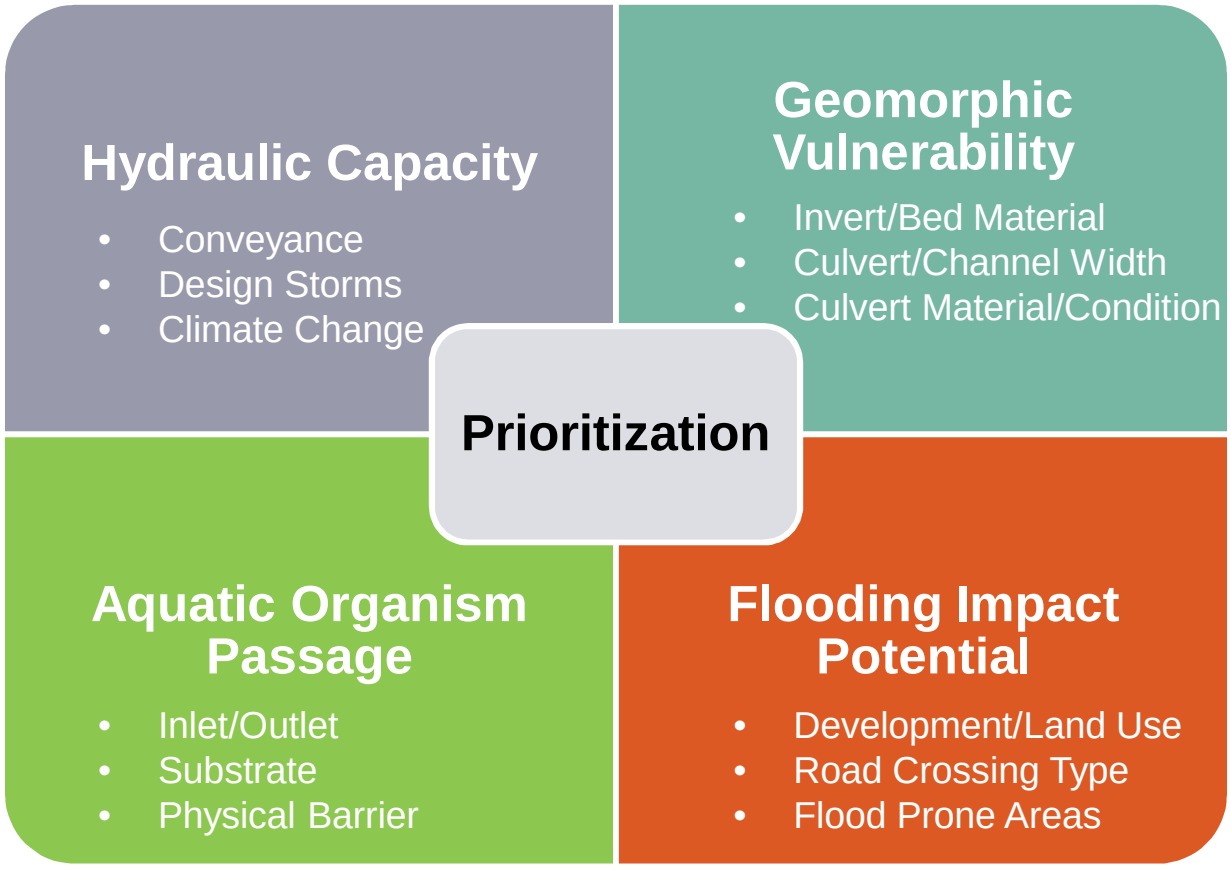
Bridges & Culverts – Assessment Criteria



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Bridges and Culverts - Findings

- 38% are presently hydraulically undersized (less than 25-year design flow capacity)
- 49% will be undersized under a Year 2070 climate change scenario
- Only 40% of stream crossings provide for full passage of aquatic organisms

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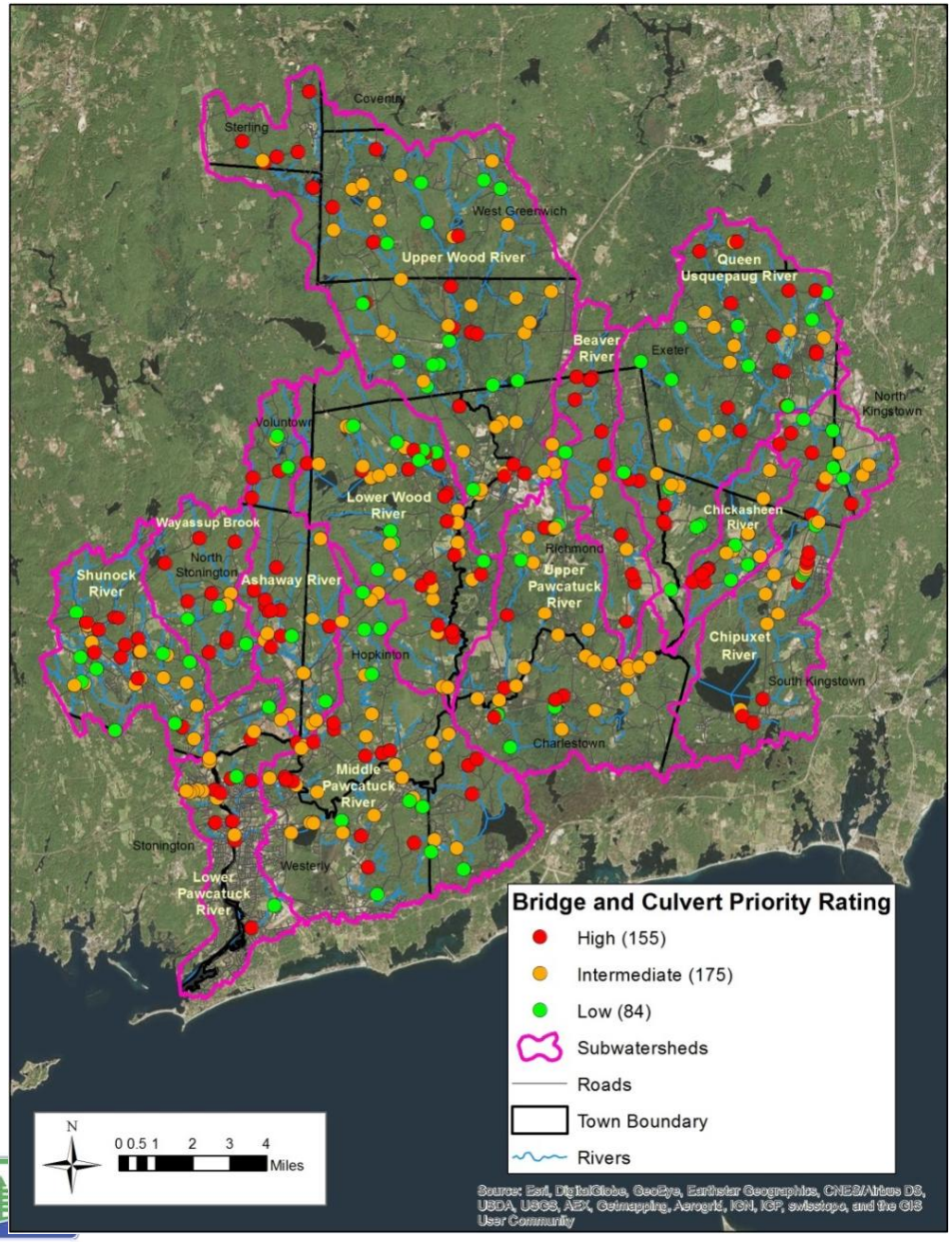
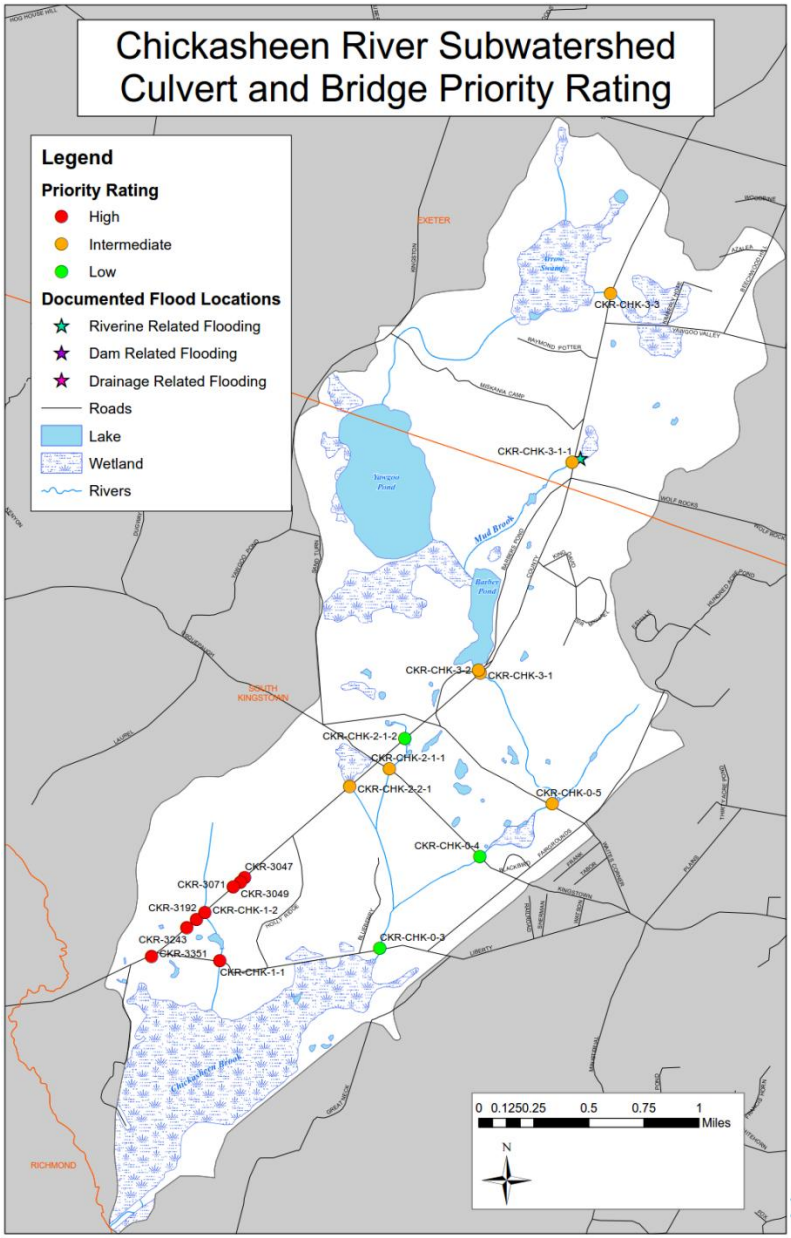
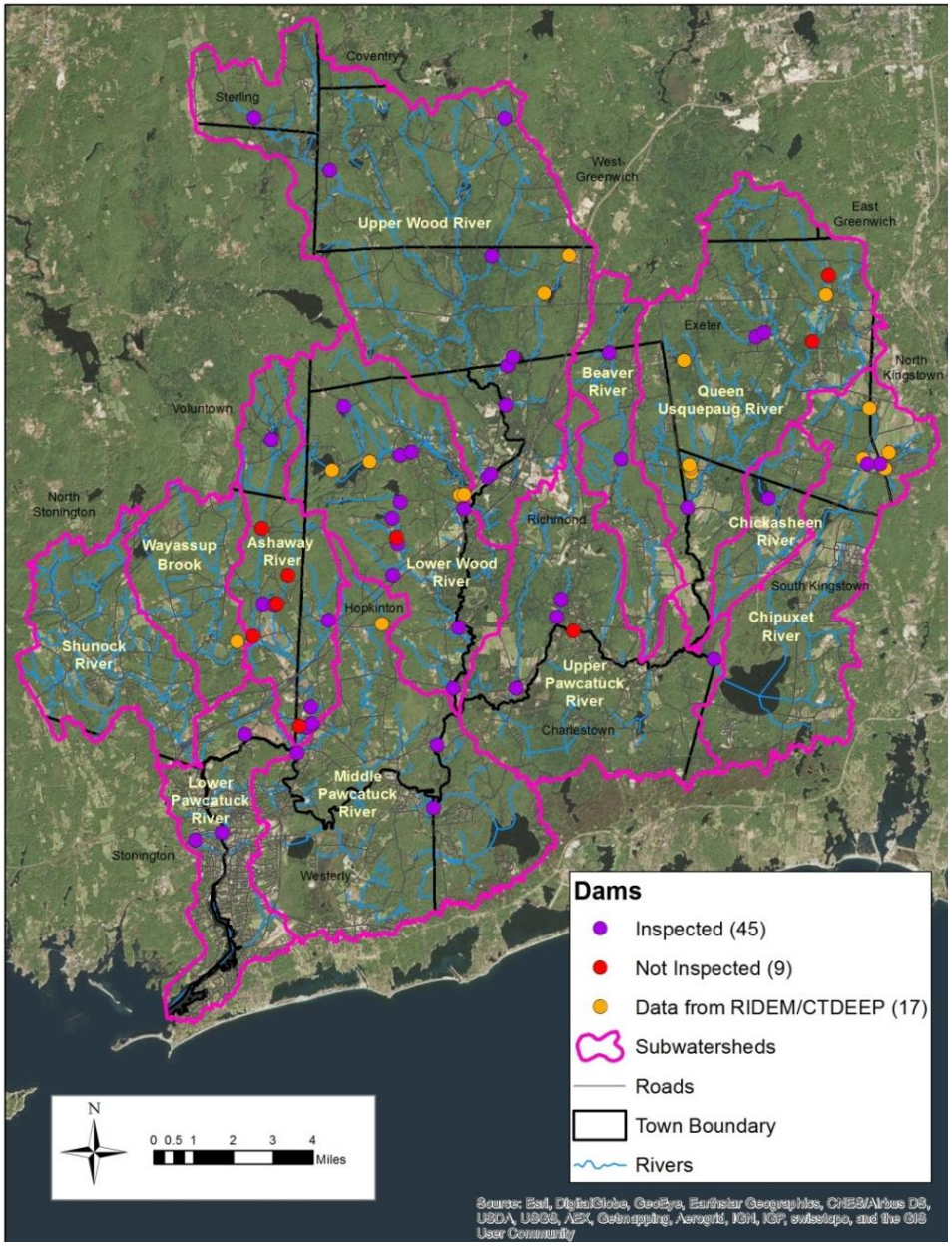
Culvert & Bridge Priority Ratings





Wood-Pawcatuck Dams

- Initially identified 150 dams
- Identified 70 highest priority dams for visual inspection
- Inspected 43 dams
- Denied access to 27 dams



Dams – Field Inspections

- Dam inspection protocols modified from the Massachusetts Office of Dam Safety (Phase 1 Formal Dam Safety Inspection Checklist)

Inspection Items
Name, Location, Uses
Size
Hazard Classification
Condition and Deficiencies:
• Embankment
• Dikes
• Upstream Face
• Downstream Face
• Appurtenances
• Concrete Structures
• Masonry Structures
• Spillway

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Dams – Alternatives Assessment

- Removal/Breach
- Repair
- Repurposing
- Aquatic Organism Passage
- No Action/ Maintain

Evaluation Criteria
Hazard Classification
Dam Condition
Owner's Ability to Maintain
Capacity
Benefits vs Loss of Current Uses
Downstream Continuity
Cost effectiveness
Ease of Permitting
Feasibility of Repurposing
Hydraulic Impacts
Wetland Impacts

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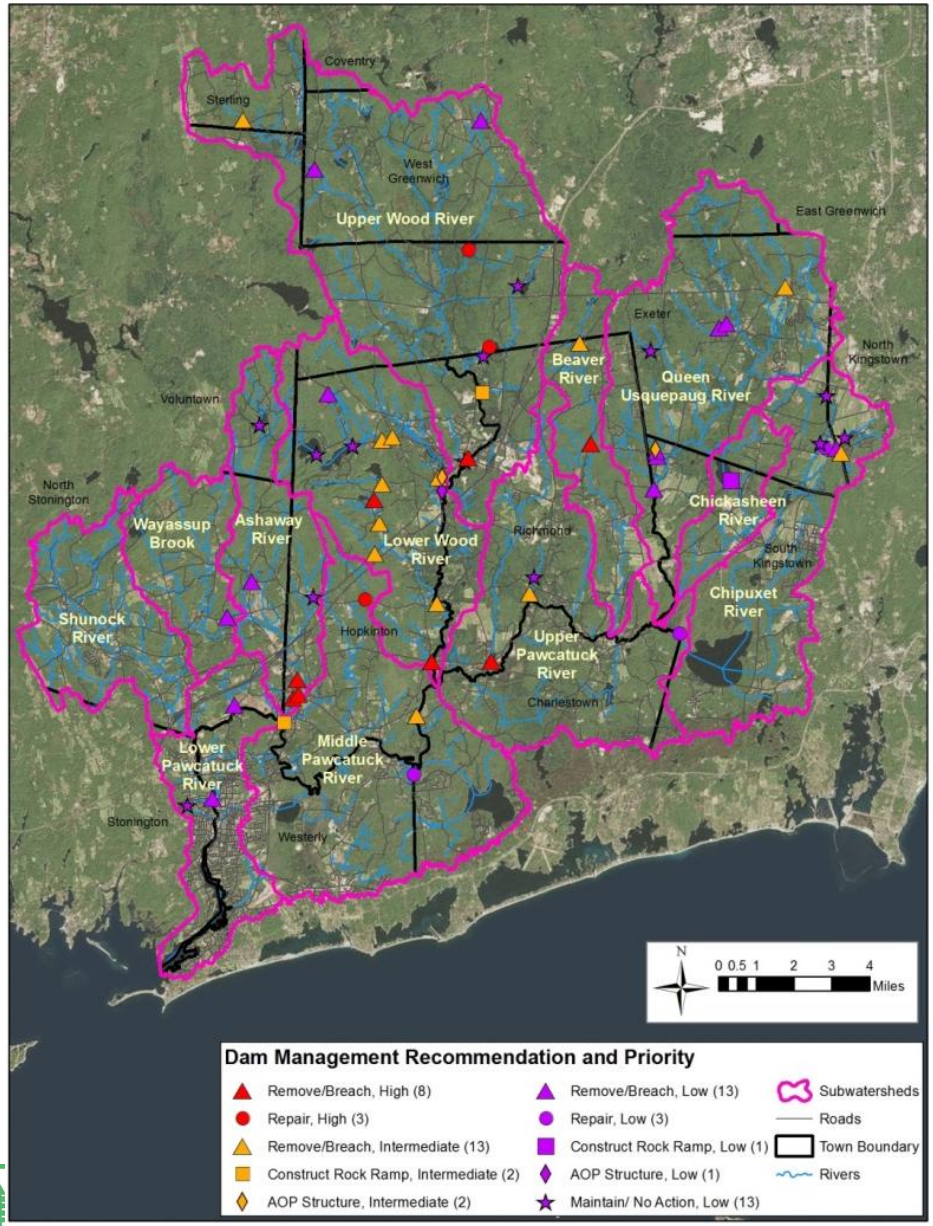
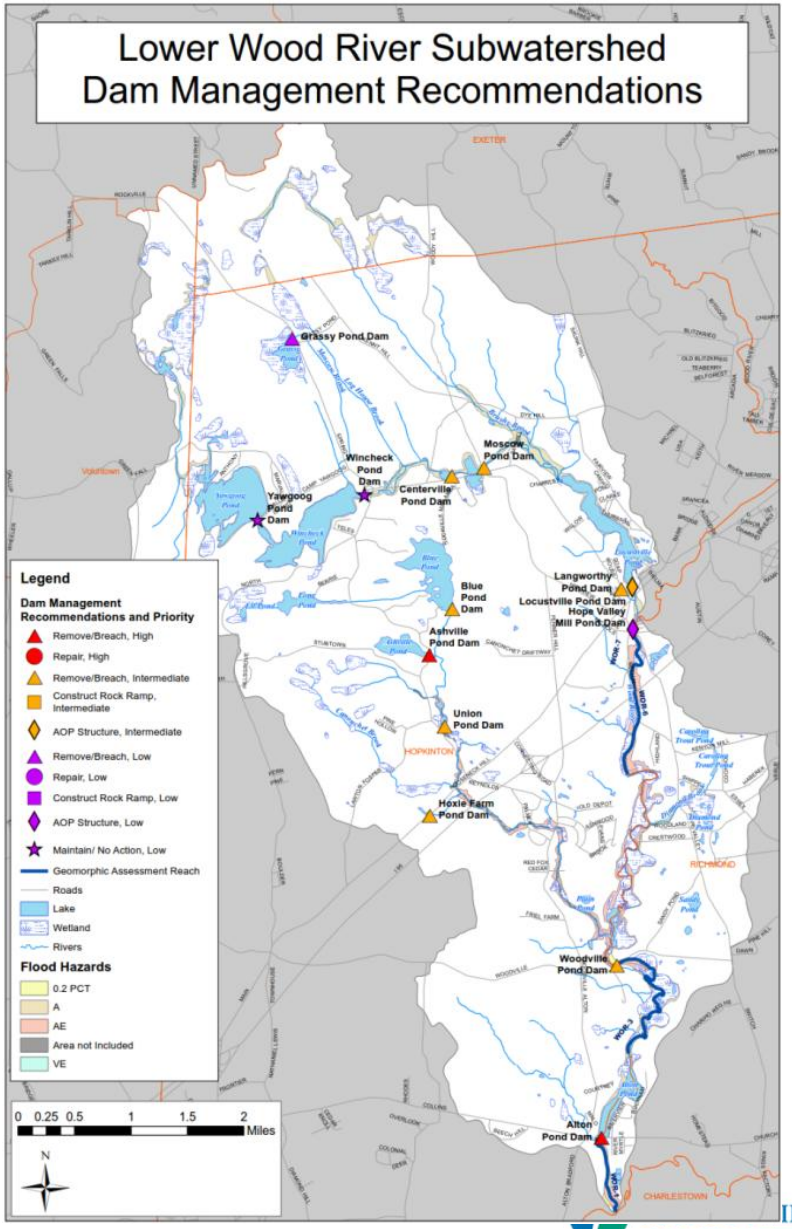
Dam Assessment Results





Assessment Recommendations

- Watershed plan will identify prioritized recommendations for bridges, culverts, and dams
  - Recommendations by subwatershed
  - Typical design and permitting considerations
  - Approximate costs
  - Potential funding sources
- More detailed evaluation needed to confirm feasibility of recommendations and to support design and permitting

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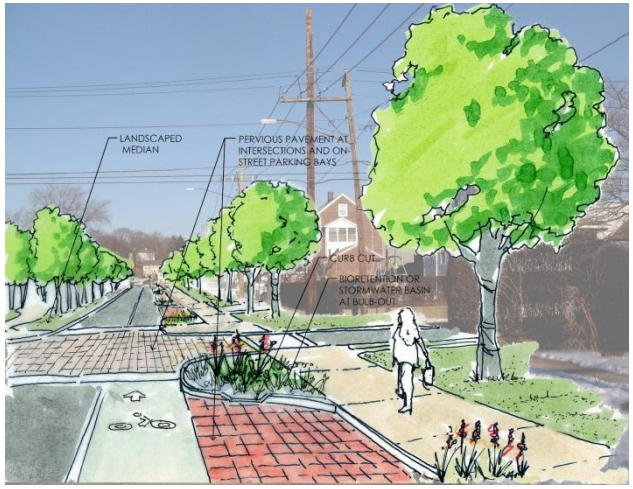
Geomorphic Assessment

John Field, Field Geology Services

Green Infrastructure Assessment

- Identify Opportunities for Green Infrastructure (GI) Retrofits
  - Enhance resiliency
  - Provide water quality and ecosystem benefits
- Approach
  - GIS Screening evaluation
  - Field inventories
  - Concept designs

Parcel or Site-Based Retrofits



ROW/Street Retrofits

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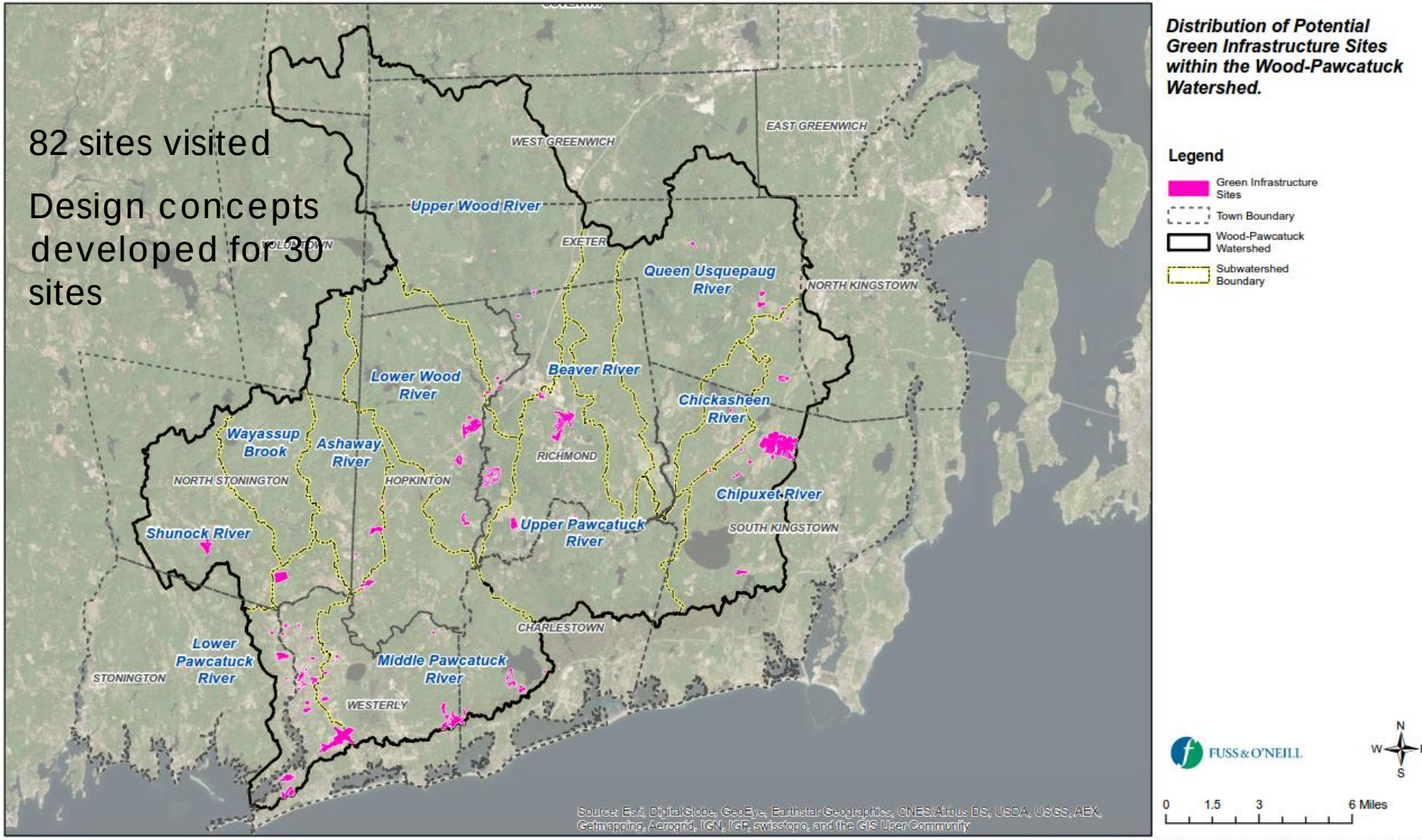
Potential GI Retrofit Sites



Retrofit Site 272A – Westerly Senior Center Bioretention

State Street, Westerly, Rhode Island

Site Description

The proposed retrofit concept is located at the Westerly Senior Center near the intersection of Westminster and State Streets in Westerly, RI. The site consists of an asphalt parking lot divided into multiple parking areas. There is a swale located between two sections of the parking lot, and some runoff is directed to the swale but no overflow or formal BMP exists, nor does the swale capture all of the runoff that could be directed to it.

Proposed Concept

Retrofit the current swale as a bioretention/infiltration practice. The practice would be designed to accept runoff from the surrounding parking lot and additional areas of the site and parking lot. If desired, an overflow structure could be incorporated into the design and connected to current stormwater drainage infrastructure located on Westminster Street.

Image 1: Close-up view of proposed bioretention/infiltration area.

Retrofit Concept Summary
Total Drainage Area: 1.2 acres
Total Impervious Area: 1.0 acres
Total Water Quality Volume: 3,794.0 ft^3
Runoff Reduction Volume: 379.4 ft^3

Estimated Pollutant Removal
Bioretention Area
Total Phosphorus ≈ **0.5 lbs/year**
Total Nitrogen ≈ **10.5 lbs/year**
Total Suspended Solids ≈ **410.2 lbs/year**
Bacteria (FC) ≈ **307.5 billion colonies/year**

Estimated Cost
Bioretention Area: $51,032

Image 2: Rendering of a typical bioretention area. (Image source: Johnson County Soil and Water District)

Image 3: View of proposed bioretention/infiltration area and some of the parking area that would drain to it.

Legend

- Existing Catch Basin
- Proposed Catch Basin
- Proposed Overflow Structure
- Proposed Level Spreader
- Proposed Storm Drain
- BMP Drainage Area Boundary
- Bioretention
- Raingarden
- Underground Infiltration
- Green Roof
- Pervious Pavers
- Forested Buffer
- Articulating Concrete Matting

0 45 90 180 Feet

N W E S

Disclaimer: This map is not the product of a Professional Land Survey. It was created by Fuss & O'Neill, Inc. for general reference, informational, planning and guidance use, and is not a legally authoratative source as to location of natural or manmade features. Proper interpretation of this map may require the assistance of appropriate professional services. Fuss & O'Neill, Inc. makes no warrantee, express or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

Data Source(s): Drainage Areas by Fuss & O'Neill, 2016; Aerial Photography; April 2014 USGS 0.3 m multispectral ortho imagery, downloaded from ArcGIS Online; Contour Lines from Northeast LiDAR Project 2011, RIGIS

Stormwater Retrofit Concept

Westerly Senior Center (272 A)

Retrofit Site No. 272

Westerly Rhode Island

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Watershed Wetlands Assessment

- Wetlands can provide flood mitigation, habitat, water quality, and other functions
- Identify and prioritize conservation and restoration opportunities
  - GIS-based screening
  - USFWS NWI Plus Dataset for RI and CT
  - Rhode Island Freshwater Wetland Restoration Strategy (Miller and Golet, 2001- URI)

U.S. Fish & Wildlife Service

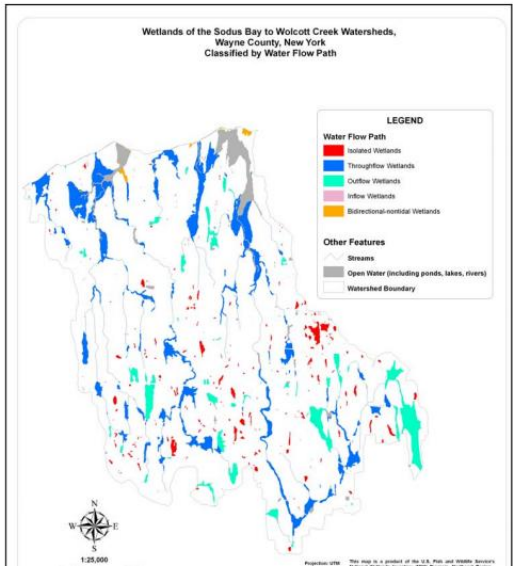
NWIPlus: Geospatial Database for Watershed-level Functional Assessment

While much government attention has focused on creating methods for site-specific analysis of wetland functions for evaluating the impacts of proposed development and for predicting the condition of wetlands through probabilistic sampling, the U.S. Fish and Wildlife Service has been developing techniques to use its National Wetlands Inventory (NWI) data to predict wetland functions for watersheds.

What is NWIPlus?

Recognizing the value of adding hydrogeomorphic properties to the NWI database (i.e., increased functionality), the NWI created a set of hydrogeomorphic-type descriptors that could be added to NWI types to facilitate predicting wetland functions. The combination of these attributes with traditional NWI types can be called "NWIPlus" resulting in an enhanced NWI database.

The new attributes describe landscape position (relation of a wetland to a waterbody if present: marine - ocean, estuarine - tidal brackish, lotic - river/stream, lentic - lake/reservoir, and terrene – not affected by such waters), landform (physical shape of the wetland – basin, flat, floodplain, fringe, island, and slope), water flow



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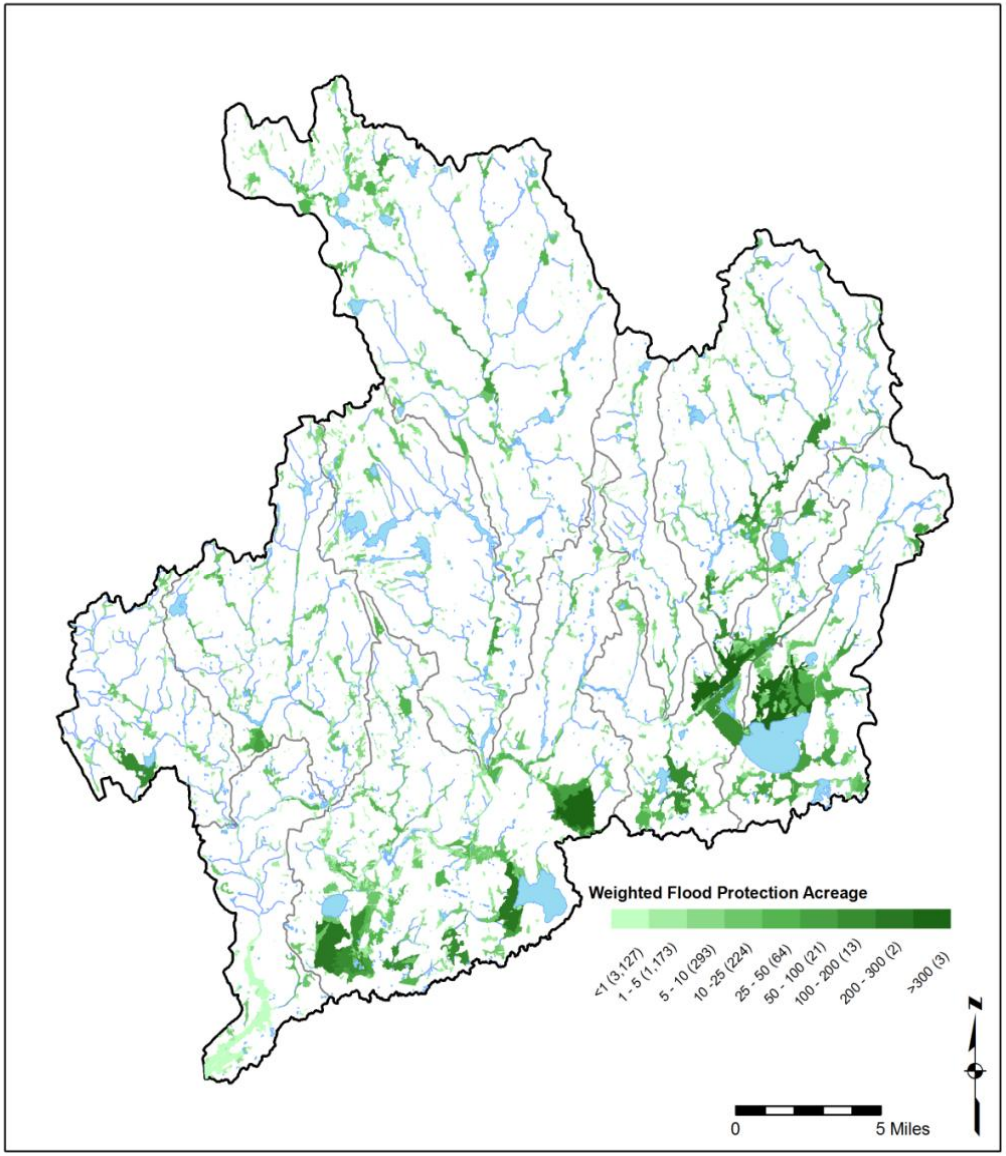
Watershed Wetlands Assessment

- 80 wetland complexes with flood protection function and human modification
- 24 assessed in the field for functions and values
- Several impoundments/dams with high conservation potential (Hazard Pond, Dolly Pond, Kasella Farm Pond)
- Other wetland restoration opportunities identified



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Watershed Plan Development

- Integrate findings and recommendations of technical assessments (see the boards around the room)
- Integrate input from the municipalities and the public
- Develop actions, schedule, lead groups, costs, funding sources, etc.

Potential Management Actions

- Land use regulatory controls
- Active restoration
  - Elevating and flood proofing structures
  - Dam removal
  - Aquatic connectivity obstruction removal
  - Bridge and culvert retrofits and replacements
- Passive restoration
  - Riparian buffer restoration and protection
  - Stream bank stabilization
  - Corridor easements
- Reach-scale river restoration
- Green infrastructure stormwater management
- Wetland and habitat restoration
- Related water quality mitigation

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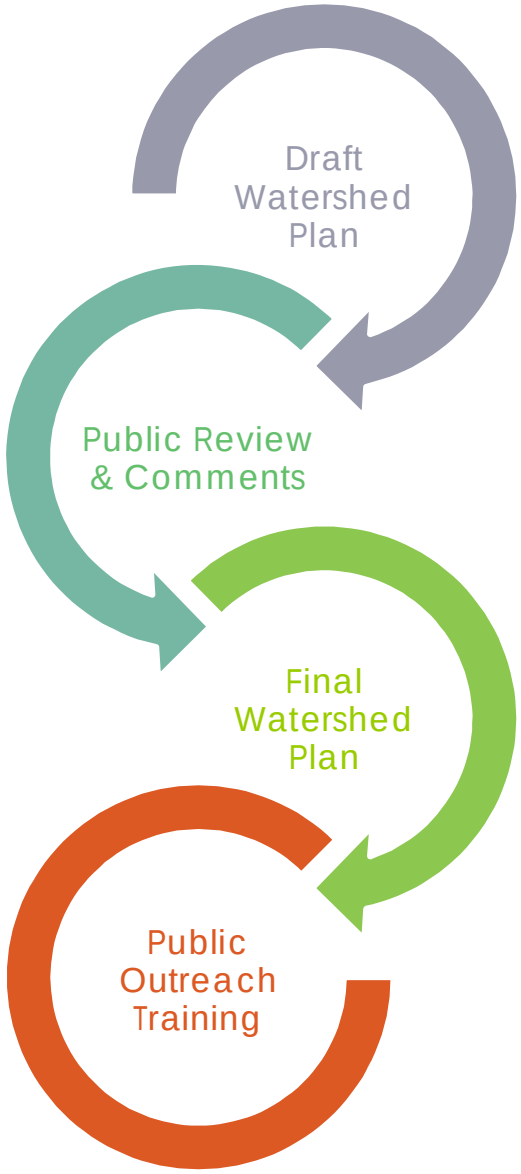
Next Steps

- Draft technical assessment reports are available for download and review
- Comments are welcome and encouraged



December

January

February

March

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Questions and Discussion

1. What are your main concerns regarding the Wood-Pawcatuck watershed?

2. What would you most like to see as outcomes of the Wood-Pawcatuck Watershed Flood Resiliency Management Plan?

3. Do you have any specific project ideas or recommendations for your area of the watershed?

FUSS & O'NEILL

Project Contacts

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