

Wetland and Stream Restoration Opportunities in New Hampshire



Restoration and Enhancement “Menu”

Range of techniques can be used to *increase the functions and values* of a degraded or altered wetland or stream

Restoration

- Excavating fill
- Restoring hydrologic regimes and aquatic connections
- Filling drainage ditches and removing drainage tiles
- Removing dams, culvert, and roads
- Rebuilding shorelines
- Removing hard bank armoring

Enhancement

- Riparian plantings and passive regeneration
- Buffer improvements to improve water quality
- Upgrading stream crossings

Creation

- Vernal pools *if appropriate* landscape and *protection is feasible*

Wetland Restoration and Enhancement Projects that can be Funded by ARM

Restoring Hydrology and Vegetation

- Remove fill from degraded wetlands on conserved lands
- Remove drainage ditches and berms
- Remove old roads
- Native plantings



Tidal Restoration and Enhancement Projects that can be Funded by ARM

Projects that will improve:

- Marsh migration
- Address rising sea levels and climate change adaptability
- Flood storage
- Improve anadromous fish migrations
- Create and enhance wildlife habitat
- Restore nutrient exchange and tidal flushing of upstream wetlands



*Salt marsh at Lubberland Creek Preserve in Durham, NH.
Photo Credit: The Nature Conservancy*

Living Shorelines

Management practice to prevent erosion and protect, restore, or enhance shoreline habitat and coastal processes

- Strategic placement of plants, natural rock, and sand fill
- Regrading topography to match natural shoreline



Resources

- [NHDES Coastal Program](#)
- [NH Coastal Adaptation Workgroup](#)
- [University of New Hampshire](#)
- [NOAA Living Shoreline Workgroup](#)



Living Shorelines

Wagon Hill Erosion Management

- Shoreline erosion at rates of up to one foot per year
- Significant loss of salt marsh



Living Shorelines

Project Team: *Town of Durham, UNH, NHDES Coastal Program*
Total Cost: \$411,476 ARM: \$200,000 (47%)

Wagon Hill Erosion Management

- Living stone sill to reduce wave energy and ice damage
- Backfilled to restore salt marsh area with gradual upland slope to enable salt marsh migration
- 30,000 saltmarsh plants
- Fence and signs to reroute foot traffic

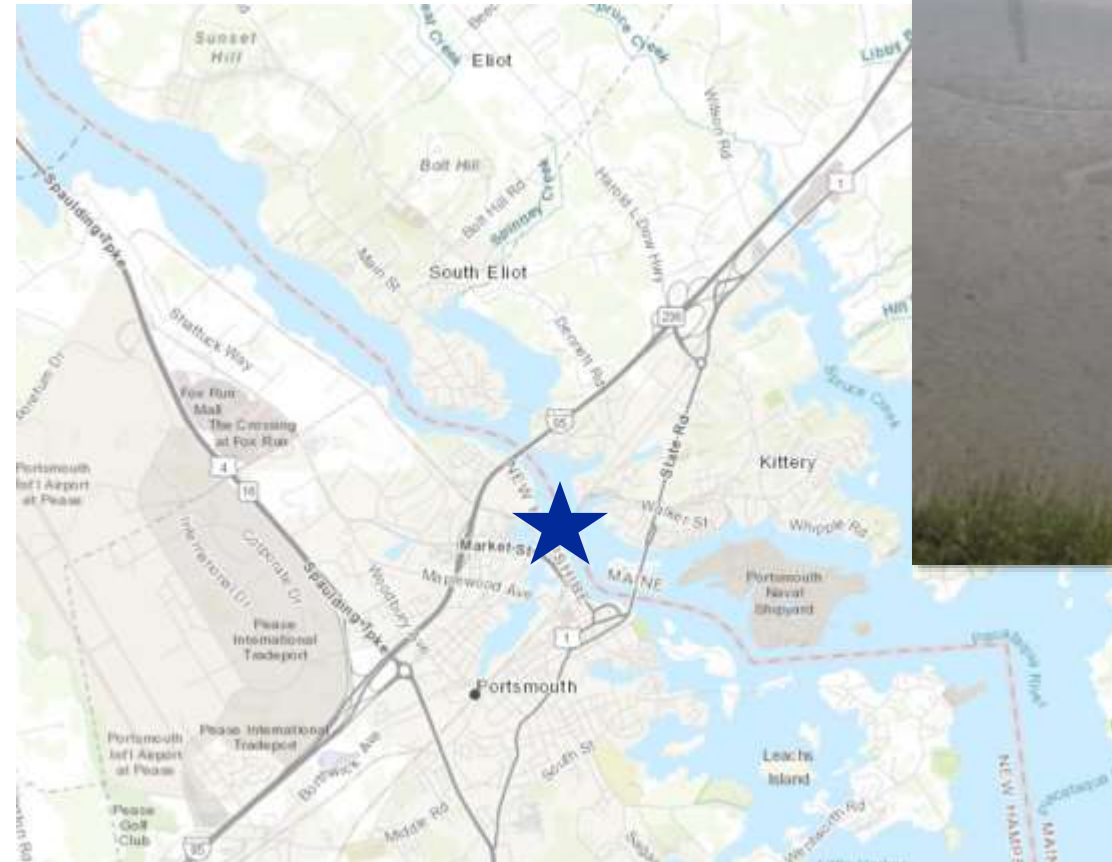


Photo Credit: New Hampshire Coastal Adaptation Workgroup

Living Shorelines

Cutts Cove fringe salt marsh

- Shoreline was filled and armored with rip-rap up to 12 feet above mean high tide



Living Shorelines

Project Team: *University of NH, NHDES Coastal Program*

Total: \$263,156 ARM: 134,736 (51%)

Cutts Cove fringe salt marsh

- Mudflat enhancement by native shell placement
- Removed 200 ft of armoring
- Create 6,000 SF intertidal salt marsh protected by rock sill
- Regrading and plantings in Tidal Buffer Zone for marsh migration with sea level rise



Photo Credits: University of New Hampshire

Removing Tidal Restrictions

A structure or landform that prevents normal tidal exchange in estuarine systems

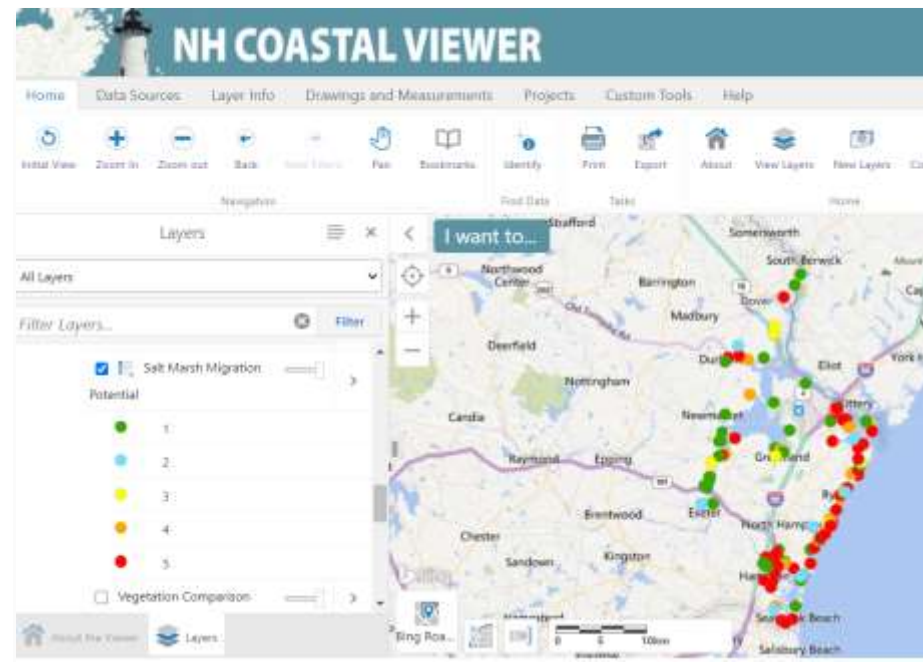
- Dikes, berms, levees
- Undersized bridges and culverts
- Roads and causeways
- Dams



Herring River, MA National Park Service

Resources

- [NHDES Coastal Program](#)
- [NHDES River Restoration Program](#)
- [Dam Bureau](#)



Lubberland Creek Culvert, Newmarket

- 36" rusted metal pipe was undersized
- Erosion and scour problems
- Flood hazard
- Tidal restriction
- Barrier to fish from Great Bay Estuary



Lubberland Creek Culvert, Newmarket

Project Team: *Town of New Market,
TNC, NHDES Coastal Program*
Total: \$411,476 ARM: \$200,000 (47%)

- 16' box culvert with streambed simulation
- Accommodate 100-year flood with sea level rise projections
- Allows marsh migration and tidal exchange
- Restored downstream channel
- Reconnect tidal flow to 2 miles upstream wetlands
- Fish passage



Stream Restoration and Enhancement Projects that can be Funded by ARM

Projects that will restore aquatic connectivity, improve wildlife habitat and stream processes, & increase flood resiliency

- Daylighting buried streams
- Habitat enhancements for fish and wildlife (e.g. wood additions, riffle and pool formation, grade controls)
- Floodplain reconnection
- Bank stabilization with bioengineering
- Removing hard bank armoring
- **Removing aquatic barriers**



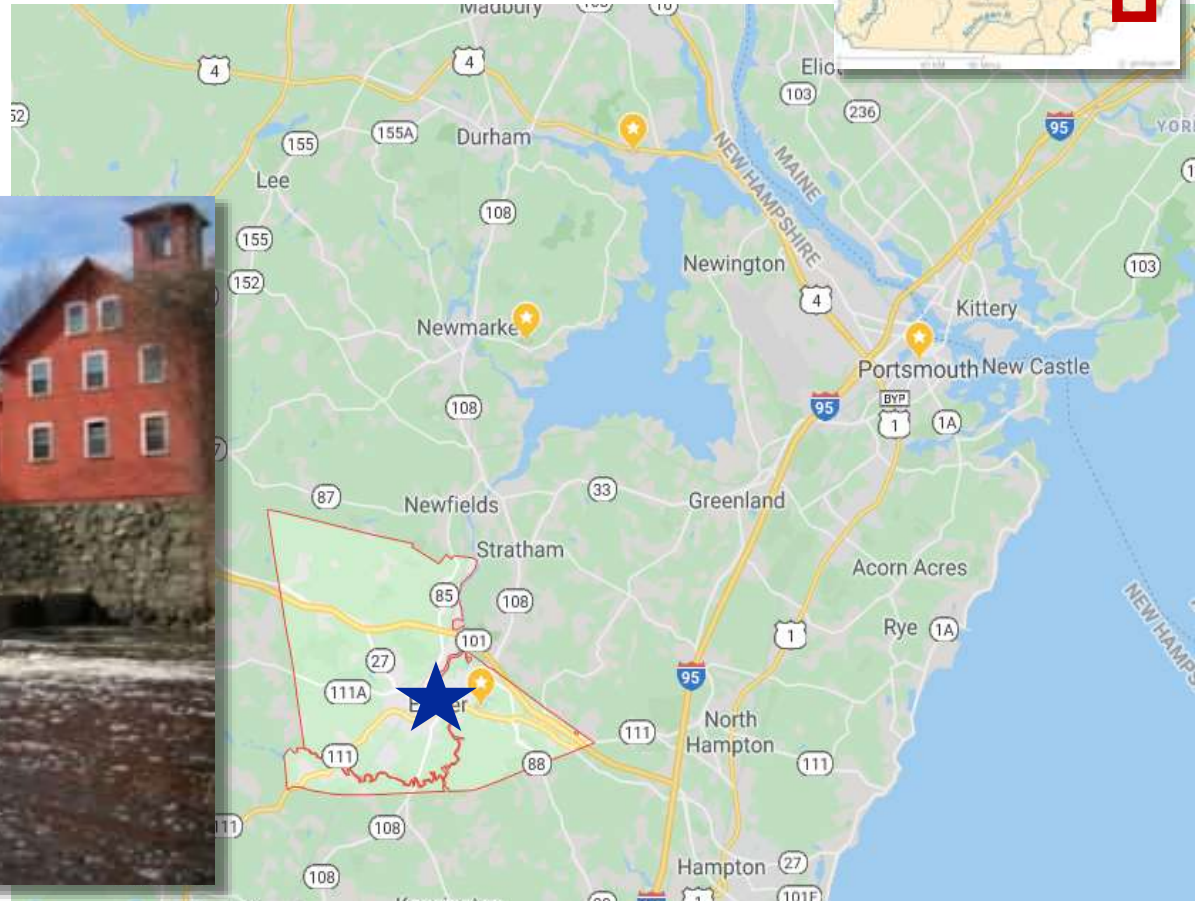
Wood additions create pool habitat for Brook Trout in Nash Stream



Coir logs, wood, and buffer plantings can be used to stabilize stream banks rather than hard rock

Great Exeter Dam Removal

- Lowest dam on a major tributary to the Great Bay
- Tidal/freshwater interface
- Barrier to anadromous fish migrations
 - American eel
 - River herring
 - Alewife



Great Exeter Dam Removal

- Dam removed in 2016
- Reconnected 15 miles of the Exeter River and tributaries to free-flowing condition
- Re-established stream geomorphology in previously impounded area

Total: \$1,968,854
ARM: \$100,000 (5%)



Daylighting Berry Brook in Dover

Project Team: *UNH Stormwater Center, City of Dover*
Total: 1,322,000 ARM: 400,000 (30%)

- Reconstruction of ~960' of historic stream channel that was underground
- Reconnected ~1 mile of 1st order stream and removed fish barriers
- Restored 2.5 acres of wetland
- Preserved 5 acres of land at headwaters of the Cocheco River



Stream Crossing: Opportunities to Restore Aquatic Connectivity

- ~20,000 stream crossings in NH
 - Many are old, undersized, and a public safety hazard
- Upgrade to meet [NH Stream Crossing Guidelines](#)
 - Opportunity to restore connectivity and enhance stream functions
 - Increase flood resiliency



Eligible Projects for ARM Funds

- **Barrier to aquatic organisms**
- Incompatible with natural stream
- Scour, erosion, and bank failure
- Water quality degradation from road fill entering stream



Stream Crossing: Opportunities to Restore Aquatic Connectivity

New Hampshire Stream Crossing Initiative

- Stream crossing surveys across the state
- Consistent protocol

Rank Crossings for:

- ✓ Geomorphic compatibility
- ✓ Aquatic organism passage
- ✓ Asset condition
- ✓ Flood vulnerability



Access to Stream Crossing Surveys and Stream Data

ARM Fund

Aquatic Resource Mitigation in New Hampshire

A State of New Hampshire website



HOME

ABOUT

MITIGATION

GRANTS

MAPPER

SUCCESS STORIES

PUBLICATIONS

FOR RECIPIENTS

The Aquatic Restoration Mapper

User Manual

Mapper Tutorial



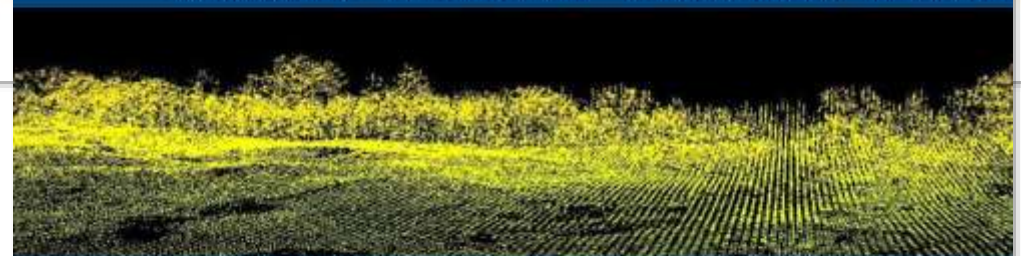
Mission



[Advisories](#) | [Events](#) | [OneStop](#)



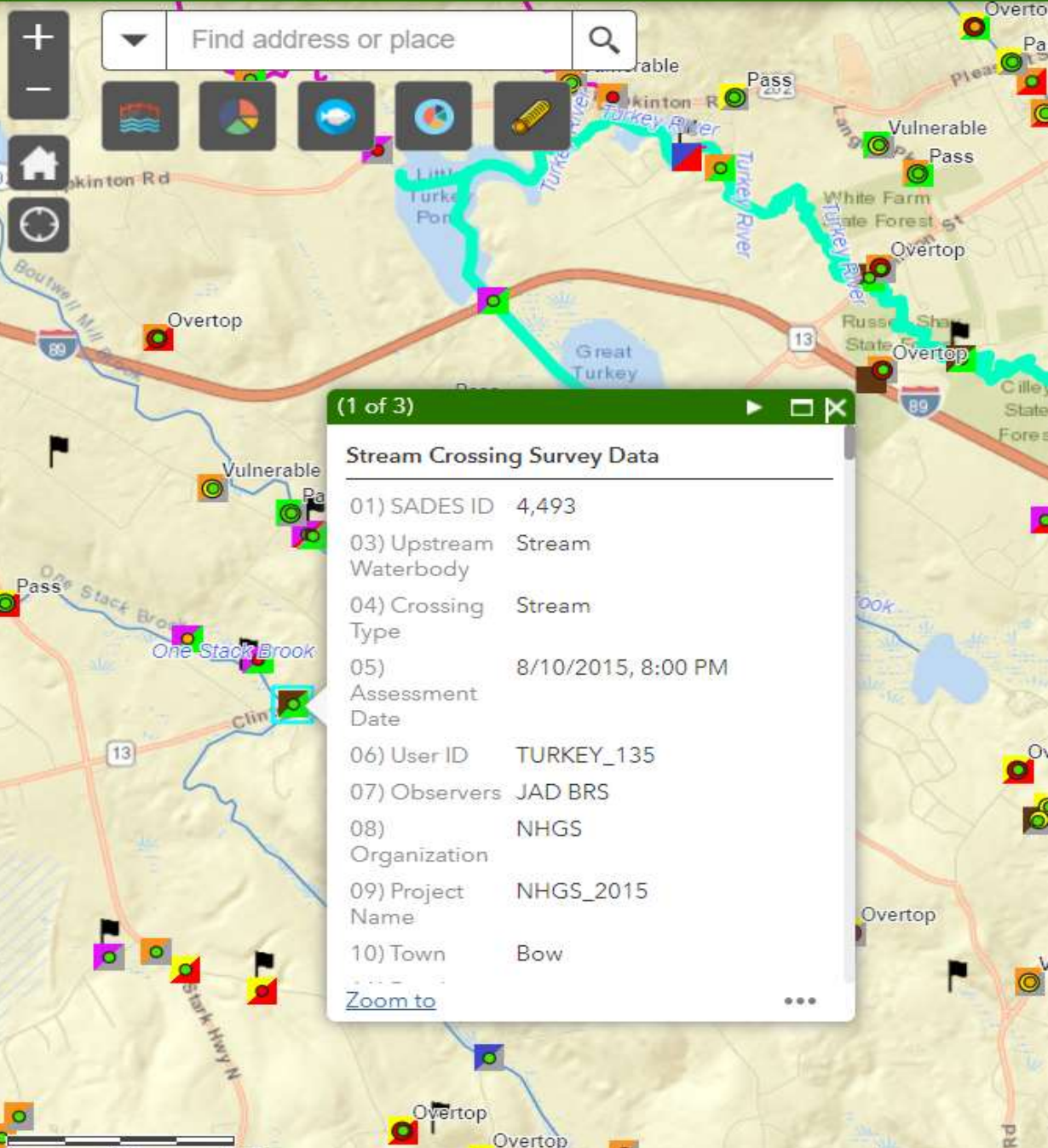
[Home and Recreation](#) | [Business and Community](#) | [Climate and Sustainability](#) | [Rules and Regulations](#)



[Home](#) > [Resource Center](#) > [Data and Mapping](#)

Data and Mapping

Maintaining and contributing to many maps and databases, including a statewide GIS clearinghouse.



Legend

- Condition**
 - Good
 - Fair
 - Poor
- Hydraulic Vulnerability 10-Year Flood**
 - Pass
 - Vulnerable
 - Overtop
- Aquatic Organism Passage Score**
 - ▲ Full Passage
 - ▲ Reduced Passage
 - ▲ Passage only for Adult Trout
 - ▲ No Passage
 - ▲ Other
- Geomorphic Compatibility Score**
 - Wetland Crossing
 - Lake/Pond Crossing
 - Fully Compatible
 - Mostly Compatible
 - Partially Compatible
 - Mostly Incompatible
 - Fully Incompatible
 - Other

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Stream Crossing Survey Data

01) SADES ID	4,493
03) Upstream Waterbody	Stream
04) Crossing Type	Stream
05) Assessment Date	8/10/2015, 8:00 PM
06) User ID	TURKEY_135
07) Observers	JAD BRS
08) Organization	NHGS
09) Project Name	NHGS_2015
10) Town	Bow

[Zoom to](#) ...

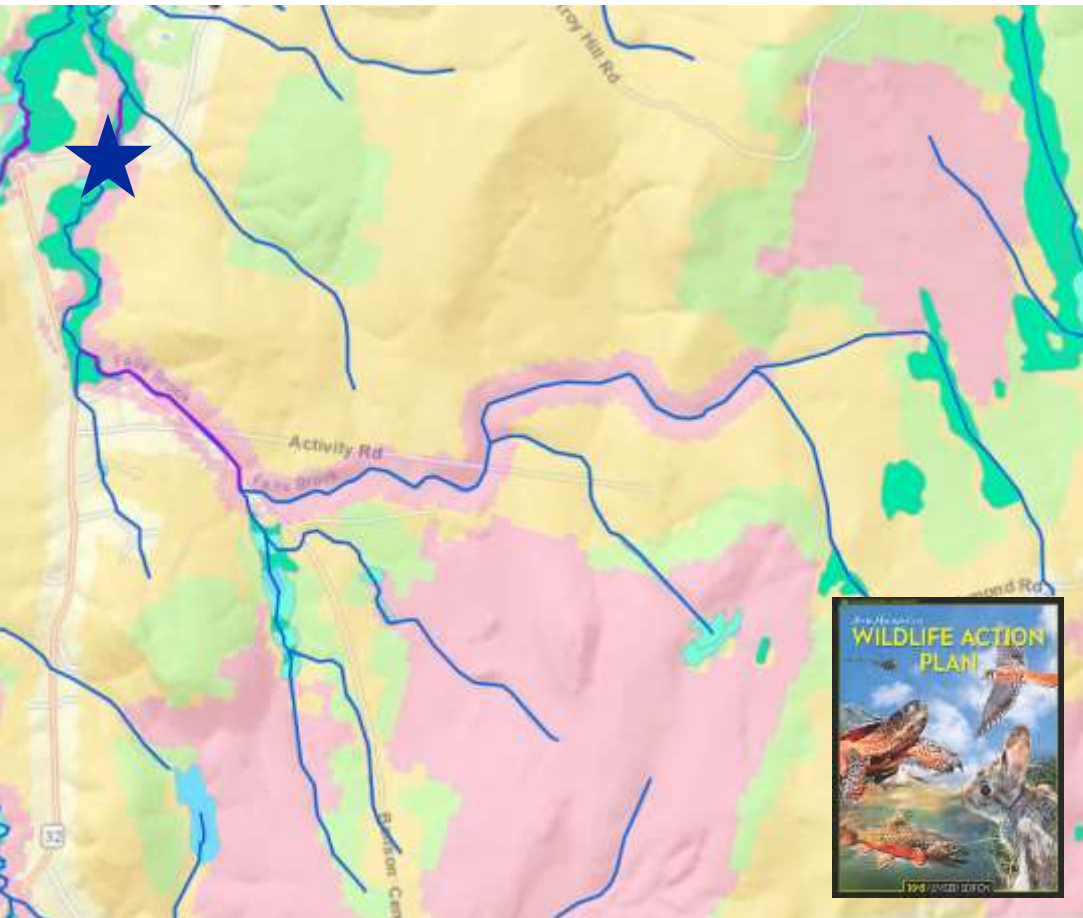
Falls Brook Culvert, Swanzey NH

- Undersized 50' long metal pipe
- Severe erosion and streambed scour
- Barrier to brook trout coldwater spawning



Falls Brook Culvert, *Swanzey NH*

- Undersized metal pipe
- Severe erosion and streambed scour
- Barrier to brook trout coldwater spawning



Falls Brook Culvert, Swanzey

Project Team: *Cheshire Conservation District, Trout Unlimited*
Total: \$175,000 ARM: \$115,000 (66%)

- Upgraded to 23-foot span open-bottom arch
- Plantings and bank stabilization
- Fish passage restored to 10 miles of upstream coldwater habitat



Grade Controls

Thompson Brook, Surry

- 3' perched box culvert
- Downstream grade controls to recreate step-pool habitat
- Reduce perch to 6"
- Passable by brook trout
- Access to ~1 mile coldwater habitat

Project Team: *T out Unlimited, Cheshire Conservation District,*
Total: \$108,295 ARM: \$74,195 (69%)



Agriculture/Forestry Stream Crossing, Colebrook

Project Team: *The Nature
Conservancy, NH F&G*

Total: \$ 11,513 ARM: \$11,513 (100%)

- Degraded, metal pipe culvert
- Barrier to fish passage and washed out, banks failing
- Replaced with open span skidder bridge



Upland Buffer and Riparian Restoration and Enhancement

Project Team: *The Nature Conservancy, NH F&G*

Total: \$149,375 ARM: \$50,000 (34%)

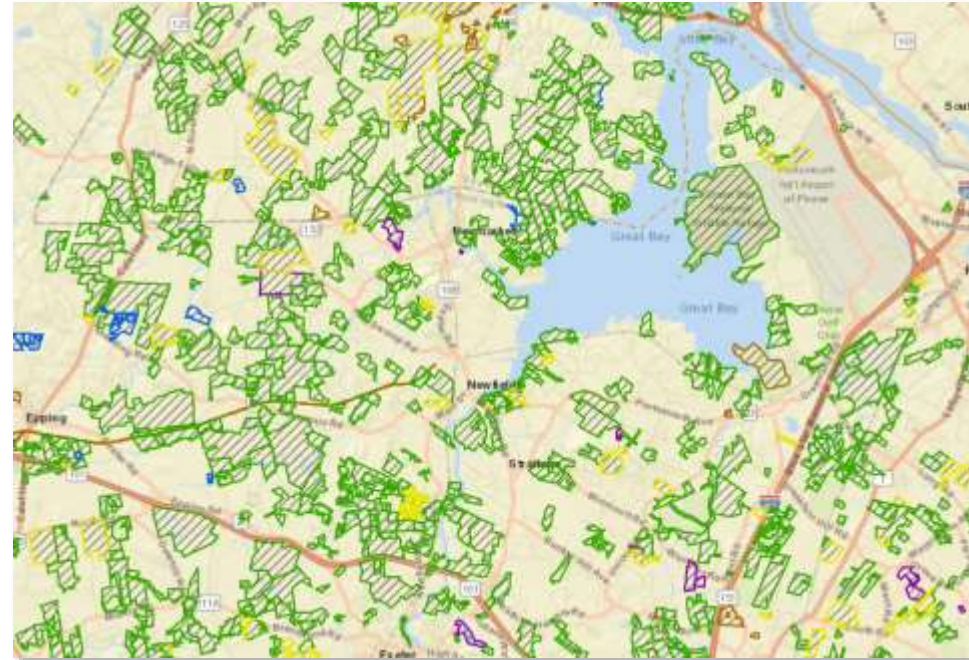
Upper CT Floodplain Plantings

- Replant old agriculture fields and increase the riparian buffer to 100'
- Treatment of invasives



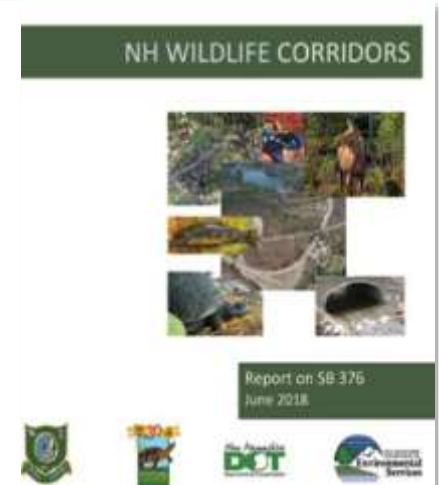
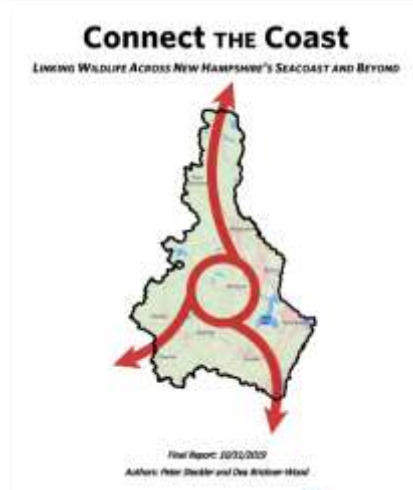
Identifying Restoration Priorities and Resources to Target Good Projects

- Look for projects on existing conservation lands
 - Guarantees the restored aquatic resource will be protected
 - Not required for dam removal and culvert projects
- Areas important for landscape connectivity
 - **Conservation focus areas**
 - **Corridors**



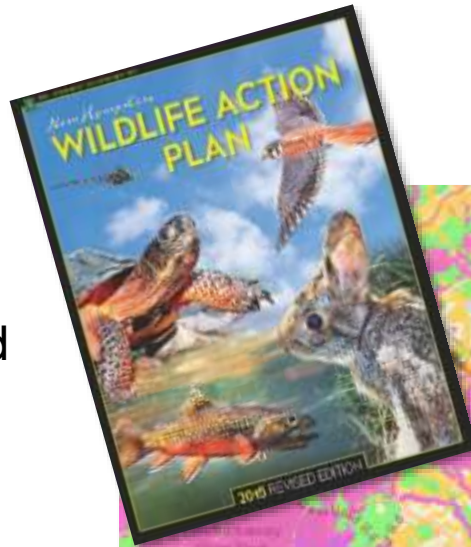
Resources

- [The Nature Conservancy Connect the Coast](#)
- [NH F&G Wildlife Corridors](#)



Identifying Restoration Priorities and Resources to Target Good Projects

- High quality fish and wildlife habitat
- Opportunity to improve habitat conditions
 - NHFG WAP Tier 1 and Tier 2
 - Benefits to threatened and endangered species
 - Aquatic WAP Fish Priorities



Legend

Wildlife Action Plan 2020: Highest Ranked Wildlife Habitat

WAP 2015: Highest Ranked Wildlife Habitat

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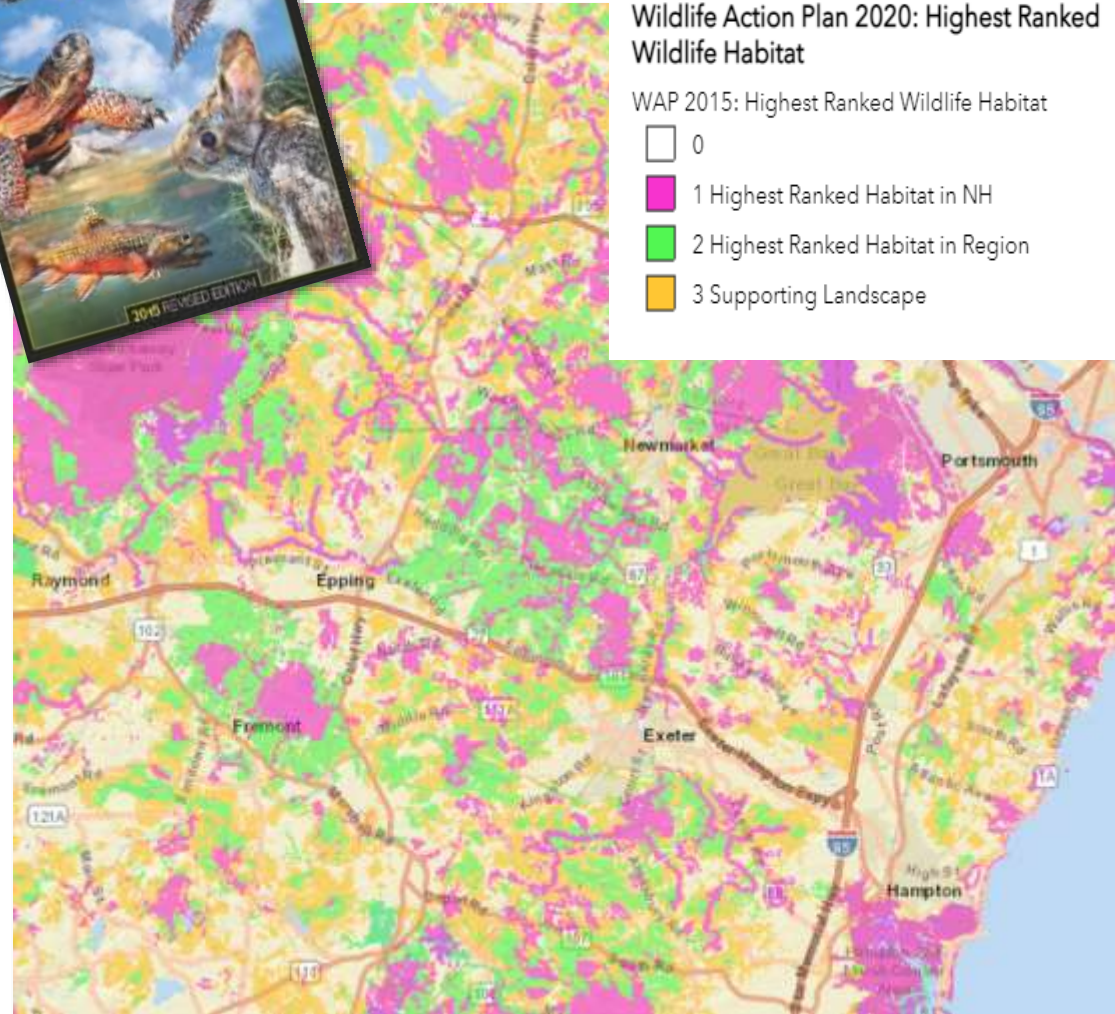
■ 1 Highest Ranked Habitat in NH

■ 2 Highest Ranked Habitat in Region

■ 3 Supporting Landscape

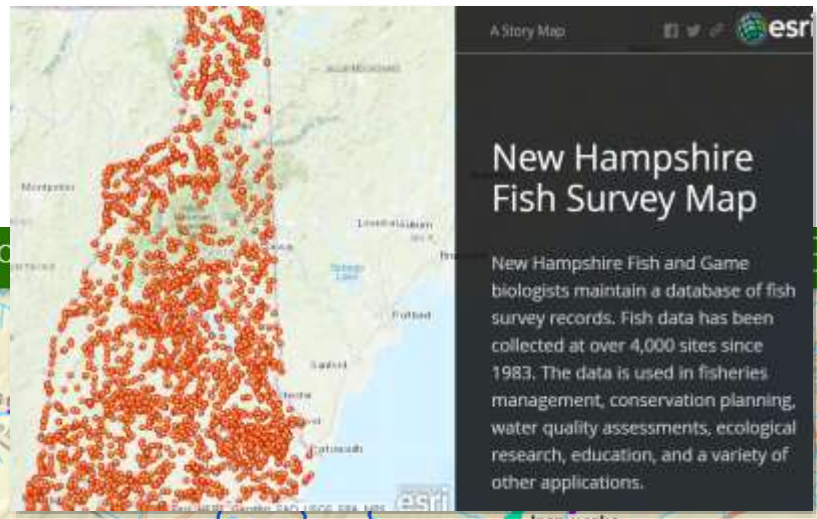
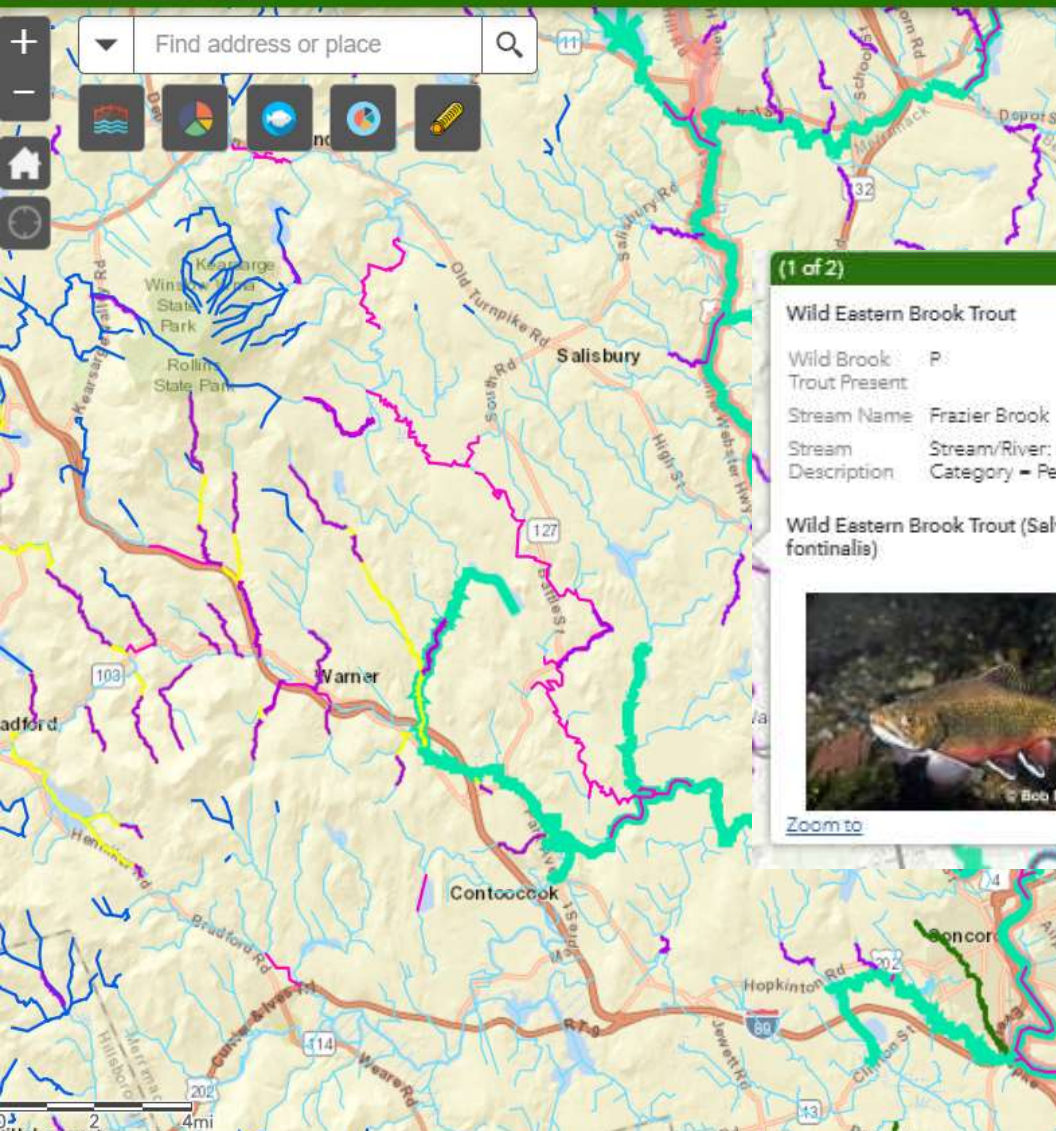
Resources

- [NH Fish and Game Wildlife Action Plan](#)
- [NH Heritage Bureau](#)



NHFG Aquatic WAP Fish Habitat

NH Aquatic Restoration Mapper Stream C




(1 of 2)

Wild Eastern Brook Trout

Wild Brook: P
Trout Present

Stream Name: Frazier Brook
Stream Description: Stream/River: Hydrographic Category - Perennial

Wild Eastern Brook Trout (*Salvelinus fontinalis*)



© Bob Michelson

Zoom to

- American Brook Lamprey
- Bridle Shiner Habitat
- Springfed Wild Brook Trout
- Wild Eastern Brook Trout
- Species of Concern
- NH Fish and Game Fishery Restoration Interest
- Herring Stock Location or Migratory Path
- Seacoast Anadromous Fish Habitat
- American Shad Spawning Habitat