FD#4

Southeast Connecticut Road-Stream Crossing Assessment for Community and Wildlife Resilience:

Findings Report and Restoration Opportunities

Prepared by:
Jon C. Vander Werff
Save the Sound
Fisheries Biologist
127 Church St, New Haven, CT 06510

Save the Sound®

Community Foundation of Eastern Connecticut

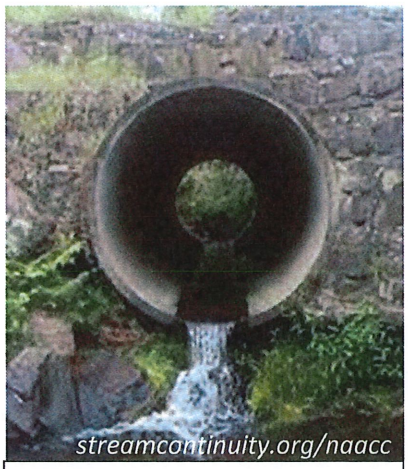
Table of Contents

project funding provided by:
Community Foundation of Eastern CT – 68 Federal Street, New London, CT 06320 – (860) 442 3572

Road-Stream Crossings: Aquatic Organism Passage and Community Resilience

Connectivity for Wildlife

"Road-stream crossings" are the bridges and culverts that are built to convey the waters of rivers, streams, and other wetlands. They are so ubiquitous along our roadways that they are rarely noticed, but there are more than 26,000 road-stream crossings in Connecticut. These crossings are built to convey people and vehicles over streams, typically with little consideration given to the wildlife that moves through and along the waterways below. Conventionally designed culverts can completely block passage of aquatic macroinvertebrates, fish, frogs, turtles, mink, beaver, ducks, and other species that live in or along streams. Species that cannot move on land are isolated in smaller habitat fragments that may not fully support their life cycle needs. As habitat conditions change (due to human activity, natural disturbances, or climate change), these species are not able to migrate to more suitable habitat for survival. Diadromous fish that need both fresh and saltwater habitats to live and spawn are particularly susceptible to these types of barriers and are regionally threatened. Tragically, species that can move on land are forced up and onto roadways where they can be hit and killed by traffic. These barriers present a serious threat to individual animals, as well as entire populations of wildlife. Woodland amphibians, struck en-mass on roads while migrating to vernal pools, are an example of species particularly threatened by wetland habitat fragmentation. Road-killed turtles are another common sight along streams in summer months, with the loss of breeding adults often spelling disaster for local populations.



This perched culvert is a dead-end for most wildlife species.

A bridge that spans the full stream and dry banks allows passage for many animals.

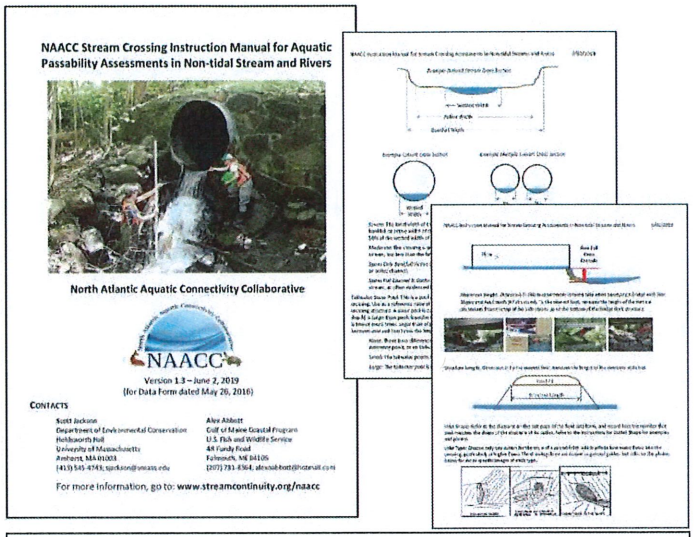
A culvert "washed out" by a storm in Beckett, MA.

Community Resilience

Crossings that are bad for wildlife are often bad for community resilience as well. Misaligned and/or undersized bridges and culverts that block wildlife passage are also more prone to flooding, debris jams, or washouts during high flows. These events are costly for towns to repair. They also create dangerous driving conditions and may block key routes for emergency vehicles during storms, leading to further community risk. Due to climate change, storms are becoming more frequent and severe across New England, posing even more risk to aging infrastructure and creating a growing need to provide timely emergency vehicle access to all residential areas.

Assessment Protocols and Database

Based on a growing realization of the risks and negative impacts associated with poorly designed road-stream crossings, the North Atlantic Aquatic Connectivity Collaborative (NAACC) was formed in 2015. NAACC maintains a spatial database of all known road-stream crossings in 13 northeast states, and trains engineers, environmental professionals, and community scientists to perform a standardized assessment survey protocol. This protocol involves in-the-field crossing structure measurements and ecological observations, followed by an automated computer modeling analysis of the data to produce a rating of barrier severity. As crossings are assessed, the NAACC database is updated. This free and publicly-available data can then be used by environmental and transportation planners to prioritize crossing for replacement or upgrades using advanced design standards (like USFS Stream Simulation, see attached guidelines). Furthermore, the ratings of individual crossings are compiled and used in combination with ecological data to produce prioritization models for connectivity restoration. Completing road-stream crossing assessments not only characterizes individual crossings, but contributes to landscape-scale planning for wildlife habitat and resilience.



NAACC protocols: standardized assessment instructions.

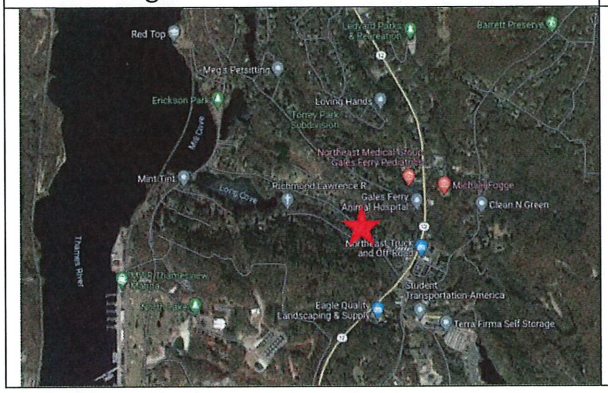
Restoration Opportunities

The ultimate goal of this effort is to identify the most important road-stream crossings for restoration and facilitate on-the-ground change. The descriptions, photos, maps, and design guidelines included with this report are intended to help Towns and regional planners prioritize infrastructure upgrades and apply for additional funding to redesign and replace or retrofit road-stream crossings for the benefit of both community resilience and ecological function. Successful implementation will mean safer roads, robust emergency access routes, and less frequent repairs. The result for wildlife will be functioning wetlands, connected habitats, and reduction in road-kills and injuries.

Success! A culvert replaced with a bridge on Churchill Brook in Pittsfield, MA allows wildlife to migrate and storm flows to pass through safely.

Priority Road-Stream Crossing Restoration Opportunity

#1 Flat Brook, Pinelock Dr, Ledyard

Upstream:	Downstream:
	
Aerial Image:	**Map Screen Shot:**
	

Structure Info:

- Located under a dead-end road, Pinelock Drive
- Two undersized perched, round culverts creating very large scour pool
- Evidence of erosion along Long Cove Road
- Damage to downstream headwall has occurred, large tress growing out of damaged area
- Susceptible to wash out during storm event

Key findings from NAACC assessment:

- **Crossing type:** 2 round concrete culverts with 4 ft diameter
- **Crossing condition:** Poor
- **Constriction severity:** Severe
- **AOP Coarse Screen / NAACC AOP Score:** Reduced AOP / 0.51

Habitat Info:

- Close proximity to tidally influenced Thames River
- Downstream side of culvert perched, limiting fish passage
- Spawning habitat potential upstream

Restoration Recommendations:

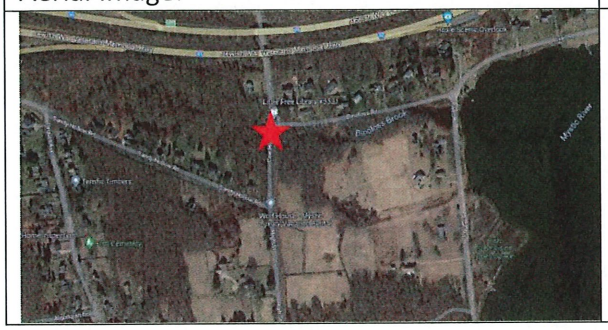
- Replace with Stream Simulation Design culvert or bridge: widen and restore stream channel (i) to increase hydraulic capacity and reduce over-topping risk, (ii) restore aquatic organism passage, and (iii) reduce debris accumulation and maintenance.
- Long Cove Road in need of bank stabilization for erosion control and storm resilience

#2 Bindloss Brook, Cow Hill Road, Groton

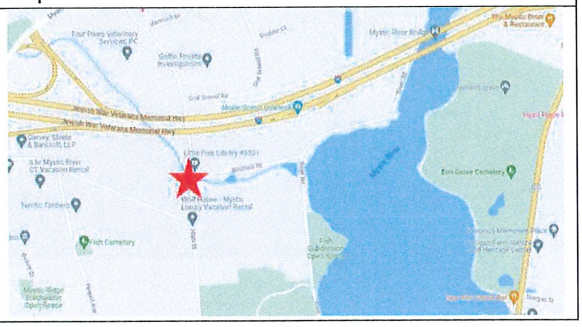
Upstream:

Downstream:

Aerial Image:



Map Screen Shot:



Structure Info:

- Near Cow Hill Road and Bindloss Road intersection
- Two Round Culverts undersized creating large scour pool downstream
- Sediment accretion evident upstream and erosion present downstream
- Limited depth of water in structure will likely limit fish movement and migration

Key findings from NAACC assessment:

- **Crossing type:** 2 round concrete culverts with 4 ft diameters
- **Crossing condition:** OK
- **Constriction severity:** Severe
- **AOP Coarse Screen / NAACC AOP Score:** Reduced AOP / 0.48

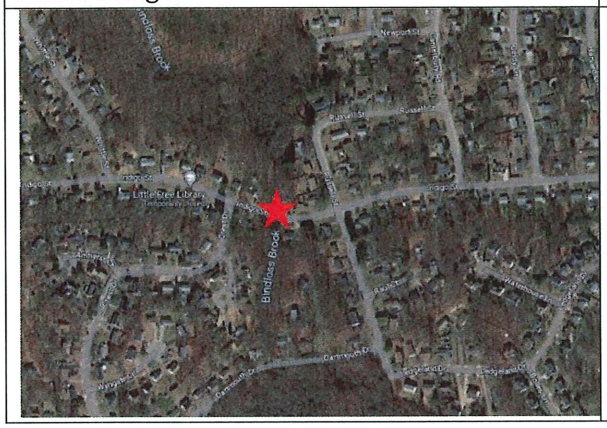
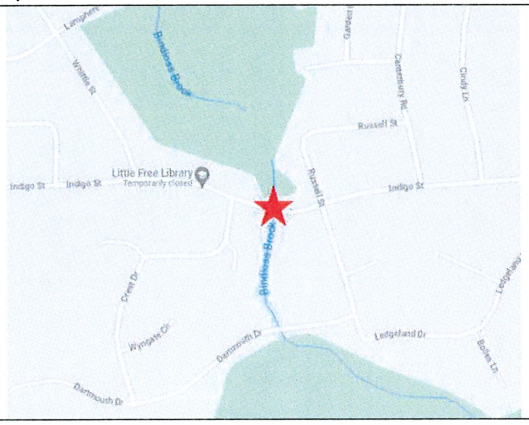
Habitat Info:

- Strong potential for spawning habitat upstream with restoration efforts
- Breached dam downstream is present at Bindloss Preserves, Avalonia Land Conservancy
- Structure is influencing substrate particle size, modifying habitat

Restoration Recommendations:

- Replace with Stream Simulation Design culvert or bridge: widen and restore stream channel (i) to increase hydraulic capacity and reduce over-topping risk, (ii) restore aquatic organism passage, and (iii) reduce debris accumulation and maintenance.
- Stabilize outlet with riparian plantings and stone to reduce erosion

#3 Bindloss Brook, Indigo Street, Groton

Upstream:	Downstream:
	
Aerial Image:	**Map Screen Shot:**
	

Structure Info:

- Between 243 and 219 Indigo Street
- Single culvert with shallow water depth likely to limit aquatic organism passage
- Perched downstream side of structure reduces aquatic organism passage
- Secondary storm drain outlet present on downstream side of structure

Key findings from NAACC assessment:

- **Crossing type:** Single primary concrete culvert with 4.5 ft diameter.
- Crossing condition: OK
- **Constriction severity:** Moderate
- **AOP Coarse Screen / NAACC AOP Score:** Reduced AOP / 0.06

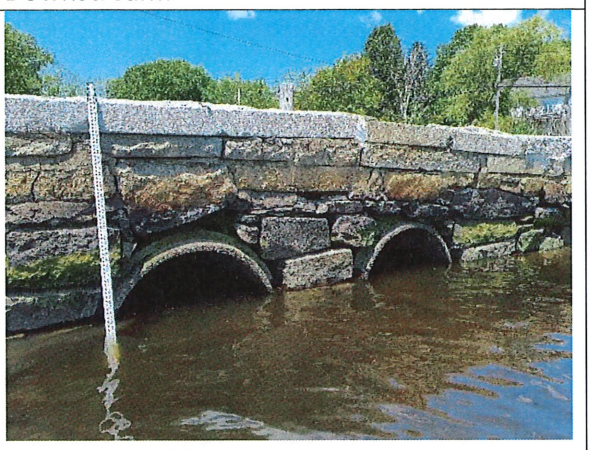
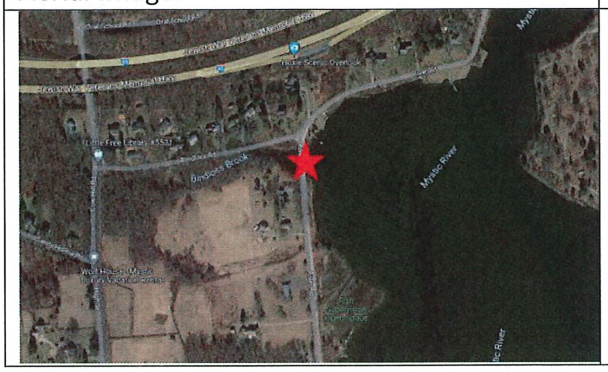
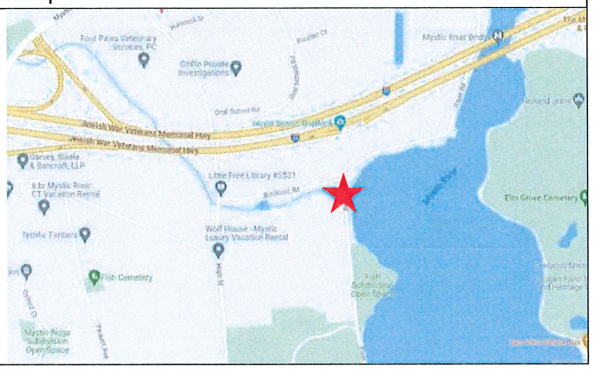
Habitat Info:

- Prominent wetland upstream
- Large sediment size for increased habitat accessibility
- Dense canopy cover moderates water temperatures

Restoration Recommendations:

- Replace with Stream Simulation Design culvert or bridge: widen and restore stream channel (i) to increase hydraulic capacity and reduce over-topping risk, (ii) restore aquatic organism passage, and (iii) reduce debris accumulation and maintenance.

#4 Bindloss Brook, River Road, Groton

Upstream:	Downstream:
	
Aerial Image:	**Map Screen Shot:**
	

Crossing Info:

- Two round culverts 4 ft in diameter, restrict fluvial and tidal flows
- High tide mark is close to road elevation
- Possible road over topping in storm event
- Restriction in flow path may lead to debris accumulation

Key findings from NAACC assessment:

- **Crossing type:** 2 round concrete culverts with 4 ft diameters
- **Crossing condition:** OK
- **Constriction severity:** Severe
- **AOP Coarse Screen / NAACC AOP Score:** Full AOP / 0.77

Habitat Info:

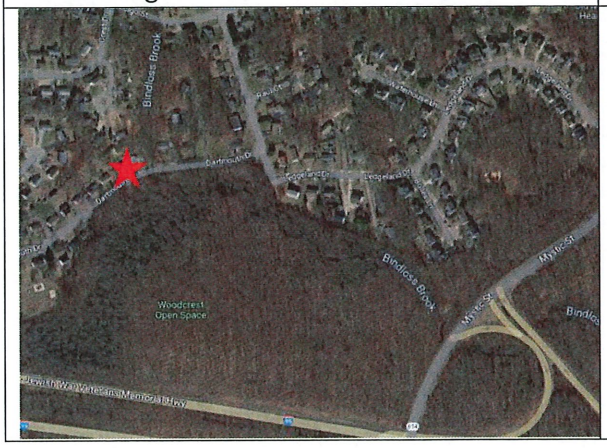
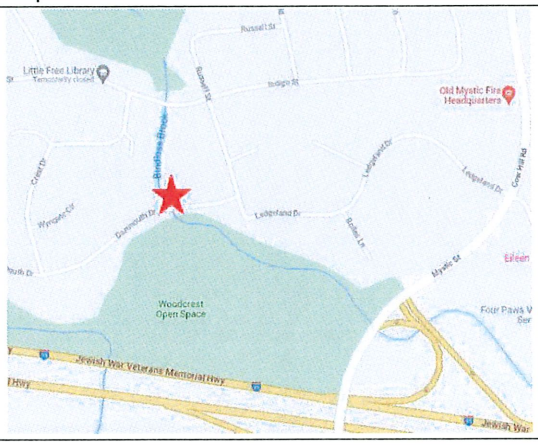
- Salt marsh presence upstream
- Strong spawning habitat potential upstream

Restoration Recommendations:

- Replace with wider culvert or bridge (i) to increase hydraulic capacity and tidal fluctuation, (ii) reduce debris accumulation and maintenance

Secondary Priority Road-Stream Crossing Restoration Opportunities

#5 Bindloss Brook, Dartmouth Rd, Groton

Upstream:	Downstream:
	
Aerial Image:	**Map Screen Shot:**
	

Structure Info:

- Upstream of Interstate I-95
- Three round culverts with minimal water depth moving through each
- Sharp skew of stream at entrance of structure increases maintenance needs

Key findings from NAACC assessment:

- **Crossing type:** 3 round concrete culverts with 3 ft diameter
- **Crossing condition:** OK
- **Constriction severity:** Moderate
- **AOP Coarse Screen / NAACC AOP Score:** Reduced AOP / 0.70

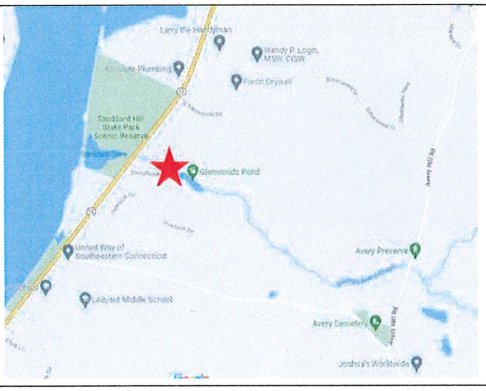
Habitat Info:

- Unknown downstream crossing conditions on I-95 due to limited access
- Shallow water depth in structure likely to limit aquatic organism passage
- Structure/stream design susceptible to sediment (cobbles and boulders) and debris accumulation

Restoration Recommendations:

- Replace with Stream Simulation Design culvert or bridge: widen and restore stream channel (i) to increase hydraulic capacity and reduce over-topping risk, (ii) restore aquatic organism passage, and (iii) reduce debris accumulation and maintenance.
- Restore stream channel to be in line with crossing structure

#6 Billings Avery Brook, Stoneybrook Rd, Ledyard

Upstream:	Downstream:
	
Aerial Image:	**Map Screen Shot:**
	

Structure Info:

- Fieldstone structure under Stoneybrook Road
- A small spillway immediately upstream of culvert inlet and Stoneybrook Road form the dam of Glenwoods Pond
- CTDEEP Dam Safety database identifies this as Long Pond Dam, #7220, Low Hazard
- Structure curves under the road

Key findings from NAACC assessment:

- **Crossing type:** single rock / stone box bridge with abutments 6 ft wide 10 feet tall
- **Crossing condition:** OK
- **Constriction severity:** Moderate
- **AOP Coarse Screen / NAACC AOP Score:** Reduced AOP / 0.70

Habitat Info:

- Pond habitat present for river herring spawning if access is provided
- Close proximity to tidally influenced Thames River
- Vegetation was thick and fallen trees were present
- Erosion present downstream
- Likely to be susceptible to storm debris jams because of design intricacies

Potential Restoration Recommendations:

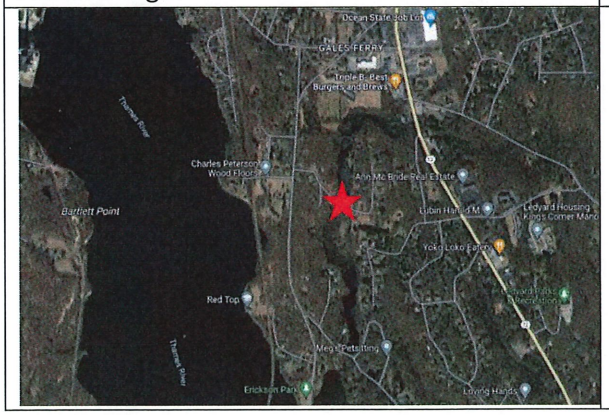
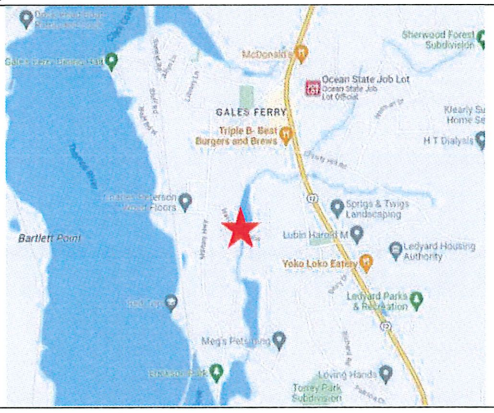
- Consider feasibility of installing technical fishway through crossing to provide diadromous fish access to Glenwoods Pond.
- Consider feasibility for removing the small spillway upstream of crossing, which would likely eliminate Glenwoods Pond, and replace with Stream Simulation Design culvert or bridge: widen and

restore stream channel (i) to increase hydraulic capacity and reduce over-topping risk, (ii) restore aquatic organism passage, and (iii) reduce debris accumulation and maintenance.

- Failing masonry in structure should be repaired in any future work.

Safety Concerns for Community

#7 Pine Swamp Brook, Structure 1 on Harvard Terrace, Ledyard

Upstream:	Downstream:
	
Aerial Image:	**Map Screen Shot:**
	

Structure Info:

- Road crossing comprises dam of Pine Swamp Pond (aka Avalonia Land Trust Pond).
- CTDEEP Dam Safety database identifies this as Pine Swamp Pond Dam, #7212, Low Hazard
- Perched round culvert with a rusted out dilapidated bottom
- Fall hazard around guard rail and repaired curbing pavement and apron

Key findings from NAACC assessment:

- **Crossing type:** 1 metal culvert with a 3 ft diameter
- **Crossing condition:** Poor
- **Constriction severity:** Severe
- **AOP Coarse Screen/ NAACC AOP Score:** No AOP / 0.03

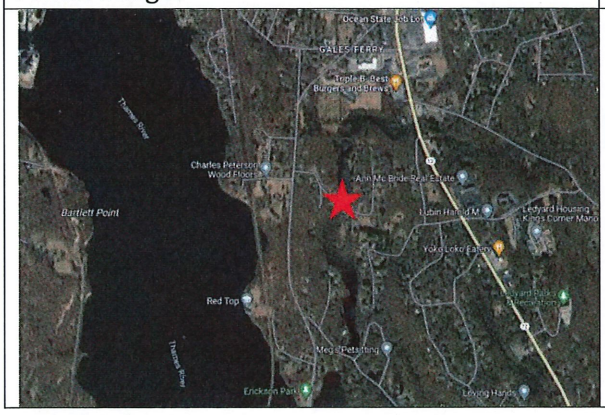
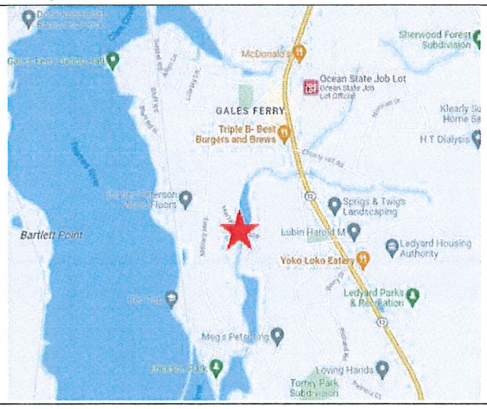
Habitat Info:

- Downstream barrier to fish migration due to natural waterfall located south of Smith Pond Way
- Resident fish habitat upstream in pond and downstream in river channel
- Perched structure reduces movement of fish migration

Restoration Recommendations:

- Consider feasibility of installing technical fishway through crossing to provide fish passage to Pine Swamp Pond
- Failing masonry in structure should be repaired in any future work.
- Reduce fall risk for children in neighborhood.

#8 Pine Swamp Brook, Structure 2 on Harvard Terrace, Ledyard

Upstream:	Downstream:
	
Aerial Image:	**Map Screen Shot:**
	

Structure Info:

- Under Harvard Terrace Road downstream of Avalonia Land Trust Pond
- CTDEEP Dam Safety database identifies this as Pine Swamp Pond Dam, #7212, Low Hazard
- Inlet drop culvert to square stone outlet
- Fall hazard around guard rail and repaired curbing pavement and apron
- Large metal conveyance structure present to move water away from road creating another safety hazard

Key findings from NAACC assessment:

- **Crossing type:** Inlet drop to square outlet
- **Crossing condition:** Poor
- **Constriction severity:** Severe
- **AOP Coarse Screen/ NAACC AOP Score:** No AOP / No score

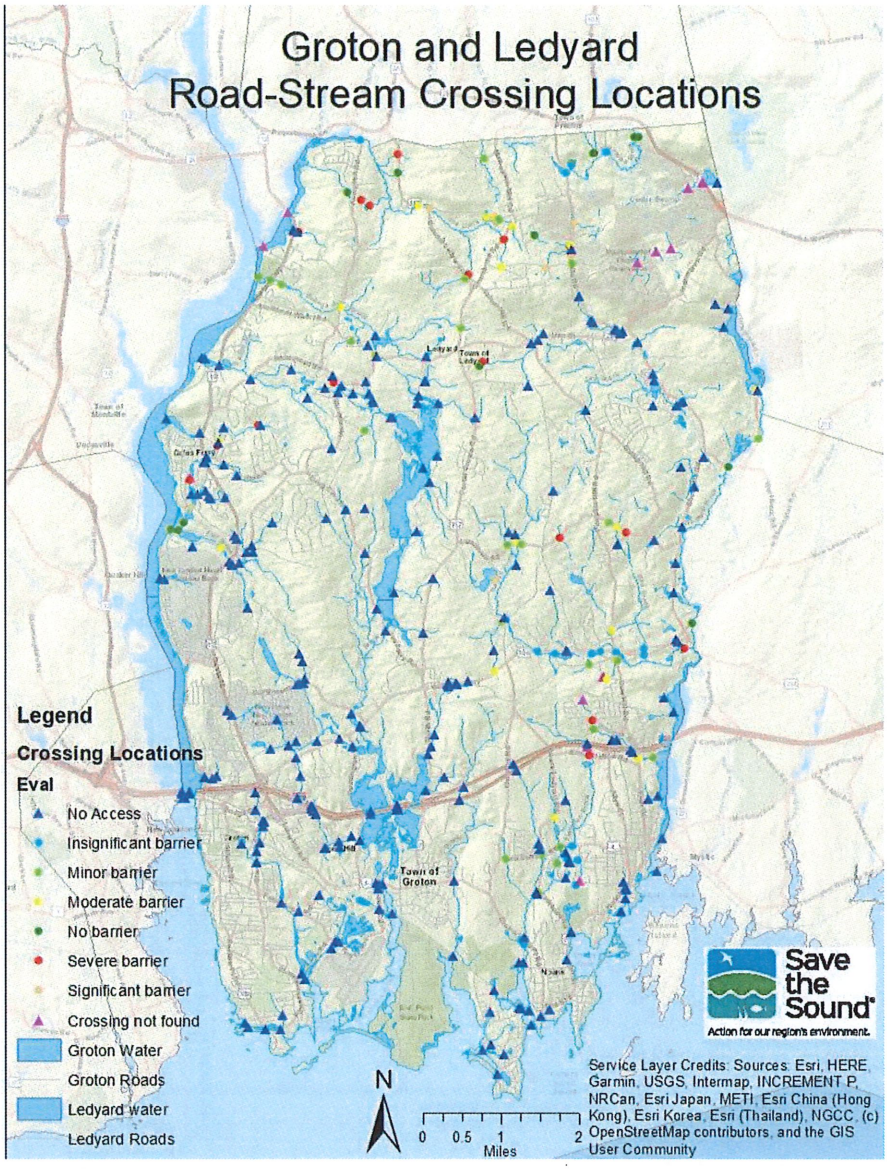
Habitat Info:

- Downstream barrier to fish migration due to natural waterfall located south of Smith Pond Way
- Resident fish habitat upstream in pond and downstream in river channel

- Perched structure reduces movement of fish migration

Restoration Recommendations:

- Refurbish dated and worn areas of structure
- Reduce fall risk for children in neighborhood


Groton and Ledyard
Road-Stream Crossing Locations
Legend
Crossing Locations
Eval
No Access
Insignificant barrier
Minor barrier
Moderate barrier
No barrier
Severe barrier
Significant barrier
Crossing not found
Groton Water
Groton Roads
Ledyard water
Ledyard Roads
Town of Groton
N
0 0.5 1 2
Miles
Save the Sound
Action for our region's environment.
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community