



Assessing Ecosystem Impacts from Road-Stream Crossings through Community Involvement

Background

Why is the NH Fish and Game Department interested in culverts?



- Block fish migration
- Reduce opportunities to (re)colonize areas
- Alter natural erosion and sedimentation rates of a stream
- Shallow depths during low flow conditions/Amplified flows during flood events
- Alter physical stream channel features

Features of a good stream crossing

- Natural streambed composition in structure
- No change in flow rate and depth
- Appropriately sized to accommodate a wide variety of flows



Benefits of Balancing Transportation with the Needs of Fish and Wildlife

- Low maintenance/often greater longevity
- More stable-more suited to greater flows
- More viable populations of aquatic species

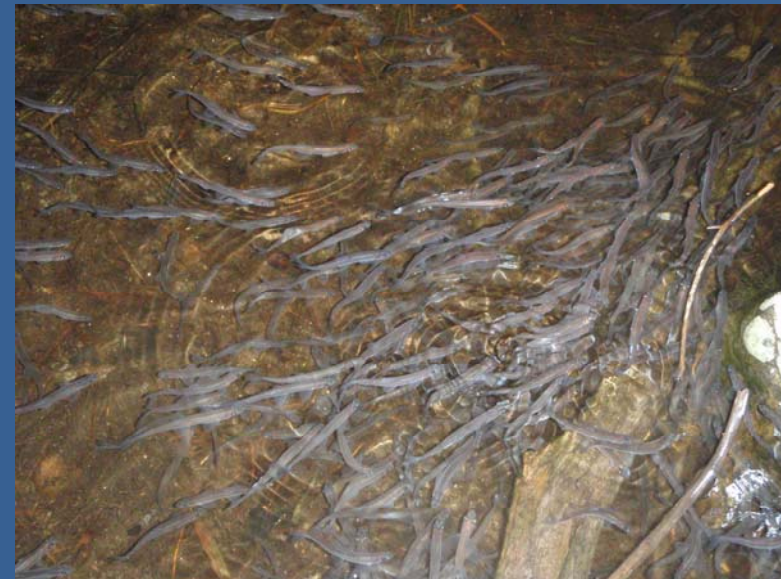


Background

Fish are migratory

Close to half of the fish species of greatest conservation need (NH Wildlife Action Plan) utilize river/stream corridors to reach spawning areas

- Alewife
- American Brook Lamprey
- American Eel
- American Shad
- Blueback Herring
- Brook Trout
- Rainbow Smelt
- Sea Lamprey

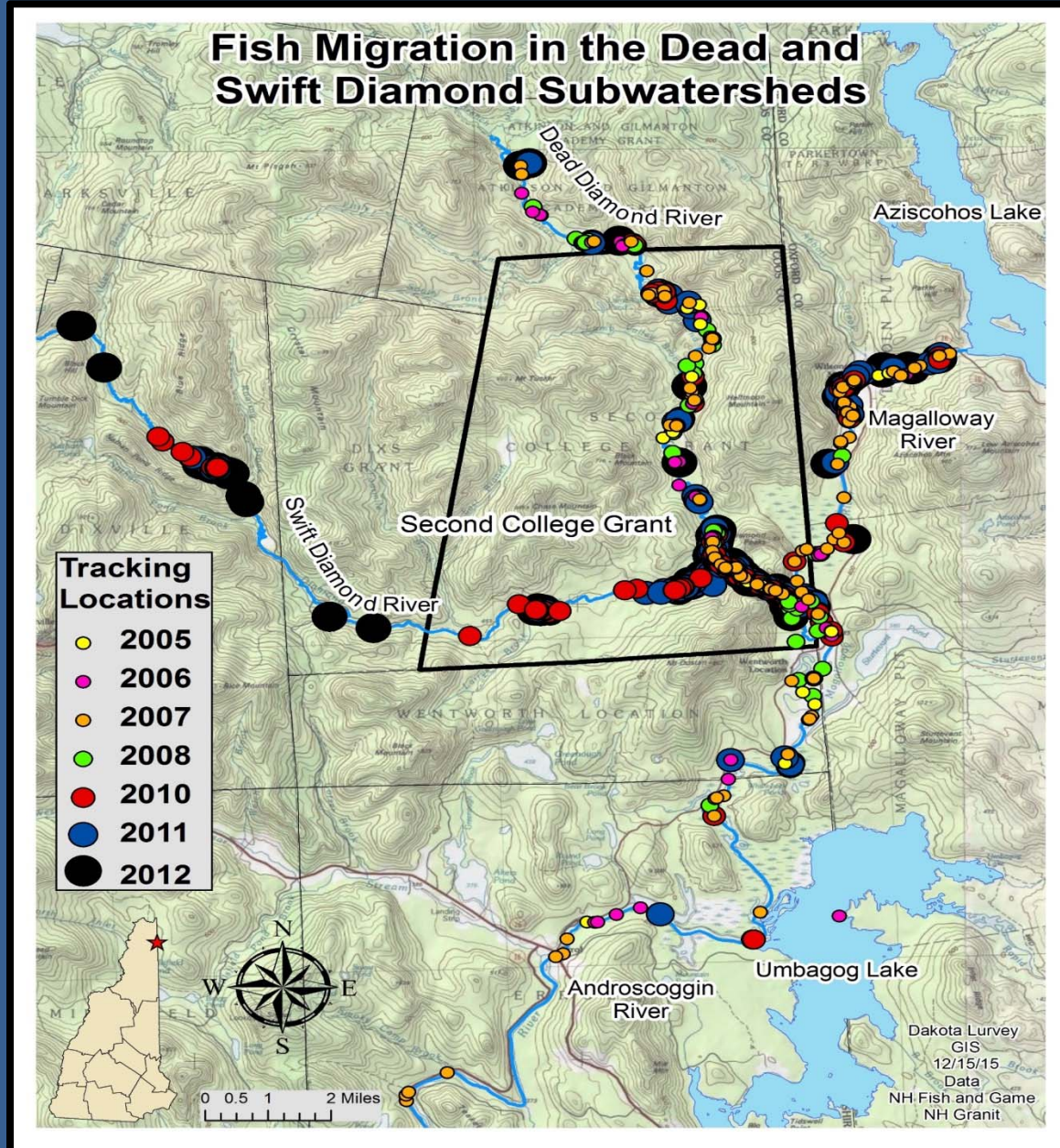


Rainbow Smelt Tributary Spawning Run



American Brook Lamprey (Juvenile and Adult) Photos Courtesy of Sean Smith

Hydrologic connectivity allows fish to migrate and disperse



One wild Brook Trout traveled over 70 miles in a single year!

Connected river corridors offer access to a variety of aquatic habitats

- Thermal refuge
- Spawning
- Overwintering
- Foraging

Populations are healthier and more sustainable

Wild brook trout in the Dead Diamond System



*"Trouts there be good store
in every brook, ordinarily 2
and 20 inches."*

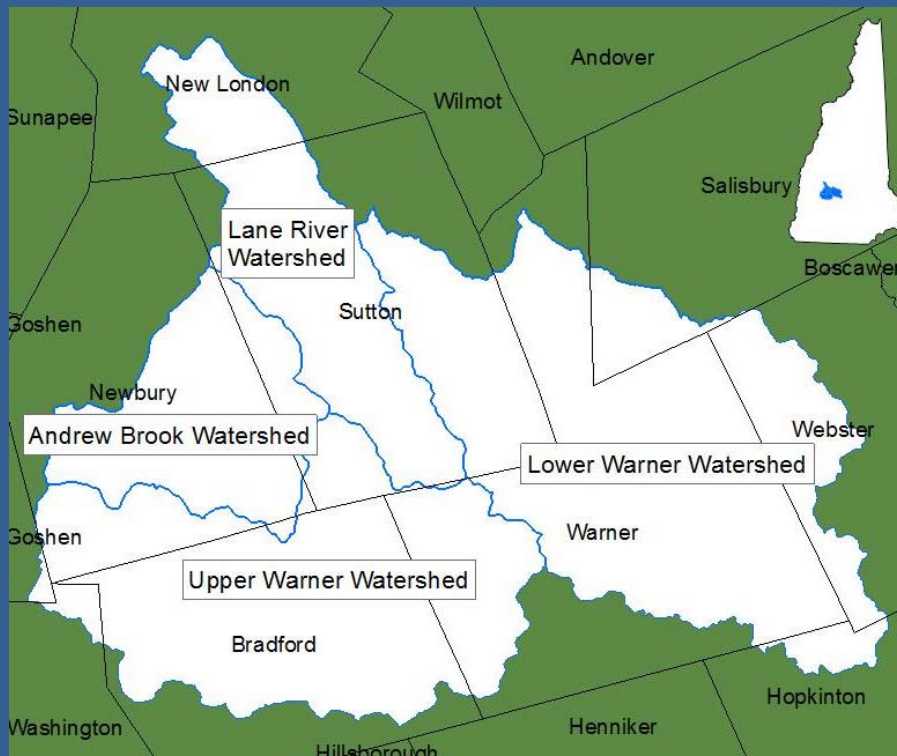
-John Josselyn, New
England Rarities
Discovered (1672)

The large size of wild Brook
Trout in the Dead Diamond
system are now a rarity for
New Hampshire

Average length of wild
brook trout in NH
= 3.75 inches (1983-2015)



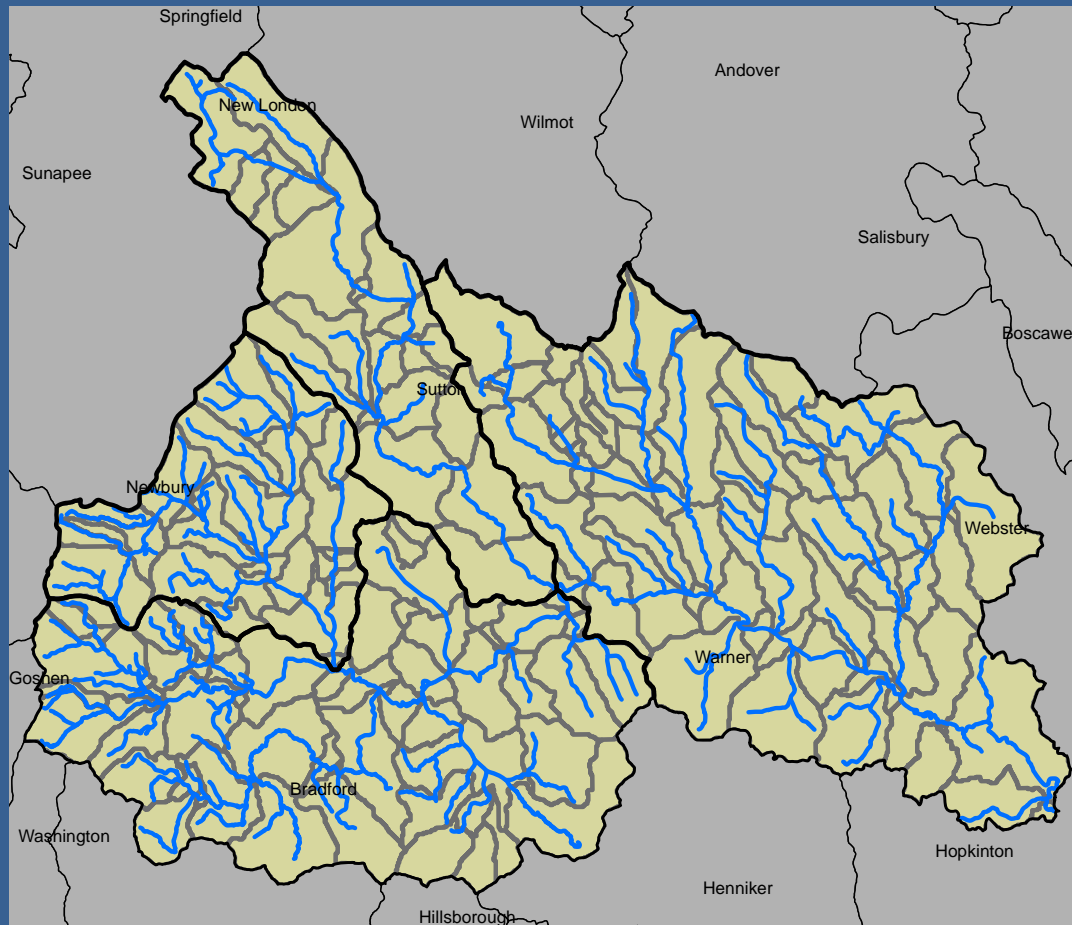
NH Fish and Game Watershed Assessments- Fish species distribution and habitat condition



Watershed selection

- Areas with suspected presence of fish species of greatest conservation need
- Areas with limited information
- Areas with strong local interest

NH Fish and Game Watershed Assessments- Fish species distribution and habitat condition



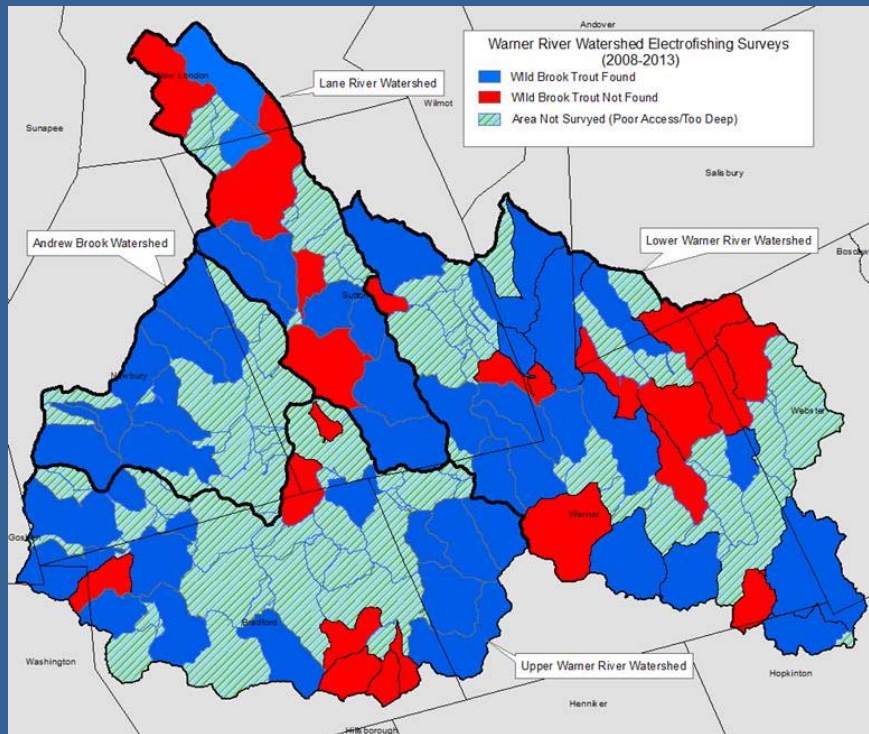
Watershed sampling protocol:

- Electrofish 100 m in approximate midpoint of every USGS catchment
- Collect aquatic macroinvertebrate samples (NHDES VBAP)
- Comment on observed land use impacts
- Summarize data and promote information to local conservation groups

Volunteers:

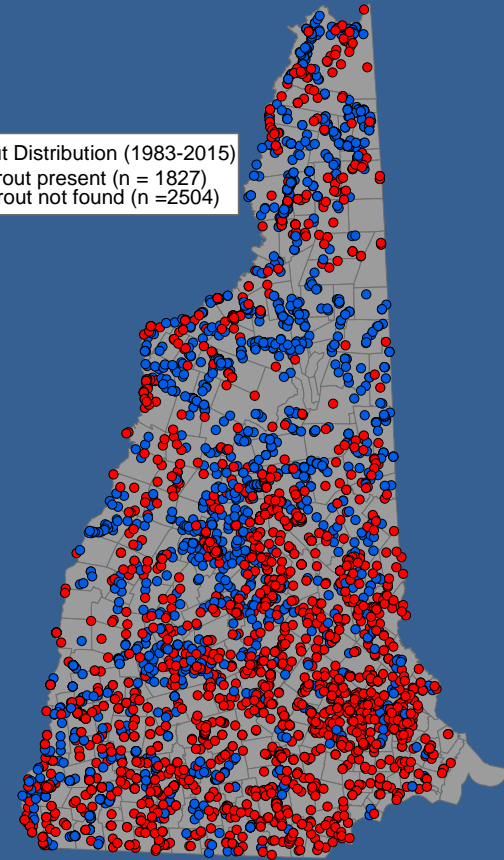
- Reduce need for NH Fish and Game staff
- Increase the number of locations that can be surveyed
- Familiar with land use practices (current/historical)
- Develop a greater sense of environmental stewardship/project ownership

NH Fish and Game Watershed Assessments- Fish species distribution and habitat condition



Wild Brook Trout Distribution (1983-2015)

- Wild brook trout present (n = 1827)
- Wild brook trout not found (n = 2504)



Once baseline fish surveys have been completed, volunteer groups want to remain active in the project area.

Possible projects:

- Public outreach events (farmers markets, old home days, fairs)
- Aquatic macroinvertebrate index sites: minimal equipment/training
- Watershed planning (river designations)
- Landowner engagement (site visits and reports to landowners)
- Road-stream crossing assessments

The progression after baseline fish surveys:

Road-Stream Crossing Assessments- describes the level of fragmentation within a watershed



Volunteers are trained to use NH Geological Survey assessment protocols

NH Fish and Game provides maps, datasheets and survey equipment (when needed)

Data currently reviewed and entered by NHFG

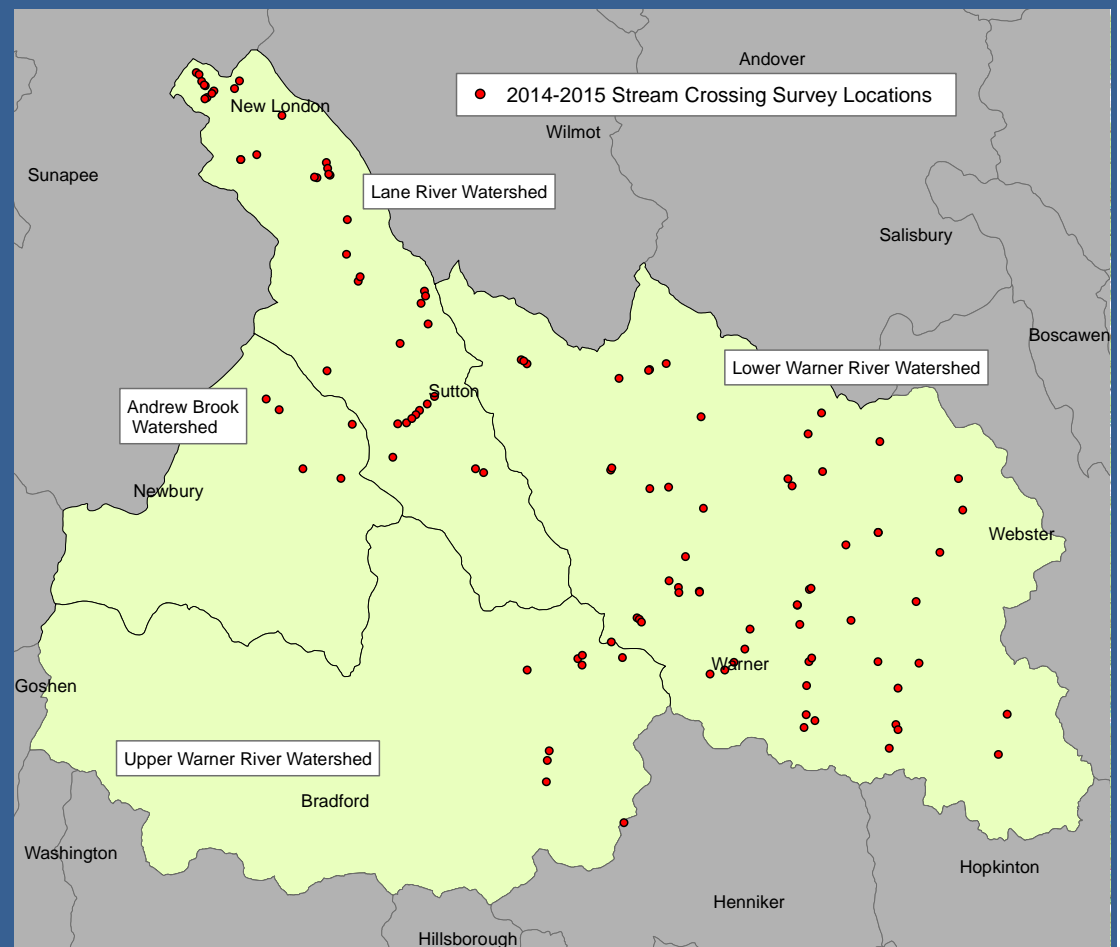


2014-2015 Collective Results

Over 130 road stream crossings assessed:

- Warner River Watershed
- Beebe River Watershed
- Town of Bath

Close to 500 hours of volunteer effort!



The collected information in the project areas help explain:

- Level of habitat fragmentation
- Condition of crossing structures
- Potential habitat alteration
- Potential vulnerability to failure

2014-2015 Collective Results

Warner River Watershed:	Structure Type:	Arch Structures:	6
		Bridges:	19
		Culverts:	91
	Condition:	Collapsing:	4.2%
		Eroding:	1.1%
		New:	20.0%
		Old:	66.3%
		Rusted:	8.4%

Average crossing structure width is only about half the bankfull width
A minimum width of 1.2 X bankfull width is recommended

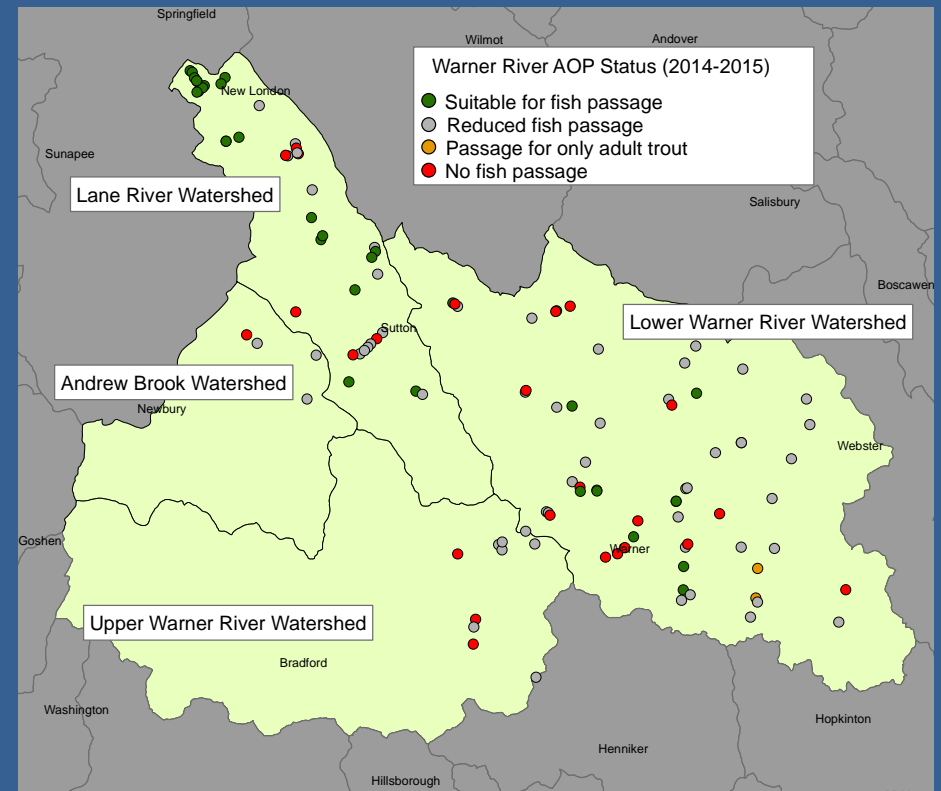


2014-2015 Collective Results

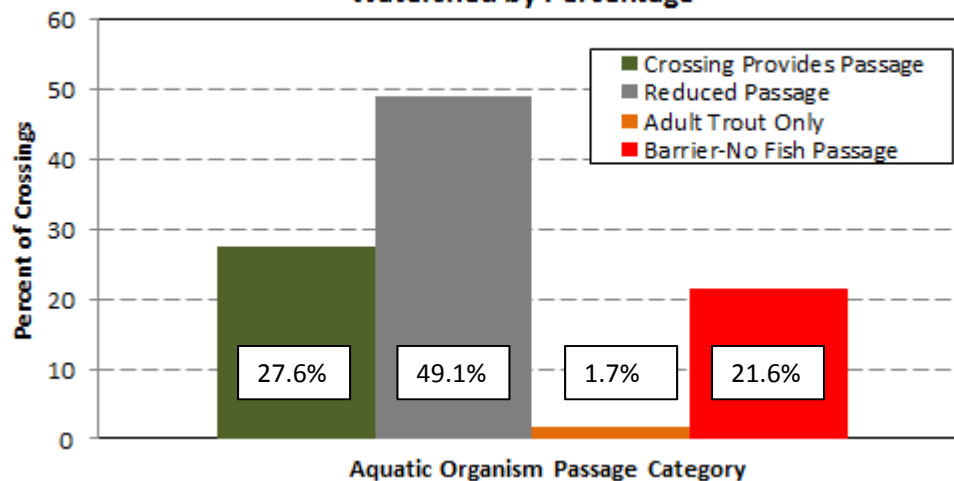
Warner River Watershed

Aquatic Organism Passage Screening Tool (Vermont Rivers Management Program)

Provides the ability to help prioritize
crossing replacement opportunities



Aquatic Organism Passage Status within the Warner River Watershed by Percentage



Variables Include:

- Outlet drop
- Presence of pool
- Pool entrance depth
- Water depth in culvert
- Substrate through structure
- Obstructions in structure

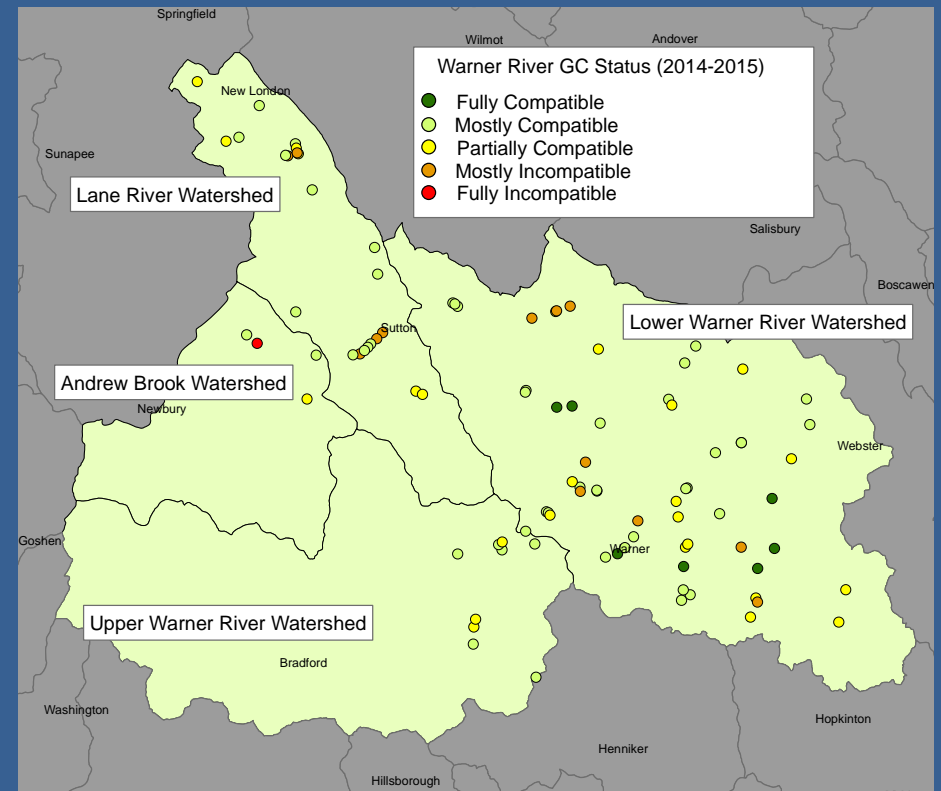
2014-2015 Collective Results

Warner River Watershed

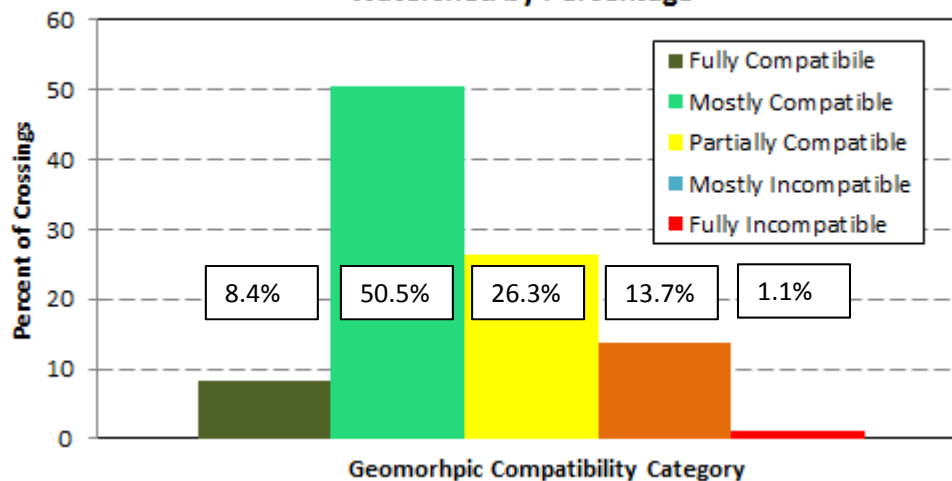
Geomorphic Compatibility Screening Tool (Vermont Rivers Management Program)

Provides the ability to help prioritize
crossing replacement opportunities

The likelihood of a structure to fail increases
when not geomorphically compatible



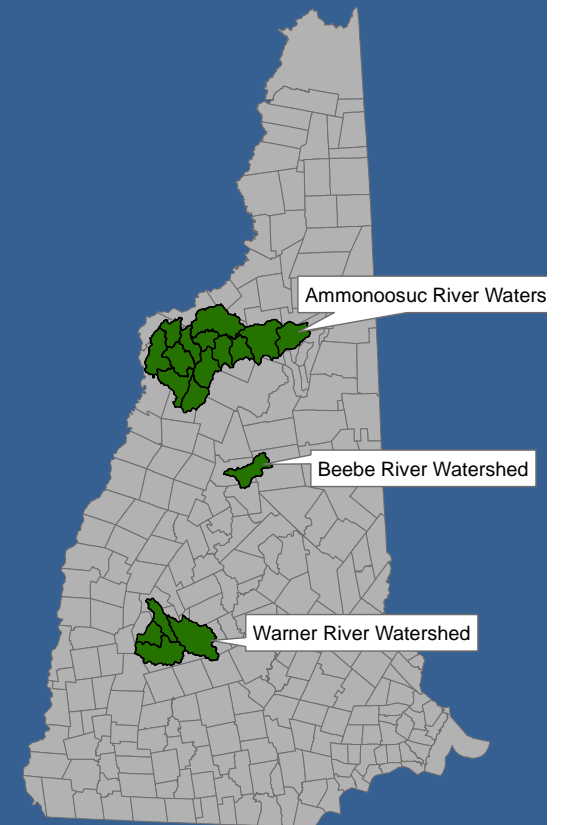
Geomorphic Compatibility Status within the Warner River Watershed by Percentage



Variables Include:

- % Bankfull width
- Substrate continuity
- Slope
- Approach angle
- Bank erosion

Future Steps



Finalize watershed level assessments (Ammonoosuc, Warner, Beebe) 2016-2017

Overlay fish distribution information with crossing data

Prioritize crossing replacement in respect to fisheries (unique communities, stream length)

Communicate results to town planners and road agents and incorporate problem crossings

Culvert vulnerability assessment

Culvert Vulnerability Model

GIS based hydraulic capacity model

- Identify if crossings can pass 10, 25, 50, 100 year flow events

GIS Analysis
(Runoff Description)

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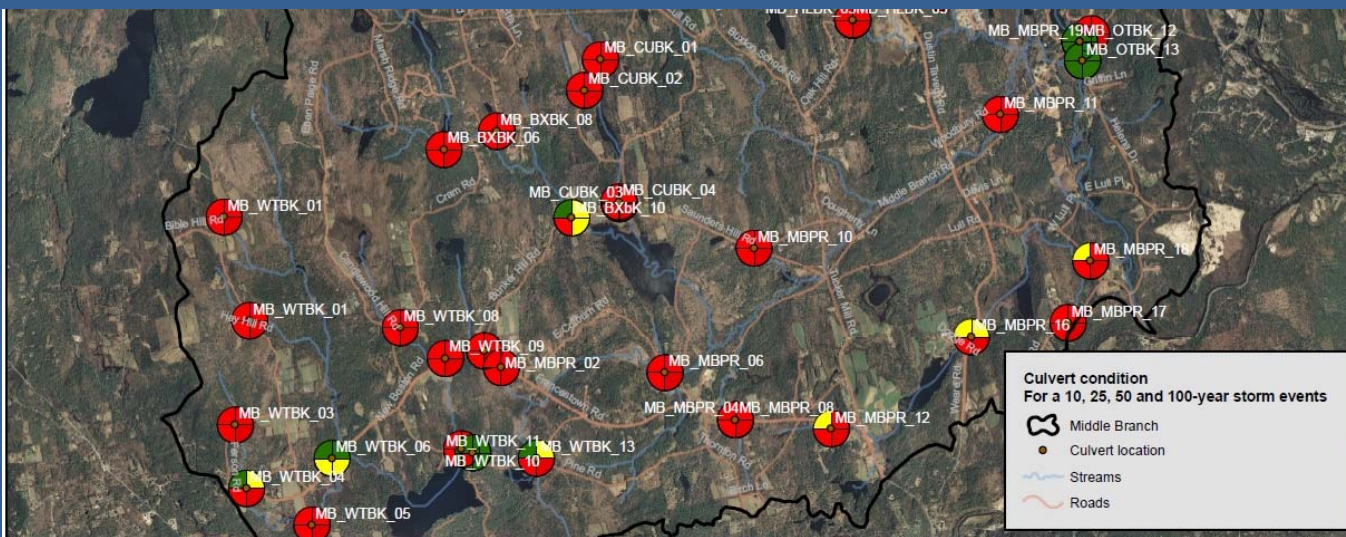
Field Data
(Physical Crossing Data)

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Model Outputs

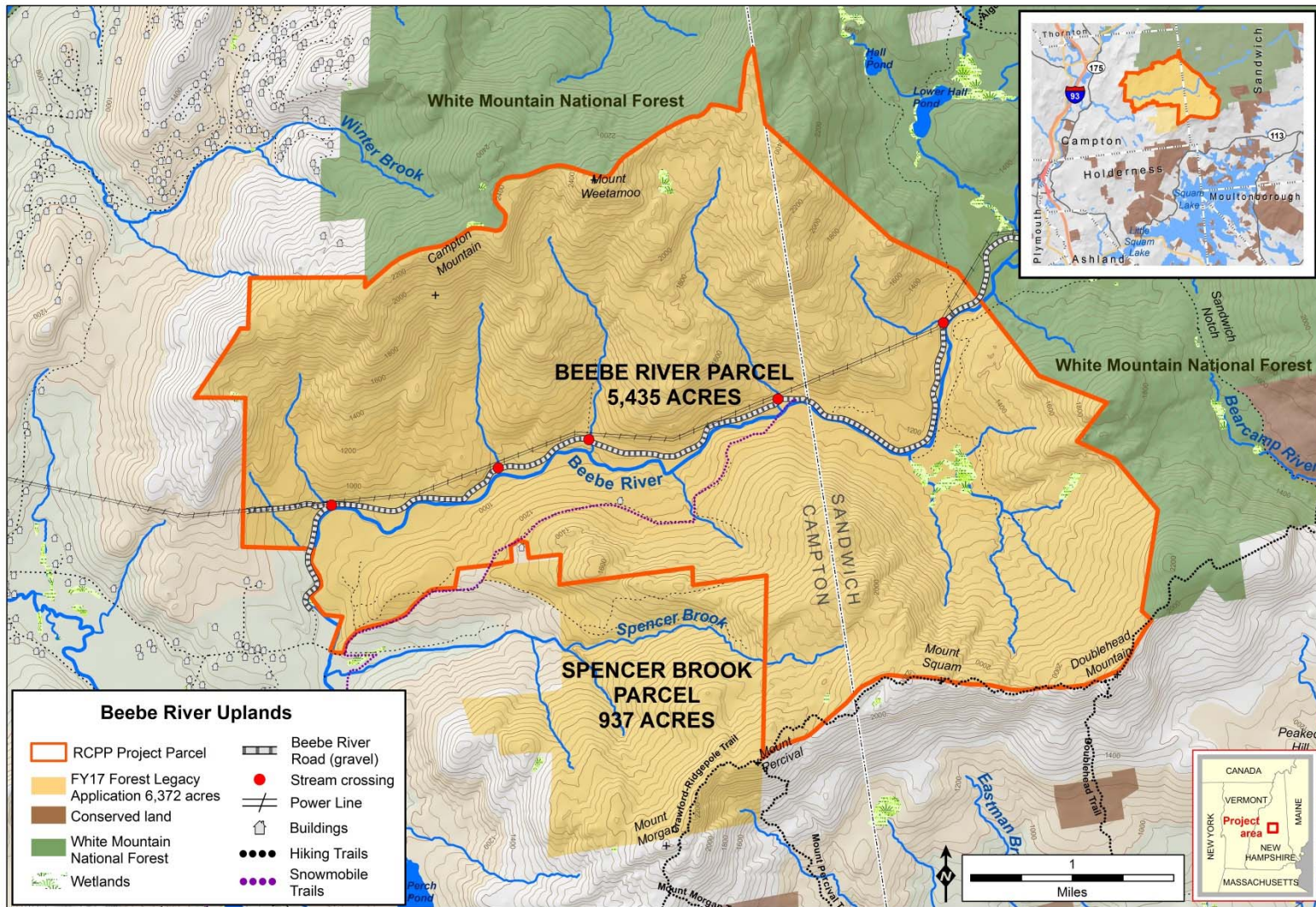
Another prioritization tool for road agents, town planners and natural resource agencies for crossing replacement

Return Interval				
2	10	25	50	100
F	F	F	F	F
P	P	T	T	F
-	-	-	-	-
-	-	-	-	-
F	F	F	F	F
F	F	F	F	F
P	P	P	T	F
P	P	P	P	P
P	T	F	F	F
P	P	P	T	T
P	T	F	F	F
P	F	F	F	F
P	P	T	F	F
F	F	F	F	F
T	F	F	F	F
F	F	F	F	F



Piscataquog River Watershed Map displaying information collected and analyzed by Trout Unlimited and Southern New Hampshire Regional Planning Commission

Beebe River Restoration and Conservation Project



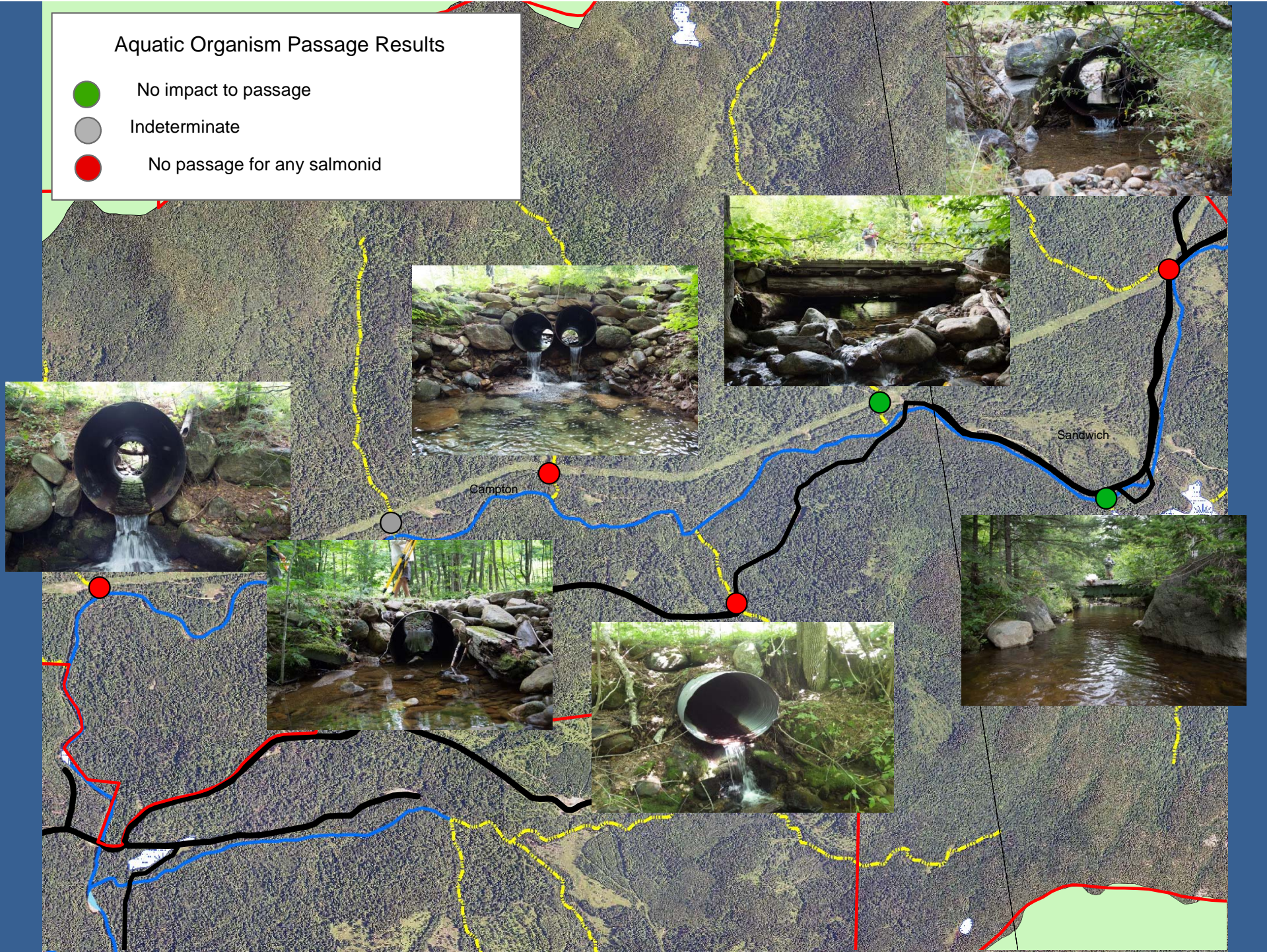
THE CONSERVATION FUND



TOWN OF SANDWICH NH

Aquatic Organism Passage Results

- No impact to passage
- Indeterminate
- No passage for any salmonid



Beebe River Restoration and Conservation Project

Mostly Compatible

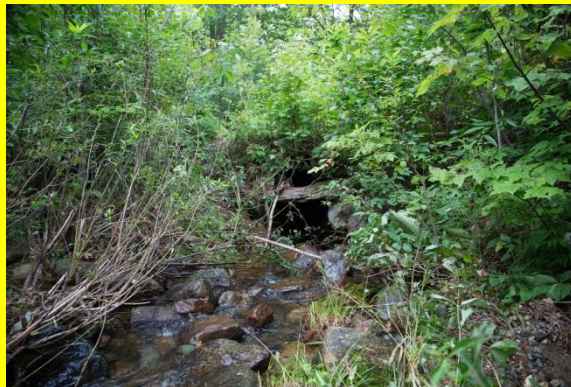


Project partners recently received a Regional Conservation Partnership Planning grant (NRCS)

Crossing replacement designs/permitting will be completed in 2016

All crossings along the Beebe River Grade Rd will be replaced in 2017- over 2/3 of the watershed will be accessible!

Partially Compatible



Thank You



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