Assessing Ecosystem Impacts from Road-Stream Crossings through Community Involvement
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
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
“Trouts there be good store in every brook, ordinarily 2 and 20 inches.”

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:

- Electrfish 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
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

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridges</td>
<td>19</td>
</tr>
<tr>
<td>Culverts</td>
<td>91</td>
</tr>
</tbody>
</table>

**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

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

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 + Field Data = Model Outputs
(Runoff Description) (Physical Crossing Data)

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

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

BEEBE RIVER PARCEL
5,435 ACRES

SPENCER BROOK PARCEL
937 ACRES

Town of Sandwich NH
Aquatic Organism Passage Results

- Green: No impact to passage
- Gray: Indeterminate
- Red: 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!
Thank You

Ben Nugent
NH Fish and Game Department, Region 2
PO Box 417 New Hampton, NH 03256
benjamin.nugent@wildlife.nh.gov
(603) 744-5470