New Hampshire's Road-Stream Crossings – Where Data, Hazard Mitigation, Infrastructure and Fish Passage Come Together to Reduce Flood Risk















### Warren Brook/Cold River, Alstead October 2005



New Hampshire House Bill 648

Chapter 179 Laws of 2007

**Comprehensive Flood Management Study Commission** 

**Final Report** 

September 2008



HB 648 Comprehensive Flood Management Study Commission: Key Finding
Need: Ensure that bridges and culverts are adequately sized.

"DOT, DES and Fish & Game with input by the Nature Conservancy, should be tasked to develop the procedure and database for a standard culvert assessment data collection."

HTTP://GENCOURT.STATE.NH.US/STATSTUDCOMM/REPORTS/18 53.PDF

### New Hampshire Stream Crossing Assessment Initiative

State Stream Crossing Steering Team (4 state agencies) NHDES (State lead) New Hampshire Geological Survey Wetlands Bureau Coastal Program NHDOT (Data management lead) NH Fish & Game NH HSEM





### New Hampshire Stream Crossing Assessment Initiative

Statewide Asset Data Exchange System (SADES)

#### New Hampshire Stream Crossing Initiative



**Field Manual** 

In Partnership With:

NH Department of Environmental Services NH Department of Transportation NH Fish and Game Department NH Division of Homeland Security and Emergency Management NH Regional Planning Commissions UNH Technology Transfer Center

Version: 6.0

SADES Stream Crossing Assessment 6.0

Guide to Parameters Collected at Each Crossing Type

Once CROSSING TYPE has been determined (based on upstream waterbody type), use the table below, along with the icons next to each parameter, to guide field data collection.

	Crossing Type					
Parameter	Stream	Wetland or Pond	Drainage			
1.) Assessment Date	Х	Х	Х			
4.) User ID	Х	Х	Х			
5.) Observers	Х	Х	Х			
6.) Organization	Х	Х	Х			
7.) Project Name	Х	Х	Х			
10.) Road Name - Field	Х	Х	Х			
12.) Structure Skewed to Roadway	Х	Х	Х			
13.) If Channel Avulses, Stream Will	Х	Х				
14.) Estimated Distance Avulsion Would Follow Road (ft)	Х	Х				
15.) Waterbody - Upstream	Х	Х	Х			
16.) Crossing Type	Х	Х	Х			
17.) Angle of Stream Flow Approaching Structure	Х					
18.) Floodplain Filled by Roadway Approaches	Х					
19.) Number of Structures at Crossing	Х	Х				
20.) Overflow Structures Present	Х	Х				
21.) Structure Type	Х	Х	Х			
22.) Structure Material	Х	Х	Х			
23.) Inlet Type	Х					
24.) Inlet Wingwall Angle - Stream Left	Х					
25.) Inlet Wingwall Angle - Stream Right	Х					
26.) Upstream - Width (A) (ft)	Х	Х	Х			
27.) Upstream - Open Height (B) (ft)	X	X	Х			
28.) Upstream - Wetted Width-Wall Rise (C) (ft)	Х	X	Х			
29.) Upstream - Total Height (D) (ft)	Х	Х	Х			
30.) Structure Opening Partially Obstructed By	X	Х				

<u>Goal</u>: to reduce risks from sediment mobilization, infrastructure damage, and public safety impacts that can result from culvert failures, while also seeking to improve fish passage through watershed networks

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#### NEW HAMPSHIRE STREAM CROSSING ASSESSMENTS -OCTOBER 2017

~6,000 stream crossings have been visited~31% of stream crossings in New Hampshire

<u>Who's collecting data?</u> New Hampshire Geological Survey Regional Planning Commissions New Hampshire Fish & Game Trout Unlimited New Hampshire DOT





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Geomorphic Compatibility; Aquatic Organism Passage

- Geomorphic Compatibility
  - A rank that predicts the long-term compatibility of a culvert with river form and sediment transport processes.

• Aquatic Organism Passage

 A ranking that predicts a crossing's overall ability to pass aquatic organisms (particularly fish).



#### Temple Stream Crossings Aquatic Organism Passage Compatibility Scores

#### Legend



- Town Roads
- Major Roads
- Full AOP
- Reduced AOP
- No AOP except adult salmonids
- No AOP including adult salmonids
- No AOP score for bridges/arches
- Unable to Score



2.25

3

Miles

# Modeling Hydraulic Capacity

### • Hydraulic Capacity Estimates

- Streamworks Trout Unlimited Model
  - 1st order estimates of Hydraulic Capacity
  - Inputs: Topography, land cover, soils, wetlands/ponds, precip, streamflow
  - Basis: HY-8 (FHWA)







Rollins Brook at French Road Epping

<50% bankfull (channel) width

Sediment continuity

Erosion and armoring



#### The ultimate goal . . . .

#### Nash Stream Forest, Stratford

Properly sized stream crossings!

- Improved sediment transport less obstruction risk public safety benefits
- Improved fish passage environmental benefits
- Improved hydraulic and flow capacity

## Aquatic Resource Mitigation Fund RSA 482-A:28 - 33

- Additional wetland mitigation option available to applicants.
- Option for projects that have difficulty in finding good mitigation.
- Process of providing a payment into a fund that pools money together to be spent in the "watershed" where impacts occurred.
- Funds go toward wetland restoration, preservation of land adjacent to aquatic resources, wetland creation or aquatic resource improvements.



ARM FUND PROJECT AWARD SITES 2009-2015

### Culvert Assessments and ARM

Assist and provide funds for improving a crossing that is deemed eligible for the stream mitigation program



Utilize information for mitigation option to replace deficient crossings for aquatic passage and address infrastructure needs

## Clean Water State Revolving Loan Fund (CWSRF)

• We are having discussions regarding how NH's stream crossing assessment data can be utilized to work with towns to fund properly sized replacements

## **Emergency Management**

- Collected data (or reference to) being placed in town hazard mitigation plans during updates
- Public assistance funds
- Pre-Disaster Mitigation (PDM)
- Repetitive damage



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овлестир	Town	Source	Flooding_D	Frequency	Date	RoodType	FloodPeriod	Impact	CrossType	Crossissue	Location	Shape_Length	Shape_Area
2075	Exeter	Exeter HMP 2012	None - Need to verify	Unknown	None	Road flood	Past/potential flood	Unknown	Culvert	Unknown	Beech Hill Rd at Beech Hill Brook	4641.301341	1589336.861
2076	Exeter	Exeter HMP 2012	Identified by town as area of chronic reoccurring flooding or high potential for future flooding.	Unknown	None	Road flood	Past/potential flood	Unknown	Bridge	Unknown	Pine Rd at the Exeter Town Line	7079.293721	3787768.164
2077	f and an	Franker MARE 2012	Need to unife	University	News	Read Bread	Past/potential	University	Unknown	University	Epping Rd (Route 101) near Old		1282105 570
2011	Laeter	Carter Hive 2012	Identified by town as area of chronic reoccurring flooding or high potential for future	oncown	none	Holad Hood	Past/potential	Unknown	cype.	CHENOWH	Franklin and River St	4137,431147	1282105.575
2078	Exeter	Exeter HMP 2012	fooding. Identified by town as area of chronic reoccurring flooding or high potential for future	Unknown	None	Road flood	flood Past/potential	Unknown	Bridge	Unknown	Neighborhoods Court Street (NH Route 108) at	3358.338072	808703.1739
2079	Exeter	Exeter HMP 2012	flooding. Identified by town as area of chronic reoccurring flooding or high potential for future	Unknown	None	Road flood	flood Past/potential	Unknown	Bridge	Unknown	the intersection o* Court Street (NH Route 108) at	16858.75181	13187370.71
2080	Exeter	Exeter HMP 2012	fooding. Mantified by town as area of cheesic more particle flooding or high reductial for future	Unknown	None	Road flood	flood Past/potential	Unknown	Bridge	Unknown	the Exeter/Kensing* Kinestee Board (Nil Boute 111)	6863.560901	3414863.853
2081	Exeter	Exeter HMP 2012	fooding.	Unknown	None	Road flood	flood	Unknown	Bridge	Unknown	at Brickyard Pond to*	7491.888912	2934312.532
2082	Exeter	Exeter HMP 2012	Identified by town as area of chronic reoccurring flooding or high potential for future flooding.	Unknown	None	Road flood	Past/potential flood	Unknown	Culvert	Unknown	Portsmouth Avenue (NH Route 108) abutting the Tow*	4666.474027	1672279.822
2083	Exeter	Exeter HMP 2012	Vulnerable to tidal storm surge, identified by town as area of chronic reoccurring flooding or high potential for future flooding.	Unknown	None	Road flood	Past/potential flood	Unknown	Culvert	Unknown	Swasey Parkways	6333.173301	1941412.632
2084	Exeter	Exeter HMP 2012	Identified by town as area of chronic reoccurring flooding or high potential for future flooding.	Unknown	None	Road flood	Past/potential flood	Unknown	Culvert	Unknown	Powder Mill Road at the railroad crossing the Exe*	20744.02272	14372125.46
2085	Exeter	Exeter HMP 2012	Identified by town as area of chronic reoccurring flooding or high potential for future flooding.	Unknown	None	Road flood	Past/potential flood	Unknown	No	None	Lary Ln neighborhood	4259.695558	982827.3784
2086	Exeter	Exeter HMP 2012	Identified by town as area of chronic reoccurring flooding or high potential for future flooding.	Unknown	None	Road flood	Past/potential flood	Unknown	No	None	Brentwood Rd (NH Route 111A) west of the intersec*	4557.401044	1457164.843
2087	Exeter	Exeter HMP 2012	Identified by town as area of chronic reoccurring flooding or high potential for future flooding.	Unknown	None	Road flood	Past/potential flood	Unknown	No	None	Brentwood Rd (NH Route 111A) east of the intersec*	6070.323918	2475772.724
2068	Exeter	Exeter HMP 2012	Identified by town as area of chronic reoccurring flooding or high potential for future flooding.	Unknown	None	Road flood	Past/potential flood	Unknown	No	None	Brentwood Rd (NH Route 111A) at the intersection *	3391.926162	764337.8499
2089	Exeter	Exeter HMP 2012	None - Need to verify	Unknown	None	Road flood	Past/potential flood	Unknown	Culvert	Unknown	Michael Bennet Rd	2877.365709	624359.3293
2090	Exeter	Exeter HMP 2012	Vulnerability to flooding in low-lying areas adjacent to the Exeter River	Unknown	None	Road flood	Past/potential flood	Unknown	Bridge	Unknown	King Arthur Ct and Linden St	4389.586359	1463592.631
2091	Exeter	Exeter HMP 2012	None - Need to verify	Unknown	None	Road flood	Past/potential flood	Unknown	Culvert	Unknown	Gliman Ln and Drinkwater Rd	5255.913772	1843227.508
2092	Exeter	Exeter HMP 2012	None - Need to verify	Unknown	None	Road flood	Past/potential flood	Unknown	Unknown type	Unknown	Owk St Ext	3179.05847	594905.2475
2093	Exeter	Exeter HMP 2012	Vulnerable to flooding from Squamscott River	Unknown	None	Road flood	Past/potential flood	Unknown	Unknown type	Unknown	Newfields Rd (Route 85)	12623.99964	6295376.674
2094	Exeter	Exeter HMP 2012	Vulnerable to flooding in low-lying areas adjacent to the Little River	Unknown	None	Road flood	Past/potential flood	Unknown	No	None	Colcord Pond Rd, Allard St	2480.414945	297520.4492

### **Post-Disaster Recovery Context**

New Ipswich, New Hampshire

# Summary

- Data
- Funding upsized replacements
- Collaboration
- Hard work and lots of commitment