Request for Proposal

Lamprey River Watershed Road-Stream Crossing Survey and Assessment

Background

There are approximately 496 public road-stream crossings in the Lamprey River Watershed. These are locations where perennial watercourses intersect with state and municipal roads and are crossed via either bridges or culverts. Road-stream crossings, particularly culverts, often are some of the more vulnerable components of highway transportation networks due to their susceptibility to damage from high flow events or reduced capacity resulting from accumulations of watershed products such as large woody material, sediment, ice, and miscellaneous debris. Poorly functioning road-stream crossings may also fragment aquatic habitat and pose a barrier to aquatic organisms due to perch (drop at the outlet), slope, velocity, or a combination of these factors.

Scope of Services

Under this contract, the contractor will complete a comprehensive assessment and prioritization of road-stream crossing infrastructure for selected priority areas within the Lamprey River Watershed with the goal of identifying those road-stream crossings that may be vulnerable to failure due to extreme storm events, pose a barrier to aquatic organism passage (AOP), or be geomorphically incompatible. Accepted survey methods and protocols shall be used so that all road-stream crossing data is accepted by and housed within the NH Geological Survey (NHGS) statewide database, and is accessible to the local communities, restoration practitioners, academic researchers, and the public-at-large.

Task 1: GIS work

A. Objectives

Job 1 **Locate and label public road-stream crossings**

Objective: Verify the number and locations of all public road-stream crossings for priority sub-watersheds and cold water streams within the Lamprey River Watershed. Uniquely label each road-stream crossing for proper identification and tracking.

Job 2 **Prepare GIS Maps**

Objective: Create draft maps for the field survey team, and final vulnerability maps to share with municipal officials and the New Hampshire Department of Transportation (NHDOT).

B. Approach

Job 1 **Locate and label public road-stream crossings**

Complete a detailed road-stream intersect using ArcGIS to spatially identify all selected road-stream crossings for the selected priority sub-watersheds and cold water streams

within the Lamprey River watershed. There are a total of 229 stream crossings targeted in this survey, 30 of which have been at least partially surveyed and may not require a complete stream crossing survey. There are an estimated 199 stream crossings where a complete stream crossing survey would be required (Table 1). Develop a labeling system that uniquely identifies each road-stream crossing for proper identification, future tracking, and data sharing. Labels may be provided by the NHGS.

Job 2 **Prepare GIS Maps**

Create draft quadrant maps to orient the field survey team, and final vulnerability maps to share with municipal officials and the NHDOT. The final vulnerability maps shall display AOP status, geomorphic compatibility, and flood vulnerability for each road-stream crossing, and be organized by municipality into sets at a best-fit scale of approximately 1:20,000.

Table 1: List of priority sub-watersheds and cold water streams including count of known public road-stream crossings. Partial surveys may be required at (30) road-stream crossings for which data is currently housed within the NHGS database.

Sub-Watershed	Stream(s)	Town(s)	# of Crossings	# in NHGS Dbase
Headwaters Lamprey River	Unnamed stream	Deerfield	3	
	Unnamed stream	Raymond	4	
	Non-coldwater streams	Various	62	12
Little River	Unnamed stream	Lee	1	
Lower Lamprey River	Wednesday Hill Brook	Lee	1	
Middle Lamprey River	Rum Brook	Epping	7	
	Unnamed stream	Epping	3	
	Non-coldwater streams	Various	115	18
North Branch River	Aunt Mary Brook	Candia	2	
North River	Unnamed stream	Lee	1	
		TOTAL	199	30

Task 2: Conduct field assessments

A. Objectives

Job 1 **Assess road-stream crossings; identify gaps in GIS analysis**

Objective: Complete field assessments at all priority road-stream crossings. Identify, inventory, and assess any road-stream crossings not found during spatial analysis.

Job 2 **Compile and manage survey data**

Objective: Compile and manage all survey data.

B. Approach

Job 1 **Assess road-stream crossings; identify gaps in GIS analysis**

For each road-stream crossing, complete a field assessment using the New Hampshire Stream Crossing Assessment Protocol Instructions (NHDES 2014) that records the number of culverts, structure type, material, shape, dimensions, length, condition, any obstructions, slope, bed materials, back-watering, alignment, diversion potential, bankfull width, outlet invert type, outlet drop, pool depth, water depth in culvert at outlet, and elevation of the inlet invert, outlet invert, and road surface. Identify, inventory, and perform similar assessments for any road-stream crossings not found during spatial analysis.

Job 2 **Compile and manage survey data**

Develop a data management system to compile, manage, and share all survey data collected during the road-stream crossing assessments.

Task 3: Model Assessment Data

A. Objectives

Job 1 **Model hydraulic capacity; evaluate geomorphic and AOP status**

Objective: Determine the hydraulic capacity, and geomorphic and AOP compatibility of each road-stream crossing.

B. Approach

Job 1 **Model hydraulic capacity; evaluate geomorphic and AOP status**

Calculate the hydraulic capacity of each road-stream crossing for the 2, 5, 10, 50, and 100-year events based on field measurements and runoff estimates for the contributing drainage area. Runoff shall be estimated using USGS regression equations for New Hampshire (Olson 2009). At its discretion, the contractor may estimate runoff for catchments of $\leq$ 1 square miles using the USDA Urban Hydrology for Small Watersheds TR55 (Cronshey 1986). Evaluate geomorphic compatibility of each road-stream crossing based on its percentage of bankfull width, alignment, and potential for stream diversion or capture. Evaluate AOP status for all aquatic organisms, including adult salmonids using the Vermont Culvert Aquatic Organism Passage Screening Tool (VTANR 2009). At its discretion, the contractor may also evaluate AOP status for three native fish families: salmonids, cyprinids, and percids using values for a predictive model for upstream fish passage through culverts (Coffman 2005).

Task 4: Reporting and community outreach

A. Objectives

Job 1 **Transfer data to NHGS**

Objective: Make the collected road-stream crossing data readily available to the public-at-large.

Job 2 **Develop recommendations for structure size based on design parameters**

Objective: Develop recommendations for appropriate structure sizing based on design parameters, i.e., design storm, target aquatic organisms and bankfull width.

Job 3 **Present project results to interested stakeholders**

Objective: Disseminate project results to a broad spectrum of interested stakeholders, municipal officials, and the NHDOT.

B. Approach

Job 1 **Transfer data to NHGS**

Transfer all road-stream crossing data collected to the NHGS in the designated format (Microsoft Access) for upload to the statewide database. The most current Microsoft Access shell is available from the NHGS, upon request.

Job 2 **Develop recommendations for structure size based on design parameters**

Determine structure sizing needed to achieve optimal ratings for three design parameters: flood vulnerability, AOP, and geomorphic compatibility. Develop recommendations for appropriate structure sizing and properties (e.g. span, rise, cross-sectional area, number of barrels) that address all three design parameters, i.e., design storm frequency, target aquatic organisms, and percent of bankfull width.

Job 3 **Present project results to interested stakeholders**

Present project results, findings, and recommendations to the Lamprey Rivers Advisory Committee (LRAC) and other interested stakeholders such as municipal road agents, public works directors, and selectmen in one general community presentation to be organized by the NHFGD and the LRAC. Suggest prioritization strategies, and discuss opportunities for upgrade/restoration.

C. Reporting

Provide a final report detailing all assessment activities, data analysis, hydraulic modeling, and community outreach in the format designated by the NHFGD. Submit a draft report by April 1, 2017 for review by the NHFGD. Submit the final report by June 1, 2017.

CONTRACT PERIOD:

The contract will be submitted to Governor and Council for approval and will have the duration of one (1) year from the date of approval.

SELECTION CRITERIA ONCE BIDS ARE RECIEVED:

1) Ability to efficiently and accurately assess, analyze, and model road-stream crossing infrastructure, and to convey the results to various stakeholders.
2) Ability to meet the standardized stream crossing assessment protocols and data quality standards required by NHGS for inclusion of survey results in the NH statewide stream crossing database.
3) Ability of contractor to meet contract deadlines.
4) Completeness of the bid package.
5) Financial bid cost not to exceed $17,000.

BID PROPOSAL REQUIREMENTS:

1) Description of related experience;
2) Contractor must be able to provide an official Certificate of Good Standing or Trade Name Registration in New Hampshire from the Secretary of State's Office shortly upon selection in order to proceed to Governor and Council for approval.

DIRECT QUESTIONS TO: Jason Smith (603) 271-2501

SEND PROPOSALS TO: NH Fish & Game Department
Attn: Matt Carpenter, Fish Conservation Program
11 Hazen Drive
Concord, NH 03301

RESPONSE DATE:
The deadline for receipts of bids is March 4, 2016, at 4:00 pm.

References:

Coffman, J. S. 2005. Evaluation of a predictive model for upstream fish passage through culverts (Doctoral dissertation, James Madison University).

Cronshey, R. 1986. Urban hydrology for small watersheds. US Dept. of Agriculture, Soil Conservation Service, Engineering Division.

New Hampshire Department of Environmental Services (NHDES). 2014. New Hampshire Stream Crossing Assessment Protocol Instructions, Version 2.0.

Olson, S.A., 2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S. Geological Survey Scientific Investigations Report 2008–5206, 57 p.

Vermont Agency of Natural Resources (VTANR). 2009. The Vermont Culvert Aquatic Organism Passage Screening Tool.

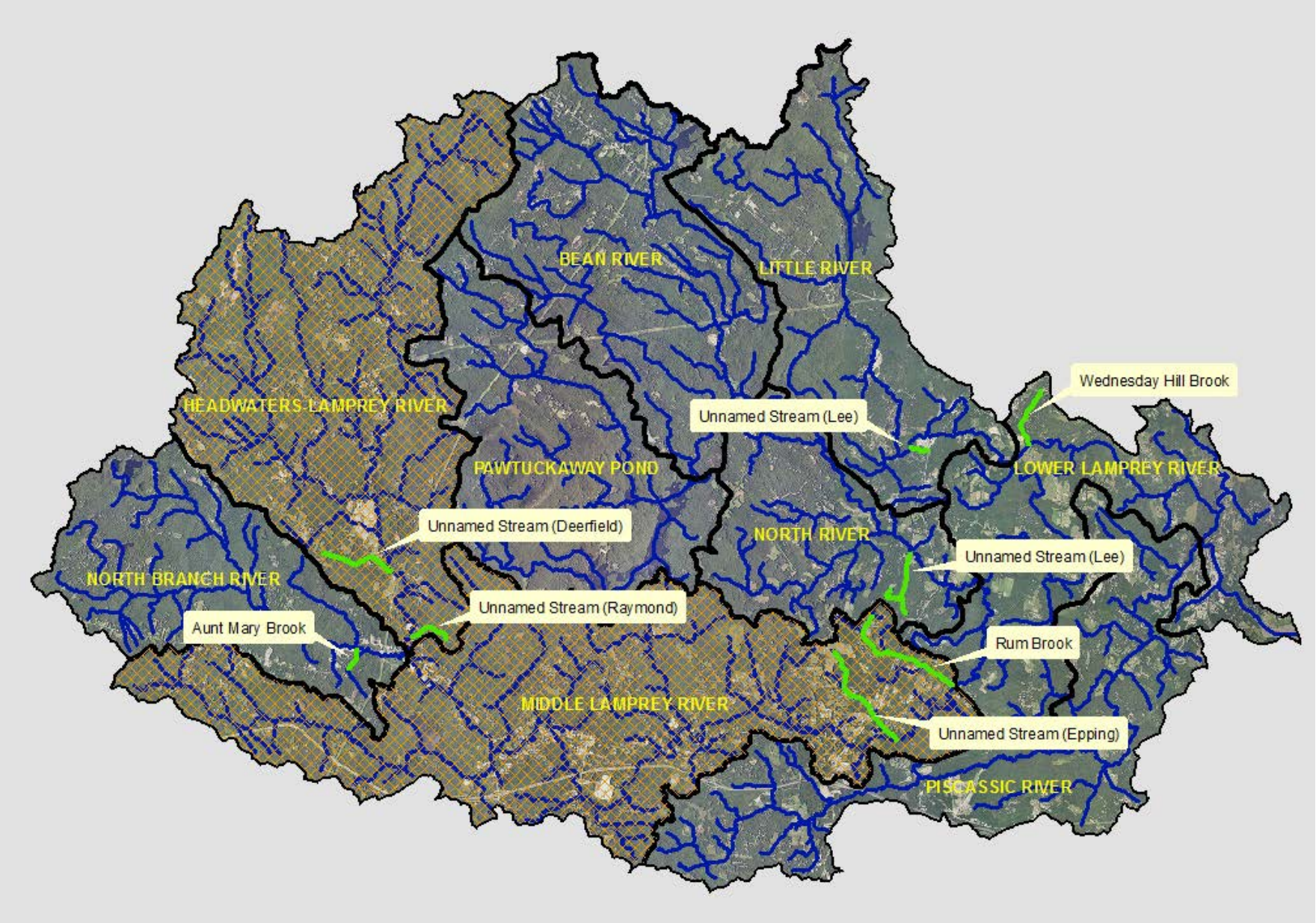

Figure 1: Road-stream crossing survey focus areas within the Lamprey River watershed including two sub-watersheds (Middle Lamprey River and Headwaters Lamprey River) and eight cold water streams.