The North Atlantic Aquatic Connectivity Collaborative (NAACC)

Evaluating Road-Stream Crossings Across a Thirteen-State Region

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September 14, 2016

NETWC

TNC Canada

Scale of the Problem

Data on 9,064 crossings in five northeastern states:

Moderate and severe barriers	45%
Minor or insignificant barriers	52.5%
Full aquatic organism passage	2.5%

Of the 6,440 culverts, excluding open-bottom arches:

Moderate and severe barriers	61%
Minor or insignificant barriers	35%
Full aquatic organism passage	0%

What is the NAACC?

- Infrastructure to support assessments and prioritization
  - Assessment protocols, field data forms
  - Online crossings database
  - Data quality procedures
  - Training programs
  - Scoring systems
  - Prioritization tools
    - Prioritization for assessment
    - Prioritization for mitigation

- Network of individuals /organizations to assess crossings, set priorities, implement projects

North Atlantic Aquatic Connectivity Collaborative (NAACC): Founding Partners

NAACC Objectives

- Reconnect streams and rivers to support healthier populations of fish and wildlife

- Proactively identify and prioritize sites for stream crossing upgrades/ replacements

- Facilitate communication and information sharing among partners

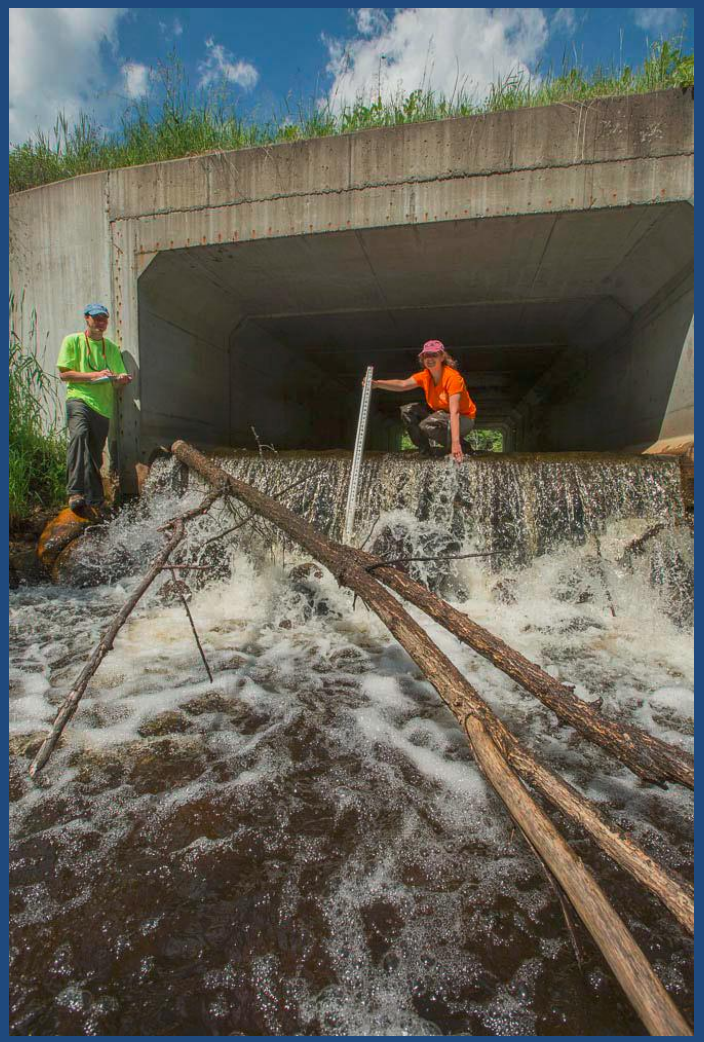
NAACC Development: Working Group

- Over 80 individuals from 13 states
- Participants represented:
  - 9 conservation organizations
  - 9 state natural resource agencies
  - 4 state transportation agencies
  - 5 federal agencies
  - 5 universities
- Input sought through development of protocol, database, scoring, etc.

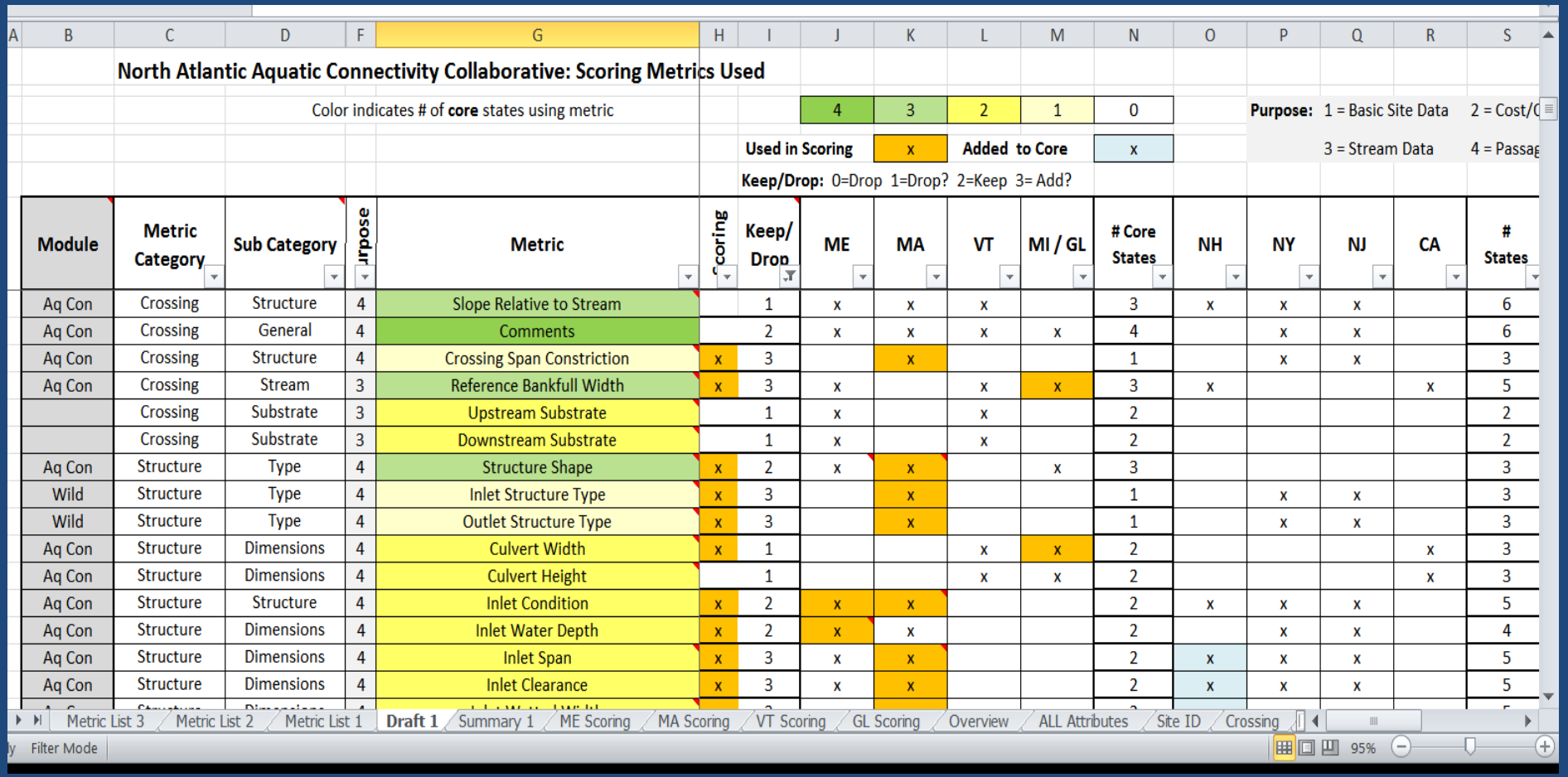
Road-Stream Crossing Assessment Protocol

North Atlantic Aquatic Connectivity Collaborative
NAACC

- Rapid aquatic organism passage (AOP) assessment
- Possibility of additional assessment modules
- Useful for trained volunteers
- Meets needs of diverse partners



Road-Stream Crossing Assessment Protocol



North Atlantic Aquatic Connectivity Collaborative: Scoring Metrics Used

Color indicates # of **core** states using metric

	4	3	2	1	0
Used in Scoring		x	**Added to Core**		x

Keep/Drop: 0=Drop 1=Drop? 2=Keep 3= Add?

Purpose: 1 = Basic Site Data 2 = Cost/C 3 = Stream Data 4 = Passag

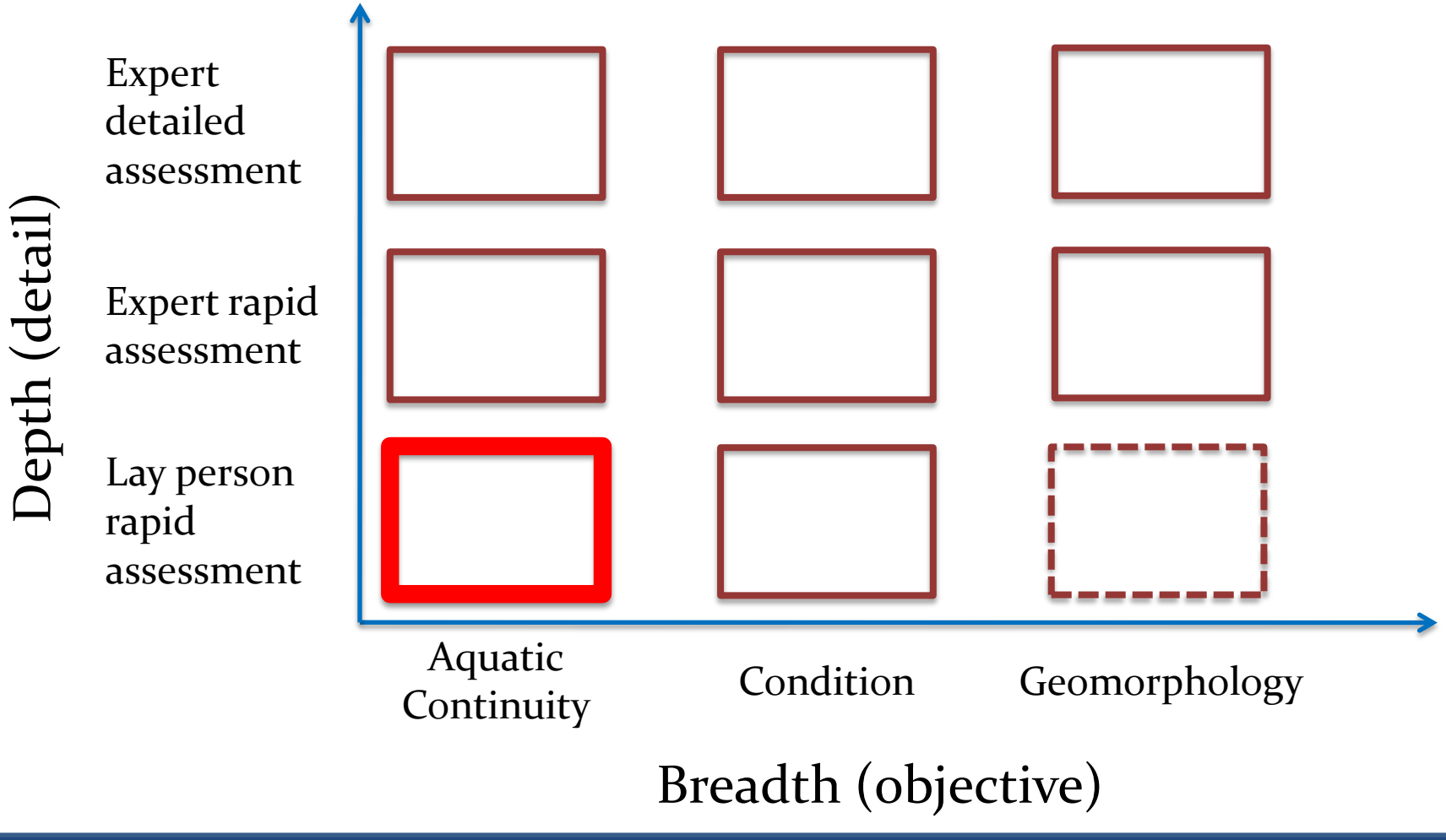
Module	Metric Category	Sub Category	urpose	Metric	coring	Keep/ Drop	ME	MA	VT	MI / GL	# Core States	NH	NY	NJ	CA	# States
Aq Con	Crossing	Structure	4	Slope Relative to Stream		1	x	x	x		3	x	x	x		6
Aq Con	Crossing	General	4	Comments		2	x	x	x	x	4		x	x		6
Aq Con	Crossing	Structure	4	Crossing Span Constriction	x	3		x			1		x	x		3
Aq Con	Crossing	Stream	3	Reference Bankfull Width	x	3	x		x	x	3	x			x	5
	Crossing	Substrate	3	Upstream Substrate		1	x		x		2					2
	Crossing	Substrate	3	Downstream Substrate		1	x		x		2					2
Aq Con	Structure	Type	4	Structure Shape	x	2	x	x		x	3					3
Wild	Structure	Type	4	Inlet Structure Type	x	3		x			1		x	x		3
Wild	Structure	Type	4	Outlet Structure Type	x	3		x			1		x	x		3
Aq Con	Structure	Dimensions	4	Culvert Width	x	1			x	x	2				x	3
Aq Con	Structure	Dimensions	4	Culvert Height		1			x	x	2				x	3
Aq Con	Structure	Structure	4	Inlet Condition	x	2	x	x			2	x	x	x		5
Aq Con	Structure	Dimensions	4	Inlet Water Depth	x	2	x	x			2		x	x		4
Aq Con	Structure	Dimensions	4	Inlet Span	x	3	x	x			2	x	x	x		5
Aq Con	Structure	Dimensions	4	Inlet Clearance	x	3	x	x			2	x	x	x		5

Metric List 3 | Metric List 2 | Metric List 1 | **Draft 1** | Summary 1 | ME Scoring | MA Scoring | VT Scoring | GL Scoring | Overview | ALL Attributes | Site ID | Crossing

Filter Mode

95%

Modular Approach



NAACC Stream Crossing Survey

NAACC Stream Crossing Survey Data Form Instruction Guide

Developed by the

North Atlantic Aquatic Connectivity Collaborative

Including: University of Massachusetts Amherst
The Nature Conservancy
U.S. Fish and Wildlife Service

Version 1.2 – May 2016

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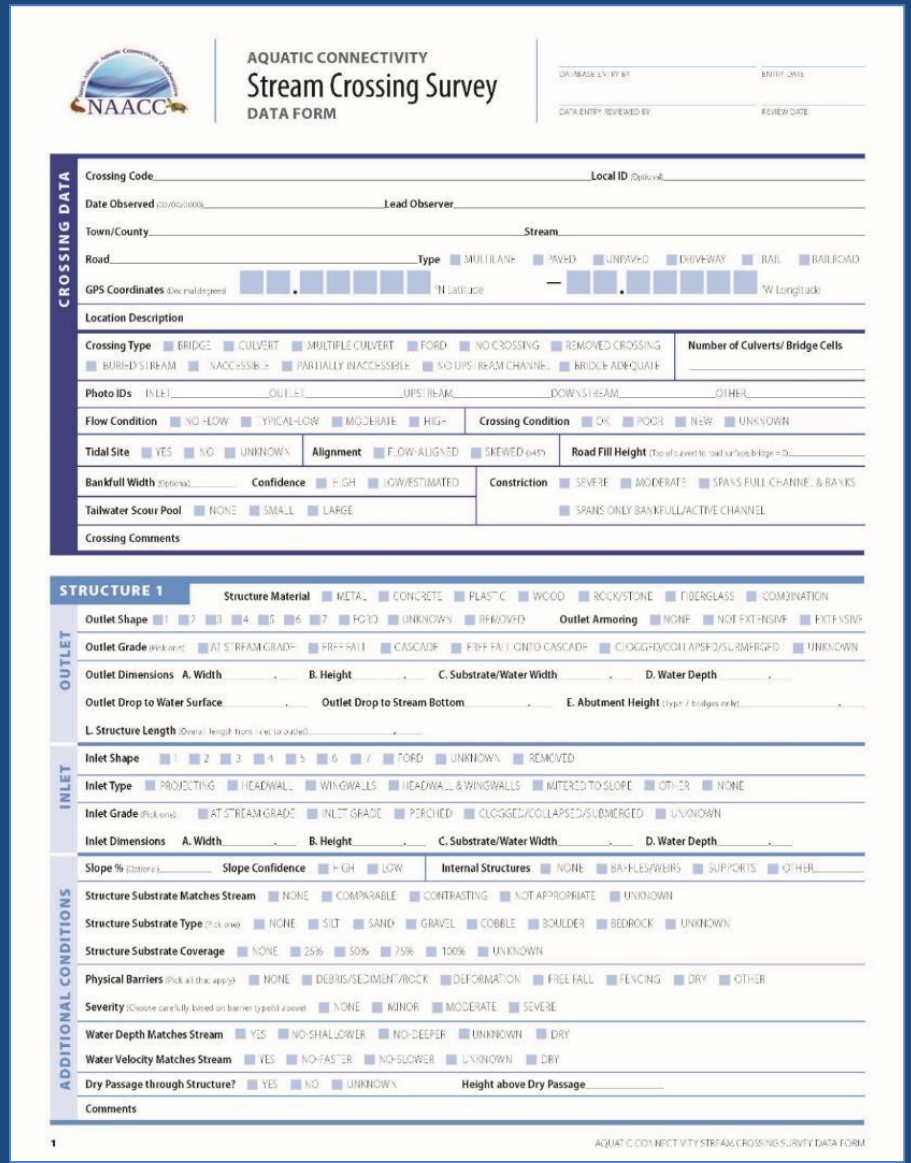
For more information, go to: **www.streamcontinuity.org**



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

CROSSING DATA

Crossing Code ____ Local ID (Optional) ____
Date Observed (mm/dd/yyyy) ____ Lead Observer ____
Town/County ____ Stream ____
Road ____ Type ☐ MULTILANE ☐ PAVED ☐ UNPAVED ☐ DRIVEWAY ☐ TRAIL ☐ RAILROAD
GPS Coordinates (Decimal degrees) ____ . ____ °N Latitude — ____ . ____ °W Longitude
Location Description
Crossing Type ☐ BRIDGE ☐ CULVERT ☐ MULTIPLE CULVERT ☐ FORD ☐ NO CROSSING ☐ REMOVED CROSSING ☐ BURIED STREAM ☐ INACCESSIBLE ☐ PARTIALLY INACCESSIBLE ☐ NO UPSTREAM CHANNEL ☐ BRIDGE ADEQUATE — Number of Culverts/ Bridge Cells ____
Photo IDs INLET ____ OUTLET ____ UPSTREAM ____ DOWNSTREAM ____ OTHER ____
Flow Condition ☐ NO FLOW ☐ TYPICAL FLOW ☐ MODERATE ☐ HIGH — Crossing Condition ☐ OK ☐ POOR ☐ NEW ☐ UNKNOWN
Tidal Site ☐ YES ☐ NO ☐ UNKNOWN — Alignment ☐ FLOW-ALIGNED ☐ SKEWED (>45°) — Road Fill Height (Top of culvert to road surface; bridge = 0) ____
Bankfull Width (Optional) ____ Confidence ☐ HIGH ☐ LOW/ESTIMATED — Constriction ☐ SEVERE ☐ MODERATE ☐ SPANS FULL CHANNEL & BANKS
Tailwater Scour Pool ☐ NONE ☐ SMALL ☐ LARGE — ☐ SPANS ONLY BANKFULL/ACTIVE CHANNEL
Crossing Comments

STRUCTURE 1

Structure Material ☐ METAL ☐ CONCRETE ☐ PLASTIC ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

OUTLET

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED — Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE
Outlet Grade (Pick one) ☐ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN
Outlet Dimensions A. Width ____ . B. Height ____ . C. Substrate/Water Width ____ . D. Water Depth ____ .
Outlet Drop to Water Surface ____ . Outlet Drop to Stream Bottom ____ . E. Abutment Height (Type 7 bridges only) ____ .
L. Structure Length (Overall length from inlet to outlet) ____ .

INLET

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED
Inlet Type ☐ PROJECTING ☐ HEADWALL ☐ WINGWALLS ☐ HEADWALL & WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE
Inlet Grade (Pick one) ☐ AT STREAM GRADE ☐ INLET GRADE ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN
Inlet Dimensions A. Width ____ . B. Height ____ . C. Substrate/Water Width ____ . D. Water Depth ____ .

ADDITIONAL CONDITIONS

Slope % (Optional) ____ Slope Confidence ☐ HIGH ☐ LOW — Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER ____
Structure Substrate Matches Stream ☐ NONE ☐ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN
Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN
Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☐ 100% ☐ UNKNOWN
Physical Barriers (Pick all that apply) ☐ NONE ☐ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER
Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE
Water Depth Matches Stream ☐ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY
Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY
Dry Passage through Structure? ☐ YES ☐ NO ☐ UNKNOWN — Height above Dry Passage ____
Comments

1 AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM

Data Input

- GPS navigation to sites
- Electronic data collection
- Option to use paper data forms
- Bulk upload to database
- Automatic scoring

Scoring Systems: Aquatic Passability Score (0-1.0)

Parameter	Weight
Outlet drop	0.161
Physical barriers	0.135
Constriction	0.090
Inlet grade	0.088
Water depth	0.082
Water velocity	0.080
Scour pool	0.071
Substrate matches stream	0.070
Substrate coverage	0.057
Openness	0.052
Height	0.045
Outlet armoring	0.037
Internal structures	0.032

Aquatic Passability Score = Min[Composite Score, Outlet Drop score]

Scoring Systems: AOP Coarse Screen

Metric	Flow Condition	Crossing Classification		
		Full AOP	**Reduced AOP**	**No AOP**
		If all are true	*If any are true*	*If any are true*
Inlet Grade		At Stream Grade	Inlet Drop or Perched	
Outlet Grade		At Stream Grade		Cascade, Free Fall onto Cascade
Outlet Drop to Water Surface		= 0		≥ 1 ft
Outlet Drop to Water Surface/ Outlet Drop to Stream Bottom				> 0.5
Inlet or Outlet Water Depth	Typical-Low	> 0.3 ft		< 0.3 ft w/Outlet Drop to Water Surface > 0
	Moderate	> 0.4 ft		< 0.4 ft w/Outlet Drop to Water Surface > 0
Structure Substrate Matches Stream		Comparable or Contrasting		
Structure Substrate Coverage		100%	< 100%	
Physical Barrier Severity		None	Minor or Moderate	Severe

Data Quality Procedures

- Training and certification requirements for observers and survey coordinators
- Shadowing requirement for observers
- Detailed instruction manual
- Data validation rules

Data Validation

Database rules that can't be violated

- Programmed into database
- Examples:
  - Required fields
  - Acceptable range of measurements
  - GPS units must be within bounding box
- Electronic data collection: applied at time of collection in the field
- Paper data collection: applied when data are entered to the database

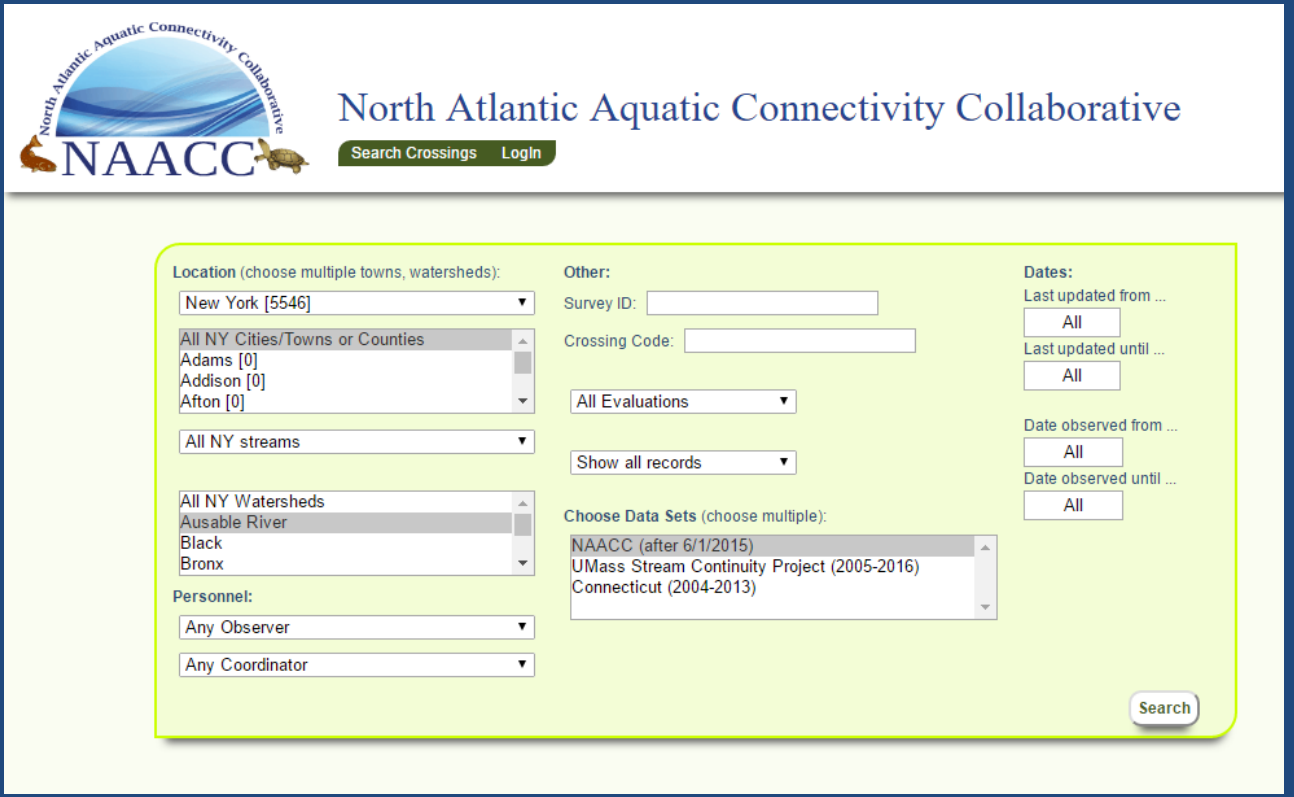
Online Crossings Database

Data Reports:

- Excel files
- Shapefiles
- Mapping interface

# of Records:

- > 16,000 new
- > 12,000 older



https://streamcontinuity.org/cdb2

Location (choose multiple towns, watersheds):

New York [5546]

All NY Cities/Towns or Counties
Adams [0]
Addison [0]
Afton [0]

All NY streams

All NY Watersheds
Ausable River
Black
Bronx

Personnel:

Any Observer

Any Coordinator

Other:

Survey ID:

Crossing Code:

All Evaluations

Show all records

Choose Data Sets (choose multiple):

NAACC (after 6/1/2015)
UMass Stream Continuity Project (2005-2016)
Connecticut (2004-2013)

Dates:

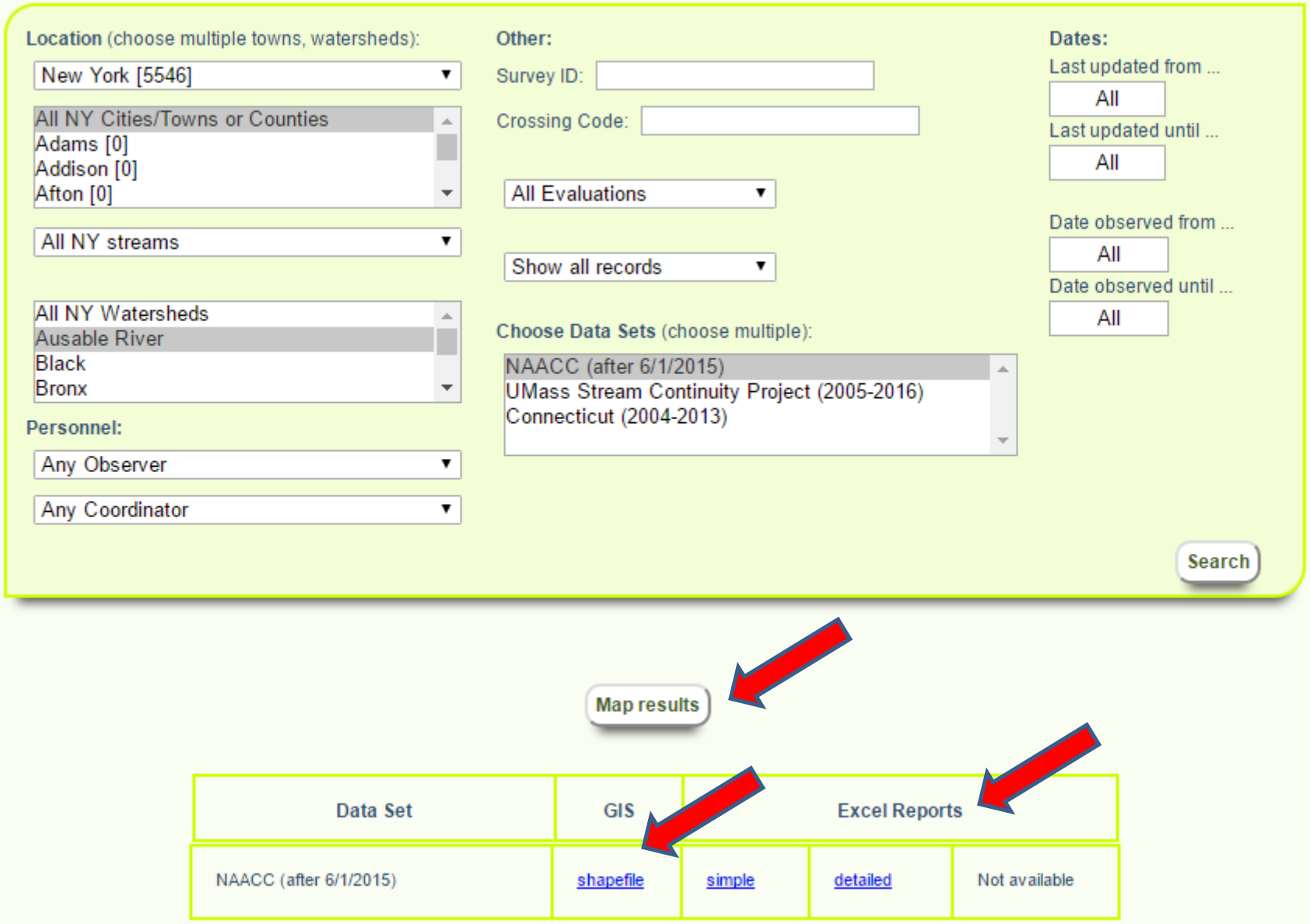
Last updated from ...
All
Last updated until ...
All

Date observed from ...
All
Date observed until ...
All

Search

Map results

Data Set	GIS	Excel Reports		
NAACC (after 6/1/2015)	shapefile	simple	detailed	Not available


Location (choose multiple towns, watersheds):
New York [5546]
All NY Cities/Towns or Counties
Adams [0]
Addison [0]
Afton [0]
All NY streams
All NY Watersheds
Ausable River
Black
Bronx
Personnel:
Any Observer
Any Coordinator
Other:
Survey ID:
Crossing Code:
All Evaluations
Show all records
Choose Data Sets (choose multiple):
NAACC (after 6/1/2015)
UMass Stream Continuity Project (2005-2016)
Connecticut (2004-2013)
Dates:
Last updated from ...
All
Last updated until ...
All
Date observed from ...
All
Date observed until ...
All
Search

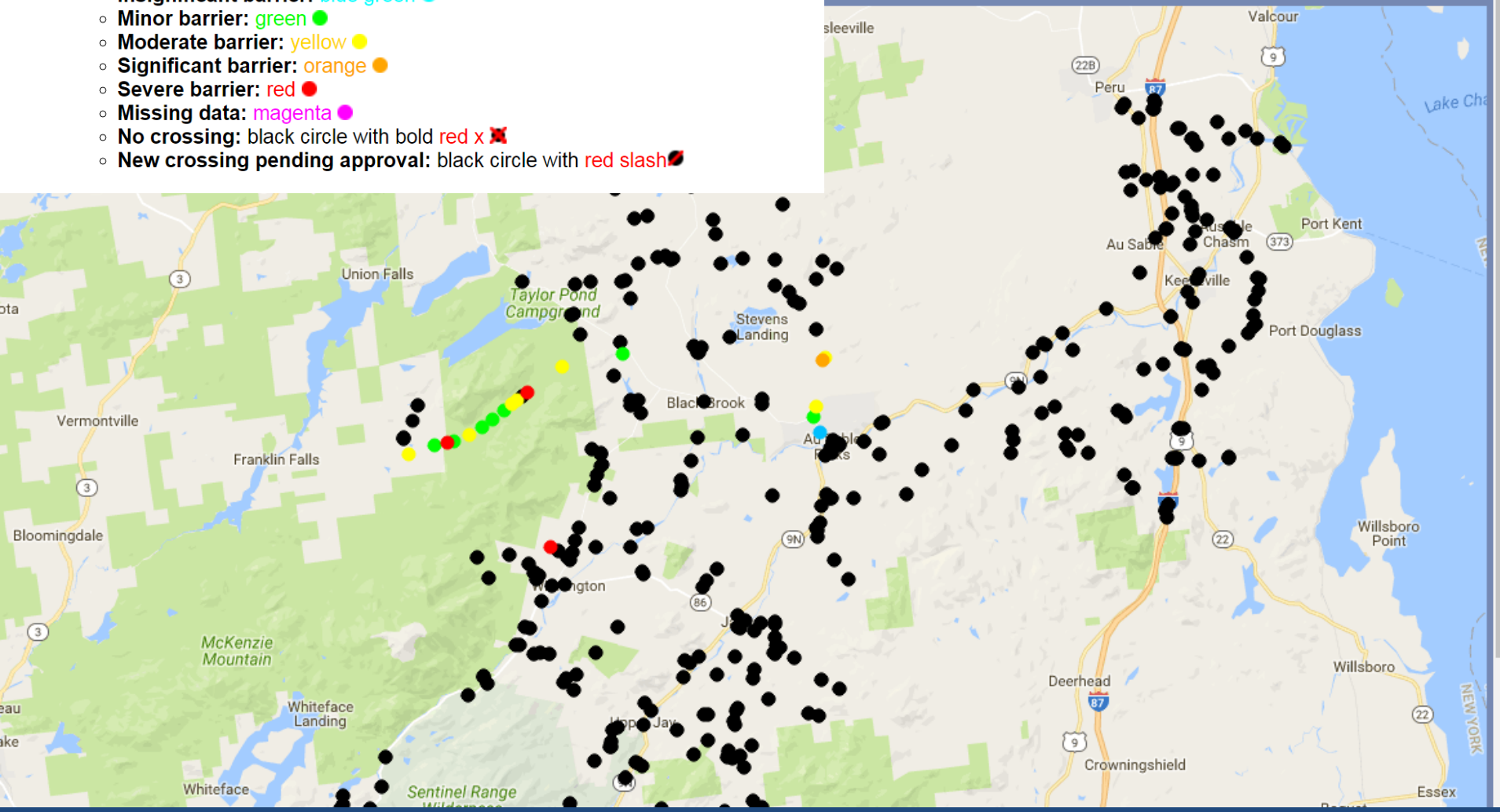
Map results

Data Set
GIS
Excel Reports
NAACC (after 6/1/2015)
shapefile
simple
detailed
Not available

Map information Click to show/hide map information

1. The colored circles on the map represent surveyed crossings color coded as follows:
   - **No barrier:** blue
   - **Insignificant barrier:** blue green
   - **Minor barrier:** green
   - **Moderate barrier:** yellow
   - **Significant barrier:** orange
   - **Severe barrier:** red
   - **Missing data:** magenta
   - **No crossing:** black circle with bold red x
   - **New crossing pending approval:** black circle with red slash

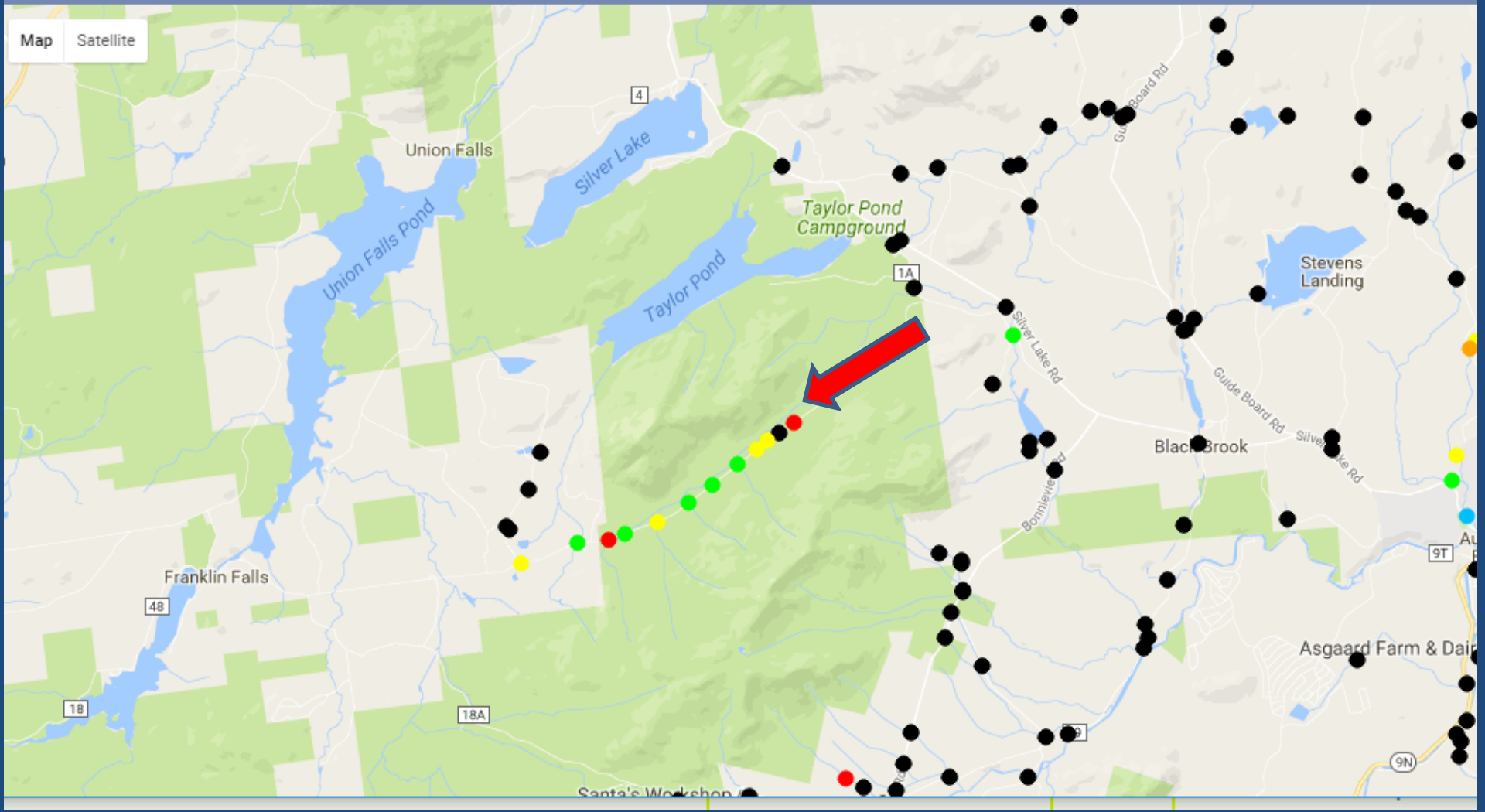
apping page!
ds having valid xy crossing codes or GPS information can be mapped. Only one
odes will be mapped.)



Welcome to our search results mapping page!

(Note that 25 of 25 surveyed records in your search results have been mapped. Only surveyed records having valid xy crossing codes or GPS information can be mapped. Only one record of records with duplicate crossing codes will be mapped.)

Map information Click to show/hide map information



NAACC Display Crossing - Google Chrome

https://www.streamcontinuity.org/cdb2/naacc_display_crossing.cfm?naaccCrossId=275

North Atlantic Aquatic Connectivity Collaborative

Search Crossings | LogIn

NAACC Data Set

Survey Id: 27583 Crossing Code: xy4446211073836850 (approved)
AOP Coarse Screen: No AOP NAACC Aquatic Passability Score: 0.00
Data checked and accurate by Jaime Masterson on 01-04-2016


xy4446211073836850(inlet)7-29-2015.jpg


xy4446211073836850(outlet)7-29-2015.jpg


xy4446211073836850(upstream)7-29-2015.jpg


xy4446211073836850(downstream)7-29-2015.jpg

Crossing Data:

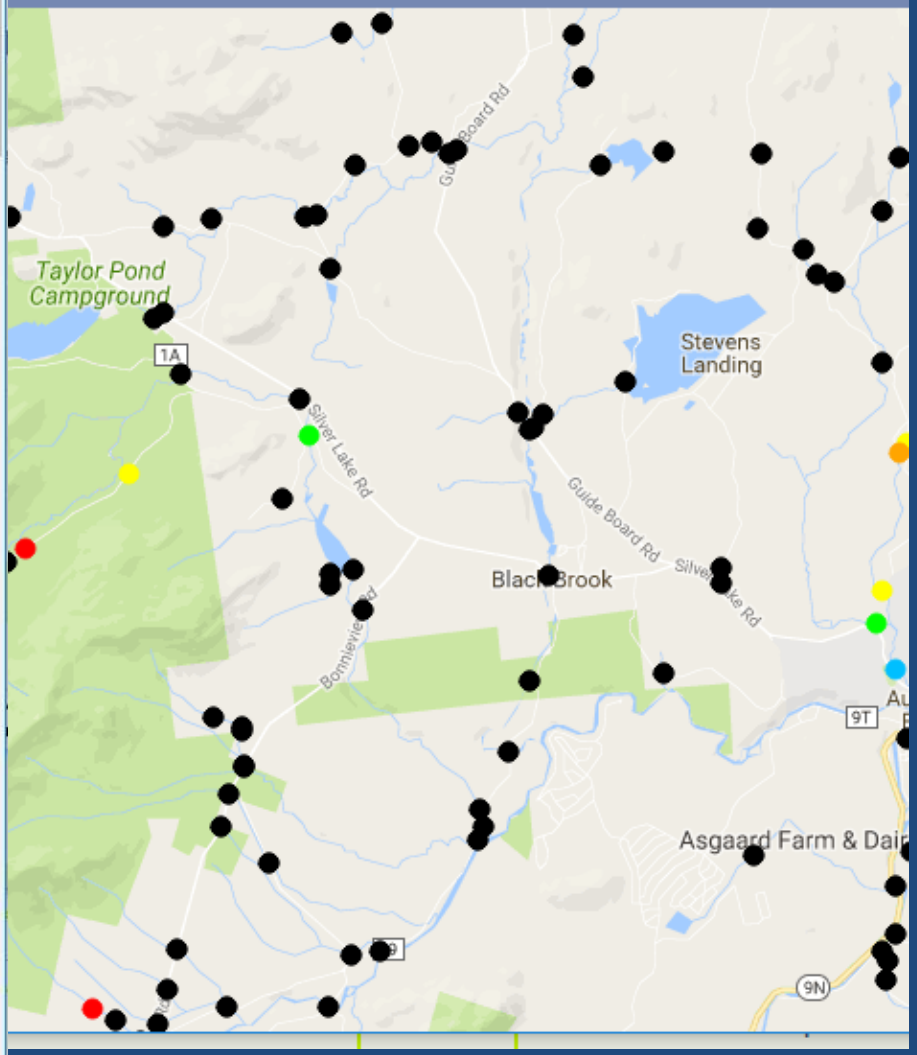
Coordinator: Jaime Masterson

Crossing Code: xy4446211073836850

Date observed in field: 07-29-2015

First entered: 12-14-2015

lts mapping page!
nly surveyed records having valid xy crossing codes or GPS information
uplicate crossing codes will be mapped.)



Distributed Coordination

- Lead observers (data collectors)
  - Technicians
  - Volunteers

- L1: local coordinators
- L2: regional coordinators
- L3: central coordinators

- Trainers

Regional Networks for Field Survey

- Trainings across the region
- > 16,000 sites assessed since June 2015
- Records from all 13 states in database

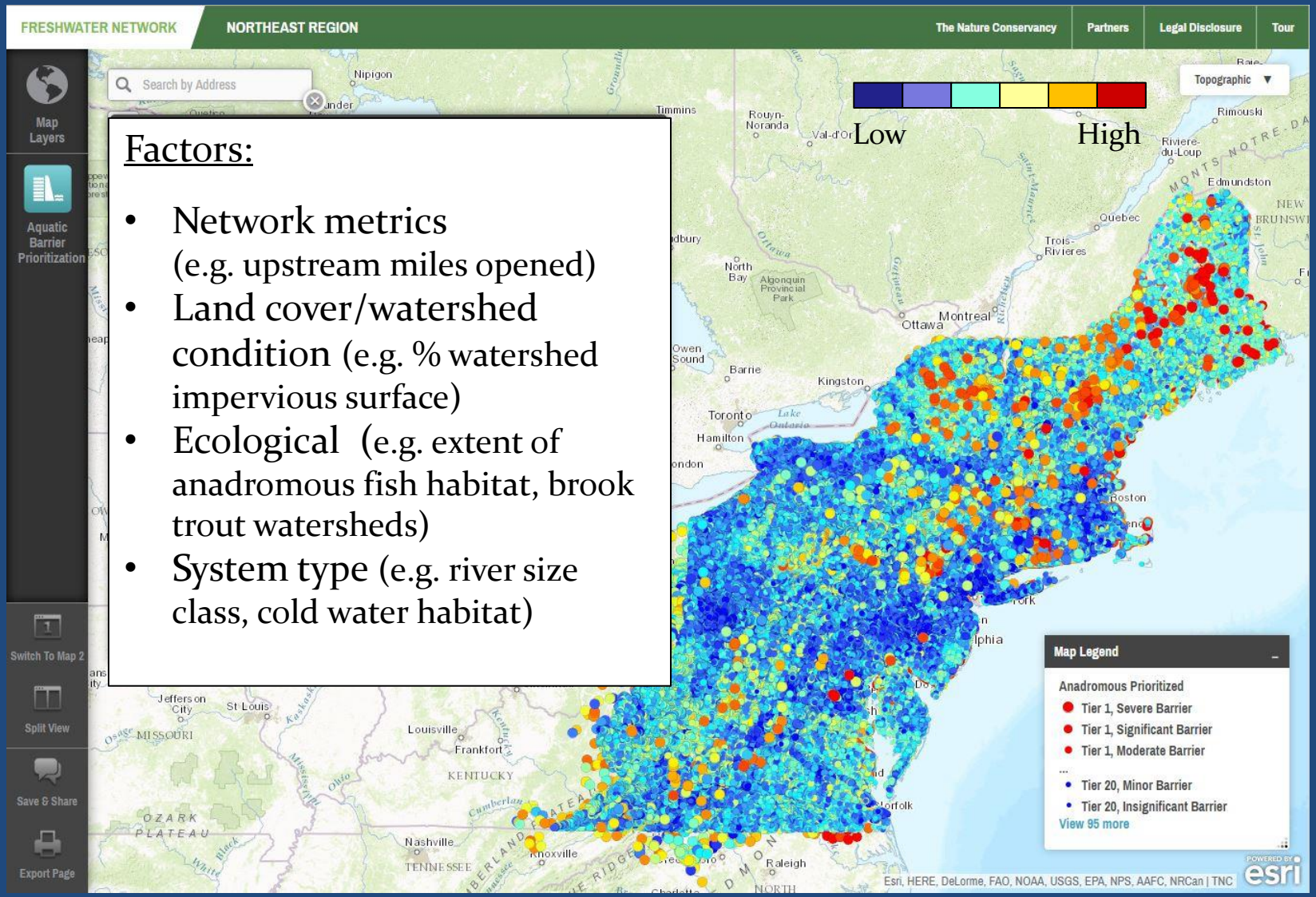
Coming Soon…

Tools to help prioritize crossings for mitigation

- UMass Critical Linkages
- TNC Northeast Aquatic Connectivity Project

Northeast Aquatic Connectivity Barrier Prioritization

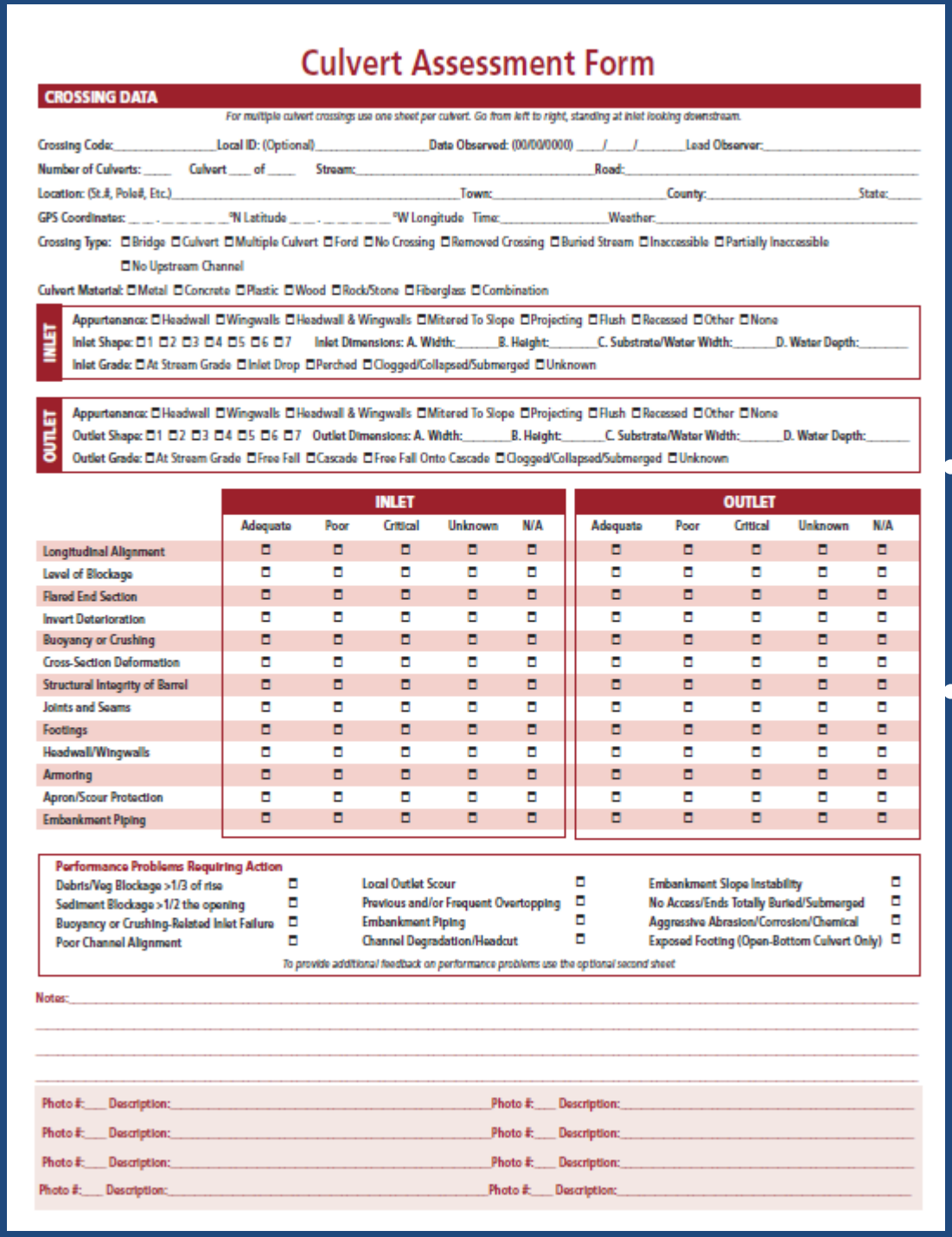
The Nature Conservancy



Coming Soon…

Modules to assess:

- Tidal culverts
- Terrestrial wildlife passage
- Culvert condition



Culvert Assessment Form

CROSSING DATA

For multiple culvert crossings use one sheet per culvert. Go from left to right, standing at inlet looking downstream.

Crossing Code:_____ Local ID: (Optional)_____ Date Observed: (00/00/0000) ___/___/_____ Lead Observer:_____

Number of Culverts: ____ Culvert ___ of ____ Stream:_____ Road:_____

Location: (St.#, Pole#, Etc.)_____ Town:_____ County:_____ State:____

GPS Coordinates: __ __ . __ __ __ __ °N Latitude __ __ . __ __ __ __ °W Longitude Time:_____ Weather:_____

Crossing Type: ☐Bridge ☐Culvert ☐Multiple Culvert ☐Ford ☐No Crossing ☐Removed Crossing ☐Buried Stream ☐Inaccessible ☐Partially Inaccessible ☐No Upstream Channel

Culvert Material: ☐Metal ☐Concrete ☐Plastic ☐Wood ☐Rock/Stone ☐Fiberglass ☐Combination

INLET

Appurtenance: ☐Headwall ☐Wingwalls ☐Headwall & Wingwalls ☐Mitered To Slope ☐Projecting ☐Flush ☐Recessed ☐Other ☐None

Inlet Shape: ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Inlet Dimensions: A. Width:_____ B. Height:_____ C. Substrate/Water Width:_____ D. Water Depth:_____

Inlet Grade: ☐At Stream Grade ☐Inlet Drop ☐Perched ☐Clogged/Collapsed/Submerged ☐Unknown

OUTLET

Appurtenance: ☐Headwall ☐Wingwalls ☐Headwall & Wingwalls ☐Mitered To Slope ☐Projecting ☐Flush ☐Recessed ☐Other ☐None

Outlet Shape: ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Outlet Dimensions: A. Width:_____ B. Height:_____ C. Substrate/Water Width:_____ D. Water Depth:_____

Outlet Grade: ☐At Stream Grade ☐Free Fall ☐Cascade ☐Free Fall Onto Cascade ☐Clogged/Collapsed/Submerged ☐Unknown

	INLET					OUTLET				
	Adequate	Poor	Critical	Unknown	N/A	Adequate	Poor	Critical	Unknown	N/A
Longitudinal Alignment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Level of Blockage	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flared End Section	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Invert Deterioration	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Buoyancy or Crushing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cross-Section Deformation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Structural Integrity of Barrel	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Joints and Seams	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Footings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Headwall/Wingwalls	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Armoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Apron/Scour Protection	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Embankment Piping	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Performance Problems Requiring Action

Debris/Veg Blockage >1/3 of rise	☐	Local Outlet Scour	☐	Embankment Slope Instability	☐
Sediment Blockage >1/2 the opening	☐	Previous and/or Frequent Overtopping	☐	No Access/Ends Totally Buried/Submerged	☐
Buoyancy or Crushing-Related Inlet Failure	☐	Embankment Piping	☐	Aggressive Abrasion/Corrosion/Chemical	☐
Poor Channel Alignment	☐	Channel Degradation/Headcut	☐	Exposed Footing (Open-Bottom Culvert Only)	☐

To provide additional feedback on performance problems use the optional second sheet

Notes:_____

Photo #:___ Description:_____ Photo #:___ Description:_____

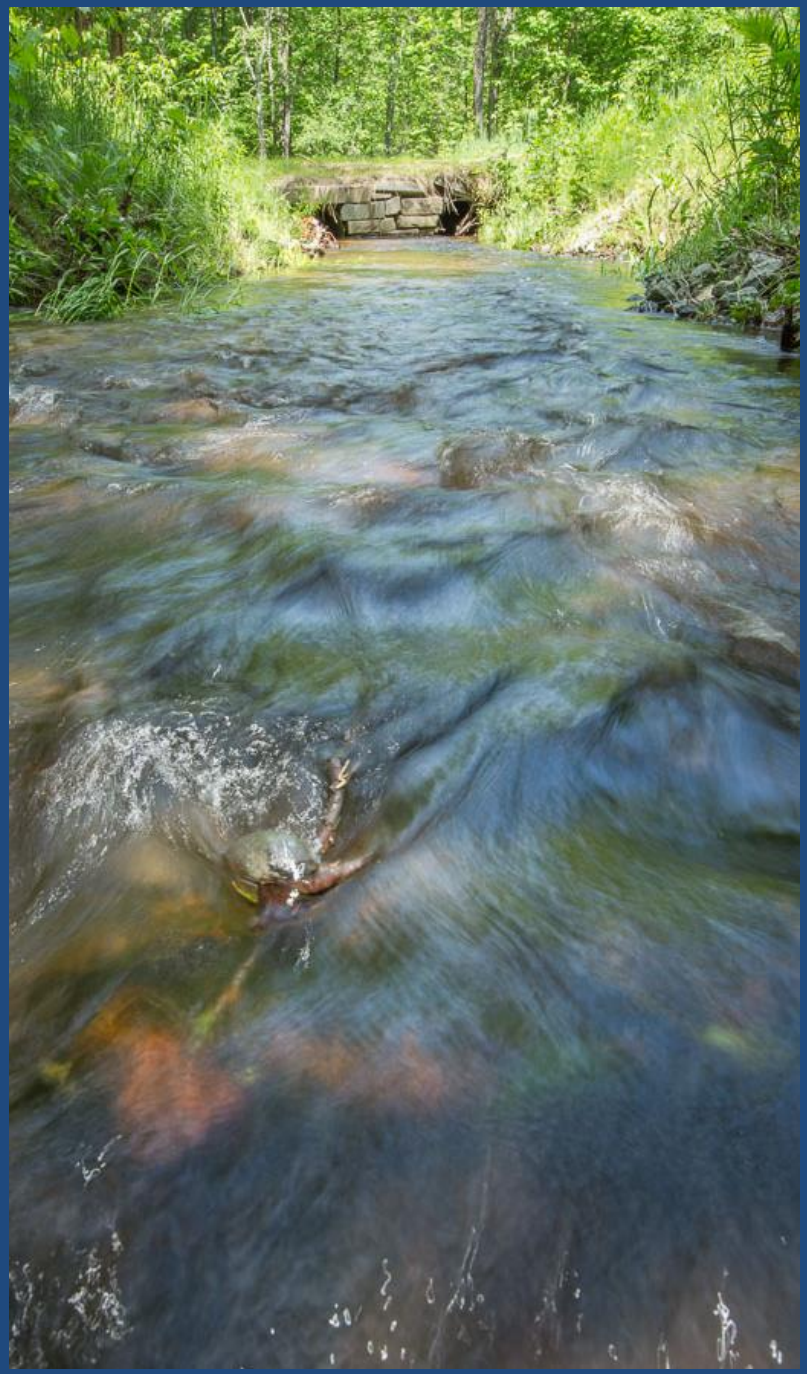
Photo #:___ Description:_____ Photo #:___ Description:_____

Photo #:___ Description:_____ Photo #:___ Description:_____

Photo #:___ Description:_____ Photo #:___ Description:_____

Culvert Condition Module

- Developed with advisory group
- By assessing condition:
  - ✓ Identify opportunities for implementation
  - ✓ Provide valuable information for DPWs and DOTs



Thank You

North Atlantic Aquatic Connectivity Collaborative

NAACC

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Next presenter