IMPROVING CONNECTIVITY – THE NS EXPERIENCE

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Nova Scotia Salmon Association

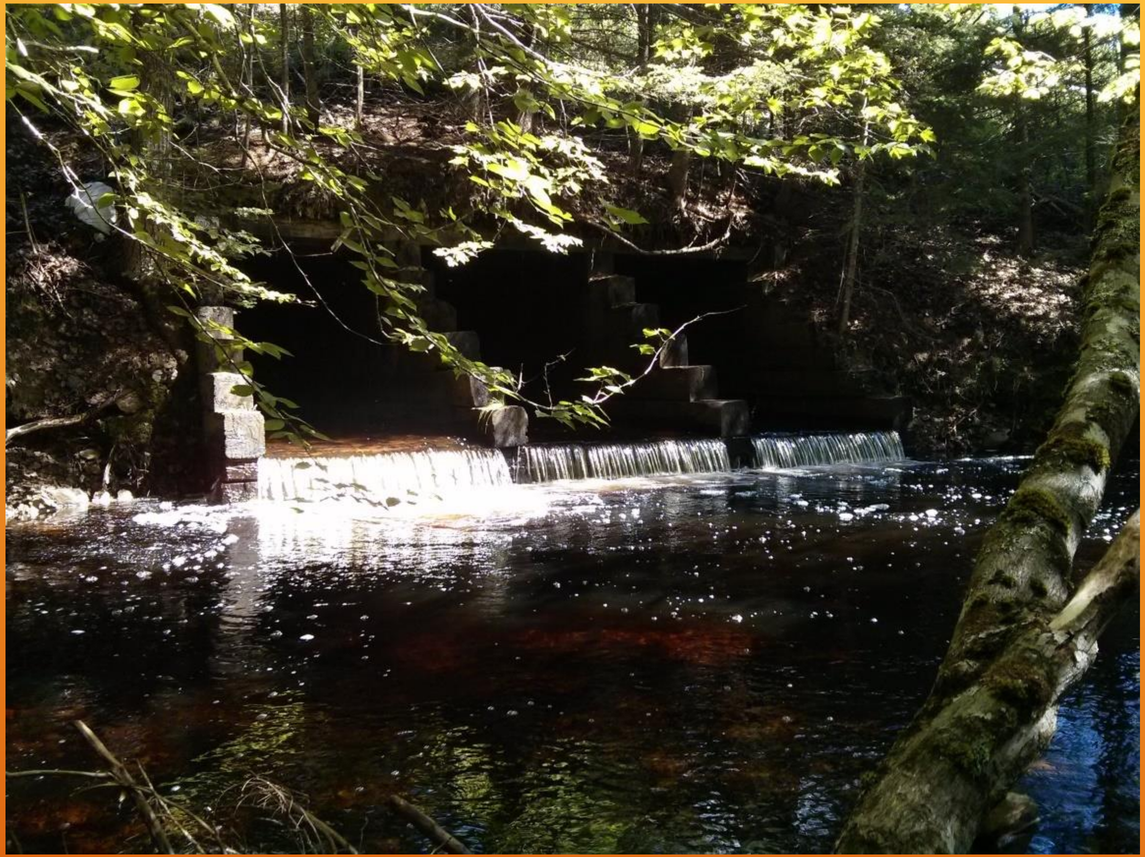
NSLC Adopt A Stream Program

AQUATIC CONNECTIVITY

- Fragmentation by:
- Dams, causeways, aboiteaux
- Malfunctioning fishways
- Stream crossings
- and, damaged, degraded stream channels

LONG, SHALLOW, STRAIGHTENED RUNS IMPEDE FISH PASSAGE

INSTREAM RESTORATION NEEDED



ASSESSMENTS FIND 50-70% OF CULVERTS ARE FULL OR PARTIAL BARRIERS TO FISH

15,541 Crossings

(not including Private Roads)

_ A great many of which are culverts.

VELOCITY BARRIER

- Water velocities are too fast during fish migration.
- Fish either unable to maintain speed or not enough endurance at speed.
- Caused by high culvert slope or undersized culvert.

DEPTH BARRIER

- Depth of water in culvert too low during migration.
- Fish unable to swim through shallow water.
- Caused by high culvert slope or over-widened culvert.

VERTICAL BARRIER

- Vertical Barrier
  - "Waterfall"
  - Outflow Drop
- Prevents fish migration when drop exceeds their ability to jump
- Not backwatered
- Called a perched outflow.

DEBRIS BARRIER

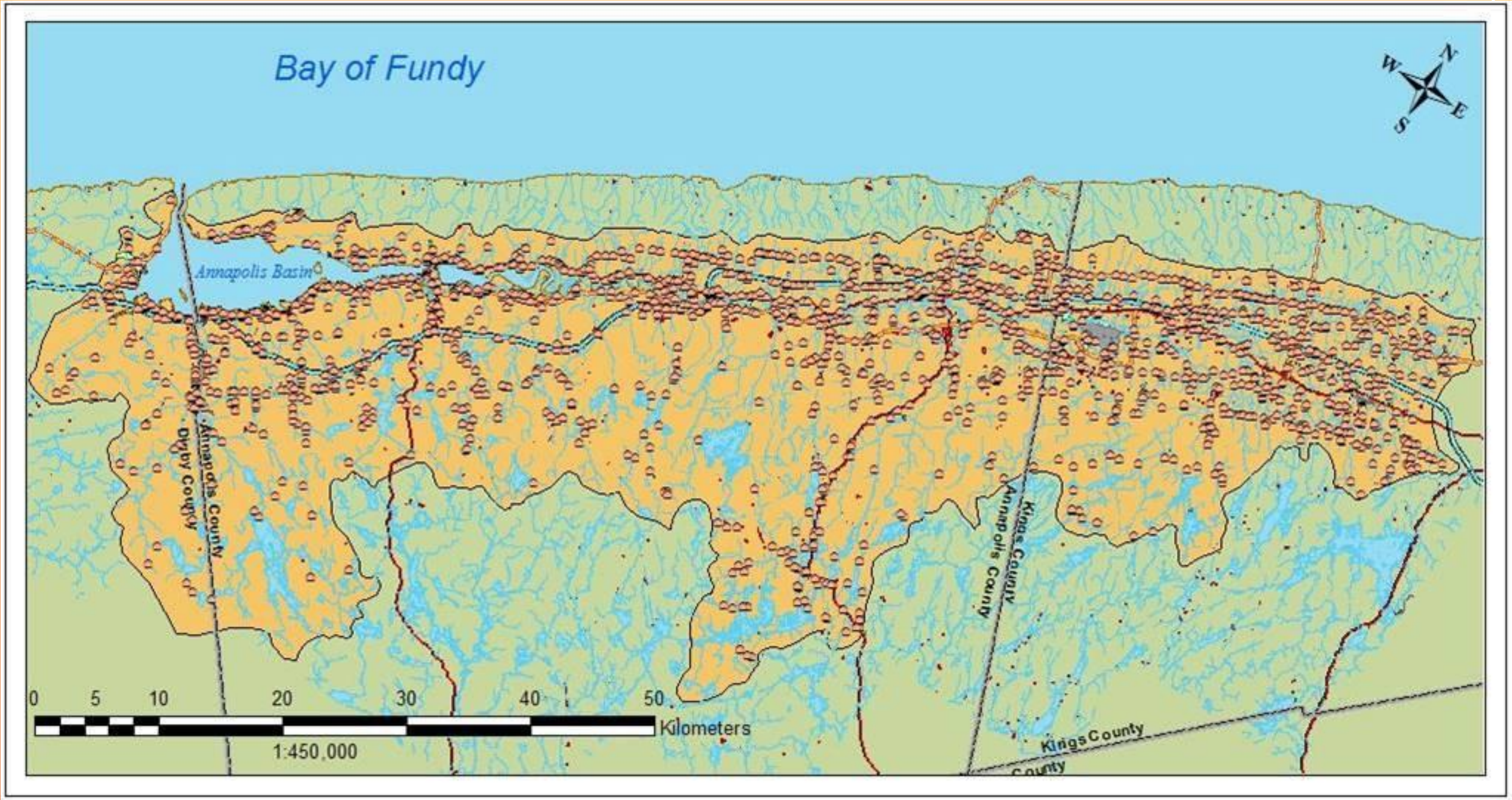
- Debris in culvert blocking fish passage
- Fish unable to swim through debris jam.
- Caused by many sources: Humans, Beavers, Natural, Floods, etc.

ACCESS TO HABITAT KEY STEP TO RESTORATION

- The Nova Scotia Salmon Association’s NSLC Adopt A Stream supports the community based restoration of aquatic habitat, providing project funding, training and technical support.
- Ensuring access to habitat is a first priority for improving productivity, increasing fish populations.
- Easier said than done for most community groups
- In 2010, we began to develop an aquatic connectivity program for Nova Scotia - when interest and resources aligned.

Broken Brooks

1,615 potential barriers



AQUATIC CONNECTIVITY PROGRAM

- 2010 -Resources with the new program sponsorship by the Nova Scotia Liquor Corporation

- Active partners in Southwest Nova Scotia:
- Clean Annapolis River Project (CARP) had been working on identifying and assessing stream crossings for a couple of years through their project Broken Brooks.

- Mersey Tobeatic Research Institute (MTRI) was collaborating with Parks Canada and in particular Kejimkujik National Park on aquatic connectivity.

- Developed protocols for assessing culverts, materials & training curriculum and offered culvert assessment training to groups across the province.

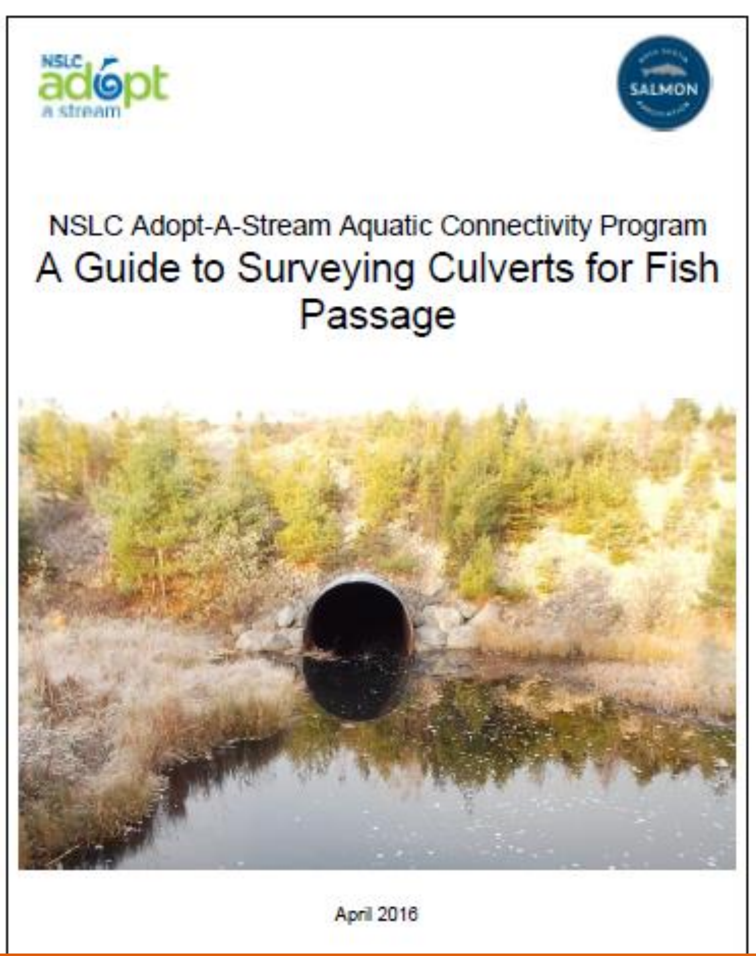
Clean Annapolis River Project

AQUATIC CONNECTIVITY PROGRAM GOALS

- Increase knowledge of aquatic connectivity in NS watersheds
- Support watershed groups in aquatic connectivity assessment efforts
- Provide consistent methodology and reporting across groups
- Enable groups and decision makers to address aquatic connectivity issues
- Support fish passage remediation where feasible

TRAINING

- Classroom presentation on survey protocols.
- Demonstration of survey equipment use
- Hands-on demonstration of culvert survey



NSLC Adopt-A-Stream Aquatic Connectivity Program

A Guide to Surveying Culverts for Fish Passage

April 2016

Clean Annapolis River Project

CULVERT ASSESSMENT – FIELD SURVEY

- Field assessment based on
  - physical & hydrological properties of the road crossings and stream
  - A few added items re stream fish habitat

The aim to collect the data needed to assess fish passage, stream connectivity and remediation potential

NSLC adopt a stream

Aquatic Connectivity Program Culvert Assessment

SALMON

Site Information			
Field Crew			
Culvert ID		Date (dd/mm/yyy)	
Stream Name		Time	
Road Name		Projection	☐ WGS 84 ☐ NAD 83
Ownership of Crossing	☐ Public Road ROW ☐ Rail Bed ROW ☐ Private	Lat (deg, min, sec)	
Debris Blockage Present	☐Yes ☐No	Long (deg, min, sec)	
Description of Debris		Fish Habitat	☐Yes ☐No

*If culvert is identified as being on a fish bearing stream, then proceed with further data collection

Photo Files			
Upstream	File Name	Downstream	File Name
Toward Inflow		Toward Outflow	
Through Culvert		Through Culvert	
Looking Upstream		Looking Downstream	
Other		Other	

Stream Characteristics

Water Quality

Air Temp (°C)		pH		DO (mg/L)	
Water Temp (°C)		Conductivity (µS/cm)		TDO (mg/L)	

Substrate Sizes (taken upstream of culvert in percent composition)

Fines (<0.2cm)		Cobble (6.4-25.6cm)		Bedrock	
Gravel (0.2-6.4cm)		Boulder (>25.6cm)			

Channel Measurements (taken upstream)

	Pool	Riffle	Run	Average
Wetted Width (m)				
Bankfull Width (m)				
Stream Width Ratio				

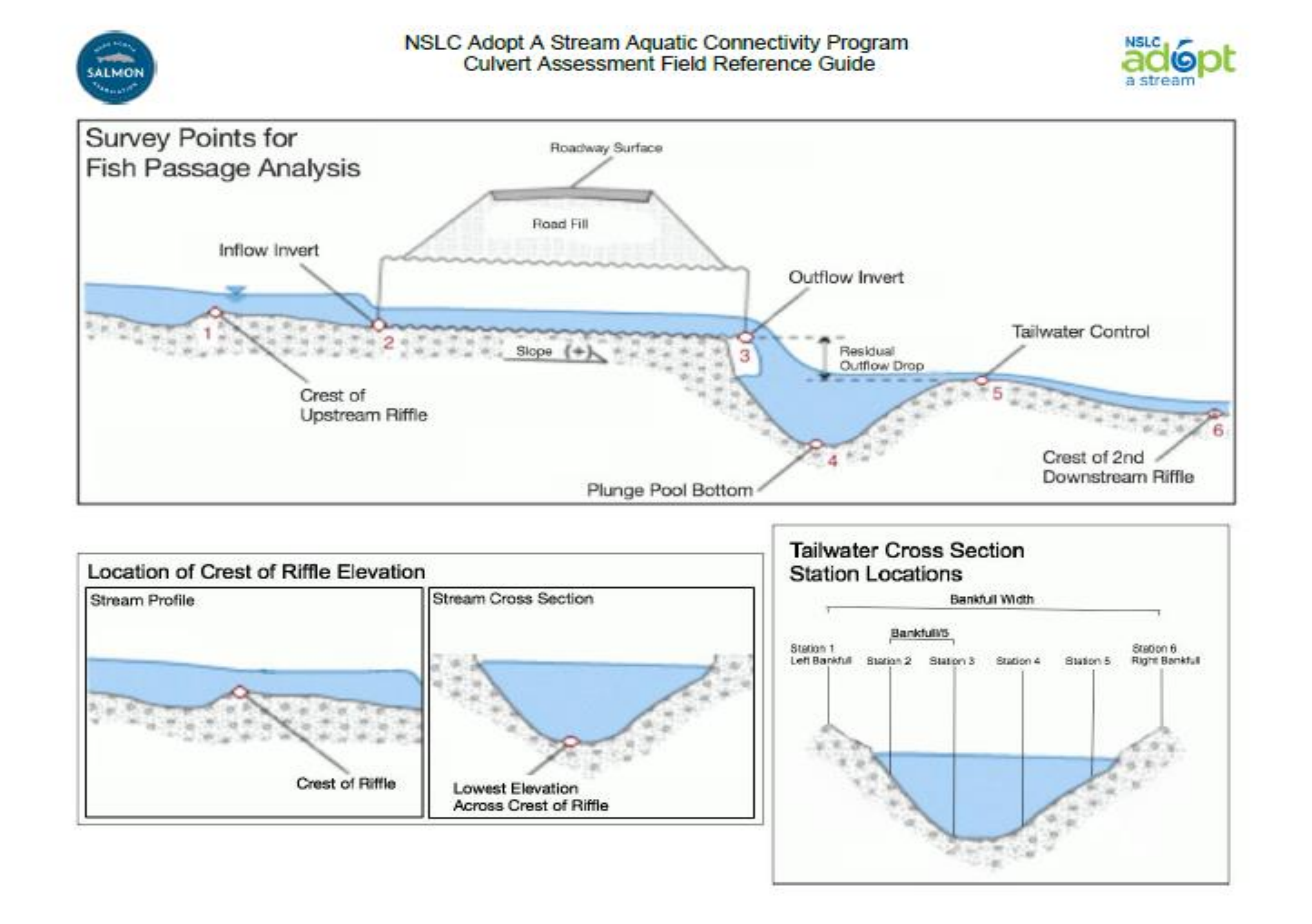
Rapid Assessment		
Is there a visable outflow drop?	☐Yes	☐No
Is the water depth less than 15cm anywhere in the culvert?	☐Yes	☐No
Is the culvert backwatered only part of the way or not at all?	☐Yes	☐No
Is the stream width noticably different above and below the culvert?	☐Yes	☐No

If the response to any of these questions is YES then continue with the full assessment.

NSLC adopt a stream

- Site Info – Meta data
- Photo files *
- Stream Characteristics
  - May as well collect some data on the brook which may inform prioritization
- Rapid Assessment
- 4 yes /no questions
- visual answers
- Any Yes = full assessment

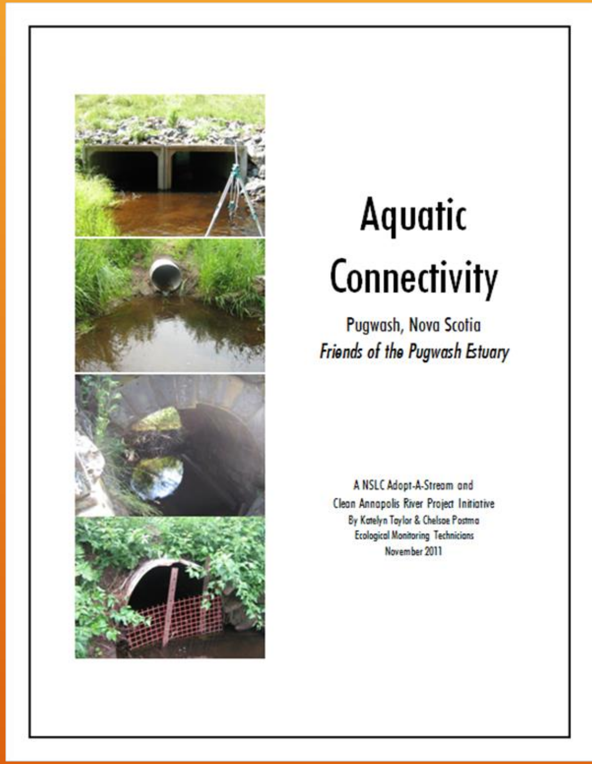
- Culvert description
- Elevations:
- Up & downstream ends
- Crest of riffles
- Tailwater control cross section
- Baffles if present



Adapted from: http://www.stream.fs.fed.us/fishxing/help/Culvert_Definition_Sketch.htm

- In-field training early in season
- Available for throughout season

TECHNICAL SUPPORT


Aquatic Connectivity

Pugwash, Nova Scotia

Friends of the Pugwash Estuary

A NSLC Adopt-A-Stream and
Clean Annapolis River Project Initiative
By Katelyn Taylor & Chelsae Postma
Ecological Monitoring Technicians
November 2011

Analysis and Reporting

CULVERT ASSESSMENT DATA

- Assessing the data
  - Watershed size/slope and land use information
  - Flow estimation
  - Fish swimming ability equations
  - Physical properties of the crossings Culverts/ Bridges
  - Stream structure below

- Some culverts can't be fixed at all
- Others can be improved to pass more fish, more of the time

REMEDIATION OPTIONS

REMEDIATION PROCESS

1. Target Assessments
   - Bottom up
   - Main Stem
   - Good habitat
2. Assess
   - AAS Culvert Assessment Course
   - Quality over quantity
   - Quality Checks
3. Analyze and Prioritize
   - Complexity/Cost vs. Habitat Gain/Benefit

Complexity: Low
Cost: Low

Complexity: High
Cost: Higher

REMEDIATION PROCESS

3. Prioritize
   - Complexity/Cost vs. Habitat Gain/Benefit
4. Design & Remediate
   - Chutes
   - Mini-Fishways
   - Baffles
   - Other

GENERAL REMEDIATION STRATEGIES

- Outflow Drop: Less than or equal to 25cm
- Outflow Drop: Greater than 25cm, less than or equal to 40cm
- Outflow Drop: Greater than 40cm
- Slope: Greater than 0.5%

- Outflow Chute
- Outflow Chute w/Downstream Weirs*
- Mini-Fishway
- Baffles

Halfway Brook, Hammonds Plains

Out flow chute with low flow barrier upstream

Moose River, Eskasoni

Six Mile Brook, Mira Cape Breton

Upper Cornwallis

2 chamber pool-wier fishway

More Brook Inverness
Tub style 2 chamber pool weir fishway

FOCUS TO DATE

- Focus on freshwater fish habitats
- Have
  - Watershed Plan framework
  - Habitat suitability assessment for Atlantic salmon and Brook trout -- physical habitat and basic WQ
  - Culvert/ crossing assessment data collection
  - Developed lots of techniques for physical habitat restoration and culvert remediation
- Lots to be done to reach our objectives

1^{ST} HABITAT FOR RESTORATION IS MIGRATION HABITAT

- Access to all habitats needed for the life cycle, no matter the quality, is essential
- Ideally take an ecosystem approach plus lots of the precautionary approach to connectivity
- The watercourse corridor is very important for all species of fish, wildlife, and overall biodiversity
- Road crossings have an impact on the connectivity for more than just target species of fish

ASSESSMENT FOR TARGET/ INDICATOR SPECIES

Science-based fish swimming ability equations

- Brook trout --- all age classes -- good
- Atlantic salmon --- all age classes – needs juvenile work
- Alewife --- adult needs work – need light in built structures
- Smelt --- adult needs work
- Eels -- elvers and adults needs work
- Swimming ability and behaviour
  - ie Alewife schools, elvers work along the bottom,
  - preferred migration velocities for all species need some consideration –just because the can doesn't mean they will
  - Have general body form equations for all species but need species specific equations for both burst and prolonged swimming ability and check endurance times under various conditions ie temp, light, turbulence, turbidity, past swimming effort.

CONCLUSION

- We have the data collection model and training that get us the information needed
- There is software to aid with the assessment. GIS and FishXing
- We have a data base ready to be populated
- We need to develop the analysis methodology and computerize much of it preferably into the database.
- We can use the tools to help and try out the restoration plan
- We need to define the criteria for passage ie flows at migration times, species behaviour, check capabilities, adjust for age and condition etc.
- Need flexibility in the model to test changes and design new crossings.

AQUATIC CONNECTIVITY

Thanks

Funded by

- Nova Scotia Liquor Corporation sponsorship
- Recreational Fisheries Conservation Partnerships Program
- NS Sportfish Habitat Fund

Partners

- NS Transportation and Infrastructure Renewal
- Clean Annapolis River Project – Habitat Stewardship Program Prevention Stream
- Community groups
- Collaboration with Petitcodiac Watershed Alliance