

The Atlantic Salmon Conservation Foundation

Multiyear Project End of Year Report

This form has been developed to simplify the reporting of your accomplishments to the ASCF. Please use this form for your End of Year Report, do not send report in other formats. The information you provide will be used to document the specific and overall accomplishments of your project and the effectiveness of the ASCF grants and may be subject to audit.

This report is distinct, and may be different, from other reports you may prepare for your project. The ASCF wishes to receive those reports in addition to this report.

Please note:

- Your Report and a statement of expenditures are due on the date provided in Schedule "C" of your contribution agreement.
- Attach copies of receipts for all ASCF funded expenditures.
- Any remaining balance of ASCF grant funds must be returned to the ASCF with the Final Report.
- Do not "refer to attachments" for information requested in this form.
- Reports are required on the date agreed to in your funding agreement. If the final report is not submitted, future applications to ASCF will not be considered. Amendment of the dates for reporting may be made by mutual agreement.
- Send reports, copies of receipts, photos, maps and final payment invoice to:

darla@salmonconservation.ca (NB or QC projects or projects resulting from an RFP for applied scientific research)
krystal@salmonconservation.ca (NS, PEI or NL projects)

or

**The Atlantic Salmon Conservation Foundation
480 Queen Street, Suite 200
Fredericton, NB E3B 1B6**

Need help?

For projects that are in New Brunswick or in Québec or projects resulting from an RFP for applied scientific research, please contact Darla Saunders (Darla@salmonconservation.ca).

For projects in Nova Scotia, Prince Edward Island or Newfoundland and Labrador, please contact Krystal Binns (krystal@salmonconservation.ca).

Office Numbers : Phone: 506-455-9900 Fax: 506-455-9905

Section A	Project Information
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Year Grant Acquired: 2017 End date: 1 December 2019

Year 1 of Project: 2017____ Year 2 of project:2018____ Year 3 of project: 20____

Year(s) covered by this report: __2017-2018_____

Organization: Nashwaak Watershed Association Inc.

Project title: Assessing and restoring aquautic connectivity in the lower Nashwaak River

Contact: Marieka Chaplin, Executive Director

Address: P.O. Box 314, Station A, Fredericton, E3B 4Y2

Phone: 506-261-4664 Fax: E-mail: director@nashwaakwatershed.ca

ASCF Grant Amount: \$ 12,175 / year for 2 years. Total 24,350

Section B	Project Description
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Category of Project (check all that apply):

- | | |
|--|-------------------------------------|
| A) Development of an Atlantic salmon and salmon habitat watershed plan | <input type="checkbox"/> |
| B) Protection and restoration of salmon habitat | <input type="checkbox"/> |
| C) Rebuilding of stocks and restoration of salmon populations | <input type="checkbox"/> |
| D) Restoration of access to critical salmon habitat | <input checked="" type="checkbox"/> |
| E) Education and awareness on the importance of salmon conservation | <input type="checkbox"/> |

Summary

Please state the importance, the objectives as stated in your funding agreement and the major results of this project.

Importance

Significant urbanization has occurred in the lower Nashwaak watershed in the last decade, leading to an increase in roads and associated stream crossings. Poorly designed, installed, or maintained culverts can restrict Endangered Atlantic salmon from reaching upriver spawning habitat, feeding grounds, or cold-water refuges, which can have significant impacts on their populations. A single culvert acting as a barrier can restrict fish from accessing several kilometres, or more, of important upstream habitat. Additionally, culverts can change water velocity, river hydrology, and become blocked with debris causing flooding and costly damage to infrastructure. Habitat fragmentation is a prolific issue in the Maritimes. The Clean Annapolis River Foundation found that 70% of culverts they assessed were barriers to fish passage and 80% of the culverts surveyed by the Petitcodiac Watershed Alliance in 2015 were either partial or full barriers to fish passage.

Prior to 2017, the aquatic connectivity of the Nashwaak Watershed was unknown. Therefore, the NWA

requested funds to conduct multi-year project to assess, prioritize, and restore barrier culverts in the Nashwaak watershed from the mouth of the river working up, to re-establish salmon access to important upstream habitat.

The project was developed from a High Priority Action Item in our 2017-2020 Action Plan. The Nashwaak River is an important salmon-producing tributary of the Saint John River and is one of DFO's priority rivers for restoration under their 2014 "Recovery Potential Assessment". This work is also in line with Atlantic Salmon Federation's 2013 "Recovery Strategy for Wild Atlantic Salmon". Habitat fragmentation and blocked access to cold-water or spawning habitats have been recognized as limiting factors for salmon populations.

Objectives

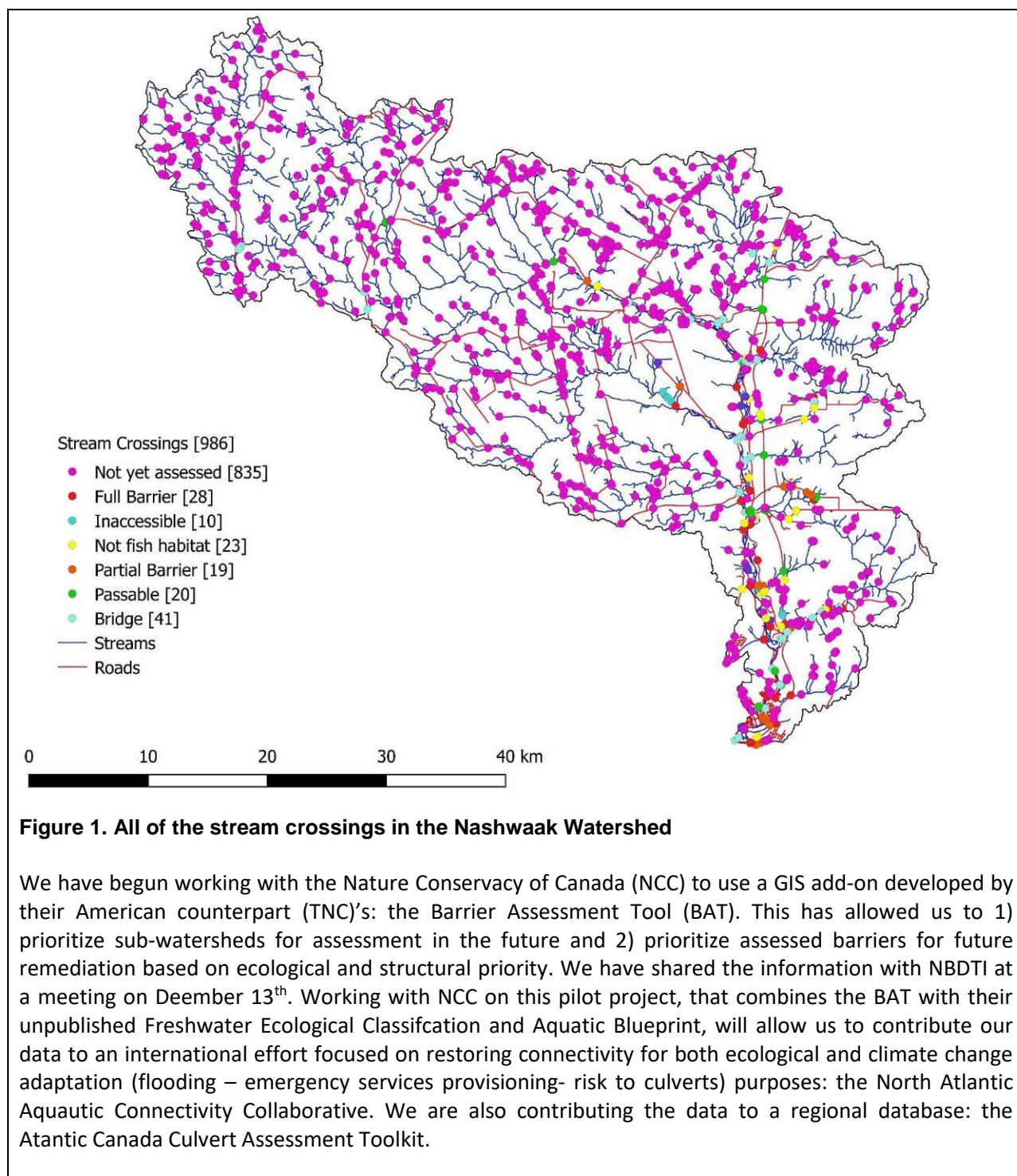
The objectives of the project were:

- 1) to increase the capacity of the NWAI to survey the Nashwaak River watershed;
- 2) to increase our knowledge of the aquatic connectivity and fragmentation of the watershed;
- 3) an overall decrease in habitat fragmentation within the Nashwaak watershed and an overall increase in habitat availability for the Atlantic salmon; and
- 4) to communicate the connectivity of the river to the public.

Results

Over the course of 2017, NWAI's capacity to survey the Nashwaak watershed has greatly increased, as has our knowledge about the connectivity and fragmentation of our watershed. We have mapped all of the stream crossings in the watershed thanks to the assistance of an NBCC student this spring. This is above our Year 1 goal of mapping only the stream crossings in the lower half of the watershed.

To date, we have assessed 138 stream crossings in the watershed with a full survey done on 67 of those crossings (using a survey rod and level), which was above our Year 1 goal of 50 full surveys. We focused on culverts in the lower watershed (from Nashwaak Bridge to Barker's Point) that were within 1 km from the main stem of the Nashwaak River. All crossings on Route 8, Rte. 148 below Nashwaak Bridge, and Rte. 628 were surveyed (except those on private land where we could not get landowner permission). Data were entered into the Atlantic Canada Culvert Assessment Toolkit (ACCAT) datasheet, which allowed slope and outflow drop to be calculated and the culvert to be categorized as a Full Barrier, Partial Barrier, or Passable. By following this protocol, it also allows our results to be compared to others in the Atlantic Provinces and to uploaded on a centralized web map. We mapped all of the surveyed culverts using GIS. Photos of all culverts are available [HERE](#). Online mapping is available [HERE](#).



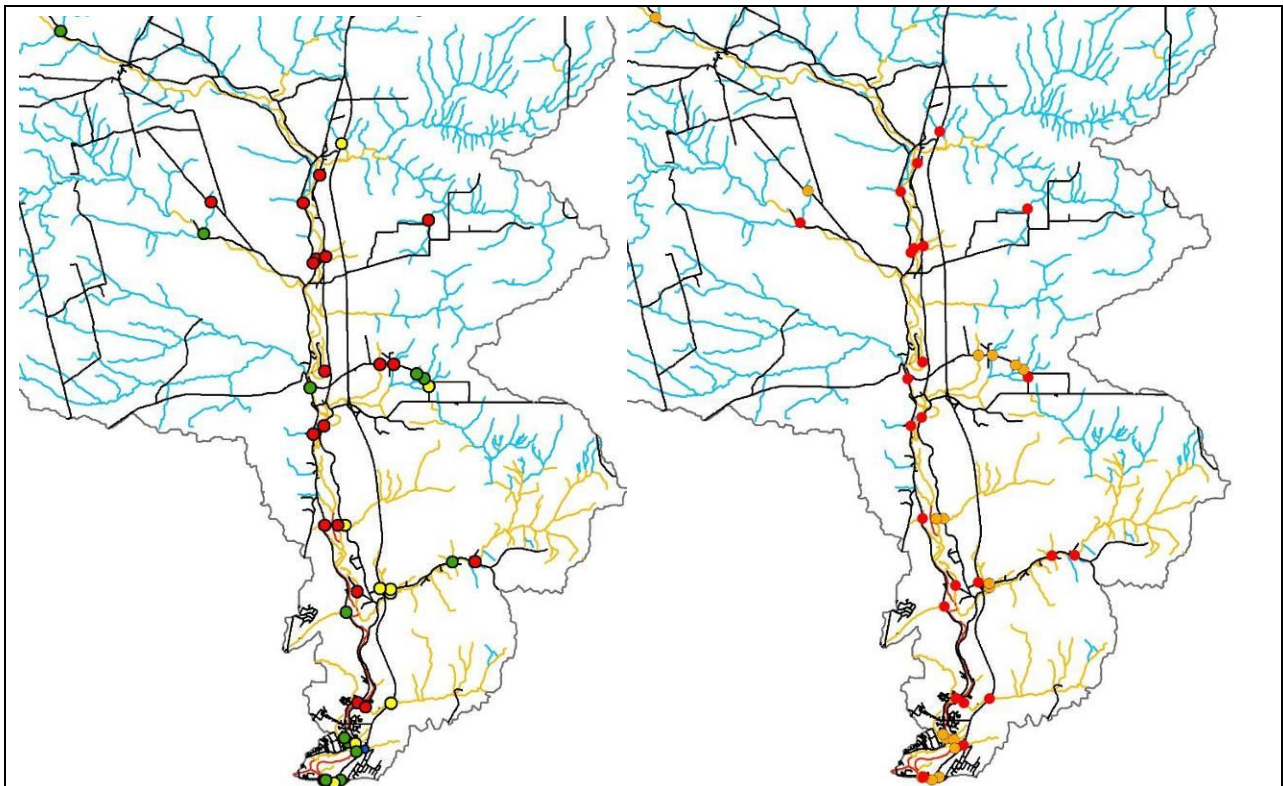


Figure 2. (left) Structural condition of the culverts assessed as barriers [green = good, yellow = fair, red = poor]. (right) Barrier classification [red = full barrier, orange = partial barrier].

Twenty-eight (42%) surveyed crossings were Full Barriers, 19 (28%) were Partial Barriers, and 20 (30%) were Passable. Major issues preventing fish passage included 1) beaver activity completely blocking a number of culverts, especially along Rte. 8 (reported to DTI), 2) older wooden box culverts on Rte. 148 and Rte. 628 collapsing (these are slated to be replaced by DTI in coming years, and, therefore, we were told not to focus remediation efforts on these culverts), and 3) culverts installed at steep slopes without baffles.



Figure 3. Beavers have flooded the upstream portion of this small stream by blocking the inlet of the culvert.

The results of our survey have led us to focus on a remediation of culvert M102 that will open up 28.04 km² of previously inaccessible habitat for salmonids. We chose this culvert to focus on because many of the culverts that we classified as Full Barriers were either 1) very old box culverts or cast in place arches that are slated to be replaced in the future, 2) the remediation was beyond our capacity (i.e., full replacement was needed), 3) were blocked by beavers, which we do not have a permit to move. Therefore, we will focus on culvert M102 as 1) Manzer Brook is one of the larger tributaries in the lower Nashwaak that has culverts as stream crossings, 2) it is on a well-travelled road meaning that it is higher priority for DTI, and 3) the culvert is structurally in good condition. DTI attempted to rehab this culvert in 2000 by lining the culvert with concrete, installing baffles for fish passage, and putting in three rock weirs downstream of the outlet. However, the rock weirs have since washed out and a blind weir was not installed in the higher two culverts (meaning that at low flow water still goes through all three culverts instead of being concentrate through the lowest culvert). The culvert is currently blocking 19.6 km stream. Drainage area upstream from the culvert is mostly forested with minor agricultural land. The stream has a moderate gradient and is cool water.

We have permission from DTI to move ahead with the design of a new fish passage option. The remediation will involve installing blind weirs on the higher two culverts to channelize the flow and building a mini-fish ladder to install on the lower culvert. The fish ladder was custom designed by HILCON Ltd., a locally owned engineering company specializing in hydraulics and hydrology, and will be custom-made over the winter by Tek Steel, a locally owned company. It will be light enough to be installed by hand and will be put in place in May/June 2018, depending on water levels. It will remain in place year-round and will be regularly cleaned by NWA staff and volunteers. Please see the attached preliminary engineering sketches.

Our work to remove debris, including car batteries, rims, beers cans, and other garbage, from all assessed culverts, and large debris blockages from at least 11 culverts, has decreased the overall fragmentation of the lower Nashwaak watershed and improved water quality downstream from these crossings. We are working hard to communicate the importance of connectivity of the river to the public via our social media channels, our annual newsletter, and conversations with landowners.



Figure 4. A debris blockage between culverts 2 and 3 at a culvert on Manzer Brook was removed, which improved the flow of water. Culvert 1 has a large tree inside of it that could not be removed with the equipment we had.

Field work has involved 80 volunteer hours (UNB students, Nature Conservancy of Canada staff, and NWA board members). An attempt was made to engage Saint Mary's First Nation fisheries staff in the project but they were busy with their own culvert assessments. However, they have assisted us with other projects and we continue to have a good working relationship with the Saint Mary's First Nation. They have been asked to assist us with the remediation of culvert M102 in the spring of 2018. In addition, at least 40 hours of volunteer GIS mapping work was done by an NBCC student this spring and the Nature Conservancy of Canada staff have volunteered their time to help us with their GIS add-on for prioritization. UNB also allowed us to borrow survey equipment valued at 500\$. More volunteer hours from two UNB Civil Engineering students are expected this winter as they will focus on the remediation of culvert M102 as a senior project. In addition, we have engaged anglers at the Fredericton Fish and Game Association.



Figure 5. Before and after of a debris blockage removal downstream from a culvert on McLean Brook.

Project performance and evaluation:

Please provide an evaluation and assessment of the performance of your project according to the performance measures outlined in the funding agreement. Include problems you encountered and how they were solved, unexpected outcomes, budget inaccuracies, timing changes, and recommendations for future work.

The project is going according to plan. We have surpassed our Year 1 goals for number of culverts mapped and surveyed. We have increased our capacity to survey the aquatic connectivity of the watershed, as well as our knowledge about the fragmentation of the river. In addition focusing on one large repair at Manzer Brook (detailed above), we have done at least 11 major debris removals, which have improved flow and fish passage in those culverts and water quality downstream.

Unexpectedly, we have begun working with the Nature Conservancy of Canada, to use a GIS add-on developed by their American counterpart to prioritize culverts for assessment and remediation and quickly calculate upstream habitat gain, land use information, and other parameters. This will be an extremely useful tool to have when approaching DTI and other culvert owners. This partnership has turned into a pilot project, where NWAI's culvert data is being combined with NCC's unpublished Freshwater Ecological Classification and Aquatic Blueprint. This partnership will allow us to contribute our data to an international effort focused on restoring connectivity for both ecological and climate change adaptation (flooding – emergency services provisioning- risk to culverts) purposes: the North Atlantic Aquatic Connectivity Collaborative.

We have also involved two UNB Civil Engineering students, who are working on an aspect of our culvert assessment project for their senior report and special study. These two partnerships (UNB Engineering and NCC) were unplanned in the initial phase of the project. We continue to work with the Peticodiac Watershed Alliance to share data for their online Atlantic Canada-wide map.

Problems encountered & solutions:

We have focused our efforts on one larger remediation (Manzer Brook at Rte. 628) rather than several smaller repairs. Manzer Brook is one of the larger fish-bearing watercourses (~28 km² drainage area) in

the lower watershed where stream-road crossings are culverts (larger streams have bridges as stream crossings). It is also on a well-traveled road, the drainage area above the culvert is mainly forest, and the stream is cool-transitional (below 21°C). Based on conversations with surrounding landowners, it appears that the hydraulics of the brook have changed since Rte. 8 was built in 2009-2010. Department of Transportation and Infrastructure (DTI) remediated this culvert in 2000; but, their fix has since washed out. Based on conversations with DTI, we were encouraged to focus our efforts on the Manzer Brook-Rte 628 culvert as 1) many of the surveyed stream crossings in our watershed are either old wooden box culverts slated or cast in place concrete arches to be replaced by DTI in the near future or they would involve remediations would be beyond our capacity (i.e., full replacement), 2) the culvert is structurally in good shape (it has been lined with concrete), and 3) there was a previous (failed) attempt to instate fish passage for salmonids. The design of the remediation, incorporation of blind weirs on the higher two culverts and a mini-fish ladder on the middle (lower) culvert, has been finalized by HILCON Ltd. and approved by DTI. The ladder and weirs will be built by Tek Steel, a locally owned company, and delivered to site. We have volunteers in place to help with the installation in May/June of 2018. In addition, UNB Civil Engineering students will be using this culvert as a senior project over the winter 2017. By reinstating fish passage at this stream crossing, we will open up 28 km² (and 19 km length of stream) of previously inaccessible habitat. Please see the attached preliminary engineering sketches for the fish ladder and blind weirs.

One setback this field season was the difficulty communicating with DTI about maintenance issues (e.g., beavers blocking culverts). DTI was also concerned about the safety and liability aspects of our group working on their infrastructure. During our presentation to DTI on December 13th we talked about these issues and solutions to the problems.



Figure 6. This triple culvert on Manzer Brook is a barrier to fish as all three culverts have outflow drops of between 38 and 62 cm. We are working on a remediation option to reinstate fish passage.

Performance measure	Results
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<i>Take from Attachment "A" of Contribution Agreement</i>	
# of NWA staff and volunteers attending training workshop.	Three staff and two board members attended a training workshop in May with Peticodiac Watershed Alliance
# of culverts mapped in a desktop survey in Year 1 / Year 2.	Thanks to assistance from a NBCC student this spring, we have mapped all the stream crossings in our watershed, which was above our goal of mapping only the culverts in the lower half of the watershed in Year 1
# of culverts surveyed in preliminary field survey in Year 1 / Year 2.	We have assessed 138 stream crossings and have done a full survey on 62, which was above our goal of 50 for Year 1.
Area (x km ²) surveyed for connectivity in Year 1/ Year 2.	As of December 2017, we have surveyed ~115 km ² for connectivity (from Barkers Point to Nashwaak Bridge between Rte 148 and Rte 8 and along Upper Durham Rd, Penniac Rd, Lower Durham Rd, English Settlement Rd, and Nashwaak West Road)
List of priority culverts to re-examine in follow-up survey in Year 1	<p>A list of priority culverts has been made and the first 6 have been shared with DTI. One culvert has been chosen for remediation work. NWA met with DTI on December 13th to discuss problem culverts, remediation options, and the two-way sharing of information.</p> <p>NWA has begun working with the Nature Conservancy of Canada to use TNC's GIS prioritization tool. We will continue to work on this mapping over the winter (2017/18). The mapping has already produced some interesting results and has helped us prioritize culverts for future remediation based on ecological and land use parameters.</p>
# of culverts examined with a hydraulic engineer in Year 1 / Year 2.	One culvert (M102) was examined with a hydraulic engineer during a full hydraulic survey. Please see the attached preliminary engineering sketches.
# of conversations with culvert owners in Year 1/ Year 2.	<p>We have contacted DTI via email and phone about several problem culverts in the area. We met in person on December 13th to discuss problem culverts and remediation options.</p> <p>The City of Fredericton will be contacted over the winter of 2017/8 about problem culverts along the walking trail in Marysville.</p>

# of recommendations made to culvert owners for remediation of a problem culvert in Year 1/ Year 2.	We have recommended to DTI that they take immediate action on 6 culverts. We have received responses about 3 of these culverts. We were also told that all the older wooden box culverts along Rte. 628 and 148 were due to be replaced in the coming years and to not focus our efforts on these culverts. A number of beaver blockages have been brought to their attention and one has been removed. We have received their go-ahead to remediate the triple culvert on Manzer Brook (M102) using the design developed by HILCON Ltd.
# of culverts remediated, repaired, or unblocked in Year 1 / Year 2	Major debris blockages have been removed from 11 culverts. One culvert will be repaired at the end of Year 1 (spring 2018)
Permits acquired, as necessary, to complete activities	No permits were required to date. Once the design of culvert M102 is complete this winter, we will apply for a WAWA permit to complete the work in the spring.
# of culvert owners who agree to reinstall or remove a culvert in the future (for culvert repairs beyond our capacity).	DTI has noted that all wooden box culverts on Rte 628 and 148 will be replaced in the coming years. We continue to bring problem culverts to their attention. Two culverts in the watershed were being replaced during our 2017 field season (one on Fisher Brook and one on Bradley Brook), which we will assess in 2018.
Area (m ²) of previously inaccessible habitat opened upon removal of barriers in Year 1/ Year 2.	Upon remediating culvert M102, 28,000 m ² of previously inaccessible habitat will be opened up to salmonids. Debris removals have opened another ~5,000 m ²
Length (m) of river made accessible to fish in Year 1/Year 2.	Upon remediating culvert M102, ~19,000 m of previously inaccessible river will be opened to salmonids. Debris removals have opened another ~2,000-3,000 m.
Report and GIS maps are shared with project funders and with public.	We will share our report and GIS maps with the funders and with public via our website once the report has been finalized
# of people reached through social media posts and newsletters.	<p>The Aquatic Connectivity Project was featured in our newsletter, distributed to 10,000 households and businesses in November and at our November AGM, attended by 40 people (see attached PDF).</p> <p>Our social media posts reach ~700 people according to Facebook insights. We have an additional 400 followers on Twitter and 80</p>

	followers on Instagram. Aquatic Connectivity was a topic featured several times over the course of the field season. We have started using a #MyNashwaak tag to track engagement on posts.
# of Action Items added to our Action Plan.	We will address this performance measure at the end of 2018.

Section C Project Results

1.

Stream(s) or river(s) where project took place: Nashwaak watershed from Nashwaak Bridge to confluence with the Saint John River, including tributaries (Manzer Brook, McLean Brook, Tay River, Penniac Stream, Campbell Creek, and others).
Total length (km) of stream if known: ~50 km
Geographic area inventoried, mapped or assessed (km ²): ~115 km ²
UTM/GPS coordinates: See attached database

If applicable, please provide the following information as they apply to your project. **Please include only new achievements that have not been reported to ASCF in past projects.**

Check	Indicator	Measure	Project Achievement		
			Year 1 2017	Year 2 2018	Year 3 20__
Development of Atlantic salmon and salmon habitat watershed plan					
<input type="checkbox"/>	Watershed plans developed/ implemented	Number of watersheds involved			
		Number of plans			
		Km ² of watershed under planning and priority setting			
Restoration of salmon habitat					
<input type="checkbox"/>	In-stream habitat restored	Area (m ²)			
<input type="checkbox"/>	Estuarine habitat restored	Area (m ²)			
<input type="checkbox"/>	Lake habitat restored	Area (m ²)			
<input type="checkbox"/>	Riparian area restored or stabilized	Area Area (m ²)			
<input type="checkbox"/>	Trees and shrubs planted	Number of trees/shrubs			
		Area (m ²)			
<input checked="" type="checkbox"/>	In-stream	Number of	1 mini fish ladder to		

	structures installed	structures	be installed in 2018		
<input type="checkbox"/>	Non-native species removed	Number of species			
<input type="checkbox"/>	Other species protected or restored	Number of species			
Rebuilding of stocks and restoration of salmon populations					
<input type="checkbox"/>	Fry released/raised	Number of fish			
<input type="checkbox"/>	Parr released/raised	Number of fish			
<input type="checkbox"/>	Smolts released	Number of fish			
<input type="checkbox"/>	Grilse released	Number of fish			
<input type="checkbox"/>	MSW released	Number of fish			
<input type="checkbox"/>	Fish tagged	Number of fish tagged			
<input type="checkbox"/>	Total fish released	Number of fish			
<input type="checkbox"/>	Stock assessment	Number of fish			
Restoration of access to salmon habitat					
<input checked="" type="checkbox"/>	Restored access to habitat	Area (m ²)	>28,000		
<input checked="" type="checkbox"/>	Debris removed	Tonnes	Debris removed at every culvert, 11 large blockages of debris (garbage) were removed. Weight is unknown		
<input type="checkbox"/>					
Education and Awareness on the importance of salmon conservation					
<input type="checkbox"/>	Type of project	Community stewardship	<input type="checkbox"/>	<input type="checkbox"/>	
		Education and awareness	<input type="checkbox"/>	<input type="checkbox"/>	
		Volunteer training	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	Target Audience and participants	Number of Grade k-12			
		Number of Post Secondary			
		Number of Landowners contact			
		Number of Volunteers	7		
		Number of Public	1		

		presentations			
		Number of Community planning			
Other indicators of success					
<input checked="" type="checkbox"/>	Culverts assessed for fish passage	Number of full assessments	67		
<input checked="" type="checkbox"/>	Area assessed for aquatic connectivity	Km ²	115		
<input type="checkbox"/>		Value or unit of measure			

Section D Communications and Media

1. Did you use the ASCF logo or sign? Yes ☒ _Often_____ No ☐
If No, please explain why not:

2. Did you provide recognition to the Foundation for its grant? Yes ☒ No ☐

Please explain the nature of the recognition:

ASCF is recognized on signage at the site of the project. The ASCF logo was included on a signboard with our other funders' logos displayed at all of our community events; we displayed the ASCF sign at our AGM and thanked the Foundation verbally; the ASCF logo was included on our annual newsletter that was distributed to 10,000 households and business in the watershed; a number of social media posts also thanked ASCF for helping to fund our work; a staff participated in a tasting event at an NB liquor store; and, finally, the ASCF sign is displayed daily in our office.

3. Please indicate which communication tools were used to highlight the project as well as the quantity (check all that apply). Be sure to attach any news clippings to the Final Report.

Newspaper	<input type="checkbox"/>	_____ quantity
Interview	<input checked="" type="checkbox"/>	1 interview on JoyFM_____
Brochure	<input checked="" type="checkbox"/>	10,000 newsletters were distributed to landowners and businesses in the watershed and Fredericton (attached)_____
Website	<input checked="" type="checkbox"/>	www.nashwaakwatershed.ca
Other	<input checked="" type="checkbox"/>	The project was highlighted in a presentation at our AGM (PDF attached). It was also featured on our social media channels

4. Are you submitting a project report (other than this one)? Yes ☒ No ☐
If yes, please be sure to send the foundation a pdf copy.

5. Did you send your data and results to another organization or data warehouse where people can access the information? Please state the organizations:

Culvert assessment data will be shared with the Peticodiac Watershed Alliance for inclusion on their Atlantic Canada aquatic connectivity map
data will be shared with the Nature Conservancy of Canada for inclusion in their Classification and Blueprint for the Maritimes.

Section E Partner and Funding Information

1. Please list all involved partners in the project and their contributions.

Please verify that the total below matches the total presented in **Part 5 of the Budget**.

Organization name	Type of group*	Description or function of partner	Amount	
			Cash	In-kind
ASCF	NG	Funding partner	12,175	
Wildlife Trust Fund	NG	Funding partner	6,000	
Youth Employment Fund	G	Funding partner for project assistant salary	1,000	
UNB	NG	Volunteer field assistants (66 hrs) & borrow of equipment (500\$ value)		1,500
Peticodiac Watershed Alliance	NG	In-kind technical support and training workshop		2,000
New Brunswick Community College	NG	40 hours of mapping work by a student		600
Nature Conservancy of Canada	NG	Field work (16 hrs) and GIS mapping assistance		2,500
NWAI Board of Directors	NG	Project oversight (10 people, 1 hr/week) and field work		3,000
Sub-total			19,175	9,600
Total (Cash + In-kind Sub-totals)			28,775	

*Government (g), non-government (ng)

2. Total number of staff paid through ASCF grant: Year 1: 2 Year 2: Year 3:
Total number of staff paid through other organizations: Year 1: 2 Year 2: Year 3:
3. Total number of volunteers involved in the project: Year 1: 9 Year 2: Year 3:
Total hours worked for the project: Year 1: >150 Year 2: Year 3:
4. Statement of Expenditures
Please provide a detailed financial statement of ASCF grant expenditures, in-kind and other funds using the Budget spreadsheet.

Section G	Recommendations to ASCF

To assist us in improving our process, please provide any comments or suggestions you may have on your experience with the ASCF.

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