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 top 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)
  allyson@salmonconservation.ca (NS, PEI or NL projects)

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 Allyson Heustis (allyson@salmonconservation.ca).

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

Section A Project Information

Year Grant Acquired: 2019 End date: 2020

Year 1 of Project: 2019__ Year 2 of project:2020__ Year 3 of project: 20__

Year(s) covered by this report:__2019-2020_____

Organization: Nashwaak Watershed Association Inc.

Project title: Assessing and restoring aquatic connectivity in the central Nashwaak watershed

Contact: Marieka Chaplin

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ASCF Grant Amount: $ 23,049

Section B Project Description

Category of Project (check all that apply):

A) Development of an Atlantic salmon and salmon habitat watershed plan	
B) Protection and restoration of salmon habitat	
C) Rebuilding of stocks and restoration of salmon populations	
D) Restoration of access to critical salmon habitat	X
E) Education and awareness on the importance of salmon conservation	X

Summary

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

Importance

In our 2017-2020 Action Plan, the assessment and improvement of aquatic connectivity within the Nashwaak Watershed was noted as a High Priority Action item. This project builds on our successes over the last three years in assessing and improving fish passage through stream crossings within the watershed and engaging the local community. We have taken a comprehensive and collaborative approach to identify, prioritize, and restore barriers to fish passage using up-to-date tools and techniques, including the Nature Conservancy's GIS "Barrier Assessment Tool".

Objectives

The objectives of the project were:

1) to increase the capacity of the NWAI to survey for aquatic connectivity;
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

There are approximately 985 stream-road crossings in the Nashwaak watershed. In May 2017, the NWAI began to map, assess, and improve these crossings. In our first field season we completed a full survey on 75 culverts and 70% were determined to be full or partial barriers to fish passage. In 2018, our second field season, we started by mapping out priority areas in the central watershed to survey, we then visited 114 sites and conducted a full-survey of 67 crossings. We updated our survey form so that full surveys included collecting water temperature, pH, conductivity, DO, and total dissolved solids as well as some additional measurements and observations that were not included in 2017 surveys. For our third field season (2019), we visited 83 sites and conducted a full survey on 50 culverts. In 2020, we visited 50 sites and conducted a full survey on 24 culverts. We focused on culverts in the headwaters and on logging or forest service roads, which required more driving time. We cleaned all surveyed sites of debris and garbage. There were no major debris blockages encountered this year.

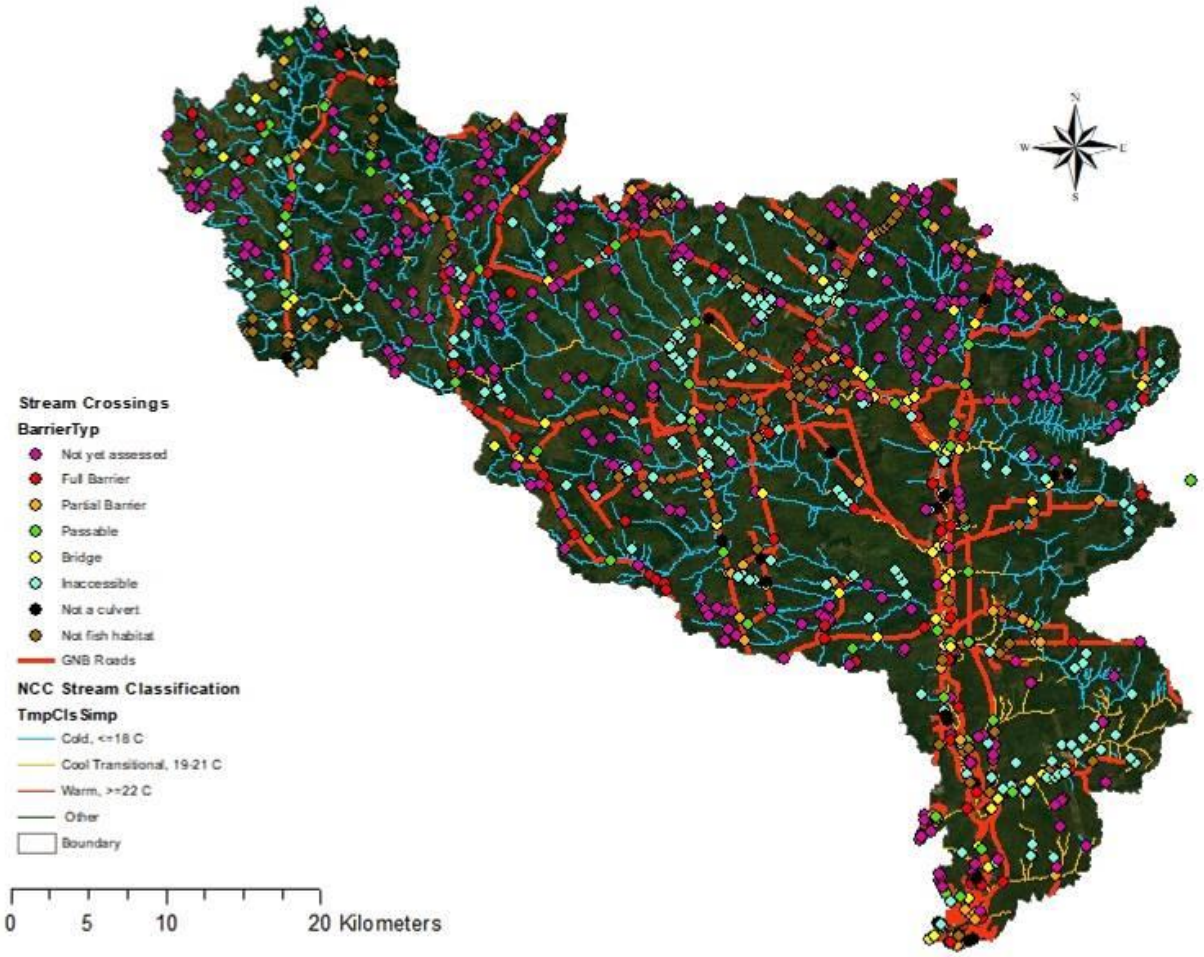

Figure 1. Updated GIS map with all culverts surveyed to date, categorized in terms of passability to fish

This survey information was entered into a central database and a GIS map, which will be shared with our partners at the end of the year. So far, we have visited 405 of the 985 crossings in the watershed (~40% complete) and we have done a full survey on 216 culverts. We have surveyed almost all the crossings on public paved roads and the main logging or forest roads. We have done at least 6 major

debris removals and 14 smaller debris removals, which have improved flow and fish passage in those culverts and improved water quality in those streams. In September this year, we completed electrofishing above and below three barriers with the help of DFO, Kingsclear First Nation, and Woodstock First Nations. We also electrofished above and below our fish ladder on Manzer Brook.

We have been regularly checking on the Manzer Brook fish ladder, installed in 2018. It survived the last two winters well and has not been catching debris. Electrofishing in August 2018 prior to the install of the remediation found seven species downstream and five species upstream (a total of 54 fish downstream and 55 fish upstream). Electrofishing in September 2020 found six species downstream and five species upstream (a total of 154 fish downstream and 104 fish upstream). Unfortunately, no new species were found upstream that were not present there before; however, higher numbers of fish were found upstream after the remediation.

Table 1. Electrofishing results from 2018, before the Manzer Brook fish ladder was installed

Site	American eel	Atlantic salmon	Black nose dace	Brook trout	Burbot	Creek chub	Sea lamprey	Slimy sculpin	White sucker	Grand Total
Manzer downstream	5	1	25	3	1			18	1	54
Manzer upstream			16	3		4	5	27		55
Grand Total	**5**	**1**	**41**	**6**	**1**	**4**	**5**	**45**	**1**	**109**

Table 2. Electrofishing results from 2020 (post-remediation)

Site	American eel	Black Nose dace	Brook trout	Common shiner	Sea lamprey	Slimy sculpin	Grand Total
Manzer downstream	1	67	11	69	2	4	154
Manzer upstream		43	11	32	8	14	108
Grand Total	**5**	**133**	**119**	**101**	**10**	**33**	**411**

Figure 2. The Manzer brook fish ladder, installed in August 2018

2020 remediation projects

Through last fall and winter, we worked with NBDTI and HILCON Ltd. on the design of fish passage structures involving baffles and chutes for three barrier culverts, which were built and installed by Tek Steel. The East Ryan Brook fish passage project was completed in July and the Limekiln and McGivney Brook fish passage projects were completed in October (thanks to an extension on our Watercourse and Wetland Alteration Permit).

At East Ryan Brook, a cast in place 2,750 x 1,800 mm concrete box installed in the 1950s on Rte 107 was too steep (2.3% over 20 m) and had a 30 cm step at the outlet, preventing fish passage through the pipe. Water in the pipe was very shallow due to its wide, flat bottom. Electrofishing in 2019 showed that there were many brook trout using this cold water stream along with a single American eel.

The remediation took place in two phases: First, a baffle was placed at the end of the enclosed pipe and another just before the drop (Fig 3). Baffle height was 350 mm and notch width and depth were 200 mm and 150 mm, respectively for both. These allowed the water in the pipe to backflood and velocity to decreae. A short chute was installed over the drop at the end of the structure. The chute contained roughness bars to prevent sheet flow. The second baffle was fitted with a small slide to allow fish to

swim up and over. The second phase, installed a few weeks later, involved three shorter baffles that extended 4/5ths of the way across the pipe (Fig 4). We alternated what side of the baffle was open to create a sinous channel through the pipe. These helped backflood the remainder of the pipe. Large rocks were placed throughout the pipe to create microhabitat. Water will eddy behind the rocks and they will provide protection for small fish.

This project opened 1.8 km^2 of habitat and 800 m of stream length above it. Electrofishing results pre- and post-remediation showed similar numbers of the same species (mainly brook trout and a few American eel). We hope that electrofishing in 2021 during higher water conditions will yield higher numbers upstream and perhaps the presence of other species. A temperature logger installed over the summer of 2020 gave an average temperature between 21 June and 21 Septemeber of only 13.33°C and a peak temperature of 18.7°C, indicating that this brook is an excellent thermal refuge for salmonids in the summer.

Figure 3. Before (left) and after (right) of the East Ryan Brook fish passage project

Figure 4. Details of the East Ryan Brook fish passage project showing the chute and first two baffles (left) and the upper three partial baffles (right) as well as the large rocks placed to provide microhabitat in the pipe.

Table 3. Electrofishing results from 2019, before the remediation structures were installed

Site	American Eel	Brook Trout	Grand Total
East Ryan downstream	1	50	51
East Ryan upstream		23	23
Grand Total	**1**	**73**	**74**

Table 4. Electrofishing results from 2020, post-remediation

Site	American Eel	Brook Trout	Grand Total
East Ryan downstream	2	40	42
East Ryan upstream		19	19
Grand Total	**2**	**59**	**61**

The McGivney Brook pipe is a cast in place concrete box (4,580 x 1,260 mm) on route 625. The remediation work at this site was completed in October 2020. This culvert was slightly too steep (0.9% over 9.8 m) to allow for fish passage. Its wide, flat bottom meant that there were only a few millimitres of water depth during low flow. Pre-remediation electrofishing found three species downstream and four species upstream (American eel was found upstream but not downstream). Similar numbers of

brook trout were found up and downstream but higher numbers of black nose dace and slimy sculpin were found downstream compared to upstream. A total of 43 fish were found downstream versus 25 upstream. Post-remediation electrofishing will be completed in 2021. A temperature logger installed over the summer of 2020 gave an average temperature between 21 June and 21 Septemeber of only 15.04°C and a peak temperature of 20.6°C, indicating that this brook is an excellent thermal refuge for salmonids in the summer.

Remediation work involved the installation of one aluminum baffle and chute at the outlet of the pipe. The baffle was 300 mm high with a notch width and depth of 400 mm and 300 mm, respectively. The chute was 400 mm wide and 615 mm long. The baffle allows water to backflood in the culvert, becoming deeper and slower (and easier for fish to swim in). The chute allows fish to swim into the culvert during low flow and it was fitted with roughness bars to prevent sheet flow. This project opened 10.2 km^2 of habitat and 8,913 m of stream length above it.

Figure 5. Before and after of the McGivney Brook fish passage project

Table 5. Electrofishing results from September 2020 (pre-remediation)

Site	American Eel	Black Nose Dace	Brook Trout	Slimy sculpin	Grand Total
McGivney downstream		16	13	14	43
McGivney upstream	1	5	18	1	25
Grand Total	**1**	**21**	**31**	**15**	**68**

The Limekiln Brook pipe is a cast in place concrete box (3,000 x 2,400 mm) on route 620. The remediation work at this site was completed in October 2020. This culvert was too steep (2.11% over 28 m) to allow for fish passage. Its wide, flat bottom meant that there were only a few millimitres of water depth during low flow. Pre-remediation electrofishing found 4 species downstream and 2 species upstream. American eel and black nose dace were not found above the pipe. A total of 14 fish were found downstream versus 6 fish upstream. Post-remediation electrofishing will be completed in 2021. A temperature logger installed over the summer of 2020 gave an average temperature between 21 June

and 21 Septemeber of 18.41°C and a peak temperature of 24.73°C, indicating that this brook would be an excellent thermal refuge for salmonids in early/late summer. However, in peak summer, it may be too warm (temperature exceeded 23°C on 20 days this summer).

The remediation involved the installation of 4 fish weirs spaced 7 m apart throughout the pipe. The baffles were 500 mm high with a notch width and depth of 300 mm and 200 mm, respectively. This project opened 7.25 km^2 of habitat and 10,732 m of stream length above it.

Figure 6. Before (left) and after (right, below) of the Limekiln Brook fish passage project

Figure 7. A close up shot showing the weirs installed for the Limekiln Brook fish passage project. The weirs were not fully installed at this point so water was just starting to flow over the chute.

Table 6 Electrofishing results from September 2020 (pre-remediation)

Site	American Eel	Black Nose Dace	Brook Trout	Creek Chub	Grand Total
Limekiln downstream	1	2	5	6	14
Limekiln upstream			2	4	6
Grand Total	**5**	**133**	**119**	**10**	**411**

Next Projects

We have met with the engineering company to go over our short listed culverts. We narrowed down what culverts to focus on by choosing culverts that had no barriers downstream, were at least 1 m wide, and were properly sized to handle increasing flows. We discussed three projects with DTI and chose to survey two in November (the third is due to be removed in future and is a larger project requiring significant funding). Surveys for Sands Brook (Giant's Glen Road) and unnamed brook on Mclean Flats Road are now complete. The survey for Porters Brook (Nashwaak West Road) will be completed before the end of 2020. Together these three projects will open around 9 km^2 of previously inaccessible habitat.

Figure 8. The Porter's Brook culvert on Nashwaak West road is a severe barrier to fish. The pool at the mouth of this brook is an important salmon holding pool that DFO closes annually on June 15. Nashwaak West Road has been closed for many years and will not reopen. If this culvert blows out in a storm, the brook, the pool at the mouth of the brook, and downstream habitat in the Nashwaak River will be irreversibly damaged.

Figure 9. This pipe on McLean Flats Roads is in very poor shape and fills with gravels annually during the freshet. These pipes need to be replaced. Local residents described many fish including Atlantic salmon using this stream in previous years.

Figure 10. This pipe on Sands Brook on Giant's Glen road has experienced major deteoration of the substrate in the last few years. Though it has open bottom it appears as though this culvert is no longer passable to fish. Black sediment control fabric is shown exposed in the photo above.

We have updated our GIS aquatic connectivity map. We will share this information with our partners this fall and winter and carry out our "Healthy Nashwaak" social media campaign to further inform the public about the importance of connected stream habitats. This winter we will also continue to prioritize barriers for remediation using the Nature Conservancy's GIS Barrier Assessment Tool. 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.

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.

Evaluation and assessment

The first four years of our aquatic connectivity project have been a huge success for NWAI. We surpassed our goal for number of culverts to map and survey. So far we have trained five staff, three board members, four summer students, and five volunteers on the survey protocol. This has increased our capacity of our organization to survey the aquatic connectivity of the watershed, as well as our knowledge about the fragmentation of the rivers in the Nashwaak watershed.

In 2020, we were able to complete three restoration projects, opening a total of 19.3 km^2 of upstream habitat area, and 20.4 km in stream length that was previously inaccessible to fish. We partnered with the DFO Aboriginal Fisheries Strategies teams from St Marys, Woodstock, Ormocoto, and Kingsclear First Nations to complete electrofishing up and downstream of these barriers.

NBDTI has been generous with their time for reviewing drawings and answering questions.

The Barrier Assessment Tool is a GIS add-on developed by The Nature Conservancy to prioritize culverts for assessment and remediation and quickly calculate upstream habitat gain, land use information, and other parameters. This is 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 was combined with NCC's newly released Freshwater Ecological Classifcation and Aquatic Blueprint. This partnership will eventually 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.

As this project has other funders and funding has been provided until March 31, 2021, a final report will be produced for this deadline and shared with all project partners and funders.

Problems encountered & solutions:

We are still learning about the aquatic connectivity of the watershed, the scale or budgets of remediations that might be needed, how many cuvlerts we can remediate in a year, and the timeline of getting DTI's approval to move forward on projects. The results of our surveys showed that remediation of the most severe barriers will be bigger, higher budget projects than expected. We also realized that most of the existing barrier culverts cannot be remediated to provide fish passage (for example, a collapsing wooden box culvert or one with a drop of >60 cm); they simply need to be replaced with new, properly designed and sized infrastructure. We have communicated these barriers to DTI, DNRED, and

other owners. It has been challenging to find suitable projects that are within our budget, on structurally sound culverts, down accessible roads, and which have the potential to open up sufficient upstream habitat to warrant remediation. With continued surveys we hope to find more potential project candidates.

Communications with DTI have improved and we have now also started conversations with DNRED about culverts on woods roads. However, timelines for approval of projects and remediation remain long.

Performance measure *Take from Schedule "A" of Contribution Agreement*	**Results**
Number of NWAI staff and volunteers trained/ mentored in survey techniques	1 NWAI staff was trained in survey techniques in 2020 (1 staff and 2 students in total 2019-2020)
Number of NWAI staff and volunteers trained/ mentored in remediation techniques	1 NWAI staff and 2 volunteers were trained in remediation techniques in 2020 (1 staff, 2 students, and 2 volunteers in total 2019-2020)
Number of stream crossings visited and assessed	62 stream crossings were visited in 2020 (145 crossings in total 2019-2020)
Number of culverts surveyed	A full survey was done on 24 culverts in 2020 (50 total culverts 2019-2020)
Area surveyed for connectivity	401 km^2 in 2020 (734 km^2 in total 2019-2020)
Amount of garbage cleaned	Over 30 kg kilograms of garbage were cleaned from stream crossings in 2020 (50 kg in total 2019-2020)
Number of water quality measurements taken	24 water quality measurements were taken in 2020 and entered into our database. All water quality measurements will be submitted to Atlantic Datastream this winter (74 water quality measurements in total 2019-2020)
List of priority culverts to re-examine in follow up survey with hydraulic engineers/NBDTI	A list was compiled in fall 2019 and projects were chosen from the list. We will revisit the list this fall to choose our projects for next year
Number of culverts examined with hydraulic engineer	A hydraulic engineer surveyed three sites in spring 2020 and an additional two sites in late fall 2020 (6 sites total 2019-2020)
Number of culverts repaired, remediated, and unblocked	3 culverts were remediated using steel baffles and/or fish ladders in 2020 (3 culverts total 2019-2020)
Area (km2) of previously inaccessible habitat opened upon removal of barriers	19.3 km^2 of previously inaccessible habitat was opened in 2019-2020
Length (km) of river made accessible to fish	20.4 km in total 2019-2020
Number of species of fish noted during electrofishing surveys	Electrofishing surveys in 2020 noted the following number of species at each site:

	East Ryan: 2 Limekiln: 4 McGivney: 4 Manzer: 6 No electrofishing surveys were done in 2019
Number of recommendations made to culvert owners about repairing culverts beyond NWAI's budget	We are in communication with NBDTI and NBERD about barrier culverts that need to be replaced. We will quantify this metric before our final report.
Number of maps produced with NCC using BAT	We have started working on the GIS mapping but will finalize this for the final report
Aquatic Connectivity Report is shared with funders, partners, and the public	As we have other funders for this project, we will share our report with them when their final report is due. It will also be publicly accessible on our website.
Updated aquatic connectivity map	Our map has been completed for this year (see above). It will be available online soon
Number of people reached through social media posts and newsletters	We send out 10,000 newsletters annually. Our Instagram channel reaches over 600 people and Twitter also reaches over 650 people. Our Facebook page has 1,568 followers. We posted 5 times on the topic of aquatic connectivity. On Facebook, posts reached an average of 4,132 people this year with an average of 489 interactions per post. Our post about our fish ladder at East Ryan Brook almost 14,000 people and had 1,665 interactions.
Number of volunteers engaged in this project	In 2020, 2 volunteers assisted with the installation of the East Ryan fish ladder and 6 volunteers assisted with the electrofishing. The NWAI's 10 board members have been involved in project oversight (18 volunteers total)
Number of volunteer hours contributed	So far, 58 volunteer hours have been contributed for field work and 20 hours for project oversight.
Data shared with partners	We will share our data at the end of the year data with provincial departments (DTI, NRED), federal departments (DFO), and with NCC for the NAACC database.

Section C Project Results

1.

Stream(s) or river(s) where project took place:

Nashwaak watershed including the main stem and tributaries
Remediation structures were installed on East Ryan Brook, Limekiln Brook, and McGivney Brook.

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

Check	Indicator	Measure	Project Achievement		
			Year 1 2019	Year 2 2020	Year 3 20_ _
Development of Atlantic salmon and salmon habitat watershed plan					
☐	Watershed plans developed/ implemented	Number of watersheds involved			
		Number of plans			
		Km^2 of watershed under planning and priority setting			
Restoration of salmon habitat					
☐	In-stream habitat length restored	Length (m)			
☐	In-stream habitat area restored	Area (m^2)			
☐	Riparian length restored or stabilized	Length (m)			
☐	Riparian area restored or stabilized	Area (m^2)			
☐	Trees and shrubs planted	Number of trees/shrubs			
☐	In-stream structures installed	Number of structures			
Rebuilding of stocks and restoration of salmon populations					
☐	Fish tagged	Number of fish tagged			
Restoration of access to salmon habitat					
x	Restored access to habitat	Area (m^2)	0	19,300,000	
x	Debris removed	Tonnes	>20 kg	>30 kg	
Education and Awareness on the importance of salmon conservation					
x	Type of project	Community stewardship	☐	☐	
		Education and awareness	☐	☐	
		Volunteer training	x	x	
☐	Target Audience and participants	Number of Grade k-12			
		Number of Post Secondary			
		Number of Landowners contact			
		Number of audience members at			

		public presentations			
		Number of participants at community planning			
Other indicators of success					
[x]	Stream crossings visited	Value or unit of measure	83	62	
[x]	Stream crossings surveyed	Value or unit of measure	50	24	
[ ]		Value or unit of measure			

Section D Communications and Media

1. Did you use the ASCF logo or sign? Yes [x] _____ quantity No [ ]
   If No, please explain why not:
   _The sign is on display in our office. We use the logo on our website and on our newsletter._____

2. Did you provide recognition to the Foundation for its grant? Yes [x] No [ ]
   Please explain the nature of the recognition:
   _____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; 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	[ ]	_____ quantity
Interview	[ ]	_____
Brochure	[x]	_Annual newsletter_____
Website	[x]	_www.nashwaakwatershed.ca_____
Other	[x]	_Social media posts (Facebook, Instagram, Twitter)_____

4. Are you submitting a project report (other than this one)? Yes [ ] No [x]
   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 with NB Department of Transportation and Infrastructure, NB Department of Natural Resources and Energy Development, The City of Fredericton, and with the Nature Conservancy of Canada for inclusion in their Classification and Blueprint for the Maritimes. Water quality data is submitted to Atlantic Datastream.

Section E Partner and Funding Information

1. Total number of staff* paid through ASCF grant: Year 1: 2__ Year 2: _3_ Year 3: __

   Total number of staff* paid through other organizations: Year 1: 2__ Year 2:_3_ Year 3:__

   *including students

2. Total number of studens paid through ASCF grant: Year 1: _0_ Year 2: _0_ Year 3: __

   Total number of students paid through other organizations: Year 1: _2_ Year 2: _0_ Year 3: _

3. Total number of volunteers involved in the project: Year 1: _0_ Year 2: _18_ Year 3: _

   Total hours worked for the project: Year 1: _0__ Year 2: _78__ Year 3: ___

4. Statement of Expenditures

   Please provide a detailed financial statement of ASCF grant expenditures, in-kind and other funds in 2020 using the Financial report spreadsheet. Do not forget to attached copies of receipts for ASCF-funded expenditures along with your report.

   In addition, please provide a budget for 2021 (if your project is anticipated to continue into next year) using the Budget spreadsheet.

Section F 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.