2020-2021 FINAL REPORT

ETF PROJECT #200011

NASHWAAK WATERSHED ASSOCIATION INC.
28 FEBRUARY 2021

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PROJECT NAME:

Assessing and Improving the Health of the Nashwaak Watershed

EXECUTIVE SUMMARY

The Nashwaak Watershed Association Inc. (NWAI) received $40,000 from the NB Environment Trust Fund in the 2020-2021 fiscal year for our monitoring project. Match funding was provided by the NB Wildlife Trust Fund, WWF Canada, and the Atlantic Salmon Conservation Foundation. The project overarching objectives were as follows: 1) monitor the health of the watershed through water quality monitoring, temperature logging, CABIN surveys, and cyanobacteria sampling; 2) assess and improve the aquatic connectivity of the watershed; and 3) community outreach on the topic of river health.

The objectives of the project were met, though we continue to work on making all 2020 data publicly available on our website. All deliverables were completed within the time frame of the grant; however, the project was set up to be a multi-year project. Therefore, the deliverables will carry over into the 2021 field season and beyond.

No permits were required for the field surveys or monitoring. NBDTI's permission was obtained and Watercourse and Wetland Alternation (WAWA) permit applications were granted for the projects on East Ryan Brook, McGivney Brook, and Limekiln Brook. NBDTI's permission has also been granted to move forward on two additional projects.

Project funding in 2020 allowed us to build on our last three successful field seasons. The overarching objective of the project is to increase our knowledge of the health of our watershed to grow our capacity to make restoration & management decisions based on sound science. Evaluation of trends in benthic community structure, water quality, and temperature will allow us to better develop and evaluate watershed and habitat management initiatives; assess the effects of particular industries on river health; communicate the health of the watershed to public; and assess the effects of our habitat restoration activities.

We believe that the project had, and will continue to have, the intended long- and short-term impacts. By monitoring the health and connectivity of the watershed, the NWAI has an increased knowledge of natural and anthropogenic processes affecting the water quality in the Nashwaak. This has allowed us to incorporate this information into our Landowner Outreach and general education projects with the aim of communicating the health of the watershed to the wider public. By continuing to monitor the quality and temperature of the river as well as barriers to fish passage, we hope to continue to recognize problem areas or industries that are negatively affecting river health and connectivity. We also aim to increase the capacity of our organization to develop ecologically valuable restoration projects as well as to measure their effects on the health of the river.

OBJECTIVES

- gain more knowledge about:
    - water quality,
    - benthic community,
    - location of thermal refugia,
    - cyanobacteria
- prioritize areas of good aquatic habitat near cold-water that are under threat,
- improve our knowledge about the connectivity of the watershed,
- increase the amount of available upstream habitat,

- decrease the risk of damage to public infrastructure.

IMPORTANCE

There are large temporal gaps in monitoring the Nashwaak watershed's health. Long-term monitoring can support the use of statistical trend assessment to help evaluate the influences of human activities & other factors on the watershed over long periods. The Department of Fisheries and Oceans (DFO)'s Ecological Restoration of Degraded Habitats handbook recognizes both water quality and high temperatures as limiting factors to fish populations. Water quality and temperature were noted as data deficient areas in our 2017-2020 Action Plan.

WATER QUALITY AND BENTHIC INVERTEBRATES

Maintaining the quality of the surface water is extremely important for ensuring a healthy watershed. Due to a broad range of natural and anthropogenic influences, the quality and temperature of a river's water can vary substantially over time and space. Much has changed in the watershed over the last 15 years, including urbanization, putting stress on the river due to an increased human population, which has led to the removal of riparian vegetation and the release of pesticides, fuels, nutrients, and bacteria. Our 2016 geomorphic survey of the lower Nashwaak recognized large areas of erosion, especially downriver from Taymouth. Bank erosion increases siltation of rivers and leads to increased levels of metals and suspended sediments. Erosion was particularly noticeable in areas where riparian vegetation had been removed. Additionally, the Sisson Brook Mine may soon begin construction. Having a knowledge of what the water quality is before it begins operating will allow us to calculate its effects.

In 2020 NWAI monitored water quality via grab samples and probes at 12 sites throughout the watershed monthly between June and October. In 2020 we monitored benthic invertebrates using the CABIN protocol at three sites in October. BMIs are a vital component of healthy streams and are considered good indicators of local conditions. However, we currently have limited knowledge of the benthic community in our watershed.

The regular monitoring of water quality allows us to:

- Identify problem areas or industries,
- Assess the condition of the river and how it changes,
- Define and approach private landowners in problem areas and discuss management options with them,
- Determine how the changes in water quality are affecting wildlife and habitat, particularly Atlantic salmon,
- Make decisions on the management of the river's health, and
- Promote community stewardship of the Nashwaak River by making the information public.

CYANOBACTERIA

River health may also give us some insight into cyanobacteria blooms, a topic of concern in the last two years. In 2019 NWAI began monitoring cyanobacteria in Nashwaak lake and river and continued to monitor two sites in the river in 2020 in partnership with UNB and ACAP St John. We deployed solid phase adsorption toxin tracking (SPATT) collectors, took grab samples that were analyzed for nutrients and samples of any suspected cyanobacteria mats. Due to COVID-19 related delays at the lab analyzing the mat and SPATT collector samples, we do not have any results to share at this time.

TEMPERATURE

The risk of extreme temperature events in a river increases with riparian zone alteration and water extraction. The removal of forests requires road networks, which typically lead to an increase in water temperatures and sediment in rivers. Both factors impact the distribution of cool- and cold-water fishes. Other factors that increase river temperatures include higher air temperatures, sedimentation, and input from water treatment plants. Though most present-day industrial and municipal operations are regulated to protect aquatic ecosystems, the persistent impacts from historical forestry operations remain unknown.

Warmer water contains less oxygen than colder water so as river temperatures rise and dissolved oxygen decreases, fish begin to experience stress, particularly salmonids (salmon, charr, and trout species). To escape warm waters in the mid-summer, many fish species will move to smaller, cooler tributaries or pools near cold seeps to survive. High temperatures can delay migration; exhaust energy reserves, which can result in reproductive failure; reduce egg survival; slow growth of fry and smolts; and decrease resistance to disease.

“Spring-fed creeks” occur in areas where there are deep deposits of coarse soils that infiltrate a large portion of rain or snowmelt and where water tables are large and steeply sloped. Spring-fed creeks have more uniform and stable flows and temperatures. They can be extremely productive habitat for cold-water fish and can provide a refuge for fish from high summer water temperatures. Major upwelling or groundwater discharge areas are also critical locations for spawning and egg incubation. Areas of coarse gravel or sand with upwelling groundwater are the most sensitive and rare environments in a salmonid stream. Spring-fed streams are ecologically important as, being fed by groundwater, they are less susceptible to variations in air temperature & can buffer changes in climate. They support animals that do not occur in the main stem & maintain the base flow of the river.

Adult Atlantic salmon are less tolerant to high temperatures than juveniles. A DFO (2012) report determined that incipient lethal temperature (or the temperature that a fish can tolerate for at least seven days) was 27.8°C for juveniles, while for adults it was around 25°C. The report noted that juvenile and adult salmon begin aggregating near cool water sources and stopped feeding when minimum night-time temperatures remained above 20°C for two consecutive nights. Therefore, according to DFO, 20°C is considered the threshold minimum temperature for assessing physiological stress in Atlantic salmon.

Determining the location of, and protecting, cold-water tributaries were noted as High Priority action items in our management plan. Monitoring the temperature of our ecologically important tributaries helps us to:

- Better understand the sources of thermal inputs and where the cold-water (<20°C) refuges, which are so important to species such as the Endangered Atlantic salmon and other salmonids, are located within the watershed (as recommended by DFO’s Ecological Restoration of Degraded Habitats document),
- Communicate the importance of cold-water refuges to the public, and
- Protect, manage, and restore those areas in the future.

In 2020 we installed 32 temperature loggers throughout the watershed.

AQUATIC CONNECTIVITY

Significant urbanization has occurred in the lower Nashwaak watershed in the last decade, leading to an increase in roads and associated stream crossings. Aquatic organisms require access to a variety of

habitats to spawn, feed, & find cool water. Poorly designed or undersized culverts can fragment aquatic populations, alter stream hydrology by changing water velocity & sediment transport, degrade water quality by increasing erosion & cause flooding.

Additionally, culverts can change water velocity, river hydrology, and become blocked with debris causing flooding and costly damage to infrastructure. Climate change & altered land use practices are shifting the timing & flow of streams. Older culverts, built decades ago, are now too small to handle the amount of water flowing through them. Remediation & debris clean-ups will improve water quality, restore stream hydrology & improve access for aquatic organisms.

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 NWAI 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. 2020 was our fourth field season.

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.

RESULTS

A full summary and analysis of both the temperature and water quality data can be found in the attached PDF documents: "2020 – 2021 Health of the Nashwaak River Report" and the "NWAI 2020 Water Quality Report Card". Water quality data was uploaded to the Atlantic Datastream portal. We will upload the temperature data soon. The CABIN results are attached to this report. The data was also uploaded to the ECCC database. A summary of our aquatic connectivity project can be found in the attached PDF entitled "2020 Aquatic Connectivity Report". We have also attached an excel file detailing each barrier culvert surveyed in 2017-2020, engineering sketches for the remediations projects completed in 2020, DTI approval letters, and WAWA permits.

PROJECT STATUS

Estimated percentage of project complete: 100%

Estimated percentage of award spent: 100%

This ETF grant allowed for the creation of three full-time jobs at the NWAI (Executive Director, Project Coordinator, and Restoration & Outreach Coordinator).

PUBLICATION OF RESULTS

All documents, excel data, and maps will be available to the public on our website shortly. We will also prepare printed copies, which will be available for loan at our office. We have shared our GIS data with

other watershed organizations using ArcOnline. Water quality data has been uploaded to Atlantic Datastream and sent to DELG. CABIN data were uploaded to the ECCC database.

We have acknowledged the NB Environmental Trust Fund as a funder of this project on several occasions, including on our annual newsletter, which is distributed to 10,000 households and businesses; on social media; at our annual general meeting held in November attended by over 40 members; and on a sign, which we display at all organization events.

Our Instagram channel reaches over 600 people and Twitter also reaches over 650 people. Our Facebook page has 1,568 followers. We posted five 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. Water Health and Temperature and Aquatic Connectivity were topics featured several times over the course of the field season. We use the #MyNashwaak tag to track engagement on posts.

ATTATCHED DOCUMENTS

Document	Summary
2020 Aquatic Connectivity Summary Report	PDF summary of our 2020 aquatic connectivity project
2020-2021 Health of the Nashwaak River Report	PDF report comparing 2020 data to historic data
NWAI 2020 Water Quality Report Card	PDF summarizing 2020 water quality and temperature data
Nashwaak Watershed Culvert Data	Excel database of all culverts surveyed 2017-2020
Temp Logger Locations 2020	Excel database summarizing temperature logger data collected in 2020
WQ data 2017-2020	Excel database of water quality data collected 2017-2020
18050_20200522_Route 107 Culvert Fish Passage_ Design Sketches	Route 107 engineering sketches
46707'19 - Nashwaak Watershed Assoc.permit	WAWA permit for Route 107 project
18050_20200724_Route 620_Limekiln Brook_ General Arrangement Drawing	Limekiln Brook engineering sketches
51119'20 - Nashwaak Watershed Assoc.permit	WAWA permit for Limekiln Brook
Approval_Letter_Limekiln_Brook_Route_620_L285	DTI approval letter for Limekiln Brook
18050_20200730_Route 625_McGivney Brook_ General Arrangement Drawing	McGivney Brook engineering sketches
51120'20 - Nashwaak Watershed Assoc.permit	WAWA permit for McGivney Brook
Approval_Letter_McGivney_Brook_M202_Rte_625	DTI approval letter for McGivney Brook
Nashwaak benthic invertebrates 2020	Excel table of 2020 benthic invertebrate data

Report submitted by: Jillian Hudgins, NWAI Project Coordinator