



2017-2018 FINAL REPORT

NEW BRUNSWICK WILDLIFE TRUST FUND

PROJECT #F307-029

NASHWAAK WATERSHED ASSOCIATION INC.

1 MARCH 2018

2017-2018 FINAL REPORT

PROJECT NAME:

Monitoring the Health of the Nashwaak Watershed

EXECUTIVE SUMMARY

The Nashwaak Watershed Association Inc. (Nwai) received \$7,000 from the NB Wildlife Trust Fund in the 2017-2018 fiscal year for our monitoring project. Match funding was provided by the NB Environment Trust Fund. The project deliverables were as follows: 1) restart monitoring water quality throughout the watershed, 2) compare new quality data to historic (1980-2005) data to look at changes and make all data publicly available, 3) deploy temperature loggers throughout the watershed to get an idea of the temperature of the main stem and of major tributaries, 4) map data using GIS, and 5) use new information to feed back into Nwai's Action Plan to prioritize future restoration and management efforts.

The objectives of the project were met, though we continue to work on making data publicly available on our website and to update our Action Plan, as it is a "living document". 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 2018-2019 field season and beyond.

The grant allotted from the Wildlife Trust Fund was approximately half of what we had initially requested, which required a scope reduction for the WTF-funded part of the project (a reduction in the number of sites sampled and loggers deployed). The reduction in scope also allotted less time to GIS mapping and updating the Action Plan. No permits were required for this project.

We believe that the project had, and will continue to have, the intended long- and short-term impacts. By resuming monitoring the health 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, we hope to continue to recognize problem areas or industries that are negatively affecting water quality or temperature. 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.

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.

Maintaining the quality of the surface water is extremely important for ensuring a healthy watershed. Due to a broad range of natural & anthropogenic influences, the quality & temperature of a river's water can vary substantially over time & 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 will soon begin construction. Having a knowledge of what the water quality is before it begins operating will allow us to calculate its effects. Therefore, in 2017 NWAI resumed monitoring water quality at 11 historic sampling sites and at two new sites.

Going forward, the regular monitoring of water quality will allow us to:

- Identify problem areas or industries;
- Assess the condition of the river and how it has changed over the last decade and a half;
- 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.

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 don't 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, & protecting, cold-water tributaries were noted as High Priority action items in our management plan. Monitoring the temperature of our ecologically important tributaries will help 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.

DELIVERABLES

The objectives of the project were:

- 1) Restart water quality monitoring at historic sampling sites throughout the watershed;
 - a. Analyze and compare new water quality data to historic (1980 - 2005) data to look at changes and make all data publicly available
- 2) Deploy temperature loggers throughout the watershed (near selected tributaries);
 - a. Compare new thermal data to the historical thermal data available
 - b. Map out cold-water refuges using GIS
- 3) Use the water quality and thermal information to feed back into the NWA's Action Plan to prioritize future restoration and management efforts, with a particular focus on protecting and restoring Atlantic salmon habitat.

RESULTS

A full summary and analysis of both the temperature and water quality data can be found in the attached PDF document. In addition, our Action Plan can be found as an attachment.

PROMOTION OF THE NB WILDLIFE TRUST FUND

We have acknowledged the NB Wildlife Trust Fund as a funder of this project on several occasions, including on our annual newsletter, which is distributed to 11,000 households and businesses; on social media; at our annual general meeting held in November attended by over 50 members (see attached PDF); and on a sign, which we display at all organization events.

Our social media posts reach ~700 people according to Facebook insights. We have an additional 400 followers on Twitter and 80 followers on Instagram. Water Health and Temperature 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.

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.

ATTACHED DOCUMENTS

Document	Summary
Health of the Nashwaak Watershed Report	PDF report comparing 2017 data to historic data
Temperature Logger Locations 2017	Excel Table of logger information
Nashwaak Watershed WQ Data (detection limits)	Excel Tables of WQ data separated by sampling site and by year
2017 Newsletter	Summary of the work done by the NWA in 2017 with thanks to our funders
Action Plan	2017-2020 Action Plan (table)
Action Plan PDF	2017-2020 Action Plan PDF Document

Submitted by: Jillian Hudgins, NWA Project Coordinator