2021-2022 FINAL REPORT

NEW BRUNSWICK WILDLIFE TRUST FUND PROJECT #F301-220

NASHWAAK WATERSHED ASSOCIATION INC.

2021-2022 FINAL REPORT

PROJECT NAME:

Monitoring the Health of the Nashwaak Watershed

EXECUTIVE SUMMARY

The Nashwaak Watershed Association Inc. (NWAI) received $9,000 from the NB Wildlife Trust Fund in the 2021-2022 fiscal year for our monitoring project. Match funding was provided by the NB Environment Trust Fund. The project deliverables were as follows: 1) document the status of and trends in water quality and in the structure and composition of BMIs in relation to changes in water quality/quantity; 2) identify problem areas/industries; 3) define and approach private landowners in problem areas and discuss management options; 4) determine how changes in water quality are affecting wildlife and habitat; 5) make decisions on the management of the river's health; and 6) promote community stewardship of the Nashwaak.

The objectives of the project were met, though we continue to work on making 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 2022 field season and beyond. No permits were required for this project.

Project funding in 2021 allowed us to build on our last four 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 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 10-Year Strategic 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 2021 NWAI monitored water quality via grab samples and probes at 11 historic sites and 5 additional sites throughout the watershed monthly between June and October. In 2021 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 2021 in partnership with UNB and ACAP St John.

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 and can buffer changes in climate. They support animals that do not occur in the main stem and 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 2021 we installed 39 temperature loggers throughout the watershed, 4 loggers incurred battery failures and 3 could not be retrieved, leaving 32 loggers with complete data.

DELIVERABLES

The objectives of the project were:

1) Regular 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 (main stem and tributaries).
    a. Compare new thermal data to the historical thermal data available.
    b. Map out cold-water refuges using GIS.

3) Sample for BMIs.
4) Sample for cyanobacteria.
5) Prepare a “Health of the Nashwaak” report and short form report card.

RESULTS

A full summary and analysis of both the temperature and water quality data can be found in the attached PDF documents: “2021 – 2022 Health of the Nashwaak River Report” and the “NWAI 2021 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.

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 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 922 people and Twitter also reaches over 804 people. Our Facebook page has 1,218 followers. We posted over 10 times on the topics of aquatic connectivity and water quality. Water Health and Temperature and Aquatic Connectivity were topics featured several times over the course of the field season. We use the #MyNashwaak and #EauNBWater 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.

ATTATCHED DOCUMENTS

Document	Summary
NWAI 2021 Health of the Nashwaak Report	PDF report comparing 2021 data to historic data
NWAI 2021 Water Quality Report Card	PDF summarizing 2021 water quality and temperature data, produced for the public
Temperature Logger Data 2021	Excel Table of logger information
CABIN Data 2021	Excel Table of 2021 benthic invertebrate data

Submitted by: Natalie Deseta, NWAI Project Coordinator