

STATE OF THE Nashwaak WATERSHED

SUMMARY 2017

The Nashwaak Watershed drains 1,707 km² of central New Brunswick. It flows 110 km from Upper Nashwaak Lake to the Saint John River in Fredericton. There are approximately 397 km of tributaries, with the largest including Grand John Brook, the Tay River, and Cross Creek Stream.

The landscape was shaped during the building of the Appalachian Mountain Range (480-280 million years ago) and, afterwards, by the movement of glaciers.

SETTLEMENT

The Nashwaak watershed was settled at least 11,000 years ago, and is the traditional territory of the Wolastoqiyik (Maliseet) people, who used rivers and streams to access food and other resources. Portage routes connecting major watersheds were vital links for trade and communication. Alteration of the rivers and land was relatively minor during this period.

European colonization began in the 17th century, with the arrival of Samuel de Champlain and French grant holders. Between 1691 and 1692, the French set up a fort at the mouth of the Nashwaak River called Fort Nashwaak; it was the first European settlement in the Fredericton area and became the capital of what was then called Acadia. The fort was sieged by the British in 1696 and abandoned in 1700. Major settlement in the area began much later, when Loyalist settlers arrived in 1783, settling further up the St. John River at Ste. Anne's Point.



The Nashwaak Watershed 

HUMAN IMPACT PAST AND PRESENT

In the 18th and 19th centuries, the major industries were logging and agriculture, which permanently changed the landscape and the ecosystems of the watershed due to construction of dams and river crossings, log runs, pollution from lumber mills, run-off from cleared land, and increased erosion due to the removal of riverside vegetation. This eventually led to degraded water quality and reduced biodiversity in the river and streams.

Relative to other watersheds in the province, the Nashwaak remains relatively undeveloped and sparsely populated (~15,000 people). The population is concentrated close to the mouth of the river, from Durham Bridge downstream. The predominant land cover or land use is forest at 92.5% (most of which has been cut and is at various stages of re-growth), followed by agriculture (2.6%) and wetlands (2%). Residential areas cover only 1% of the watershed. Agriculture and urbanization have led to the removal of vegetation, which has destabilized the riverbanks.

Water QUALITY

As land use changes, the watershed flow characteristics and sediment supply also change and streams begin to change form. If the changes occur too quickly, streams will become unstable, causing erosion, flooding, and habitat degradation.

A 2016 study revealed that 84% of the lower half of the river is either stressed or adjusting its form. The upper watershed is generally stable and contains good salmon habitat, while the central and lower portions are accumulating sediment, the river is getting wider, and it no longer contains good salmonid habitat. Major sources of sediment are eroding riverbanks, poorly maintained logging roads, and/or poorly installed culverts or bridges. Many degraded locations were identified as potential sites for restoration projects and the NWA will carefully analyze and prioritize these sites in coming years.

Though water quality has improved over the last few decades due to improvements in wastewater treatment and farming practices, point (direct) and non-point (indirect) sources con-

tinue to discharge chemicals and nutrients into the Nashwaak watershed. Major sources of pollution include:

- erosion due to the removal of river-bank vegetation and/or soil mining;
- municipal stormwater and wastewater inputs;
- fertilizer run-off;
- faulty septic systems;
- improper forestry practices; and
- industrial activities.

Water quality was last sampled at 18 sites between 1999 and 2002 with some data available outside this range. Only one site (Marysville) has

been monitored since 2005. Water quality was better in the upper watershed and degraded in the lower few kilometers, as urbanization and industrial activities increase. The Penniac Stream is an area of concern, as are Marysville and Barker's Point. In general, CCME Water Quality Indices (WQI) were mostly in the Good to Excellent range and most water quality parameters have improved since the 1980s. Watershed-wide water quality sampling resumed in 2017.





Threats

FLOODING

The watershed receives, on average, 1116 mm of precipitation/year. Peak water levels and flow occur in April-May. Mean daily discharge has increased steadily from the 1960s to the 2010s and the river has experienced more extreme flows over the last decade compared to historically.

Though the Nashwaak River is relatively short, its flooding potential is great. Areas susceptible to floods are the mouth of the river, Penniac, Nashwaak Bridge, and the area around Stanley, which frequently experiences ice jams in the spring. Annual freshet flooding occurs in the spring due to a combination of warming and snowmelt in the headwaters. Flash flooding, however, is now occurring more regularly as a result of more intense and frequent storms due to the effects of climate change. The worst flood of the last century occurred in 1923 and caused today's equivalent of \$70-140 million in province-wide damages to infrastructure. The 2008 flood, perhaps the worst of the last decade, resulted in \$23 million in province-wide damages and caused high water levels of 22.25 m at Durham Bridge; however, the December 2012 flood caused the highest water levels at Durham Bridge since 1950 (22.54 m – about 4 m above average levels) (River Watch, 2017). The removal of forests along the lower floodplain of the Nashwaak has greatly reduced the river's ability to control the amount and timing of flood waters and floods will continue to occur with higher frequency and severity if land clearing continues.

TEMPERATURE

The Nashwaak is a warm river compared to others in the province, with temperatures regularly surpassing 23°C. The water has become warmer due to the removal of stream-side vegetation, which has resulted in the Nashwaak becoming wider, shallower, and less shaded. Prolonged exposure to temperatures over 20°C cause stress in cold-water fish. Tributaries to the Nashwaak, however, display much better temperatures regimes, sometimes staying as cool as 14°C in the summer and providing thermal refuges for salmon and trout.

Temperatures have increased in Atlantic Canada by 0.8°C since 1900, which is more than the global average increase of 0.6°C. Climate change will likely lead to a change in seasonal run-off patterns, reduced ground water recharge potential, decreased stream flow, increased flooding, warmer waters threatening cool-water fish populations, and increased vulnerability to invasive species.



BIODIVERSITY

Although the watershed has been altered by human activity, the landscape provides habitat for many plants and animals and the lakes, wetlands, and streams support many aquatic species. The watershed is home to 38 species of mammal, 15 species of amphibian, 7 species of reptile, 211 confirmed species of breeding bird, 21-30 species of fish, and 7 species of freshwater mussel. However, this diversity of plants and animals is threatened by habitat loss and fragmentation, pollution, and climate change. The southern tip of the watershed is particularly subject to habitat altering influences. At least 20 species of animals and 6 species of plants are listed as Species at Risk.

Protecting land is one way to sustain biodiversity. At least 3.2% of the watershed is legally protected, including Hyla Park Conservation Area and 20 ha of Provincially Significant Wetlands. There are four additional Environmentally Significant Areas and one City-owned park (Killarney Lake). All watercourses and wetlands are also protected by a no-development buffer zone.

A remnant Atlantic salmon population remains in the Nashwaak watershed, which is the largest salmon-producing tributary of the Saint John River below the Macataquac Dam. The Nashwaak provides 5.69 million m² of salmon production area. Historically, the Nashwaak was home to some of the best salmon angling in the Maritimes. However, the Outer Bay of Fundy Atlantic salmon population has dropped by 64.3% over the last three generations, possibly due to mortality at sea, parasites, habitat loss, and warming waters. Historically, the population was greatly affected by the construction of dams, which eliminated habitat, by recreational and commercial fisheries, and by silt and sedimentation. Salmon returns to the Nashwaak started to plummet in the mid-1980s to early-1990s and DFO estimates that the Nashwaak population will decline towards local extinction in the next 100 years without human intervention. To counteract this, the NWAI is working to improve salmon habitat and cool the river through bank restoration, tree-planting, and education programs.

Forests filter pollution, absorb rainfall, regulate stream flows, moderate water temperatures, stabilize stream banks, and provide homes for wildlife.

In 2005, the NWA began restoring vegetation along degraded riverbanks. The presence of old growth Acadian upland and floodplain forests are essential to maintain and restore the health of the Nashwaak watershed. Re-establishing native trees will have many positive benefits such as controlling erosion, absorbing run-off, shading streams, and sequestering carbon. The Nashwaak Watershed Association Inc. has committed to restoring the lower Nashwaak River floodplain back to native silver maple forests. These forests will provide homes and food for species at risk, improve degraded salmonid habitat, and lower the temperature of the river. They will also provide a buffer against climate change and the risk of increased flooding.

ABOUT THE NASHWAAK WATERSHED ASSOCIATION

The NWA's long term goal is to manage the Nashwaak watershed as a healthy ecosystem that balances a variety of economic, recreational, social, and landowner interests so that it will serve the community while maintaining a

healthy resource for generations to come. We strive towards this goal so that eventually:

- Healthy natural areas are protected and expanded through acquisition and restoration projects;
- The Nashwaak River and its tributaries are green corridors that connect to forested upland;
- Pollution sources are addressed and reduced;

- Native fish species thrive and salmon return in greater numbers; and
- The Nashwaak River becomes a role model for how people, wildlife, and the river can live together in harmony.



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WHAT IS THE NWA DOING TO ACHIEVE THIS GOAL?

Between 2005 and 2016, NWA enhanced at least 6.95 km of shoreline with 20,708 trees, acorns, and cuttings.

In 2015, management plans were developed for the Marysville Flats and the Neil's Flats to restore these city-owned retired hayfields back to silver-maple floodplain forests, one of the most threatened and least protected ecosystems in northeastern North America. Approximately 90% of the original floodplain habitat along the Nashwaak River has been destroyed by agriculture and development. Silver maple floodplain forests are estimated to be worth approximately \$72,000 USD/hectare/year based on flood mitigation alone.

The NWA has been working since 2011 to develop a "Greenway" along the banks of the lower Nashwaak River. The land falls within the floodplain and cannot be developed. Much of the land is retired hayfields. Up to 23.3% of the Greenway could be restored back to floodplain forest and another 2.0% could be restored back to Acadian forest. As a forested wetland, the Greenway will greatly increase flood

protection for Fredericton, improve air quality, control erosion, and moderate temperatures. This natural buffer will ensure that future generations can enjoy the Nashwaak River as we do today.

The NWA is also implementing many new programs and projects to assess and improve watershed health and to educate watershed residents. Some of our initiatives include:

- Monitoring water quality and temperature throughout the watershed
- Assessing river crossings and working to make all culverts passable to fish
- Assessing eroding riverbanks and prioritizing future restoration projects
- Continuing the development of its Upstream/Downstream elementary school education program focused on trees, erosion, and the importance of the Nashwaak River
- Completing the bio-engineered restoration demo site in Marysville
- Planting trees and willow stakes along the Greenway with community members
- Sharing our successes with watershed residents and others



What can you do?

- Leave a vegetated buffer along stream banks to prevent erosion
- Plant a rain garden filled with hardy native plants that will help filter run-off
- Regularly maintain your septic system
- Minimize the use of fertilizers on lawns and gardens - choose natural methods
- Participate in local tree planting or stream clean-up events
- **Get to know your river!** Walk, run, or bike the trails, paddle the waters, or learn how to fly fish.
- Learn more about the watershed by reading our State of the Nashwaak report or our 2017-2020 Action Plan.
- **Become a NWA volunteer** - learn more about opportunities at www.nashwaakwatershed.ca or contact director@nashwaakwatershed.ca

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