NORTH BAY - MATTAWA
CONSERVATION
AUTHORITY

Watershed-based
Resource Management Strategy

DRAFT June 10, 2024

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Acknowledgement of Traditional, Ancestral and Treaty Lands

As we work towards reconciliation with Indigenous people, we respectfully acknowledge that we are in Robinson-Huron Treaty territory and the land on which we live and work is the Traditional Territory and Treaty Lands of the Nbisiing Anishinaabeg (ah-nish-nah-beg) as well as the unceded and ancestral Traditional Territory of the Algonquin People and the Metis Nation.

As shared stewards of Ontario's land and water resources – along with these First Nations communities – the North Bay-Mattawa Conservation Authority appreciates and respects the history and diversity of the land and its peoples and are grateful to have the opportunity to live in this Territory.

Acknowledgments and Authors

The Watershed-based Resource Management Strategy (**"Watershed Strategy"**) for the North Bay-Mattawa Conservation Authority (NBMCA) was developed following Conservation Ontario's Guidance on the Conservation Authority Mandatory Watershed-based Resource Management Strategy, the Conservation Authorities Act and its regulations, and draft content from other Conservation Authorities.

Watershed partners, Indigenous communities, and the NBMCA Board of Directors are sincerely appreciated for their valuable input and feedback during the development of the NBMCA Watershed Strategy.

The authors of the NBMCA Watershed Strategy are Chitra Gowda, Chief Administrative Officer, Secretary Treasurer (Lead); David Ellingwood, Director, Water Resources/Deputy CAO; Angela Mills, Water Resources Specialist; Githan Kattera, Water Resources Coordinator; Valerie Murphy, Regulations Officer; Anna Brownlee, Administrative Assistant.

The NBMCA Board of Directors provided final review and approval on (date to be inserted later).

1. Legislative Background

The North Bay-Mattawa Conservation Authority (NBMCA) was formed under the Conservation Authorities Act of Ontario in 1972 at the request of its member municipalities. The NBMCA is a community-based, environmental organization dedicated to conserving, restoring, developing and managing renewable natural resources on a watershed basis. It is one of 36 conservation authorities (CAs) in Ontario and is governed by a Board of Directors comprised of its ten member municipalities. NBMCA is a member of Conservation Ontario, the network organization of all CAs.

The Conservation Authorities Act and accompanying regulations have been amended by the Province of Ontario since 2017, including updates made in 2021. CA programs and services are categorized per legislation as follows:

- **General Functions:** Corporate-wide services that support several/all program areas
- **Category 1: Mandatory programs and services**
- **Category 2: Municipal programs and services provided on behalf of a municipality**
- **Category 3: Programs and services advisable by the CA to implement in the CA's jurisdiction.**

Ontario Regulation (O. Reg.) 687/21 and Sections 21.1.1 and 21.1.2 of the Conservation Authorities Act established a requirement for Transition Plans (including a Program and Service Inventory) and Agreements to carry out CA Programs and Services.

O. Reg. 686/21 sets out the mandatory programs and services which must be delivered by CAs in Ontario. Specifically, section 12(1)3 of the regulation requires all Conservation Authorities to prepare a "Watershed-based Resource Management Strategy" ("**Watershed Strategy**").

The Watershed Strategy includes Category 1 programs and services provided by the CA. It may also include both Category 2 and Category 3 programs and services, where the relevant agreement permits the inclusion of these programs or services in the Watershed Strategy. Sections 12(4)-(7) of O. Reg. 686/21 set out the required components to be included in the Watershed Strategy.

2. Watershed Strategy Overview

2.1 Purpose

The purpose of the Watershed Strategy is to assist with evolving or enhancing the delivery of NBMCA programs and services. The Watershed Strategy improves efficiencies and effectiveness of Category 1 programs and services and, where the relevant agreements allow, Category 2 and 3 programs and services.

2.2 Goal

The goal of the Watershed Strategy is to design and deliver cost-effective programs and services that protect people and property from natural hazards and climate change impacts, protect municipal drinking water sources, conserve nature, and provide opportunities for outdoor recreation and education across the NBMCA watershed.

2.3 Framework

The NBMCA Watershed Strategy is developed using a data-based framework, from which knowledge is derived. This informs planned actions throughout the watershed, through a collaborative partnership approach. **Figure 1** provides the overarching framework.

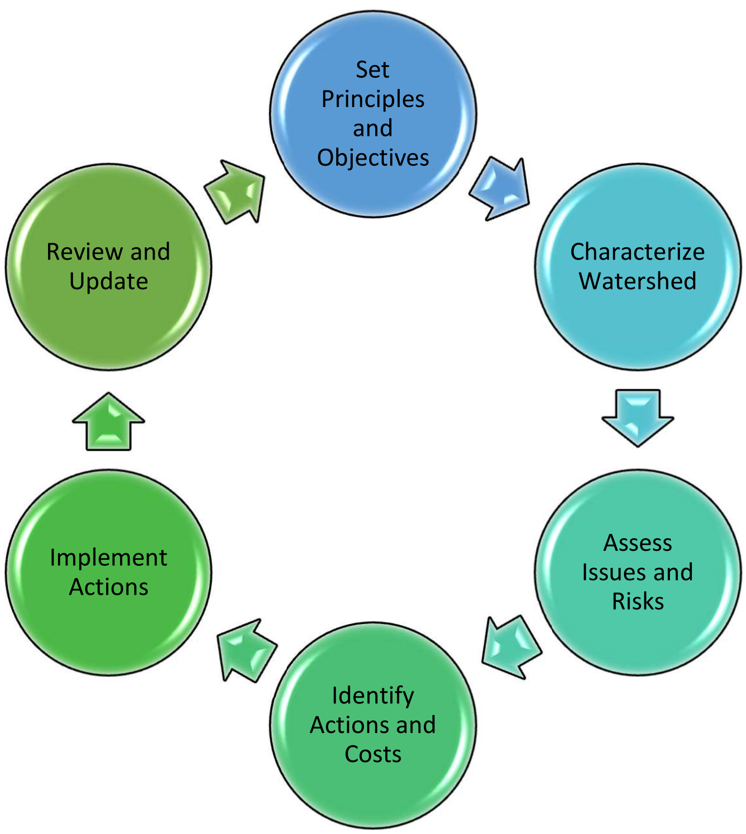


Figure 1: Framework of the Watershed-based Resource Management Strategy

The Watershed Strategy framework begins with setting guiding principles and objectives which reflect the issues of the watershed. The watershed is characterized through a summary of existing science-based studies and information. The next step is to identify and assess issues and risks that may impact the effective delivery of Category 1 mandatory programs and services, while also identifying gaps in addressing the issues/risks (i.e., whether additional programs and services are needed). Actions to address such risks are then identified and implemented throughout the watershed. To support continuous improvement, the Watershed Strategy is reviewed and updated periodically. Consultations with stakeholders and the public is required during the development of the Strategy and its subsequent reviews/updates.

The Watershed Strategy may be used to identify actions and Category 2 and 3 programs and services, with cost estimates, that are recommended to support the delivery of mandatory CA programs and services. It provides a mechanism to update the NBMCA programs and services inventory and could identify where opportunities exist for improving and/or maintaining watershed health.

3. Guiding Principles and Objectives

This section describes the guiding principles and objectives that inform the design and delivery of NBMCA's mandatory programs and services, per O. Reg. 686/21 Section 12(4)(1).

3.1 Guiding Principles

The following are the guiding principles of the NBMCA's programs and services:

- The watershed forms the basis of conservation, restoration, development, and management of natural resources by the NBMCA.
- The Watershed Strategy is the framework to identify and assess resource conditions, trends, risks, and issues and to implement programs and services to manage them.
- The Watershed Strategy informs policy and decision-making by the Conservation Authority and other partners.
- Water and other natural resources are vital natural assets that help manage climate change impacts, mitigate natural hazards, filter contaminants, assimilate waste, sustain biodiversity, and provide green spaces for recreation and other community benefits.
- Resource management decisions are transparent and take into consideration a broad range of community uses, needs, and values, including ecosystem needs.

3.2 Objectives

The objectives are set to underpin a performance evaluation framework that will effectively measure the Watershed Strategy's value. The objectives are aligned to the legislated scope of the Watershed Strategy, reflecting Category 1 programs and services and, where supported through agreements, Category 2 and 3 programs and services.

The objectives of the NBMCA Watershed Strategy are:

- To characterize groundwater and surface water resource systems and other natural resources of the watershed.
- To identify and understand key resource issues and primary stressors that cause them.
- To eliminate or mitigate the risk to life and property from flooding, erosion, and other natural hazards and from the impacts of a changing climate.
- To mitigate the risk to municipal drinking water sources and to ensure a sustainable and clean water supply for communities.
- To conserve nature and provide opportunities for outdoor recreation and education.

4. Governance and Jurisdiction

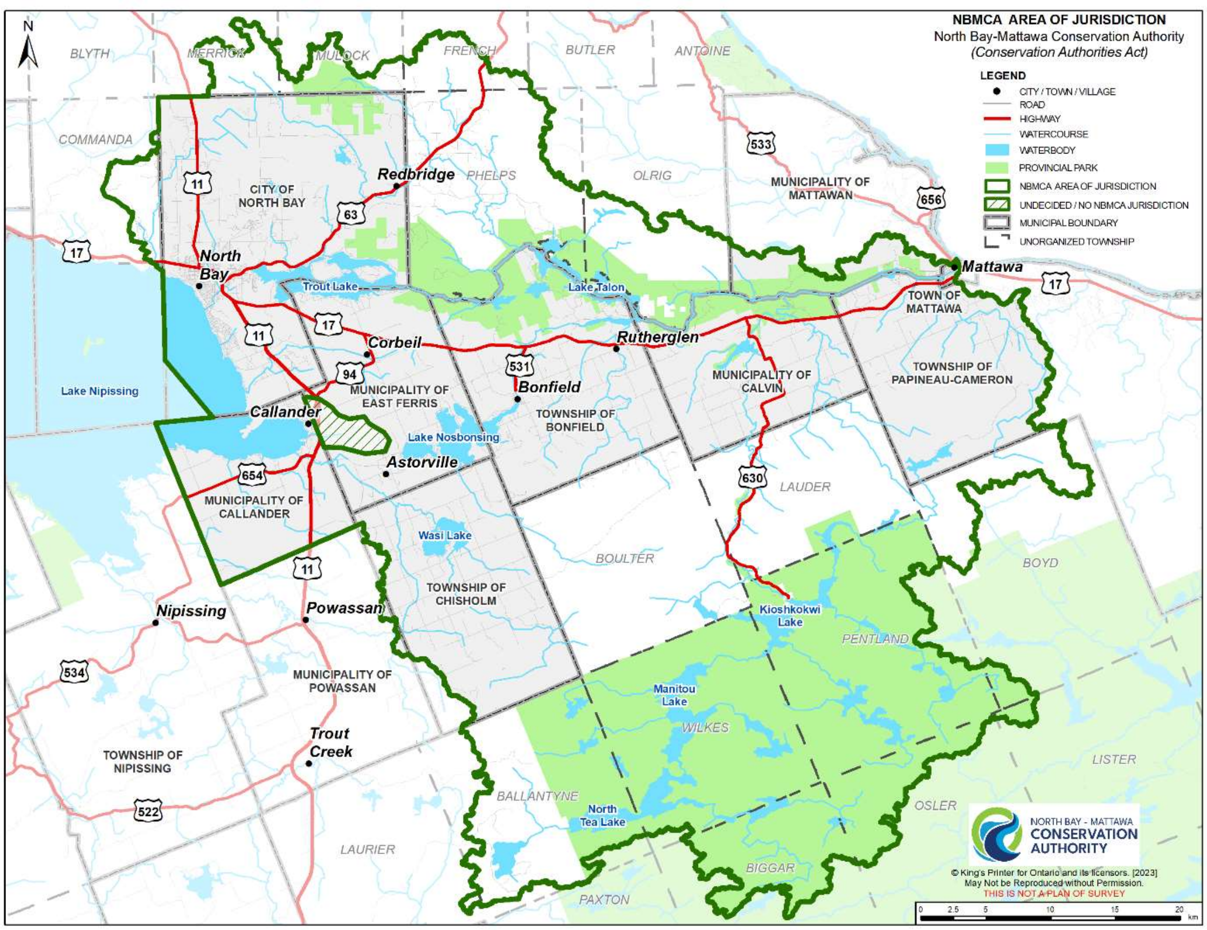
The NBMCA was formed under the Conservation Authorities Act of Ontario in 1972 at the request of its member municipalities. The NBMCA has responsibilities under three pieces of legislation with different areas of jurisdiction:

- Conservation Authorities Act
- Clean Water Act, 2006
- Ontario Building Code Act.

4.1 Conservation Authorities Act

NBMCA administers its objects and responsibilities defined in the Conservation Authorities Act within a 2900 sq km area, based on the watersheds within the Lake Nipissing and the Ottawa River Basins. Highlights of the NBMCA's jurisdictional area include the shoreline of Lake Nipissing within the City of North Bay and the Municipality of Callander, Trout Lake, Wasi Lake, the Mattawa River, the North Bay Escarpment, and parts of Algonquin Park.

Figure 2: North Bay-Mattawa Conservation Authority Area of Jurisdiction under the Conservation Authorities Act



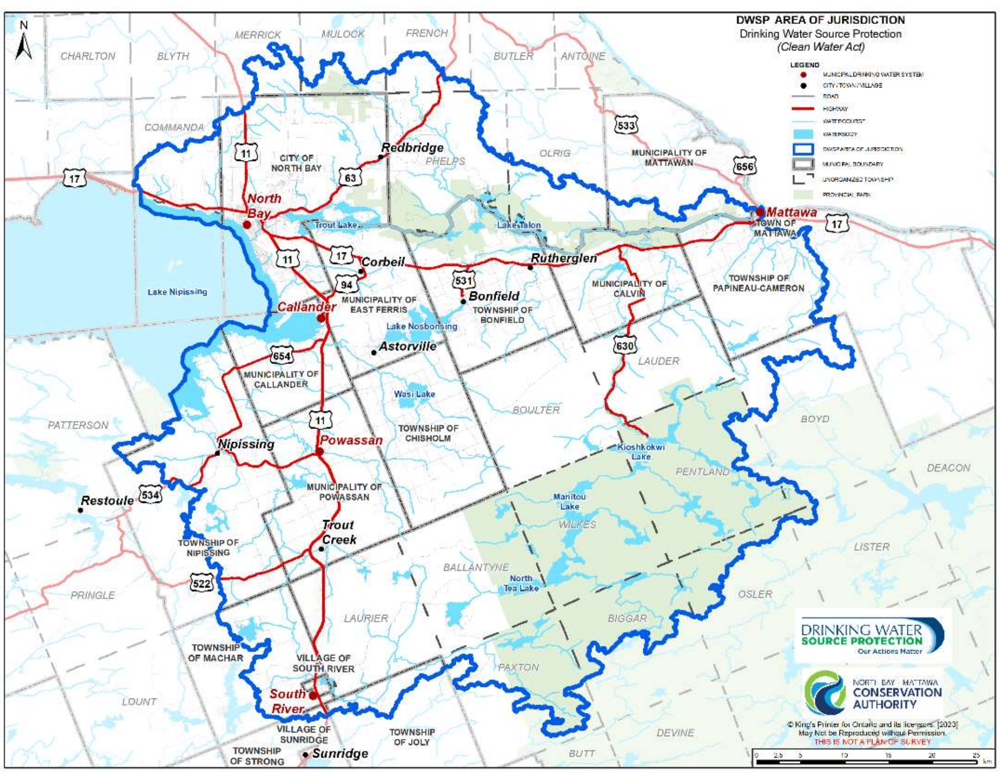
The NBMCA is governed by a Board of Directors comprised of 12 members representing ten participating municipalities as listed below. Representation on the board is based on the population of the municipality located within the NBMCA watershed jurisdiction.

- City of North Bay: 3 members
- Municipality of Callander: 1 member
- Municipality of Calvin: 1 member
- Municipality of East Ferris: 1 member
- Municipality of Mattawan: 1 member
- Municipality of Powassan: 1 member
- Town of Mattawa: 1 member
- Township of Bonfield: 1 member
- Township of Chisholm: 1 member
- Township of Papineau-Cameron: 1 member.

4.2 Clean Water Act, 2006

Under the Clean Water Act, 2006, the 4,000 square kilometer jurisdiction is called the North Bay-Mattawa Source Protection Area (NBMSPA), governed by the North Bay-Mattawa Source Protection Authority. In addition to the ten member municipalities noted above, the North Bay-Mattawa Source Protection Authority also includes the Village of South River, Township of Nipissing, and Township of Strong. See **Figure 3**.

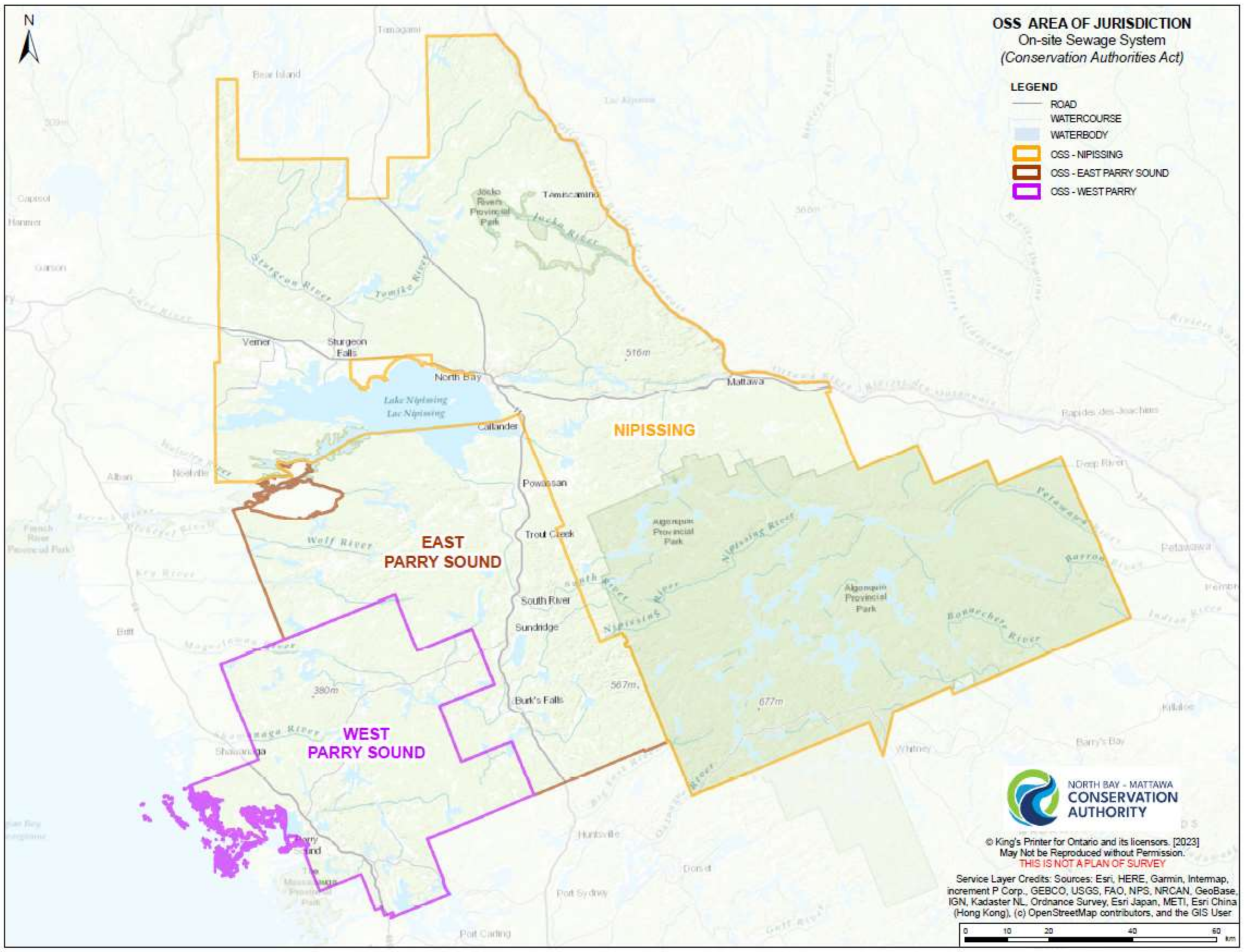
Figure 3: North Bay-Mattawa Source Protection Authority Jurisdiction under the Clean Water Act, 2006



4.3 Ontario Building Code Act

The Ontario Building Code Part 8 appoints NBMCA as the delivery agent for the On-site Sewage System (OSS) program across more than 20,000 square km of jurisdiction. The NBMCA OSS program is delivered in the Districts of Nipissing and Parry Sound (excluding the Township of the Archipelago) as well as portions of Algonquin Park. See **Figure 4**.

Figure 4: North Bay-Mattawa Conservation Authority Jurisdiction under the Ontario Building Code Part 8 – On-site Sewage System Program



5. Watershed Characterization

NBMCA is a watershed science-based organization that utilizes and relies on studies, monitoring programs and other information on the state of the natural resources within its watershed jurisdiction to support the delivery of mandatory programs and services. Examples of such studies that help characterize the watershed are the NBMCA Integrated Watershed Management Strategy, watershed plans, subwatershed plans, assessment reports prepared under the Clean Water Act, 2006, and watershed report cards.

- **Appendix A** provides several maps that support the watershed characterization.
- **Appendix B** provides a summary of existing technical studies and other natural resource information relied upon by NBMCA.
- **Appendix C** provides an overview of monitoring programs.

The maps, content of existing studies, monitoring programs and other information provide a baseline of existing knowledge which NBMCA utilizes to support activities delivered by the mandatory programs and services. These resources directly assist with watershed characterization, identifying any triggers or issues within the watershed and relevant guiding principles and objectives, and assessing and mitigating risks.

These studies carried out by NBMCA provide a characterization of the watershed's surface water and groundwater resource systems and other natural resources, which regulate natural hazard processes and support the hydrological and ecological integrity of the watershed:

- NBMCA Integrated Watershed Management Strategy
- NBMSPA Assessment Report
- NBMCA Watershed Report Card
- Water Budget.

5.1 Physical Geography

The NBMCA watershed is located between the eastern shores of Lake Nipissing and extends to the confluence of the Mattawa River and Ottawa River. A major watershed divide cuts through the area from north to south directing water flow either west to Lake Nipissing and the French River watershed or east towards the Mattawa River and the Kipawa River – Upper Ottawa River watershed. These two large watersheds within the NBMCA area of jurisdiction under the Conservation Authorities Act are subdivided into 20 subwatersheds as shown in **Figure 5**.

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Figure 5: Map of NBMCA subwatersheds

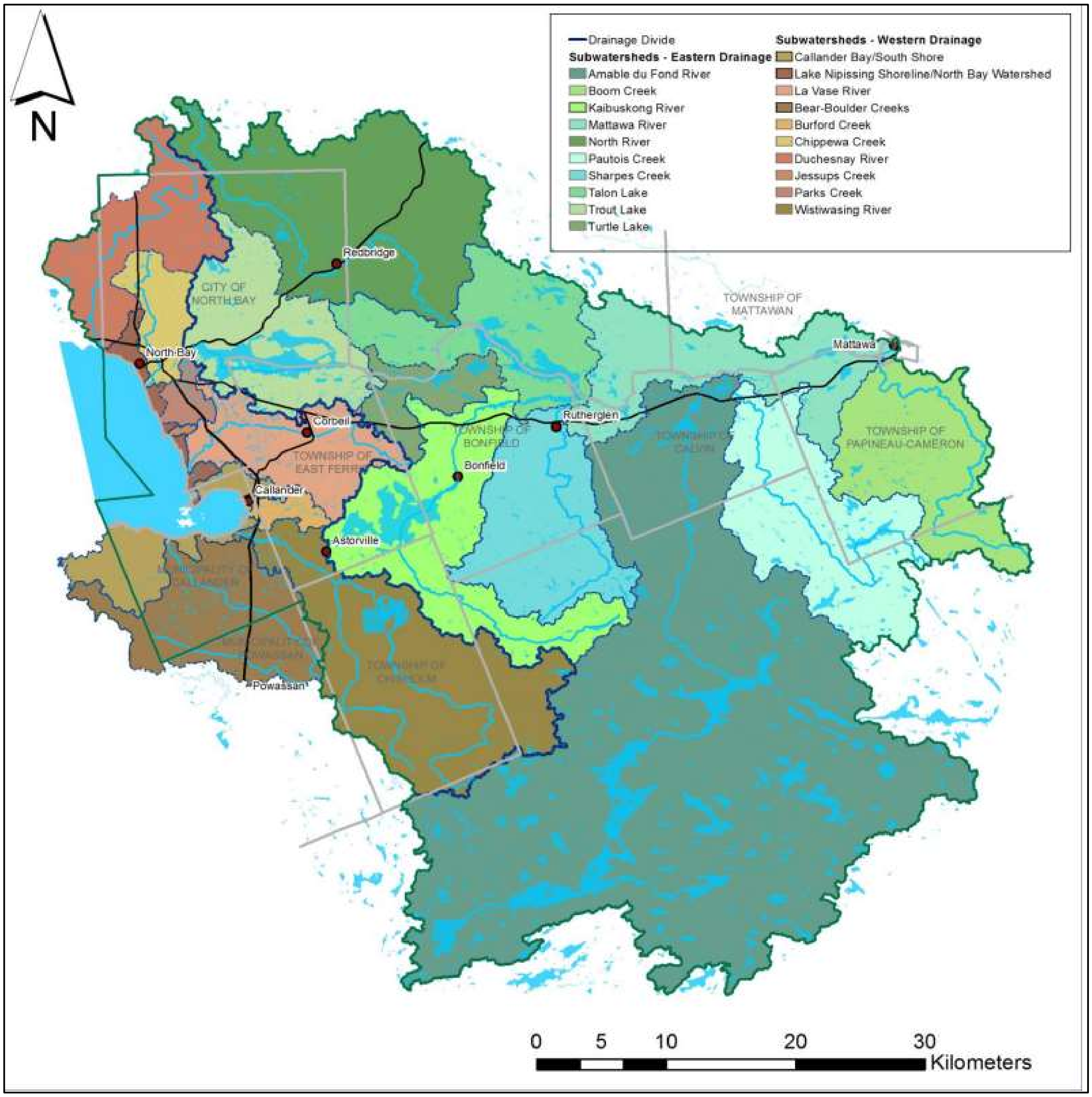

Table 1: NBMCA subwatershed areas

Subwatershed	Tertiary Watershed	Area Within NBMCA Jurisdiction (km^2)	Area Outside NBMCA Jurisdiction (km^2)
Duchesnay Creek	French River	101.65	
Chippewa Creek	French River	37.77	
Park Creek	French River	14.01	
Jessups Creek	French River	1.31	
La Vase River	French River	90.76	
Lake Nipissing Shoreline / North Bay	French River	16.61	
Burford Creek	French River	1.22	11.67
Wistiwasing River	French River	234.38	
Windsor / Boulder / Bear Creeks	French River	67.12	59.61
Callander Bay/South Shore	French River	30.03	34.83
Trout Lake	Kipawa River – Upper Ottawa River	131.67	
Turtle Lake	Kipawa River – Upper Ottawa River	45.08	
North River	Kipawa River – Upper Ottawa River	247.77	
Kaibuskong River	Kipawa River – Upper Ottawa River	181.88	
Lake Talon	Kipawa River – Upper Ottawa River	130.09	
Sharpes Creek	Kipawa River – Upper Ottawa River	136.88	
Amable du Fond River	Kipawa River – Upper Ottawa River	964.41	
Pautois Creek	Kipawa River – Upper Ottawa River	175.78	
Boom Creek	Kipawa River – Upper Ottawa River	137.86	
Lower Mattawa River	Kipawa River – Upper Ottawa River	143.39	
Total Area		**2889.67***	**106.11**

* excludes the small portion of the Little Sturgeon River at the north end of the City of North Bay

5.2 Population

Historic settlement and development of the area was driven by the nature of the landscape, which directed access routes, limited agricultural activities and provided challenges to road construction. The Mattawa River extends from west to east across the northern portion of the NBMCA watershed. It provided a major transportation link from Lake Nipissing in the Great Lakes watershed across to the Ottawa River, traditionally for First Nations and later for European fur traders. Much of the terrain is rugged and otherwise difficult to navigate. The City of North Bay was established on the divide at the only point east of Lake Nipissing where road and (eventual) rail access from south to north was possible without a major bridge.

The total population residing within the NBMCA watershed is estimated at 66,200 (Statistics Canada, 2021). This population is culturally diverse with over 90 languages spoken and approximately 24% of the population is knowledgeable in both English and French (City of North Bay, 2023). Population distribution and changes within the NBMCA watershed for the period 1996 to 2021 are indicated in Table 2. Note that since population data is reported based on political boundaries (municipalities, etc.) while the NBMCA watershed is defined by watershed boundaries, the total population for the NBMCA watershed is an estimate.

Approximately 73% of the population of the NBMCA watershed resides in the City of North Bay which is the only major urban centre in the NBMCA watershed. Most of the rest live in the towns and hamlets. However, depending on the municipality, there may be a significant portion of the population on rural properties. A large portion of the NBMCA watershed is virtually uninhabited. Population distribution and density is indicated in Table 3. The overall population growth trend experienced between 2016-2021 is expected to continue, with an increase of newcomers moving to the community (City of North Bay, 2023).

Table 2: Population Distribution and Change within the North Bay-Mattawa Conservation Authority Jurisdiction

Name	Municipal Designation	Population						% Change
		1996	2001	2006	2011	2016	2021	1996-2021
Bonfield	Township	1,765	2,064	2,009	2,016	1,990	2,146	21.6%
Callander	Municipality	3,168	3,177	3,249	3,864	3,863	3,964	25.1%
Calvin	Municipality	562	603	608	568	516	557	-0.9%
East Ferris	Municipality	4,139	4,291	4,228	4,512	4,862	4,946	19.5%
Mattawa	Town	2,281	2,270	2,003	2,023	1,993	1,881	-17.5%
North Bay	City	54,332	52,771	53,966	53,651	51,553	52,662	-3.1%
Subtotal:		**66,247**	**65,176**	**66,063**	**66,634**	**64,777**	**66,156**	**-0.1%**
Townships only partially within NBMCA Area (population of entire territory)								
Chisholm	Township	1,197	1,230	1,318	1,263	1,291	1,312	9.6%

Name	Municipal Designation	Population						% Change
		1996	2001	2006	2011	2016	2021	1996-2021
Mattawan	Municipality	115	114	147	162	161	153	33.0%
Papineau-Cameron	Township	973	997	1,058	978	1,016	982	0.9%
Powassan	Municipality	3,311	3,252	3,309	3,378	3,455	3,346	1.1%
Subtotal:		**4,399**	**4,363**	**4,514**	**4,518**	**4,632**	**4,481**	**1.9%**
Total:		**70,646**	**69,539**	**70,577**	**71,152**	**69,409**	**70,637**	**0.0%**

Table 3: Population Density within the North Bay-Mattawa Conservation Authority Jurisdiction (2021)

Name	Municipal Designation	2021 Population	Census Calculated Land Area (km^2)	Density 2021 (pop/km^2)
Municipalities Located Completely within the NBMCA Jurisdiction				
Bonfield	Township	2,146	206.22	10.4
*Callander	Municipality	3,964	102.98	38.5
Calvin	Municipality	557	140.13	4.0
East Ferris	Municipality	4,946	151.94	32.6
Mattawa	Town	1,881	3.67	512.5
North Bay	City	52,662	315.53	166.9
Subtotal:		**66,156**	**920.47**	**71.9**
Municipalities Located Partially within the NBMCA Jurisdiction				
Chisholm	Township	1,312	205.77	6.4
Mattawan	Municipality	153	200.12	0.8
Papineau-Cameron	Township	982	564.23	1.7
Powassan	Municipality	3,346	223.26	15.0
Subtotal:		**4,481**	**987.61**	**4.54**
TOTAL:		**70,637**	**1,908**	**37.0**

5.3 Climate change

5.3.1 Overview

There is broad international scientific agreement that human activities are primarily responsible for recently documented climate change (IPCC 2014a). This has largely been attributed to the release of greenhouse gases (GHGs) into the atmosphere, which have caused warming temperatures, which in turn have changed precipitation regimes and increased extreme weather events. Since the Intergovernmental Panel on Climate Change (IPCC) released its first report in 1990, average global temperature increases of about 0.1 °C per decade have been observed (IPCC 2014a), contributing to an average global temperature increase of between 0.95 °C and 1.20 °C to 2011-2020 over 1850-1900 average (IPCC, 2021). The period between 2016 and 2020 was the hottest five-year period between 1850 and 2020 (IPCC, 2021).

Long-term changes to temperature and precipitation are expected as a result of climate change. Under low GHG emissions scenarios, the IPCC (2021) predicts global average temperature is likely to increase by 1.0 °C to 1.8 °C by 2100 relative to 1850-1900. In their worst case GHG emissions scenarios, however, the IPCC (2021) predicts that average global temperatures could increase as much as 5.7 °C by 2100 relative to 1850-1900.

While these trends are expected to continue well into the future, the extent of climate change will largely depend on the level of GHG emissions mitigation around the world. Failure to reduce international GHG emissions will lead to more significant changes and increased risk of impacts. However, even if GHGs were dramatically reduced today, anthropogenic warming, atmospheric carbon levels and other impacts would continue for centuries due to the time scales associated with climate processes and feedbacks. These predictions point to the need for adaptation to climate change as well as for reducing sources of GHG emissions.

5.3.2 Existing Climate Data

Existing climate data for the NBMCA watershed have been provided by Gartner Lee (2008). From a climate change perspective, these data are valuable for the climate baseline they provide and for comparing observed climate trends against projected trends.

For the NBMCA watershed, Gartner Lee (2008) has provided data on climate stations, average annual precipitation, precipitation distribution, metrological zones, evapotranspiration, and long-term historic temperature and precipitation trends and averages. This information is contained within the Section 2.5 Conceptual Water Budget of the 2023 Draft Proposed Update of the Assessment Report for the North Bay-Mattawa Source Protection Area. Estimated annual precipitation and evapotranspiration within the area is provided in Figures 6 and 7 respectively.

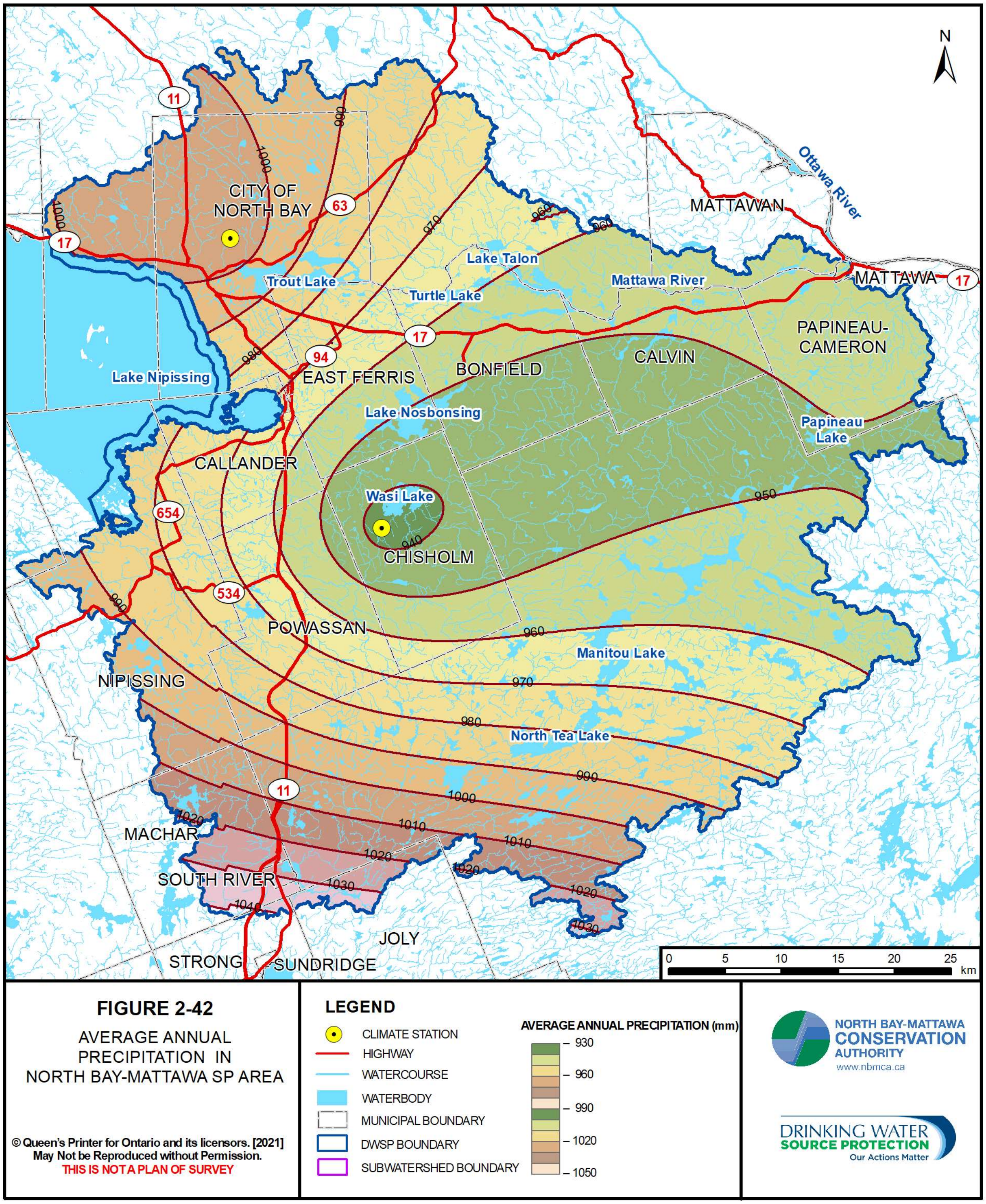

Figure 6: Precipitation in the North Bay-Mattawa Conservation Authority Watershed

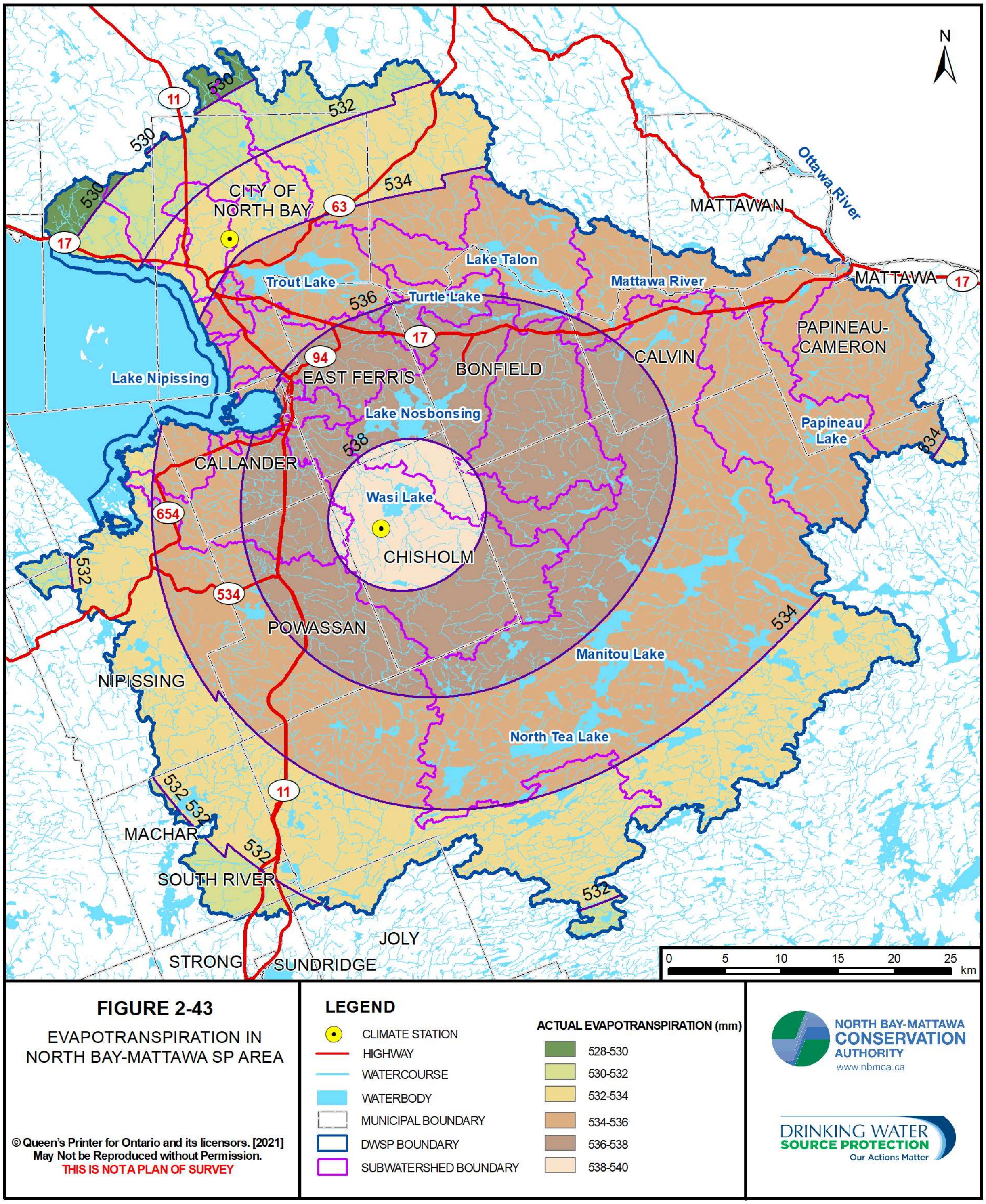

Figure 7: Evapotranspiration in the North Bay-Mattawa Conservation Authority Watershed

These data will be useful for conducting region-specific analyses of climate change scenarios, which is beyond the scope of this report. For example, using temperature and precipitation data from the North Bay weather station, OCCIAR (2010) found that annual mean temperature in the North Bay area increased over the period 1938 to 2008, and that total annual precipitation increased by 110 mm during this same time period.

5.3.3 Anticipated Changes in Water Quantity and Quality Due to Climate Change

In Ontario, climate change is expected to affect water quality, stream flow, lake levels, groundwater infiltration, and patterns of groundwater recharge to streams (de Loë & Berg, 2006; Chiotti & Lavender, 2008; Pearson & Burton, 2009). More specifically, changes to the hydrologic cycle as a result of climate change may influence the vulnerability and reliability of source water for drinking. For example, changes in seasonal and annual flow variability may alter the groundwater recharge, which is critical to the supply of drinking water. Increased water temperature, reduced stream flow and changing lake levels may also influence the water quality of a surface water source (Ontario Ministry of Environment 2006).

Generally, annual runoff is expected to decrease, although increased winter runoff and high flows due to extreme precipitation events throughout the year are expected. Lake levels are expected to decline and groundwater recharge is expected to decrease. There will be changes to groundwater discharge in the amount and timing of baseflow to streams, lakes, and wetlands. Ice cover on lakes is expected to be reduced or eliminated completely over time. Snow cover will also be reduced and water temperature in surface water bodies will increase. Finally, it is expected that soil moisture will increase in the winter but decrease in the summer and autumn.

Potential impacts from climate change (Table 4) that may be pertinent to source water protection planning in Ontario have been summarized by de Loë and Berg (2006). They draw on a number of previous studies (e.g., Lavender et al., 1998; Bruce et al., 2000; Great Lakes Water Quality Board, 2003; Kling et al., 2003; Auld et al. 2004; Bruce et al. 2006) with a focus primarily on the Great Lakes Basin.

Table 4: Potential Impacts of Climate Change

Type of Change	Potential Impacts of Change
Frequency of extreme rainfall events	• greater frequency of waterborne diseases • increased transportation of contaminants from the land surface to water bodies
Runoff	• increased stress on fish habitat due to reduced streamflow • reduced water quality because less water is available for dilution of sewage treatment plant effluents and runoff from agricultural and urban land • increased erosion from flashier stream flows • increased water treatment costs due to decreased water quality • increased competition and conflict over reduced water supplies during drought periods • increased frequency of flooding-related damage due to more high intensity storms
Lake levels	• changes to coastal wetland form and function because of declining lake levels • decreased water quality resulting from lower water volume, increased non-point source pollution, and increased chemical reactions between water, sediments and pollutants • increased water treatment costs due to reduced lake water quality • increased costs associated with moving water supply intakes • increased need for dredging of harbours and channels • reduced hydropower production due to lower flows between connecting channels
Ice cover	• longer navigation season due to reduced ice thickness and shorter ice cover season • increased shore erosion and sedimentation • increased water temperatures due to decreased ice cover
Water temperature	• increased stress on fish habitat due to increases in water temperature • reduced water quality (e.g., increased algae production) as water temperature increases • greater frequency of taste and odour problems in drinking water supplies

Type of Change	Potential Impacts of Change
Groundwater recharge and discharge	• changes to wetland form and function as discharge decreases • greater costs for groundwater-dependent communities, industries and rural residents associated with deepening wells • increased conflict because of additional competition for scarcer supplies • increased frequency of shallow wells drying up in rural areas • greater frequency of low flows in streams dependent on baseflow, causing increased competition and conflict, and increased stress on aquatic ecosystems
Soil moisture	• increased stress on plants due to decreased summer soil moisture • increased demand for irrigation to supplement soil moisture on drought prone soils

The findings presented in Table 5 are also consistent with more recently published work on climate change and water resources in Ontario (e.g., Chiotti and Lavender 2008, Pearson and Burton 2009). However, in some cases, other studies provide additional context and information. For example, the Expert Panel on Climate Change Adaptation (2009) notes that streams flowing in and out of some small lakes may also dry up for as long as several weeks in the summer. More frequent spring, summer and fall rainstorms will increase the risk of flooding and will increase the erosion of riverbanks and the turbidity of drinking water sources. Increased lake effect precipitation is also likely to occur in the lee of the Great Lakes because of more ice-free, open water in winter. Along with an earlier spring, this may in turn lead to a greater volume of spring run-off.

5.4 Ecology

5.4.1 Species at Risk

Species at risk are those given status rankings of extirpated, endangered, threatened, or special concern by the provincial Committee on the Status of Species at Risk in Ontario or the federal Committee on the Status of Endangered Wildlife in Canada. There are 29 species that have been provincially and/or federally designated as at risk in the NBMCA watershed.

The NBMCA watershed has not been extensively surveyed for occurrences of species at risk. The provincial Natural Heritage Information Centre, Ministry of Environment, Conservation and Parks, and Fisheries and Oceans Canada do not provide consistent data on species at risk in this area. Known occurrences appear to be associated with easily accessible study routes. Records may have resulted from other studies conducted in the area.

5.4.2 Invasive Species

There are around 200 non-native species occurring in the Great Lakes watershed of which many are considered “invasive”. Typically non-native, invasive species have high reproductive rates, lack natural population checks such as predators and disease, and aggressively out-compete indigenous species for resources. Once introduced, invasive species spread quickly. Once established they are difficult to eradicate (OFAH, 2006). The spread of invasive species is monitored through a partnership program involving Ontario Federation of Anglers and Hunters and the Ministry of Natural Resources and Forestry.

Invasive species have been introduced to the area through human activities including global shipping, recreational boating, aquarium and water garden trades, and the aquaculture industry. Some of the locally occurring invasive species include the Spiny Waterflea (*Bythotrephes longimanus*), which was first discovered in Lake Nipissing in 1998 and occurs within Callander Bay (Filion, 2011). Purple Loosestrife (*Lythrum salicaria*) is a common and widespread invasive species which has been in the area for over a century. Other examples include spongy moth (*Lymantria dispar dispar*), emerald ash borer (*Agrilus planipennis*), common reed (*Phragmites australis australis*), Himalayan balsam (*Impatiens glandulifera*), and Japanese knotweed (*Reynoutria japonica*) (OFAH 2020).

5.5 Water Quality

5.5.1 Surface Water

At most sites within the NBMCA watershed, chemical parameters are usually below limits established by Provincial Water Quality Objectives (PWQOs) or the Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life established by the Canadian Council of Ministers of the Environment (CCME). These low concentrations reflect the generally undeveloped conditions and relative lack of pollutant sources in the area. Water quality shows some evidence of degradation in the Wasi River, Chippewa Creek, and the La Vase River, the latter two of which drain some urbanized portions of the City of North Bay. Additional water quality sampling targeting total phosphorus and chloride analysis further indicate Bear Creek, Boulder Creek, Burford Creek, Boom Creek, Parks Creek, and Windsor Creek are degraded with high phosphorus concentrations and Windsor Creek also has high chloride concentrations. Chippewa Creek tends to exhibit the highest levels of total suspended solids and nitrates, and chloride and phosphorus concentrations appear to be particularly elevated during winter, based on limited sampling conducted in recent years.

Phosphorus is usually the limiting nutrient for algae growth in aquatic systems and is a parameter of concern at both high and low concentrations in local subwatersheds. The Wasi River has consistently exhibited high levels of total phosphorus along with Wasi Lake and Callander Bay into which it drains. Eutrophication, as evident in excessive growth of algae, in the latter waterbodies has been an ongoing concern for many years. Callander Bay is the source for the municipal drinking water supply for Callander and has experienced blooms of toxic cyanobacteria (often referred to as blue-green algae).

Trout Lake is the other area that has been closely monitored for phosphorus. Trout Lake is a deep, cold, oligotrophic lake of very low nutrient status. The City of North Bay has consistently supported the monitoring of phosphorus levels in Trout Lake at eight sites since 1986. Sampling was conducted from June to August on a weekly basis up until 2017. In 2018 and 2019, sampling occurred weekly from May to September, and since 2021, sampling has occurred monthly May to October. Over the period of record phosphorus levels have remained relatively consistent and do not display any obvious trends.

5.5.2 Groundwater

NBMCA monitors groundwater at six monitoring wells in partnership with the MECP's Provincial Groundwater Monitoring Network (PGMN). Water level is monitored at all six of these sites and water quality is sampled at four of these wells as outlined in Table 5.

Table 5: Provincial Groundwater Monitoring Network (PGMN) wells

ID #	Name	Location	Depth (m)	Static Water Level (mbtoc)[1]	Water Quality sampling
W272-1	Fabrene Inc.	Fabrene Inc.	24.7	5.43	No
W274-1	Marshall Park	Marshall Avenue at Booth Rd	5.18	2.94	Yes
W277-1	Trans Canada Pipeline	Hwy 11 N	10.8	7.31	Yes
W390-1	Chisholm	Beach Rd, public beach	141	2.32	No
W391-1	Bonfield	Grand Desert Rd and Boundary Rd	79.3	9.94	Yes
W392-1	Feronia	Cemetery Rd and Hwy 63	91.9	10.39	Yes

Generally, where there are Ontario drinking water quality guidelines, objectives, or standards, water quality from these wells is below these established targets. Exceptions are as follows: maximum copper detected in W274-1 and W277-1 has been above the Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG) aesthetic objective for copper (1.0 mg/L). All results for dissolved organic carbon (DOC) and iron at W274-1 have exceeded the ODWSOG aesthetic objectives (5 mg/L DOC; 300 µg/L iron). Lastly, median and maximum values for total dissolved solids at W274-1 also exceed ODWSOG aesthetic objectives (500 mg/L).

There are limitations with regards to assessing accurate trends relating to water quality in the NBMCA watershed. Provincial programs such as the PWQMN and PGMN each involve the collection of surface water and groundwater samples, respectively, with the overall goal of water quality monitoring and assessment. Although these are useful tools and data from other monitoring work over the past several years has improved the amount of data currently available within the NBMCA watershed, the data set remains too sparse to determine dominant trends in most areas. Monitoring will continue towards an accurate statistical analysis of water quality parameters within the broader NBMCA watershed.

Complete analyses have yet to be conducted on water quantity from the long-term water level dataset available from all six monitoring wells.

6. Resource Issues

6.1 Introduction

Watershed resource issues and needs can be determined from an understanding of current subwatershed health, recent subwatershed trends, the current level of management being provided, and the successes of management actions to affect improvements. These characterizations are only possible if adequate information is available. Impacts anticipated within the planning horizon are identified for each system. Subwatershed needs and issues are presented from multiple perspectives to explore a more holistic understanding of their environmental, societal, and economic values.

Refining the understanding of NBMCA features, conditions, processes, resource values and stresses over time will aid in refining the description of resource and protection needs.

Resource issues are identified in the following sections. Significant baseline data gaps exist in many subwatersheds that hamper the identification of management needs. Subwatersheds that have been within the NBMCA's jurisdiction since its inception have received preliminary assessment work including preliminary hydrologic and erosion evaluations. Some subwatersheds have received preliminary resource evaluation work such as wetland evaluation, stream habitat characterization or basic water quality data collection; or have benefited from regional studies. Subwatersheds added to the NBMCA in 2002 have significant information deficits. A summary of resource issues and the subwatersheds in which they occur is provided in Table 6.

NBMCA has identified key resource issues that will be addressed in the 2024 Watershed-Based Resource Management Strategy. These issues are identified in the context of climate change and based on a review of environmental monitoring data, technical reports and studies, and the expertise of NBMCA staff.

6.2 Summary of Key Natural Resource Issues

6.2.1 Climate Change

Climate change is overarching and influences the other resource issues. Changes to climatic conditions impact the return period of storm events for flood design criteria, habitat suitability for invasive species, natural hazards, and water quality.

Changing meteorologic patterns

The changes to storm patterns, include precipitation intensity, frequency, and seasonality. Together, these will define hydrologic conditions across the landscape. The combined influence of temperature will particularly affect winter and spring conditions with regards to snow accumulation, lake ice formation, and melt. Under high emissions scenarios, future Spring and Autumn precipitation are expected to increase, with the greatest increases in the spring and no notable change in the summer precipitation relative to current climate conditions (Climate Risk

Institute and Dillon Consulting Limited, 2023). Winter total precipitation and the proportion of precipitation that falls as rain are both expected to increase (Climate Risk Institute and Dillon Consulting Limited, 2023).

With extreme precipitation, more localized variability can be expected, and it is important to acknowledge regional averages do not always reflect specific communities or experiences within one watershed (Climate Risk Institute and Dillon Consulting Limited, 2023). In the future, 1-day maximum precipitation amounts are projected to increase, reflected in higher frequency scores by the end of the century (2080s) (Climate Risk Institute and Dillon Consulting Limited, 2023).

According to the 2015 IWMS, the subwatersheds that drain into Lake Nipissing (through City of North Bay and Municipality of Callander) have overall higher scoring for sensitivity to climate change than those draining towards the Mattawa River and some subwatersheds are highly vulnerable to climate change too (Stantec Consulting Ltd., 2015).

Flood design criteria

With changing meteorological patterns, the return period of storm events of a given magnitude or intensity are changing. What was once a regulatory event with a 1:100 year return period will become more frequent and new criteria for the regulatory event will need to be updated. This has impacts on floodplain mapping and stormwater infrastructure planning needs.

Floodplain and flood damage centre mapping is crucial to comprehensive flood preparedness efforts. Regular updates to floodplain mapping are imperative, ensuring alignment with evolving conditions and integrating climate change projections, particularly in areas where mapping has not yet been conducted.

Invasive species

Many plants and animals that are non-native can be a threat to the ecological functions within the NBMCA area of jurisdiction. Invasive species can disrupt food chains, out complete native species, introduce parasites and destroy habitat (MNR 2012). Invasive species are spread both intentionally and unintentionally by people and their actions and movements. Introduction of new species to local ecosystems can have costs in terms of biodiversity, as well as economically, as their invasion can have negative consequences to fishing, hunting, forestry, tourism and agriculture (MNR 2012) (IWMS, 2015).

Climate change can accelerate the introduction and spread of invasive species. Together, invasive species and climate change reduce ecosystem resilience and negatively impact biodiversity (Invasive Species Centre, 2024). More frequent extreme weather events (such as floods and droughts) stress native species, making them more vulnerable to attack and less able to respond to increased competition, pests, or diseases and create opportunities for invasive species movement and survival (Invasive Species Centre, 2024; Natural Resources Canada, 2023). A changing climate can affect species life cycles and their ability to spread into new areas (Invasive Species Centre, 2024). Increased carbon dioxide (CO_2) in the atmosphere leads to higher CO_2 uptake in plants, which can increase herbicide resistance (Invasive Species Centre, 2024). Changes to climate (including temperature, humidity, and rainfall) can create favourable conditions for increased spread of invasives (Invasive Species Centre, 2024).

The spongy moth (*Lymantria dispar*), for example is an invasive species that will be impacted by climate change. The largest outbreak of the spongy moth in Ontario occurred in 2021 and large patches of forest surrounding Trout Lake were notably defoliated. The fungus that helps control this insect will be less effective if the spring-summer weather is warm and dry. Warmer winter temperatures can lead to an increased survival rate of the eggs, but greater egg mortality could occur if snow depth is reduced (lack of insulation) (Natural Resources Canada, 2023).

Climate change can also exacerbate the impacts of invasive species such as Eurasian watermilfoil (*Myriophyllum spicatum*), a perennial aquatic plant. Thick beds of this plant create stagnant conditions that impact water quality and reduce dissolved oxygen levels impacting aquatic habitats for native species (Simkovic, 2020). With climate change, warmer lake temperatures reduce the amount of dissolved oxygen water can hold and will impact natural dynamics of lake stratification and oxygen exchange (Dove-Thompson et al., 2011). Together, invasive species and climate change will enhance stresses on aquatic habitats.

The increasing unpredictability of global circulation patterns and their influence on the location, frequency, or intensity of extreme weather patterns, such as polar vortices, make it increasingly difficult to predict the patterns of established invasive species. Intense cold periods or lack thereof impact overwintering mortality which influences populations for the following seasons (Natural Resources Canada, 2023).

6.2.2 Natural Hazards

Riverine flooding

Flooding associated with waterways and smaller inland lakes is considered riverine flooding. Areas that have high exposure and high consequence of flood impacts are known as Flood Damage Centres. There are several areas in NBMCA's jurisdiction which are particularly prone to flooding, including urban rivers through the City of North Bay and the confluence of the Mattawa River and Ottawa River in the Town of Mattawa. Multiple factors, such as late or rapid snowmelts, deep frost, excessive rainfall, ice jams, and/or dam failures can contribute to flooding. High water levels on Lake Nipissing impact the flood risk in the lower reaches of Chippewa Creek, Parks Creek, Jessups Creek, and the La Vase River. The area surrounding Parks Creek is particularly vulnerable and there is a back flood control structure to limit upstream riverine flooding during high lake water levels.

Climate change can exacerbate existing flood vulnerabilities. Extreme precipitation intensity and magnitude events can trigger flash flooding. Due to the localized nature of extreme precipitation associated with convective thunderstorms, they can be difficult to forecast. The impact of these extreme events will vary with urban landscapes where the land is more impervious, and drainage is dependent on local storm sewers and their capacity to handle the event flow and their rate of discharge to local streams will determine flood risk.

Conditions in 2019 are notable. Precipitation was above normal over the winter, complemented with considerable snowpack that for many dates remain the maximum relative to historical record. Significant rainfall through April and May 2019 (202 % and 137 % of normal, respectively relative to 1981-2010) in addition to the significant snowpack resulted in riverine flooding throughout the watershed. The Ottawa River at Mattawa reached its third highest recorded peak water level (after 1960 and 1979) since water regulation began at the Otto Holden Dam upstream.

Other factors contribute to riverine flooding, as was experienced in 2022 when a beaver dam let go on Lansdowne Creek in East Ferris and Callander. Damages were significant such that the lower reaches of the creek (an underground conveyance system) needed to be reconstructed.

Shoreline flooding

Shoreline flooding occurs along the boundaries of larger inland lakes such as Lake Nipissing. It is a critical concern, particularly for the dynamic beaches along Lake Nipissing's shoreline, where hazards such as flooding, wave uprush, overtopping along shorelines, erosion (exacerbated by wave action), sediment displacement, and ice-related damage prevail. These hazards can be exacerbated by climate change, which intensifies the frequency and severity of extreme weather events such as storms, including winds and heavy rainfall. Increased magnitude and intensity of precipitation events contribute to higher water levels, amplifying the risk of flooding. Moreover, changing weather patterns can lead to alterations in storm surge dynamics, further heightening the vulnerability of shoreline areas to inundation. This poses significant threats to local communities, ecosystems, and infrastructure.

In addition to riverine flooding previously mentioned in 2019, shoreline flooding was also significant along the Lake Nipissing shoreline that year. Water levels were similarly the third highest since full dam construction at the Lake Nipissing outlet, with water levels in only 1960 and 1979 recorded higher. Water levels on Lake Nipissing were elevated for an extended period of time such that the Parks Creek back flood structure was in operation for six weeks. Numerous shoreline properties were damaged during this event.

Low water / drought

Historically, periods of dry weather and low water levels or drought are relatively uncommon in Ontario (about every 10-15 years). However, studies on changing weather patterns indicate that low water levels may become more common, potentially compounded by the province’s steadily increasing demands for water and by climate change (OMNR, 2010).

The Ontario Provincial Climate Change Impact Assessment Technical Report (Climate Risk Institute and Dillon Consulting Limited, 2023) indicates drought conditions are expected to have slight increases in moisture deficit across all regions of Ontario. However, drought is particularly challenging to represent due to the need to factor in evapotranspiration and the numerous definitions of drought used by various communities (e.g., climatological, agricultural drought, etc.). It is expected that the impact of drought conditions on local wildfire risk will lead to the return period frequency to become 2.5 to 3 times that of the baseline conditions (Climate Risk Institute and Dillon Consulting Limited, 2023).

Changes to storm patterns can mean fewer, larger magnitude events can lead to longer periods of dry conditions, while total precipitation may or may not change. Storms of greater intensity may increase runoff and decrease groundwater recharge. This is of concern for several municipal water supplies, as well as for the many residents who rely on private wells. There can be increased competition and conflict over reduced water supply during periods of drought. Drought conditions will also increase demand for irrigation in agricultural areas.

Wetlands

The North Bay-Mattawa Conservation Authority defines a wetland as land that a) is seasonally or permanently covered by shallow water or has a water table close to or at its surface, b) directly contributes to the hydrological function of a watershed through connection with a surface watercourse, c) has hydric soils, the formation of which has been caused by the presence of abundant water, and d) has vegetation dominated by hydrophytic plants or water tolerant plants, the dominance of which has been favoured by the presence of abundant water, but does not include periodically soaked or wet land that is used for agricultural purposes and no longer exhibits a wetland characteristic referred to in clause c) or d).

Wetlands are an essential natural resource. In Northern Ontario, wetlands are a prevalent and integral component of the ecology. They are amongst the most biologically diverse ecosystems on earth. Wetlands have a wide range of functions, including filtering surface water, floodwater attenuation and then either slowly releasing it, even significantly later during drier periods or infiltrating it into the groundwater system.

Wetlands contribute to the maintenance of water quality by filtering and capturing pollutants, sediments, soil-bound nutrients, etc. Wetlands, particularly in Northern Ontario, are a significant support for flora and fauna. Wetlands contribute economic, cultural, social well-being by ensuring a healthy environment and providing people the opportunity to enjoy and appreciate its qualities.

Activities on lands adjacent to wetlands will typically have an effect on these wetlands. Land use change can lead to impaired ecosystem functions (e.g., loss of natural benefits & services), reduced resiliency to impacts of climate change, and biodiversity loss. The appropriate maintenance and management of wetlands will contribute to community sustainability into the future. Sound wetland management contributes to a healthy environment. Wetlands can only be appropriately managed through awareness and the collective cooperative efforts of public agencies, private sector interests and residents.

Unstable slopes

Slope instability is a process that can result in ground loss or ground movement. These movements can affect the structures or natural features that are present at the top of the slopes or the bottoms of the slopes as well as on the slope face. Ground movement or instability can result in the loss of ground support and cause damage to buildings, roads, utilities. Unstable slopes also increase the risk to public safety.

Soils have unique, site-specific qualities that determine their stability. Detailed assessments, including geotechnical engineering reports, are generally required for sites where slopes are high and steep (i.e., higher than 3 m and steeper than 3 units horizontal to 1 unit vertical) for further review and consideration. The sudden movement of ground can also cause and lead to erosion and sedimentation.

Erosion

Erosion is a pervasive concern across the watershed. Erosion is the process by which a material moves from its parent location due to the force of an erosive agent. Erosion is often caused by natural processes such as water (e.g., stormwater) and wind movement as well as anthropogenic activities including boat wake. Natural erosion rates are accelerated by land use activities that leave soils exposed, like agriculture and land development (Toronto and Region Conservation Authority, 2019). As erosion is accelerated, soil particles – often referred to as sediment - are suspended and carried away by overland flow and deposited into receiving waterbodies and waterways. Eroded sediments are deposited through sedimentation processes.

Hydrology is often studied in conjunction with erosion to consider how the scouring forces of flowing water affect the stream's morphology (Stantec Consulting Ltd., 2015). Safe setbacks are established near steep or unstable stream banks or in relation to meander belt zones. Erosion and sedimentation impact water quality (suspended solids and nutrients), aquatic habitat, and sediment accumulation in waterbodies and waterways. This then impacts flood risk and can have economic impacts for maintaining ditches, culverts and marinas, for example.

6.2.3 Water Quality

Surface water

Several subwatersheds were reported to have "many parameters" including phosphorus and potentially bacteria levels that exceed Provincial Water Quality Objectives (PWQO), per 2015 IWMS, such that developing management objectives was recommended (Stantec Consulting Ltd., 2015). Phosphorus concentration is correlated to sediment transport and is of particular concern across the watershed with seven of sixteen sampled subwatersheds (four subwatersheds have no stream sample locations) averaging above the TP PWQO in the 2023 Watershed Report Card. Phosphorus is a nutrient that can contribute to blue-green algae blooms, which have been a recurring issue in several area lakes, including Callander Bay, the source for Callander municipal supply. Shallow, warm-water lakes and embayments (such as

Callander Bay and Wasi Lake) have issues with oxygen depletion, and this anoxia triggers phosphorus release from lake sediments, impacting fish habitat and water quality alike. Climate change impacts could enhance these lake processes.

Chloride is another parameter of concern, particularly for the protection of aquatic life. The Canadian Council of Ministers of the Environment (CCME, 2011) have established long-term chronic exposure and short-term acute exposure water quality guidelines of 120 mg/L and 640 mg/L, respectively. The long-term dataset from Chippewa Creek indicates maximum concentration in non-winter (April to November) samples exceed the long-term exposure guideline (182 mg/L) and median concentration of winter (December to March) samples is equal to the long-term exposure guideline (120 mg/L). Limited non-winter samples at Parks Creek and Windsor Creek also indicate elevated chloride concentrations but additional samples are required for robust analyses. These sites have not been sampled in the winter.

Groundwater

This section is based on water quality data available from four groundwater monitoring wells. Generally, where there are Ontario drinking water quality guidelines, objectives, or standards, water quality from these wells is below these established targets. Exceptions are as follows: maximum copper detected in W274-1 and W277-1 (both shallow wells with limited standing water) has been above the Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG) aesthetic objective for copper (1.0 mg/L). All results for dissolved organic carbon (DOC) and iron at W274-1 have exceeded the ODWSOG aesthetic objectives (5 mg/L DOC; 300 µg/L iron). Lastly, median and maximum values for total dissolved solids at W274-1 also exceed ODWSOG aesthetic objectives (500 mg/L).

PFAS

There are concerns with per- and poly-fluoroalkyl substances (PFAS) contaminants in the groundwater around the Jack Garland Airport in North Bay and nearby streams which flow into Trout Lake, the municipal water supply for the City of North Bay. PFAS are a large class of synthetic chemicals that are a concern for both environmental and human health (Environment and Climate Change Canada and Health Canada, 2023). Within the context of the DWSP program, PFAS cannot be included as a drinking water threat until a drinking water quality guideline is established and the Ministry of Environment, Conservation and Parks incorporates it as a prescribed drinking water threat.

6.2.4 Other Issues

Anthropogenic Pressures

In addition to the environmental issues, there are development, industrial, and recreational pressures on the landscape. Development pressures include urban expansion, intensification, and redevelopment of seasonal-use properties to permanent residences, as well as future highway expansion. Industrial pressures include aggregate extraction, forestry and logging activities, agricultural land use, including traditional and hobby farms, peat production, smallscale hydroelectric production, and the Trans-Canada pipeline. Future development and industrial activities should consider the cumulative downstream and groundwater conditions in addition to the impacts of climate change on resource issues, particularly as it relates to water quantity (e.g., erosion and flood risk), quality (e.g., habitat), and wetland protection. Best management practices should be used to mitigate these downstream effects.

Land use change is a primary factor in the development process. Changes may include the removal of vegetation, stripping of topsoil and alterations to topography and drainage patterns. Without careful planning focused on minimizing the potential impacts of these activities, anthropogenic pressures such as construction, can have adverse impacts on adjacent and downstream natural features and private properties.

Recreational pressures stem from the vast areas of natural landscape in the North Bay-Mattawa watershed from residents and visitors alike. Some of these pressures include boating, fishing (and ice fishing), hunting, off-road motorized vehicles (i.e., ATVs and snowmobiles), camping, swimming, and hiking. These activities, among others, can also enable the transport of invasive species into this area.

An overview of resource issues are detailed by subwatershed in Table 6. Information was primarily sourced from 2015 Integrated Watershed Management Strategy and supplemented with recent water quality results where phosphorus issues were previously unknown. Phosphorus data is reported in the 2023 Watershed Report Card and accompanying Explanatory Document.

Data and knowledge

There are few long-term historic datasets in the area to establish subwatershed baseline conditions. This would entail climatological data, hydrological data, and water chemistry data (surface and groundwater). As of the 2015 Integrated Watershed Management Strategy (IWMS), 13 of 20 subwatersheds lacked or had very limited data available (Stantec Consulting Ltd., 2015). This especially applies to the subwatersheds that were added to the NBMCA in 2002 as well as those in rural organized and unorganized townships. Limited water quality data has since been collected in some of these, but full baseline characterization (parameters detailed in the 2015 Integrated Watershed Management Strategy) remains a challenge. This hampers the identification of management needs. Resource management strategies need to consider cumulative downstream impacts. Of the subwatersheds with existing watershed management plans, many recommendations have not been fully implemented (as of 2015). Some subwatersheds may appear to have stable conditions, but with unknown risk factors and baseline conditions, future conditions remain uncertain.

Additionally, the absence of real-time precipitation data underscores the need for enhancements in data availability and accuracy to bolster flood forecasting and response capabilities.

Table 6: Resource issues by subwatershed, as identified in the 2015 Integrated Watershed Management Strategy. Double checkmark signifies "very high" land use change vulnerability.

Resource Issue	Duchesnay Creek	Chippewa Creek	Parks Creek	Jessups Creek	La Vase River	Lake Nipissing Shoreline / North Bay	Windsor / Boulder / Bear Creeks	Burford Creek	Callander Bay / South Shore	Wistiwasing (Wasi) River	North River	Trout Lake	Turtle Lake	Kaibuskong River	Lake Talon	Sharpes Creek	Amable du Fond River	Pautois Creek	Boom Creek	Lower Mattawa River
Baseline data lacking	✓						✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓
Existing management plan insufficient		✓	✓			✓			✓	✓				✓						
Climate change - high sensitivity	✓	✓	✓		✓	✓			✓	✓										
Climate change - high vulnerability		✓							✓	✓				✓						
Flooding	✓	✓	✓	✓	✓	✓			✓	✓	✓				✓		✓			✓
Floodplain mapping	✓	✓			✓		✓	✓	✓	✓	✓			✓			✓	✓		✓
Stormwater management	✓	✓	✓	✓	✓	✓			✓			✓								
Low water conditions					✓				✓			✓	✓		✓					
Groundwater overburden aquifer	✓	✓									✓			✓		✓				
Water quality concerns	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓					
Erosion and sediment transport	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓						
Phosphorus		✓	✓	✓	✓	✓	✓	✓	✓	✓				✓					✓	
Chloride		✓	✓				✓													
Surface water bacteria objectives		✓	✓	✓	✓	✓		✓												
Blue-green algae									✓	✓				✓	✓					
Oxygen depletion									✓	✓		✓								
Per- and poly-fluoroalkyl substances (PFAS)		✓										✓								
Land use change - high vulnerability					✓				✓	✓				✓✓	✓			✓		✓
Development pressures	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Highway expansion		✓	✓		✓								✓	✓		✓	✓	✓	✓	✓
Industrial development	✓			✓	✓							✓								✓
Aggregate extraction	✓	✓					✓			✓	✓	✓		✓	✓	✓	✓	✓		✓
Forestry and logging		✓								✓	✓			✓	✓	✓	✓	✓	✓	✓
Agricultural land use					✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Peat production												✓								
Hydroelectric production																	✓			✓
Trans-Canada pipeline	✓	✓										✓	✓	✓		✓	✓	✓	✓	✓
Recreational pressures	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Invasive species									✓											

7. Programs and Services Descriptions

7.1 Overview of NBMCA Programs and Services

The Conservation Authorities Act and accompanying regulations were amended by the Province of Ontario since 2017, including a new categorization of Conservation Authority (CA) programs and services. The NBMCA Programs and Services Inventory was updated accordingly, per the requirements of the Conservation Authorities Act.

- **Category 1:** Mandatory programs and services
- **Category 2:** Municipal programs and services provided on behalf of a municipality
- **Category 3:** Programs and services advisable by the CA to implement in the CA's jurisdiction.

The Table 7 below provides an overview summary of the program areas.

Table 7: Overview of NBMCA Programs and Services

Program Area	General Description
Category 1 (Mandatory)	
A. Corporate Services ("General Functions" per O. Reg. 402/22) **Category 1 (Mandatory)**	These are operational activities and capital works that provide a corporate-wide supporting function that are not related to the provision of a specific program or service. They include governance support, finance, human resources, geographical information systems (GIS), information technology (IT), communications, legal expenses, office equipment and supplies, administrative office buildings, vehicle fleet, asset management, etc.
B. Planning and Regulations **Category 1 (Mandatory)**	The main goal of the Planning and Regulations operational program is to protect life and property from natural hazards specified in O. Reg. 686/21. They include natural hazard input and review for member municipalities, planning boards, and unincorporated areas; Section 28 permitting process; and technical studies such as updating the regulated areas.
C. Water Resources Management **Category 1 (Mandatory)**	The main goal of the Water Resources Management program is to protect life and property from natural hazards specified in O. Reg. 686/21. They include operational activities and capital works covering flood forecasting and warning, Water Erosion Control Infrastructure (WECI) provincial grant funded projects, other flood and erosion control projects, ice management, natural hazard infrastructure operational plan and asset management plan, low water response, watershed-based resource management strategy, and watershed monitoring (provincial partnership surface water and groundwater monitoring programs).
D. Conservation Areas and Lands	The main goal is to protect, conserve and manage conservation areas and lands owned by NBMCA, including operational activities and capital works to provide safe, passive recreation to the public through the

Program Area	General Description
Category 1 (Mandatory)	management of NBMCA owned lands including public parks and trails, Section 29 enforcement, maintenance of assets such as bridges, benches, pavilions, etc., tree planting on NBMCA lands, land inventory, conservation area strategy, policy for land acquisition and disposition, Planning Act comments as the land owner.
E. Source Protection Authority (SPA) **Category 1 (Mandatory)**	These are operational activities to protect existing and future municipal drinking water sources in the North Bay-Mattawa Source Protection Authority (NBMSPA) per the Clean Water Act, 2006. They include governance support to a Source Protection Committee and to the NBMSPA, technical studies, policy updates/development, proposal review and comments, plan input and review, and significant threat policy implementation.
F. On-site Sewage System (OSS) Program **Category 1 (Mandatory)**	These are operational activities to regulate existing and new septic systems to protect the environment per the Building Code Act, 1992, Part 8. They include permitting and compliance for on-site sewage systems (septic systems) in municipalities and unorganized townships, and mandatory maintenance inspections to over 500 properties identified under the Clean Water Act, 2006.
Category 2 (Delegated by a Municipality)	
G. Watershed-Municipal Programs **Category 2 (Delegated by a Municipality)**	These are operational activities that include watershed-wide monitoring that supplement the mandatory watershed monitoring (under Water Resources Management program area), and septic system reinspection program under the Trout Lake Management Plan.
Category 3 (Non mandatory; advisable by NBMCA)	
H. Watershed-Support Programs **Category 3 (Non mandatory)**	These are operational activities and capital works that NBMCA has determined are advisable to provide to further the purposes of the Conservation Authorities Act. They include benthic monitoring, watershed report card, land acquisition and disposition, land lease and agreement management, stewardship and restoration, Miskwaadesi (Painted Turtle site), septic systems related plan input and review, Mattawa River Canoe Race.
I. Ski Hill **Category 3 (Non mandatory)**	These are operational activities and capital works that support the Laurentian Ski Hill Snowboarding Club, which is operated by a separate Board and staff. NBMCA owns most of the major capital assets.

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