2023 Watershed Report Card Explanatory Document

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NORTH BAY - MATTAWA CONSERVATION AUTHORITY

Contents

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Cover photo taken by A. Mills at Johnson Creek, Laurentian Escarpment Conservation Area

Overview

The purpose of the Watershed Report Card is to report on the health of Ontario's watersheds using a set of key environmental indicators with a focus on local conditions. Conservation Authorities across Ontario collaborate with Conservation Ontario to publish Watershed Report Cards every five years.

The purpose of this explanatory document is to provide an explanation on how the reported grades were calculated, explain the grades presented in the 2023 Watershed Report Card for the North Bay-Mattawa Conservation Authority, highlight the changes since the 2018 Watershed Report Card, and review known data gaps. Guidelines for watershed report cards were developed by Conservation Ontario (2022) in partnership with the 36 Conservation Authorities in Ontario.

Grading methods

There are four types of environmental resources that are included in Watershed Report Cards: surface water (streams, rivers, and lakes), groundwater, forests, and wetlands. The indicators used and their grading systems are outlined in Table 1.

Table 1: Watershed Report Card grading breakdown by indicator.

	Streams & Rivers		Lakes	Groundwater		Forests			Wetlands
Grade	Total Phosphorus (mg/L)	Benthic Macroinvertebrate (Family Biotic Index)	Total Phosphorus (mg/L)	Nitrite+ Nitrate (mg/L)	Chloride (mg/L)	Forest Cover (%)	Forest Interior (%)	Forested Riparian (%)	Wetland Cover (%)
A	< 0.020	0.00-4.25	< 0.010	≤ 2.5	≤ 62.5	> 75.0	> 11.5	>57.5	> 11.5
B	0.020-0.030	4.26-5.00	0.010-0.020	2.6-5	62.5-125.0	65.1-75.0	8.6-11.5	42.6-57.5	8.6-11.5
C	0.031 – 0.060	5.01-5.75	0.020-0.040	5.1-7.5	125.1-187.5	55.1-65.0	5.6-8.5	27.6-42.5	5.6-8.5
D	0.061 – 0.180	5.76-6.50	0.040-0.050	7.6-10.0	187.6-250.0	45.1-55.0	2.5-5.5	12.5-27.5	2.5-5.5
F	> 0.180	6.51-10.00	> 0.050	> 10.0	> 250.0	< 45.1	< 2.5	< 12.5	< 2.5

The overall grades in the 2023 Watershed Report Card (WRC) are B (Good) for surface water resources (streams, rivers, and lakes) and A (Excellent) for groundwater, forest, and wetland resources. These results reflect the conditions based on the specific data periods mentioned below. Noted changes in this document are compared to the grades from the 2018 WRC. Long-term trends have not been evaluated.

Stream & River Water Quality

Indicators from the Conservation Ontario (2022) guidelines for surface water reflect key issues of nutrients (total phosphorus; TP) and aquatic health (benthic macroinvertebrates; BMI). Chloride is an emerging concern and is analyzed and described in the 2023 WRC but has not yet been incorporated into grading system. Data included in the 2023 WRC were collected between 2017 and 2021. Due to the pandemic, no samples were collected in 2020.

Routine sampling for stream and river chemistry occurs monthly April through November each year by NBMCA staff as part of the Provincial Water Quality Monitoring Network (PWQMN), in partnership with the Ministry of Environment, Conservation and Parks (MECP). Sampling expanded in 2017 with the reactivation of a PWQMN station, and again in 2018, adding nine NBMCA stations for TP sampling. Chloride

results are available historically from the seven PWQMN stations only. Chloride sampling began in 2022 at the 12 NBMCA stations and results will be included in the next WRC.

The 75th percentile is the point where 75 % of data are lower and 25 % are higher than that value. The 75th percentile is used for TP and chloride analyses, based on the Conservation Ontario (2022) guidance document. It is used because samples are more often collected during dry weather which may not capture conditions that could result in higher TP or chloride levels (e.g., during or immediately after large storm or snow melt events, which can flush nutrients or contaminants from the landscape into the streams and rivers). The 75th percentiles of available data over the five-year period (2017-2021) were used to compare to the WRC grading system for TP (see Table 1) or the Canadian Water Quality Guidelines for the Protection of Aquatic Life for long-term (120 mg/L) and short-term (640 mg/L) chloride exposure[1]. For TP, 0.03 mg/L is the threshold to eliminate excessive plant growth in rivers and streams, based on the Ontario Provincial Water Quality Objective[2].

Benthic macroinvertebrates (BMI) are the creatures living in the streambed, have no spine, and are large enough to be seen without magnification. They include insects and their larvae, molluscs, worms, etc. BMI are a good indicator of aquatic health over long-term conditions because they are not very mobile in the streams and different types of BMI have different tolerance levels for water quality. BMI samples are collected in the spring and identified to family level taxonomy using a microscope. This is the first NBMCA WRC where BMI data was analyzed for the grades. Historically, only one subwatershed had been sampled for BMI; now, results from 10 subwatersheds are included (see Table 4). Where possible, BMI are collected from the same stations as water chemistry sampling, but not all of these sites are suitable for BMI sampling (i.e., too deep or fast to sample safely). Some stations are sampled every year and others on a rotational basis. The WRC guidelines use a Family Biotic Index, combining the number of individual BMI from each family with their known tolerance value, scored from 0 (extremely sensitive/high quality) to 10 (not sensitive/low quality). Grade intervals are based on Hilsenhoff (1998) water quality thresholds. In slow moving water such as the Kaibuskong River, aquatic health may appear lower with this index.

The subwatershed grades for stream and river water quality are calculated by averaging the individual grades for TP and BMI where both datasets are available. The overall NBMCA watershed grade is a weighted average based on watershed size (i.e., grades in larger subwatersheds have a stronger influence than grades in smaller subwatersheds).

Lake Water Quality

Nutrients such as total phosphorus (TP) are an indicator of lake health. TP reflects the natural geology, human disturbance, and headwater (source area) water quality. High concentrations of TP can cause excessive plant and algae growth and contribute to blue-green algae blooms in lakes. TP is sampled in partnership with the provincial Lakes Partner Program (LPP). Many of the lakes included in this report were sampled by NBMCA staff, but some were sampled by other LPP partners.

TP concentrations are generally higher in spring than through the summer, therefore only spring TP results are included in the grading calculations. Spring sampling is collected generally two to three weeks after the ice melts from the lakes and while the water column is mixed. Only the first sample of the year taken

[1] https://sustainabletechnologies.ca/app/uploads/2014/05/CWQG_chlorides.pdf

[2] https://www.ontario.ca/page/lakeshore-capacity-assessment-handbook-protecting-water-quality-inland-lakes-ontarios-precambrian#section-1

on or before May 31st is included in the Watershed Report Card grade analysis. Spring TP concentrations are generally higher than through the summer, though both Wasi Lake and Callander Bay have had higher concentrations in the late summer. Data included in the 2023 WRC were collected between 2017 and 2019. Due to the pandemic, no samples were collected in 2020. Samples collected in 2021 did not meet the May 31st cut-off date for inclusion.

If there is more than one station on a lake (e.g., Trout Lake has eight stations, Lake Nosbonsing has seven stations, and other lakes each have one to three stations), results from all stations are averaged for each year, and then averaged across years when sampled in multiple years in the five-year reporting period. Trout Lake, Callander Bay, Wasi Lake, and Lake Nosbonsing have been sampled annually. Other area lakes are sampled on a rotational basis and may have only one year of data reported in the 2023 WRC.

Provincial Water Quality Objectives for TP in lakes are < 0.01 mg/L to provide a high level of protection against aesthetic deterioration and <0.02 mg/L to avoid nuisance algae growth for the ice-free period[3]. The overall watershed grade is weighted based on lake size (i.e., grades in larger lakes have a stronger influence than grades in smaller lakes).

Groundwater Quality

Groundwater is an important resource that is used by many watershed residents for water supply. There are six Provincial Groundwater Monitoring Network wells in the NBMCA watershed (see Table 2). Water level is monitored at all six wells. Water quality sampling is done at four of these wells; the other two wells are not sampled due to location and technical configuration.

Table 2: Monitoring well overview.

Well Name	Location	Depth (m)	Sample Frequency
W272-1	City of North Bay	25.3	Not sampled
W274-1	City of North Bay	5.2	Every year
W277-1	City of North Bay	10.0	Every year
W390-1	Township of Chisholm	140.8	Not sampled
W391-1	Township of Bonfield	73.8	Every 2 years
W392-1	City of North Bay	86.0	Every 2 years

Groundwater quality can vary greatly with distance between wells and with depth, especially in different aquifers (the water-bearing layers in the soil and bedrock). Findings presented here may not be representative of water quality at other wells in this area. Pathogens such as *Escherichia coli* (*E. coli*) are not included in this testing.

The indicators analyzed for groundwater quality are the 75th percentile of nitrate+nitrite (reported together from the MECP lab) and chloride concentrations. Groundwater wells are sampled up to once per year and a 10-year sample period (2012-2021) is used for the 2023 WRC. No samples were collected in 2020 due to the pandemic.

[3] https://www.ontario.ca/page/lakeshore-capacity-assessment-handbook-protecting-water-quality-inland-lakes-ontarios-precambrian#section-1

The grading system is based on the Ontario Drinking Water Quality Standards. High nitrate causes health problems, and its Maximum Allowable Concentration for drinking water is 10 mg/L[4]. High chloride can damage plumbing systems and the aesthetic objective for chloride is ≤ 250 mg/L[5]. Grades for both indicators have been evenly distributed through this range (see Table 1). The overall grade is averaged based on the results from the 4 wells.

Forest Condition

Forests provide resiliency to climate change. They help improve air quality, protect biodiversity, prevent soil erosion, mitigate flooding, and regulate ecosystems. To characterize forest conditions, three indicators have been used: overall percent forest cover of each subwatershed, percent forest interior, and percent of forested riparian zone. To be included, a forest must be more than 0.5 ha in size. Windbreaks, urban street trees, shrublands, thickets, and newly maturing woodlands or plantations do not count as forest cover for the purposes of the WRC. Interior forest is the portion of a forest that is more than 100 m from the forest edge and is a habitat indicator of whether the forest is continuous or broken into smaller pieces across the landscape. Forested riparian zone is an indicator of natural vegetation within 30 m of lakes, rivers, and streams, and the protection it provides.

Environment Canada's (2013)[6] *How Much Habitat is Enough?* publication provides targets of 30 % forest cover in Southern Ontario which would not be a suitable target in Northern Ontario. An alternate grading system was developed for use in Northern Ontario, placing 70 % in the middle of the grade B range. The Environment Canada (2013) report also targets 10 % forest interior to support species habitat requirements, which is placed in the middle of the grade B range. It also recommends 75 % of stream length be naturally vegetated, and this is typically split between 50 % forest cover and 25 % marsh, meadow, and thicket in healthy systems. This 50 % forest cover is the target placed in the middle of the grade B range for forested riparian cover. These three indicators are averaged to calculate the Forest Condition grade for each subwatershed.

The forest indicators are calculated using the best available Geographic Information System (GIS) data from the Provincial Land Cover database[7]. The available Provincial Land Cover GIS layers for this area have not been updated since 2000. The watershed grade is based on overall forest conditions.

Wetland Cover

Wetlands provide nature-based solutions for climate change. They are an important landscape feature, providing diverse habitat, improving water quality, and help protect land from flooding. Wetlands are special areas that cross the boundary between aquatic (i.e., lakes or ponds, and rivers or streams) and upland terrestrial landscapes, including marshes, swamps, bogs, and fens. Swamps, thickets, and closed bogs are wetlands dominated by trees and are also included in the forest cover indicators. Wetland cover

[4] https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-nitrate-nitrite/page-2-guidelines-canadian-drinking-water-quality-guideline-technical-document-nitrate-nitrite.html#a3

[5] https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-chloride.html

[6] https://publications.gc.ca/site/eng/9.652667/publication.html

[7] https://geohub.lio.gov.on.ca/documents/lio::provincial-land-cover/about

is calculated using the best available GIS information. A wetland delineation project in 2018 improved mapping based on refined wetland boundaries.

Environment Canada (2013)[8] recommends restoring wetlands to 6 % of subwatersheds and 10 % of major watersheds, or to 40 % of the historical percent of wetlands of the landscape. Landscapes dominated by steep and hilly terrain may naturally have lower wetland cover compared to lower, flat landscapes. The 10 % target is used as the middle of the grade B range. The watershed grade is based on overall wetland cover.

Subwatershed Grade Overview

The grades are provided by subwatershed and by indicator in Table 4. This table also provides:

- the name of the body of water or groundwater well where samples are collected,
- the number of years of data for each indicator and station,
- the 75th percentile concentration of chloride, phosphorus, and nitrate+nitrite,
- the BMI Family Biotic Index value,
- the percent land cover for forest and wetland indicators, and
- the resulting letter grade, based Table 1 (duplicated below as Table 3 for convenience).

Table 3: Watershed Report Card grading system by indicator. Duplicated from Table 1.

	Streams & Rivers		Lakes	Groundwater		Forests			Wetlands
Grade	Total Phosphorus (mg/L)	Benthic Macroinvertebrate (Family Biotic Index)	Total Phosphorus (mg/L)	Nitrite+ Nitrate (mg/L)	Chloride (mg/L)	Forest Cover (%)	Forest Interior (%)	Forested Riparian (%)	Wetland Cover (%)
A	< 0.020	0.00-4.25	< 0.010	≤ 2.5	≤ 62.5	> 75.0	> 11.5	>57.5	> 11.5
B	0.020-0.030	4.26-5.00	0.010-0.020	2.6-5	62.5-125.0	65.1-75.0	8.6-11.5	42.6-57.5	8.6-11.5
C	0.031 – 0.060	5.01-5.75	0.020-0.040	5.1-7.5	125.1-187.5	55.1-65.0	5.6-8.5	27.6-42.5	5.6-8.5
D	0.061 – 0.180	5.76-6.50	0.040-0.050	7.6-10.0	187.6-250.0	45.1-55.0	2.5-5.5	12.5-27.5	2.5-5.5
F	> 0.180	6.51-10.00	> 0.050	> 10.0	> 250.0	< 45.1	< 2.5	< 12.5	< 2.5

[8] https://publications.gc.ca/site/eng/9.652667/publication.html

Table 4: 2023 Watershed Report Card grade by indicator and subwatershed. Letter grades provided in brackets.

Subwatershed	Stream & River Water Quality								Lake Water Quality			Groundwater Quality				Forest Condition				Wetlands
	Stream or River Name	No. years	Chloride (mg/L)	No. years	Total Phosphorus (mg/L)	No. years	Benthic Macroinvertebrate (Family Biotic Index)	Overall Grade[9]	Lake Name	No. years	Total Phosphorus (mg/L)	Well ID	No. years	Nitrate+ Nitrite (mg/L)	Chloride (mg/L)	Forest Cover (%)	Forest Interior (%)	Forested Riparian Zone (%)	Overall Grade [10]	Wetland Cover (%)
Amable Du Fond River	Amable Du Fond River	4	1.76 (<long-term)	4	0.0124 (A)			A								85.6 (A)	71.5 (A)	83.5 (A)	A	10.2 (B)
Boom Creek	Boom Creek			3	0.0105 (C)	1	5.52 (C)	C								93.0 (A)	75.8 (A)	90.3 (A)	A	14.9 (A)
Burford Creek	Burford Creek			3	0.0410 (C)	1	5.60 (C)	C								91.1 (A)	72.5 (A)	83.1 (A)	A	21.1 (A)
Callander Bay/South Shore									Callander Bay	3	0.0203 (C)					74.4 (B)	40.2 (A)	62.9 (A)	A	26.1 (A)
Chippewa Creek	Chippewa Creek	4	103.50 (<long-term)	4	0.0273 (B)	4	6.31 (D)	C	Delaney Lake	1	0.0361 (C)	W277-1	8	1.89 (A)	17.90 (A)	49.9 (D)	21.3 (A)	51.9 (B)	B	8.3 (C)
Duchesnay Creek	Duchesnay Creek	4	18.15 (<long-term)	4	0.0255 (B)			B								87.6 (A)	66.7 (A)	82.5 (A)	A	17.1 (A)
Jessups Creek	Jessups Creek			3	0.0920 (D)			D								80.1 (A)	53.5 (A)	90.6 (A)	A	31.2 (A)
Kaibuskong River	Kaibuskong River	4	6.21 (<long-term)	4	0.0209 (B)	1	5.76 (D)	C	Lake Nosbonsing	3	0.0154 (B)					75.9 (A)	56.2 (A)	73.5 (A)	A	11.2 (B)
La Vase River	La Vase River	4	29.80 (<long-term)	4	0.0489 (C)			C								80.7 (A)	53.8 (A)	76.1 (A)	A	17.5 (A)
Lake Nipissing Shoreline/North Bay									Lake Nipissing	1	0.0111 (B)					39.3 (F)	23.5 (A)	53.5 (B)	C	15.2 (A)
Lake Talon									Lake Talon	2	0.0110 (B)					83.8 (A)	69.5 (A)	80.9 (A)	A	5.4 (D)
Mattawa River	Mattawa River	4	4.20 (<long-term)	4	0.0132 (A)			A	Earl's Lake	1	0.0177 (B)					84.7 (A)	64.6 (A)	74.3 (A)	A	5.8 (C)
									Chant Plein Lake	1	0.0131 (B)									
									Taggart Lake	1	0.0176 (B)									
North River	Balsam Creek			3	0.0193 (A)			A								94.5 (A)	78.7 (A)	91.1 (A)	A	8.0 (C)
	North River			3	0.0204 (B)	1	4.86 (B)													
Parks Creek	Parks Creek			3	0.0345 (C)	1	6.71 (F)	D	Circle Lake	1	0.0141 (B)	W274-1	8	0.95 (A)	8.30 (A)	58.7 (C)	27.7 (A)	62.4 (A)	B	19.0 (A)
									Depensiers Lake	1	0.0178 (B)									
Pautois Creek	Pautois Creek			3	0.0255 (B)	1	4.39 (B)	B	Papineau Lake	2	0.0083 (A)					89.1 (A)	74.3 (A)	84.0 (A)	A	10.1 (B)
Sharpes Creek	Sharpes Creek			3	0.0250 (B)	1	4.98 (B)	B				W391-1	4	0.07 (A)	1.45 (A)	86.8 (A)	72.4 (A)	85.9 (A)	A	9.1 (B)
Trout Lake	Four Mile Creek			3	0.0195 (A)	1	4.57 (B)	B	Four Mile Lake	1	0.0082 (A)	W392-1	5	0.05 (A)	14.00 (A)	69.8 (B)	46.9 (A)	68.2 (A)	A	8.7 (B)
	Lees Creek					1	5.86 (D)		Trout Lake	3	0.0053 (A)									
Turtle Lake									Pine Lake	1	0.0072 (A)					83.7 (A)	63.0 (A)	76.4 (A)	A	12.5 (A)
									Turtle Lake	1	0.0062 (A)									
Windsor/Boulder/ Bear Creeks	Bear Creek			3	0.0640 (D)			C								83.6 (A)	59.7 (A)	79.4 (A)	A	22.3 (A)
	Boulder Creek			3	0.0585 (C)															
	Windsor Creek			3	0.0385 (C)															
Wistiwasing (Wasi) River	Wasi River	4	5.47 (<long-term)	4	0.0436 (C)	1	5.79 (D)	C	Wasi Lake	3	0.0205 (C)					78.6 (A)	59.6 (A)	76.3 (A)	A	15.2 (A)

[9] Overall stream water quality grade averages Total Phosphorus (TP) and benthic macroinvertebrates grades, where both are available. If more than one stream was sampled in a subwatershed, grades were averaged by indicator category before averaging to get overall grade. Chloride is not included in overall grades but is compared to long-term and short-term Canadian Water Quality Guidelines for the Protection of Aquatic Life.

[10] Overall Forest Condition averages the three indicator category grades.

Changes in results since the 2018 Watershed Report Card

The following summarizes notable changes in subwatershed grades between the 2018 and 2023 Watershed Report Cards (WRC). Long-term trends have not been statistically evaluated.

Stream & River Water Quality

- Since the 2018 WRC, 10 stations have been added on Parks Creek, Jessups Creek, La Vase River, Boulder Creek, Bear Creek, North River, Balsam Creek, Sharpes Creek, Pautois Creek, and Boom Creek. This has helped to fill data gaps.
- Total phosphorus (TP) levels in Chippewa Creek improved from 0.043 mg/L (grade C in 2018 WRC) to 0.027 mg/L (grade B in 2023 WRC). For the 2023 WRC, benthic macroinvertebrate (BMI) data (grade D) was included. When considering both TP and BMI data, the subwatershed grade remains at C.
- Total phosphorus (TP) levels in the Trout Lake subwatershed (sampled at Four Mile Creek) remained at 0.019 mg/L (grade A for both 2018 and 2023 WRC). For the 2023 WRC, benthic macroinvertebrate (BMI) data for Four Mile Creek (B) and Lees Creek (D) was included. When considering both TP and BMI data, the subwatershed grade decreases to B.
- Total phosphorus (TP) levels in the Kaibuskong River increased from 0.016 mg/L (grade A in 2018 WRC) to 0.021 mg/L (grade B in 2023 WRC). For the 2023 WRC, benthic macroinvertebrate (BMI) data (grade D) was included. When considering both TP and BMI data, the subwatershed grade decreased to C. Note in slow moving water such as the Kaibuskong River, aquatic habitat may appear lower in quality with the BMI indicator.
- The grade for Windsor/Boulder/Bear Creeks subwatershed was previously based only on samples from Windsor Creek. In Table 4 above, the results for each of the three cr eeks is shown. The results for these creeks are averaged for the subwatershed grade in the 2023 WRC and remains at C.
- The overall watershed grade for stream and river water quality decreased from an A (based only on TP in the 2018 WRC) to B (in the 2023 WRC considering both TP and BMI). This change is mainly due to the 10 additional stations sampling for TP.

Lake Water Quality

- Since the 2018 WRC, five additional stations were added on Lake Nipissing, Pine Lake, Taggart Lake, and Lake Chant Plein for a more comprehensive picture of watershed lake quality. These stations were sampled by NBMCA staff. Other Lake Partner Program (LPP) participants sampled Delaney Lake, Circle Lake, and Depensiers Lake. Four Mile Lake, Lake Talon, and Papineau Lake were sampled by both NBMCA staff and other LPP partners in different years.
- Kawawaymog Lake and Smith Lake were graded in the 2018 WRC and have been sampled since 2017 but did not meet the May 31st spring cut-off for inclusion in the 2023 WRC.
- TP levels in Callander Bay increased from 0.017 mg/L (grade B in 2018 WRC) to 0.020 mg/L (grade C in 2023 WRC)
- TP levels in Papineau Lake decreased from 0.014 mg/L (grade B in 2018 WRC) to 0.008 mg/L (grade A in 2018 WRC)
- The overall grade for watershed lakes was “B+” in 2018. For consistency with other WRC grading systems, the “+” or “-” has been removed. Overall grade for watershed lakes the 2023 WRC remains B.

Groundwater Quality

- No changes in grades; grade remains A.

Forest Condition

- No changes in grades; grade remains A.

Wetland Cover

- All changes in grades since the 2018 WRC are from improved wetland detection and watershed boundary mapping rather than changes to the landscape. Note the landscape in subwatersheds such as North River, Lake Talon, and Mattawa River is rural with lakes and vast hilly regions of higher elevation. Their grades reflect natural landscape condition rather than human influence.
- Amable du Fond River subwatershed grade increased from C to B.
- Chippewa Creek subwatershed grade decreased from B to C.
- Lake Talon subwatershed grade decreased from C to D.
- Mattawa River subwatershed grade increased from D to C.
- Trout Lake subwatershed grade increased from C to B.
- Turtle Lake subwatershed grade increased from B to A.
- Overall watershed grade for wetland cover increased from B to A.

Watershed Data Opportunities

Understanding watershed conditions depends on the quality and quantity of available data. In turn, it is prudent to identify opportunities for improvements in sampling and therefore data collection. Relevant observations are provided below.

Stream & River Water Quality

- Spatial gaps in total phosphorus data were considerably reduced in 2017 and 2018 by adding 10 sample stations. The following may further enhance spatial coverage:
    - Stations in the Callander Bay/South Shore subwatershed were sampled until 2016 and included in the 2018 WRC. The focus at the time was primarily Cranberry Creek, which is influenced by the sewage lagoons and not representative of the subwatershed. It is recommended that new stations be identified to help represent the Callander Bay/South Shore subwatershed.
    - The Trout Lake subwatershed grade is based mostly on data from Four Mile Creek which may not be representative of the other streams flowing into Trout Lake. Additional stations on streams feeding into Trout Lake would support analysis of subwatershed conditions.
    - Currently, there are no sample stations on inflowing streams to the Turtle Lake and Lake Talon subwatersheds due to a lack of road access. The opportunity to add sample stations can be examined in the future. Note that although the North River, Kaibuskong River, and Sharpes Creek flow into Lake Talon, they are not included in the Lake Talon subwatershed and are reported on separately in the 2023 WRC.
- Currently, most BMI stations are rotational and only have one sample year in the five-year period. It would be ideal if one station per subwatershed were sampled every year.

Lake Water Quality

- Some of the lakes included in the 2023 WRC were sampled by other partners of the Ontario Lakes Partner Program (LPP) and when available, this data is included. These lakes may not be routinely sampled. NBMCA will continue partnership with LPP and review opportunities for additional lake sampling.
- Total phosphorus in the water column is expected to be highest when the lake is mixed, generally two to three weeks after the ice melts in the spring. Sampling completed by May 31st of that year is included in the WRC as spring data. A comparison of sample timing relative to ice melt and the influence on laboratory results can be examined in the future.

Groundwater Quality

- There are currently four groundwater monitoring wells sampled across the NBMCA watershed, and three of these are within the City of North Bay. In order to reflect the broader watershed conditions, the addition of more monitoring wells could be explored in partnership with the Province of Ontario and municipalities.

Forest Conditions

- The best available Geographic Information System (GIS) information available from the Province of Ontario for the NBMCA watershed has not been updated since 2000. Should the funding opportunity arise, satellite orthoimagery can be reviewed and the mapping can be updated manually.

Wetland Cover

- The 2018 wetland delineation project improved wetland detection and the accuracy of mapped wetland boundaries. A comparison to the historical wetland cover changes through time can be made in a future project.
- The wetland cover WRC grading system was developed with consideration for the Southern Ontario landscape, where many of the naturally occurring wetlands have been lost to agriculture and urbanization. The grading system may not reflect subwatersheds that are naturally low in wetland cover due to landscape topography. A separate methodology could be developed through the provincial working group.

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