Mississippi Valley
WATERSHED
Report Card 2013
FULL REPORT

Mississippi Valley Conservation Authority has prepared this report card as a summary of the state of our forests and surface water.

A member of

Conservation Ontario

Mississippi Valley Conservation

Executive Summary

This 2013 Mississippi Valley Watershed Report Card presents a snapshot of the health of the watershed based on key environmental indicators. Watershed report cards assess and grade current surface water quality, forest conditions, and groundwater quality, and then compare those with previous report card findings. Mississippi Valley Conservation (MVC) is committed to producing a Watershed Report Card every five years to measure the environmental progress in the eleven subwatersheds within the Mississippi Valley watershed.*

The guidelines and updated grading system used for this report card were developed by Conservation Ontario in 2011 (*Guide to Developing Conservation Authority Watershed Report Cards, Conservation Ontario*, 2011). Surface water quality indicators include total phosphorous, benthic invertebrates and bacteria (*E. coli*). Forest conditions indicators include percent forest cover, forest interior and forested riparian zone. Indicators for groundwater quality are nitrate + nitrate and chloride. The 2011 province-wide guidelines use a more stringent grading system than was used for the 2007 report cards. As such, the 2007 information was re-graded with the new system to allow accurate comparisons with the 2013 information.

Overall, the Mississippi Valley watershed scores well in all categories. Its surface water quality grades range from A to C. Since the 2007 report cards, overall water quality scores have changed very little across the 11 subwatersheds. Forest conditions grades range from A's—in eight of the subwatersheds—to B's in the remaining three.

There is insufficient data in this reporting cycle to assign grades for groundwater, however, a review of the data shows that the groundwater quality is generally very good across most of the watershed.

In all cases, the high scoring grades are concentrated in the western part of the watershed and the slightly lower grades are in the eastern part. This is not surprising given the very differing dominant land uses in these two areas; with the western area best described as a rugged, well forested, low population density "cottage-county" area; and the eastern area moving into a mix of rural mixed-resource, agricultural and urbanized areas supporting a much higher population density.

This report card reinforces the great value in the current MVC monitoring program. It also highlights some gaps in the program including sampling site locations and monitoring frequency. Addressing these gaps will provide a more comprehensive overview of subwatershed conditions. Continuing to gather data and monitor changes in environmental information is essential to ensure watershed stakeholder understanding of the issues and to assist in decision-making.

Crotch Lake is a major reservoir lake on the Mississippi River system. It can store enough water to provide 60 to 100% of the flows downstream during the summer months.

*The first Mississippi Valley Watershed Report Card was released in 2007. This document highlights the changes in grading and reporting standards since 2007.

Introduction

The Mississippi Valley 2013 Watershed Report Card provides a practical way to report on data and information that covers a large and varied watershed. It provides a snapshot of the current condition of the watershed and identifies changes that may have taken place over the last five years. This reporting supports a collective effort among the 36 Conservation Authorities across the Province of Ontario to use a standardized grading system of several environmental parameters. The grades in the report card are intended to indicate the current state of the watershed, but will also be used to track changes and to provide information for future decision makers.

The report card helps the conservation authority target rehabilitation and protection efforts, improve accountability to stake holders, and support the broader reporting requirements of provincial and federal governments. The report card focusses on three province wide areas of study: surface water quality, groundwater quality, and forest cover using a standard grading scheme created by Conservation Ontario. By using these standards the Mississippi Valley watershed can easily be compared to other watersheds in the province.

We are continually collecting information about the features and functions of the Mississippi Valley's watershed environment. It is important to recognize that the data in this report is based on our best understanding of current conditions using technologies at hand. As a data set grows over time we will be better able to track changes in the watershed and plan for the effects of natural anomalies such as droughts and floods. We will use theses Watershed Report Cards as a way to track changes in the health of the watershed by reporting on the same parameters every 5 years.

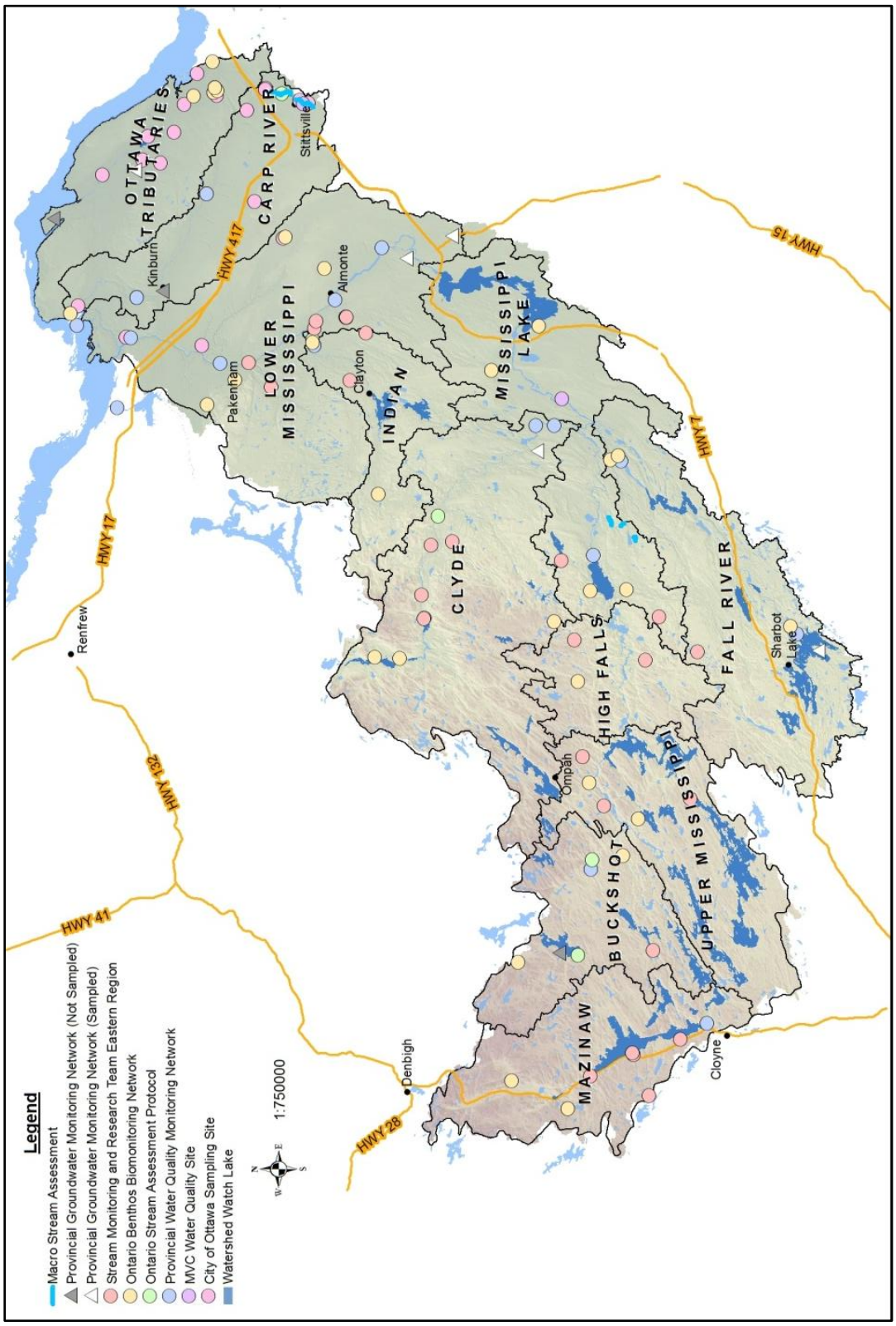
Electrofishing is one type of monitoring technology used to collect fish for identification.

Watershed Scale

The Mississippi Valley watershed is located in south-eastern Ontario and encompasses an area of 4450 km^2. The Mississippi River has its headwaters north of Mazinaw Lake, near Bon Echo Provincial Park, and empties into the Ottawa River, near Fitzroy Harbour. It covers portions of eleven municipalities from the Addington Highlands in the west to the City of Ottawa in the east.

For this report card, the Mississippi Valley Conservation watershed was subdivided into eleven sub-watershed areas (see Map 1). These areas include nine subwatersheds of the Mississippi River system that are defined by the drainage areas of its major tributaries, and by the placement of flood control dams. The two other subwatersheds are both located within the City of Ottawa and do not drain into the Mississippi River. They are the Carp River watershed and an Ottawa Tributaries subwatershed that groups a number of smaller creeks, both of these subwatersheds drain directly into the Ottawa River. Assessing environmental information on a subwatershed basis, helps us measure how conditions are changing in different locations throughout the watershed, and helps target rehabilitation work across the varying landscapes.

Map 1: Mississippi Valley's Eleven Subwatersheds and Monitoring Locations



Grading System

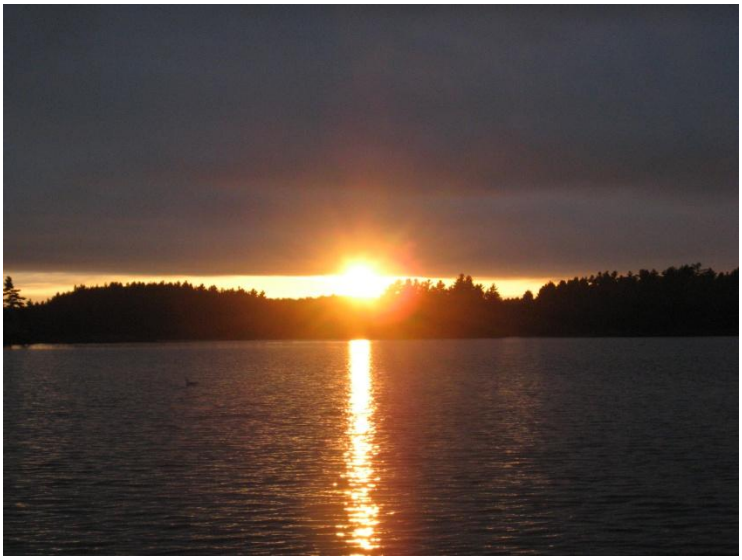
Mississippi Valley Conservation Authority (MVC) produced its first watershed report card in 2007. Since 2007, new surface water and groundwater monitoring sites have been added across the watershed and the benthic monitoring programs have expanded. More accurate and detailed mapping and Geographic Information Systems (GIS) layers have also helped improve the assessment of forest cover. The 2013 report card assesses and grades surface water quality, groundwater quality, and forest conditions in each of the subwatersheds comparing them with previous report card findings. This document also highlights the changes in grading and reporting standards since 2007.

The 2007 Mississippi Valley Watershed Report Card used a province-wide grading system for Conservation Authorities developed by Conservation Ontario in 2003 (Conservation Ontario, 2003). In 2011, these guidelines were reviewed and updated to ensure the most current scientific rationale was incorporated, and to optimize the grading system to reflect the range of environmental conditions across the province. This 2013 Report Card used the 2011 guidelines and updated grading system for Conservation Authority Watershed Report Cards (Conservation Ontario, 2011).

The Watershed Report Card focusses on three province wide areas of study, surface water quality, groundwater quality, and forest cover within a standard grading scheme created by Conservation Ontario. By using these standards the Mississippi Valley watershed can easily be compared to all other watersheds in the province. The data presented in this report is based on our best understanding of current conditions and technologies at hand. It is our goal to enhance sampling and reporting measures in order to draw more comprehensive conclusions. As the data accumulates we will be better able to understand the effects of natural occurrences such as droughts and floods, and the anthropogenic impacts such as deforestation and urbanization on the system and adapt its management as a result. As such, watershed report cards will be released every five years to report on the current conditions of the watershed.

Surface water quality indicators are total phosphorus and benthic invertebrates. Forest conditions indicators are percent forest cover, percent forest interior and percent riparian zone forested.

The 2007 information was regraded using the updated grading system to allow accurate comparisons with the 2013 information. Since the 2007 report card, environmental work has been done in a number of these watersheds, new stressors may have emerged, and more data and information have become available. The information in the 2013 Mississippi Valley Watershed Report Card reflects these changes.



Water means different things to everyone; however we all need it to survive—good water is our common denominator.

Mississippi Valley Watershed

The Mississippi Valley watershed area covers a diverse range of landscapes, dominated by the Canadian Shield in the west and moving to transition between Precambrian and Paleozoic bedrock formations where shale, limestone and sandstone plains are the dominant feature in the east end of the watershed. As a result the west end of the watershed features a more rugged landscape, covering a broad expanse of forested lands dotted by numerous lakes and rivers that make up the head waters of the Mississippi watershed and support a thriving cottage country. Through the central and east part of the watershed the Mississippi River passes through a number of small villages, crossing a mix of forested lands, farmland, woodlots, rural housing, some commercial development and a rapidly growing urban area in the City of Ottawa.

Reflecting trends seen elsewhere in Southern Ontario, the water and natural areas in the watershed face on-going pressure from urban and rural land uses. In the western "cottage country" part of the watershed, there is a growing shift from seasonal small scale use to year round residential use as more commuters and retirees are making the shift to live at the lake year round. The sustained demand for waterfront or near-water properties has caused an increase in "back-lot" development on the lakes and rivers throughout the watershed. The natural rural areas are also a draw for residents seeking rural estate lot type development.

The eastern part of the MVC watershed is home to one of the most rapidly growing urban areas in the City of Ottawa. The watershed areas of the Carp River and the Ottawa River Tributaries have seen extensive urban growth in recent years. Both of these watersheds also contain large expanses of arable cleared lands that are used for agriculture.

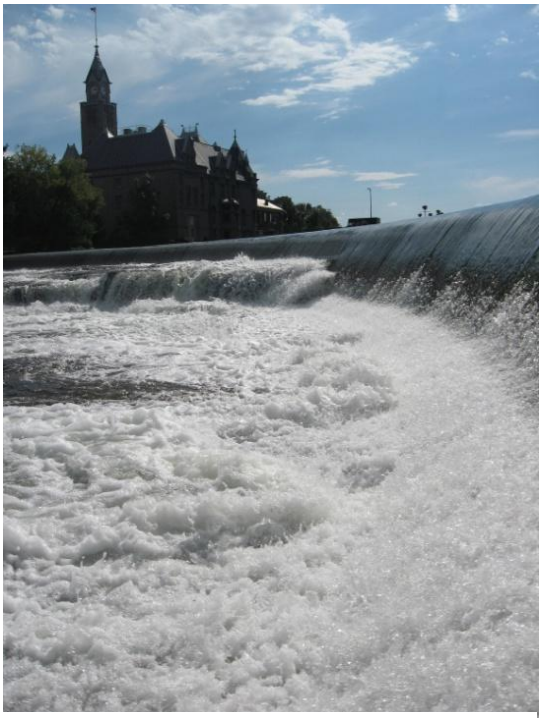
Despite these pressures, at a province wide level, the MVC watershed scores very well on the environmental indicators assessed in this report. In order to ensure that we stay on the right track, there is an on-going need to continue to gather data and monitor changes in environmental conditions to support the public's and agencies' understanding of the issues and to assist in decision-making.

The following sections provide detailed summaries of how the eleven subwatersheds score in each the three categories: surface water quality; forest condition and groundwater quality. We have also included a section that highlights the results our Watershed Watch Program that focusses on the long term monitoring of the water quality of our many lakes.

Surface Water Quality

Clean water is essential for a healthy watershed. It supports diverse aquatic habitat, vibrant recreational areas, good quality drinking water, and adds to the aesthetic appreciation of the natural environment. Water in a river or stream is affected by the surrounding land cover and how that land is used. There are a number of parameters used to measure overall water health including chemical conditions such as pH and nutrient levels; flows and quantity; and temperature. The presence or absence of certain fish and aquatic insects are also excellent indicators of surface water quality. The following is an introduction to the MVC water quality monitoring program and highlights the type of data collected and more specifically, reports on the overall health of our watercourses.

The Mississippi Valley watershed report card was developed to outline current water quality conditions and document changes over relatively short periods of time (every five years). This report card examines surface water quality conditions in the eleven subwatersheds from 2006 to 2011. These surface water quality conditions were then compared with those reported on in 2007. It is important to note that water quality varies from year to year and the indicators that measure water quality can fluctuate independently of each other in any given year.



Surface water is used by some municipalities for drinking water.

Indicators and Methodology

This report card has used the new 2011 guidelines and grading system developed by Conservation Ontario (Conservation Ontario, 2011). The Conservation Ontario water quality grading scheme uses three different indicators; total phosphorous concentrations, benthic population composition, and E. coli concentrations. MVC has focussed its sampling efforts on the first two indicators: total phosphorous and benthic invertebrates. MVC does not sample for the bacteria *E. coli*. The 2007 information was regraded using the updated grading system to ensure accurate comparisons with the 2013 information.

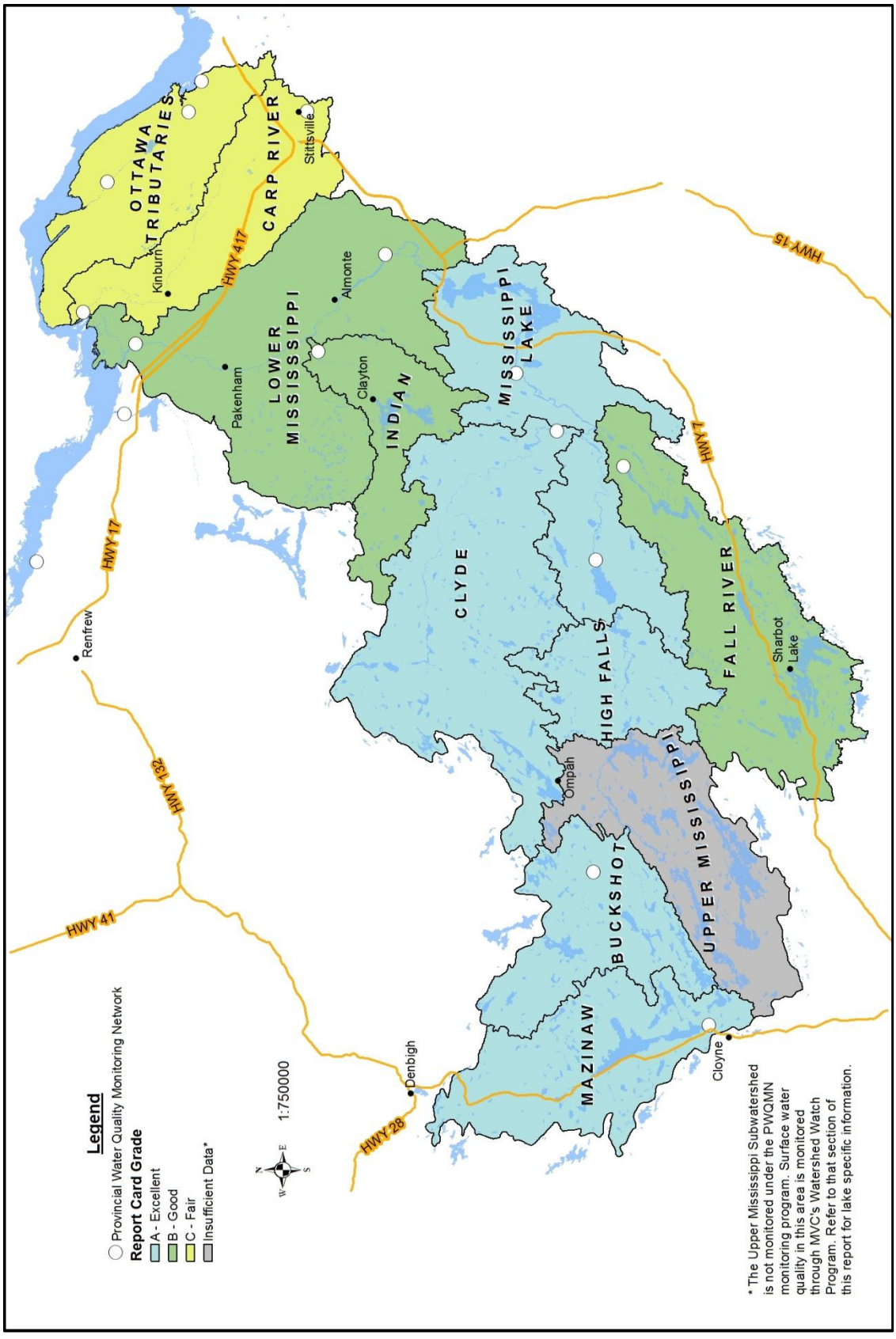
Total Phosphorous

Total Phosphorous means the amount of phosphorous in the water measured in milligrams per litre (mg/L). Phosphorous, found in soaps, detergents, fertilizers and waste, contributes to algae blooms in streams and lakes. Phosphorous tends to bind to soil particles making it a good indicator of soil delivery to streams. The chemical makeup of water also includes pH, dissolved solids, and metals. The data reported here includes only phosphorous levels present at our sample sites. Focusing on this nutrient provides a consistent indicator for tracking stream health across all Ontario watersheds.

Phosphorous levels in the Mississippi Valley watershed are measured as a part of the Provincial Water Quality Monitoring Network (PWQMN). As shown on Map 2, there are 16 regular sampling sites throughout the watershed, 14 of which are sponsored by the MOE, while MVC sponsors the other 2 samples. Water samples are collected monthly at each of the sites during the ice free season of April to November.

For watershed reporting purposes, the 75th percentile was calculated for all phosphorous data from 2007-2011 for the site closest to the outlet of each watershed. The 75th percentile (means 75% of the data fall below this value) is used to reflect the tendency for this sampling data to be dry weather, meaning that over 5 years the variations caused by seasonal droughts, or extremely wet conditions, do not bias the phosphorous concentration trends.

Map 2: Surface Water Quality Grades and PWQMN site locations.



For reporting purposes, we choose monitoring sites that are closest to the downstream end of each subwatershed because they are most representative of the larger upstream system. As such, eight currently monitored PWQMN sites have been selected for this Report Card. City of Ottawa monitoring data has also been used to report on water quality in the Carp River subwatershed and several creeks in the Ottawa Tributaries subwatershed. These are areas where we chose to have fewer monitoring sites in an effort to avoid duplication with the City's monitoring program. Phosphorous levels are not currently monitored under PWQMN in the Upper Mississippi subwatershed due to the consistency of geography, land use, and sampling results from the Mazinaw through the High Falls subwatersheds. Surface water quality for the lakes in the Upper Mississippi and other subwatersheds is monitoring through MVC's Watershed Watch Program. Details and results for lake water quality are presented under the Watershed Watch section of this report.

Benthic Invertebrates

Benthic invertebrates are aquatic insects that live in stream sediments. They are excellent indicators of water quality and stream health because, unlike fish, their limited mobility makes it difficult for them to move away from contamination, or the sampling procedure. Different benthic species have radically different tolerances to factors such as pollution, sedimentation, temperature, and differing levels of dissolved oxygen. For example a Stonefly (Plecoptera) requires fast water and high oxygen to thrive, whereas a Scud (Isopoda) can be found in slower more turbid waters (Hilsenhoff, 1988). This makes it possible to create a grading scale for water quality based on the composition of organisms found in a specific water body.

Benthic invertebrates are good indicators of water quality. Graphic: Environment Canada

MVC samples aquatic benthic invertebrates as part of the Ontario Benthos Biomonitoring Network (OBBN). The OBBN is a standardized provincial program co-operatively developed by the Environment Canada Environmental Monitoring and Assessment Network (EMAN), the National Water Research Institute (NWRI), and the Ontario Ministry of the Environment (MOE). MVC adopted the program in 2003 and now monitors 86 sites across all eleven subwatersheds. Other indicators measured at the benthic sampling sites to help determine stream quality are: pH level, water temperature, dissolved oxygen (mg/L) and conductivity (µS/cm).

Benthic sampling sites in five of the eleven subwatersheds are located near the subwatershed outlet. As such the results from these five sites can be used to represent an entire subwatershed condition for report card grading. Resampling of existing outlet sites will help track changes over time. The remaining six subwatersheds will be investigated to determine if the benthic sampling protocol can be applied at additional outlet locations.

For the benthic sampling procedure, three samples are collected at each site and transferred to the MVC lab for identification. There are often thousands of organisms in each sample, however only 100 organisms are randomly selected and identified from each sample. Using a simplified version of the Hilsenhoff Family Biotic Index (FBI) (Hilsenhoff, 1988), a score for water quality is calculated based on the number and type of invertebrates found in each sample. Each invertebrate species is given a score from 0 to 10 indicating its pollution tolerance. Low numbers indicate sensitivity to pollution while organisms with high numbers are pollution tolerant.

To be consistent across the province future outlet samples will be scored using the full FBI range which will be used to calculate a score. This score will then be compared to the grading scale defined by Conservation Ontario. Over time, trends and patterns in the data can be studied and water quality issues addressed using best management practices in areas of concern.

Surface Water Quality Grading and Results

Both indicators, total phosphorous and benthic invertebrates, are given equal weight in determining the overall surface water quality score for each subwatershed. Point scores for each indicator were calculated, added together then divided by two, to determine the final point score and overall letter grade for water quality in each watershed (based on the Conservation Ontario 2011 grading scheme presented in Table 1). Table 2 lists the final grades and point scores for each of the Mississippi Valley eleven subwatersheds. Map 2 shows the distribution of grades by watershed.

Table 1: Water Quality Grading Index (Conservation Ontario, 2011)

Total Phosphorous (mg/L)	E. coli (#100/mL)	Benthic Invertebrates (Modified FBI)	Point Score	Grade
<0.020	0-30	0.00-4.25	5	A
0.020-0.030	31-100	4.26-5.00	4	B
0.031-0.060	101-300	5.01-5.75	3	C
0.061-0.180	301-1000	5.76-6.50	2	D
>0.180	>1000	6.51-10.00	1	F

Table 2: Summary of Surface Water Results and Grades (based on Conservation Ontario, 2011)

	2002-2006				2007-2011			
Subwatershed	**Total Phosphorous (mg/L)***	**FBI**	**Average Points**	**Grade**	**Total Phosphorous (mg/L)***	**FBI**	**Average Points**	**Grade**
Mazinaw	0.008	n/a	5	A	0.005	n/a	5	A
Buckshot	n/a	6.04	2	D	0.013	n/a	5	A
Upper Mississippi	data not available				data not available			
High Falls^	0.016	n/a	5	A	0.011	n/a	5	A
Fall River	0.014	n/a	5	A	0.011	5.42	4	B
Clyde	0.019	n/a	5	A	0.015	4.77	5	A
Indian River	n/a	n/a	n/a		0.020	4.76	4	B
Mississippi Lake^	0.020	n/a	4	B	0.016	n/a	5	A
Lower Mississippi **	0.028	n/a	4	B	0.028	n/a	4	B
Carp River **	0.057	n/a	3	C	0.062	4.69	3	C
Ottawa River Tributaries**	See Table X		3	C	See Table X		3	C

* based on 75th percentile of total phosphorous concentrations over 5 year periods

** includes data provided by the City of Ottawa's monitoring department.

^ Total Phosphorous data taken in next subwatershed downstream but used to represent upstream conditions.

Of the eleven watersheds, five scored an A grade, three scored a B grade, and two scored a C grade. Overall, the best water quality scores were found in Mazinaw, Buckshot, High Falls, Clyde, and the Mississippi Lake subwatersheds. The poorest water quality scores were found in the Carp River and Ottawa River Tributaries subwatershed. It should be noted that the new 2011 province-wide guidelines have a more stringent grading system and higher grades tend to be recorded in areas of the province where there is less development or intensive land use.

Since the 2007 report card, overall water quality has improved or remained unchanged in all but one subwatershed, the Fall River. This subwatershed dropped from an A grade to a B grade. Many variables, including weather (rainfall, temperature) and point source pollution, can impact indicators differently. Some of the extremes in weather conditions since 2007 (drought, flooding) may account for some fluctuations in water quality conditions across the subwatersheds.

City of Ottawa

The City of Ottawa conducts its own water sampling within the Ottawa River Tributaries subwatershed, thus their results, although displayed differently (Table 3), have been used to provide that area with a surface water grade. Due to the variety of stream basins in this watershed, specific phosphorous results are shown for three of the major creeks rather than the average.

Table 3: Ottawa River Tributaries Grade Results

	2006				2007-2011			
Station Name	**Total Phosphorous (mg/L)**	**FBI**	**Average Points**	**Grade**	**Total Phosphorous (mg/L)**	**FBI**	**Average Points**	**Grade**
Constance Creek	0.048	n/a	3	C	0.050	n/a	3	C
Shirley's Brook	0.059	5.98	3	C	0.050	6.19	3	C
Watt's Creek	0.091	n/a	2	D	0.079	6.42	2	D

Note: Grades based on data from the combined sampling efforts of MVC and the City of Ottawa and scored according to Conservation Ontario Guidelines 2011.

What the Results are Telling Us

According to current data, water quality across the watershed scores quite well, with some lower ratings moving downstream from the more rural west end of the watershed to the more urbanized east end. While the data shows that there has been little change in overall water quality scoring since the 2007 report, gaps have been identified in earlier data making it difficult to get an accurate picture of how water quality has changed over the last five years. During the previous reporting period (2001-2005) the benthic monitoring program was new. OBBN is now well established in the Mississippi Valley watershed and more data will be accumulated for future reporting cycles.

In all but the two more urbanized subwatersheds, the Carp River and Ottawa Tributaries, total phosphorous concentrations consistently rated very well in most cases—slightly below the 0.03 mg/L Provincial Water Quality Objectives (PWQO) for an excellent to good water quality rating. The factors contributing to poor water quality typically are directly related to a reduced vegetation cover in the riparian zone, increased impervious surfaces such as concrete and asphalt, ongoing use of road salts and fertilizers, and lack of storm water management ponds.

The subwatersheds that score highest in water quality are also those that score highest in riparian cover, the natural vegetation found growing along the banks of creeks. This data is presented under the Forest Conditions section of this report. This is not surprising, given the many natural benefits provided by a good riparian vegetation cover such as filtration of surface runoff from adjacent lands, and erosion and pollution control. The riparian zone also provides habitat for fish, birds, and mammals traveling through or living in the ecosystem.

The two more urbanized subwatersheds, the Carp and the Ottawa tributaries, also have the most agricultural use in their rural areas. Fencing livestock, providing alternative water sources, naturalizing low yield agricultural lands, and maintaining riparian habitat where possible are best management practices that can help to greatly improve surface water quality.

MVC, in partnership with member municipalities, special interest groups, and landowners, offers incentive grants and technical assistance to help rural landowners improve and protect surface and ground water quality. Since 2002, MVC and the Ottawa Rural Clean Water Program has provided grants to landowner projects such as erosion control, buffers and windbreaks, chemical storage, runoff management, septic system repairs and replacements, and well upgrade, replacement or decommissioning.

Forest Conditions

Forest conditions are also assessed to measure watershed conditions. In addition to providing fuel and timber, wooded areas provide habitat for fish and wildlife. They also provide areas for recreation and education. Forests act as a major filter and cleansing system for the water that soaks into the ground and feeds wells and underground drinking water systems. Forests also help protect and build the soil and reduce soil erosion. Wooded areas produce oxygen and purify the air by taking up nutrients and pollutants. Tree cover is especially important in large blocks, or along watercourses. Research shows that water taken from forested watersheds is far better in quality and quantity than water taken from non-forested lands.

Indicators and Methodology

This report card uses the 2011 guidelines and grading system developed by Conservation Ontario (Conservation Ontario, 2011). The 2007 MVC Report Card used two indicators (percent forest cover and percent forest interior), based on the 2003 Conservation Ontario guidelines. In 2011, the guidelines were updated to incorporate the newest science and to better reflect conditions across the province. There are now three indicators: percent forest cover, percent forest interior, and percent forested riparian zone. These indicators were chosen because they provide a great deal of information about the overall health of the watershed and can be calculated quickly and uniformly across the watersheds using Geographic Information Systems (GIS) technology. The text below describes these indicators, how they are calculated and their importance.

Forest cover is essential to keeping our lakes and river clean.

Percent Forest Cover

Forest cover includes all types of forest that are greater than 0.5 ha in area such as upland forests, lowland forest, treed swamps, plantations and mature shrub thickets. The percentage forest cover was calculated by dividing the area of forested woodland within each subwatershed by the total area of the subwatershed.

Environment Canada Habitat Guidelines (Environment Canada, 2004) suggest a minimum of 30 per cent forest cover across a watershed to maintain the important functions forests provide to both humans and wildlife. Before its settlement in the mid to late 1800's the Mississippi Valley Watershed was largely covered by forest. Settlement and land clearing resulted in the loss of these original landscape features. However, there are still large forested areas in the watershed, particularly in the western part sitting on the Canadian Shield. In the eastern part of the watershed, the large forested areas are isolated and not connected to other forests. This is called a fragmented landscape.

Varying forest types provide greater diversity of plant and animal species. The Mississippi Valley upland forests are generally composed of Sugar Maple, American Beech, White Ash, Red Oak, White Pine, White Birch, and Basswood. Common lowland species include Eastern White Cedar, Eastern Hemlock, Green Ash, and Yellow Birch. Treed swamps contain Poplar, American White Elm, Willow, Silver Maple, Red Maple, Black Ash, Eastern Hemlock, Yellow Birch and Eastern White Cedar. The most common plantation species are Red Pine, White Pine and White Spruce.

Percent Forest Interior

In addition to species composition, the sizes and shapes of forest areas are also important. Larger forested areas provide more of the interior area that some songbirds require to nest and breed successfully. Forest birds are a good indicator of habitat quality and the ability of habitat to sustain native animals and plants. Forest interior includes the core of the woodlot, minus the outer 100 metres along the edge. The outer 100 m is considered 'edge' habitat and is prone to high predation, wind damage and is more likely to possess non-native plants. Forest interior provides a measure of forest fragmentation and habitat quality and size.

Healthy forest interior is good wildlife habitat, and recreational resource.

The percent forest interior is calculated by dividing the area of forest interior by the area of the watershed. Environment Canada's Habitat Guidelines (Environment Canada, 2004) suggest a minimum of 10 percent interior forest should exist within a given watershed. Unfortunately, in some parts of the Province interior forest is becoming increasingly rare, making it a key habitat type for preservation efforts.

Percent Forested Riparian Zone

Long narrow bands of forested area, that often follow watercourses or fencerows, provide connecting corridors birds and animals need to move safely between the areas that provide life sustaining features such as, food, shelter, and breeding habitat. The percentage forested riparian zone is the amount of forest cover within a 30 metre riparian zone adjacent to all open watercourses and lakes. It is calculated by dividing the area of forest cover within this zone by the total area of the zone.

Hearty shoreline plants provide erosion control.

Riparian habitats support high numbers of wildlife species and provide an array of ecological functions. Forest cover along waterways also protects aquatic life. Environment Canada (Environment Canada, 2004) recommends 75% of stream length be naturally vegetated and that "streams should have a minimum 30 m wide naturally vegetated adjacent-lands area on both sides, greater depending on site-specific conditions."

It should be noted that while this report looks at only forested riparian areas, other non-forested permanent cover types such as meadow, thicket or marsh also enhance the riparian habitat and water quality. MVC does not have the mapping detail to include assessment of the other vegetation types, as such only forest cover is measured in this report card.

Methodology

For this watershed report card, forest cover conditions were assessed using the Provincial OGDE dataset, Wooded Area. This data layer represents wooded area only, adapted from the Southern Ontario Ecological Land Classification (1998) and improved through data maintenance and updates based on new information such as that from the Southern Ontario Land Resource Information System (SOLRIS) and new evaluations from more detailed imagery such as Digital Raster Acquisition Project for the East (DRAPE) . This mapping has greater accuracy and detail than the mapping used for the 2007 watershed report card. A more detailed explanation of the differences in the two mapping sources is provided at the end of this section.

Forest Conditions Results

The percent forest cover, forest interior and riparian zone were converted to a score and a grade according to Conservation Ontario standardized guidelines (Table 4). The grading varies slightly from the system used in the 2007 watershed report cards (Conservation Ontario, 2003).

Table 4: Conservation Ontario's Guideline for assigning a grade to Overall Forest Conditions (Conservation Ontario, 2011)

Forest Cover (%)	Forest Interior (%)	Riparian Zone Forested (%)	Point Score	Grade	Overall Forest Conditions	
					Final Points	Final Grade
>35.0	>11.5	>57.5	5	A	>4.4	A
25.1 - 35.0	8.6 - 11.5	42.6 - 57.5	4	B	3.5 - 4.4	B
15.1 - 25.0	5.6 - 8.5	27.6 - 42.5	3	C	2.5 - 3.4	C
5.0 - 15.0	2.5 - 5.5	12.5 - 27.5	2	D	1.5 - 2.4	D
<5.0	<2.5	<12.5	1	F	<1.5	F

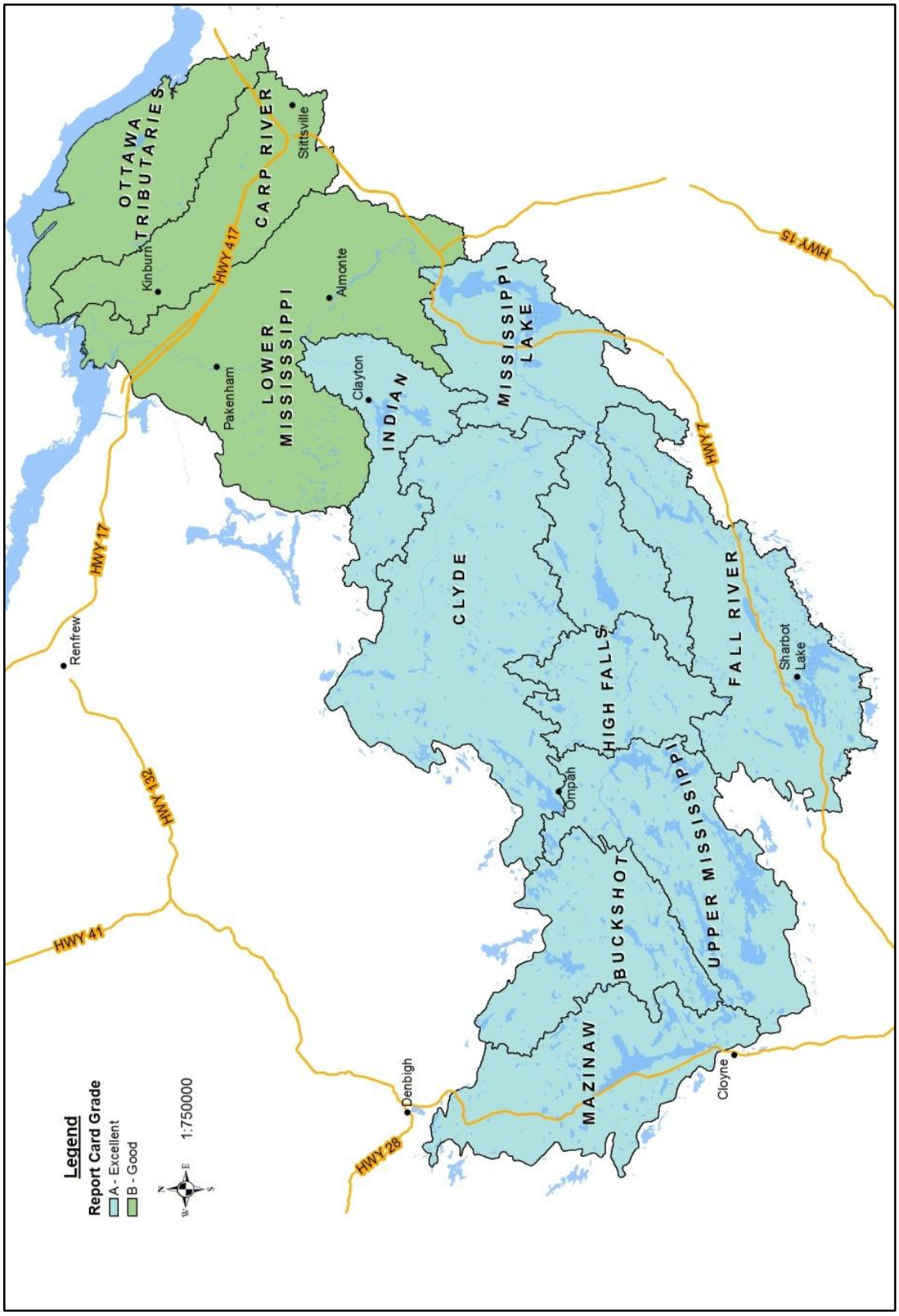
Table 5: Subwatershed Forest Condition Grades

Sub Watershed	Forest Cover		Forest Interior		Riparian Zone		Total Points	Final Grade
	Percent	Grade	Percent	Grade	Percent	Grade		
Mazinaw	79.2	A	52.2	A	67.5	A	5.0	A
Buckshot	78.8	A	47.4	A	58.5	A	5.0	A
Upper Mississippi	68.0	A	39.3	A	65.5	A	5.0	A
High Falls	69.9	A	31.5	A	65.7	A	5.0	A
Fall River	68.0	A	29.4	A	63.4	A	5.0	A
Clyde	76.7	A	43.9	A	62.5	A	5.0	A
Indian	63.7	A	28.7	A	55.3	B	4.7	A
Mississippi Lake	55.9	A	26.1	A	48.7	B	4.7	A
Lower Mississippi	43.4	A	14.5	A	37.0	C	4.3	B
Carp River	34.0	B	10.1	B	27.7	C	3.7	B
Ottawa River Tributaries	37.2	A	9.8	B	24.4	D	3.7	B

The entire watershed scores very well in terms of overall forest cover and forest interior with all but one of the subwatersheds receiving an A in forest cover, all but two scoring an A on forest interior. No subwatershed scored below a B in both categories. The percentage and grading for forest conditions for the MVC eleven subwatershed areas is presented in Table 5 and Map 3 illustrates the overall Forest Conditions grades for each subwatershed. The grades for each of the three forest conditions are also illustrated in Figure 2a (Forest Cover), Figure 2b Forest Interior and Figure 2c (Riparian Zone).

This is not surprising given the predominantly rural character of the watershed where large tracts of forested land still remain. Ranging between 60 and 80 percent, forest cover is highest in the western part of the watershed which lies on the Canadian Shield where the rugged topography and shallow soils reduced the historical degree of clearing of the land for agricultural purposes and development.

Map 3: Map of Subwatershed Overall Forest Condition Grades



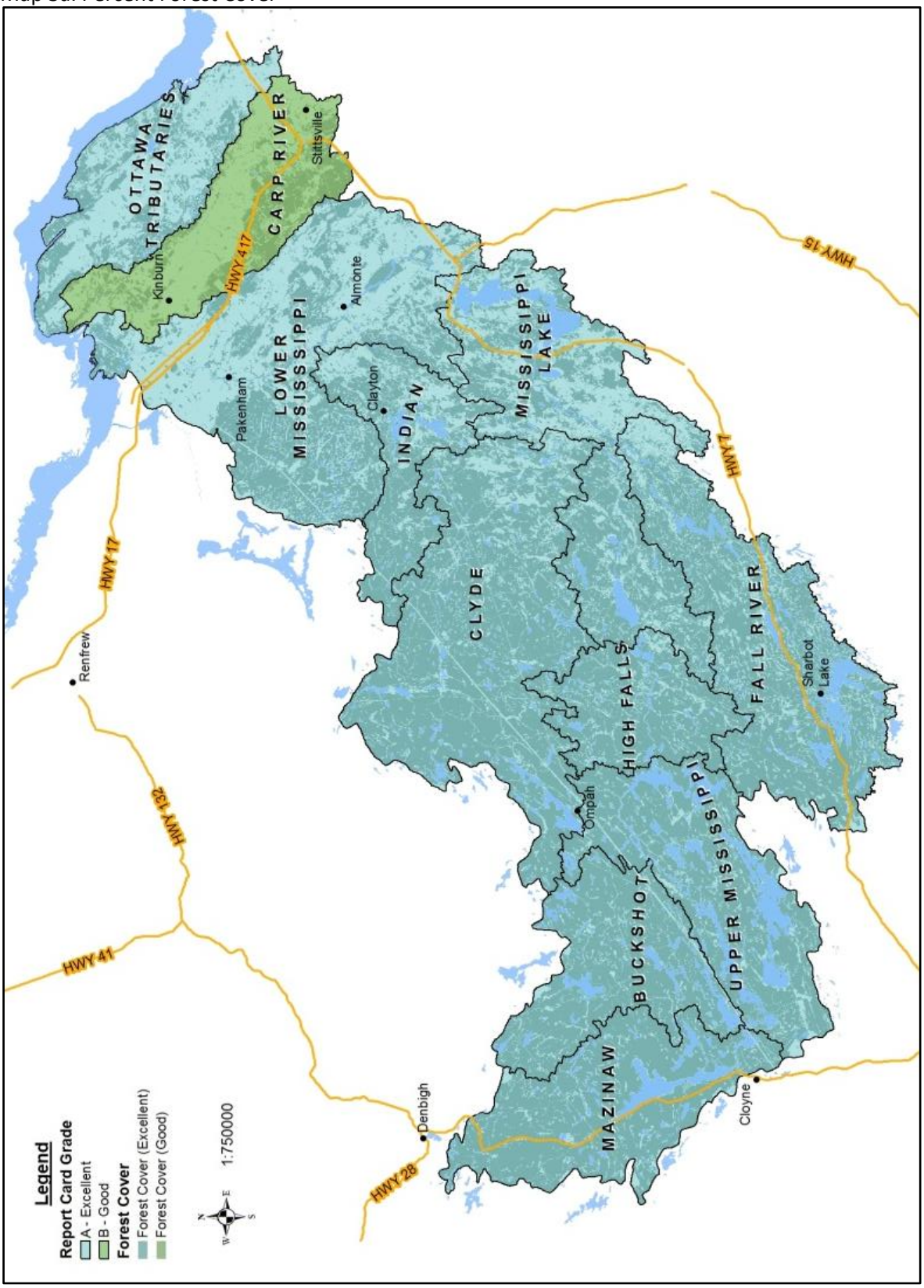
The Carp River with 34% forest cover and 10.1 % forest interior scored B's in both categories. The Ottawa River Tributaries subwatershed scored a B in forest interior, and a D in riparian forest cover, it scored an A for overall forest cover which is probably due to it having large non-agricultural areas such as the Carp Hills Area of Natural and Scientific Interest (ANSI) and the Constance Creek Provincially Significant Wetland. The lower final grades for both of these subwatersheds are a reflection of their more extensive agricultural and urban land use than in the other sub watersheds.

The scorings for Forested Riparian Zone are more variable across the watershed, showing a progression from A and B grades is the less urbanized western watershed areas to C and D grades in the eastern end of the watershed. Again, this is largely a reflection of differences in predominant land use, where the western watershed area is characterized by a more rural Canadian Shield landscape, with a low density of development.

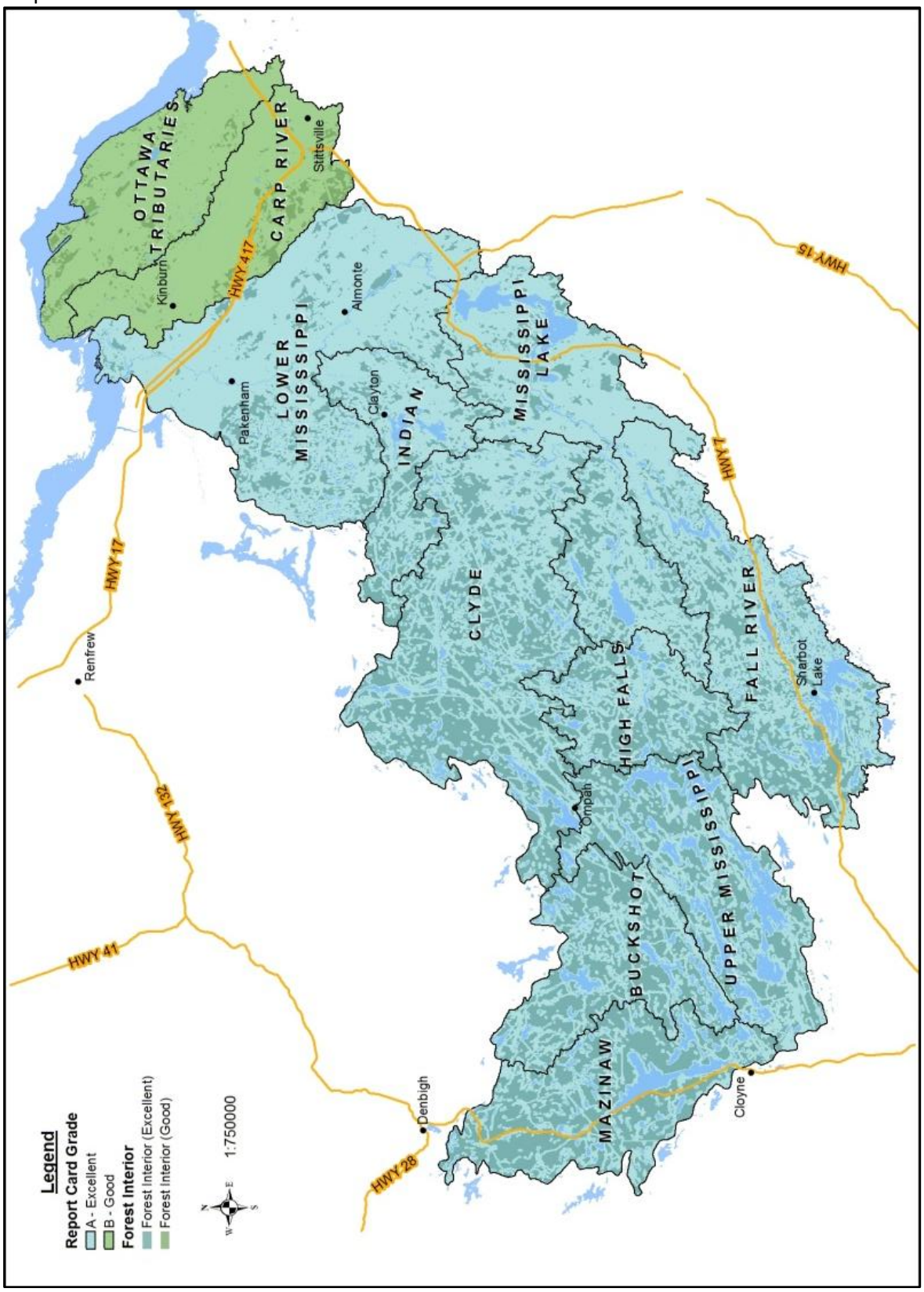
In an effort to enhance and protect existing forest cover, water quality, and wildlife corridors, MVC has been promoting the establishment or maintenance (where already present) of a minimum 30 metre wide riparian buffer along all watercourses. Through our land use planning advisory program, municipalities are encouraged to include policies and provisions in their land use planning documents to implement riparian vegetated buffers. MVC also implements stewardship initiatives focused on key areas where forest cover enhancement could increase the percentage cover on both private and public lands. One of these initiatives was introduced in 2011 where MVC offers waterfront landowners with free or low cost shoreline planting depending on the circumstances. The findings of the report card will be used to target more concerted efforts in delivery of the shoreline naturalizations program.

The Carp River is a significant part of the watershed. Shoreline planting is challenging in some areas due to soil type, however any planting that can be done along this stream will benefit the water.

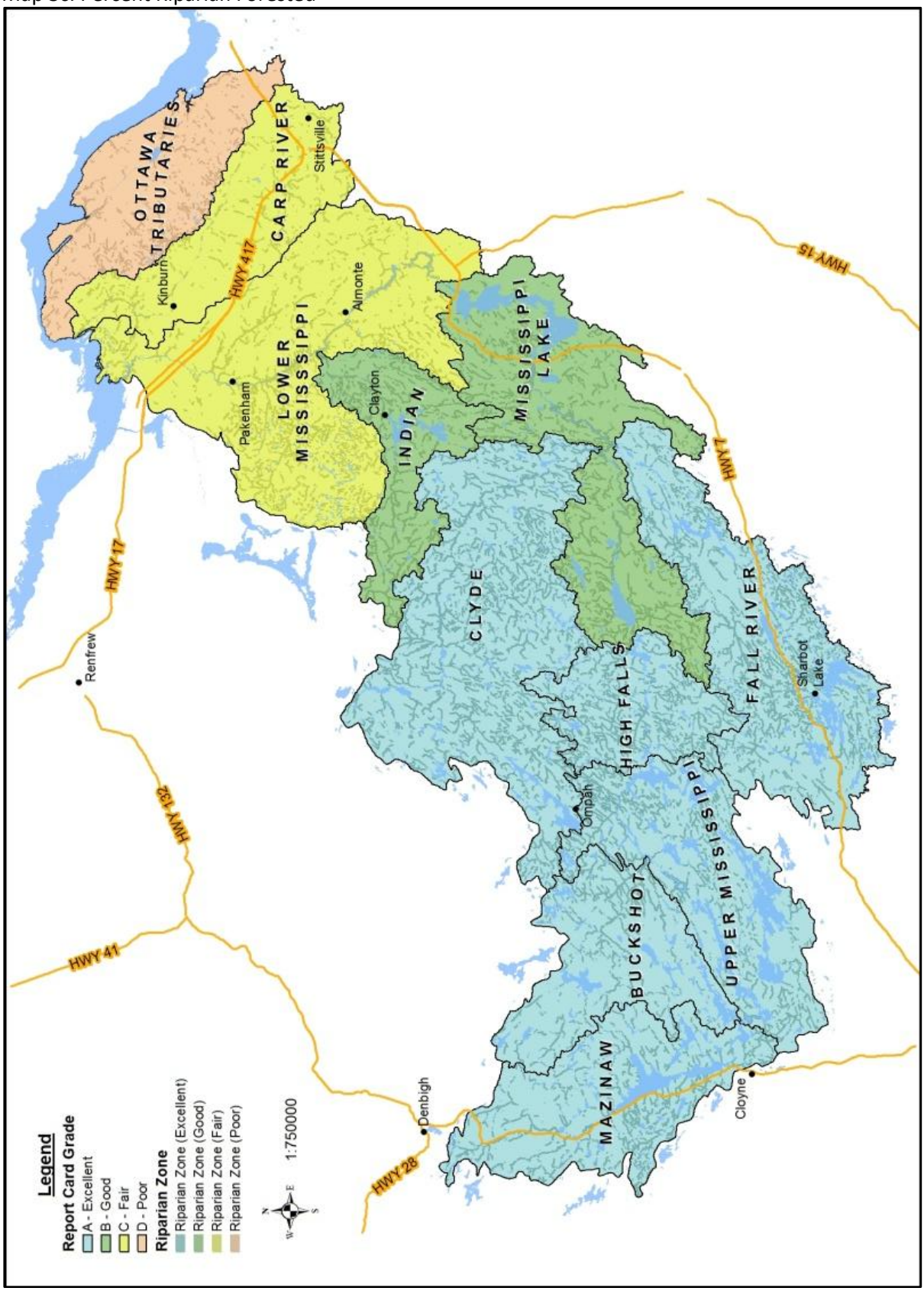
Map 3a: Percent Forest Cover



Map 3b: Percent Forest Interior



Map 3c: Percent Riparian Forested



How this Compares to the 2007 Report Card

MVC has acquired more detailed up-to-date mapping information since the preparation 2007 report card. While this change in data has provided for a more accurate assessment of forest cover, forest interior and forested riparian area, the change in mapping information has eliminated the ability to make direct comparisons between the 2007 and 2013 report cards as a way to measure on the ground changes in forest condition over the last five years.

In 2007 report card, the forested area was evaluated from the geographic layer MR_SIL (an acronym from data creator of the data layer, Mississippi Rideau Source Protection Region). The data layer represents a view of land use at the time based on two sources of information, Provincial Land Cover 2000, and the MNR SOLRIS land cover. SOLRIS, a project of the OMNR that mapped land cover features, focused on areas deemed non-Canadian Shield. The data capture technique of SOLRIS was considered superior to the existing land cover classification layers that were derived from Satellite imagery. As approximately two thirds of the Mississippi Valley watershed is on the Canadian Shield a merge of the two data sets was necessary to gain a comprehensive land cover for the Source Protection Region.

The current forest area was evaluated using the Provincial OGDE dataset, Wooded Area. This data layer represents wooded area only and is adapted from the Southern Ontario Ecological Land Classification 1998. The data set demonstrates data maintenance and updates based on new information such as that from SOLRIS and new evaluations from more detailed imagery such as DRAPE. Wooded area is considered a comprehensive representation of the watershed forested area based on the data maintenance since the last watershed report card.

A comparison between the 2007 and 2013 forest cover assessments actually showed an increase in both the percent forest cover and the percent forest interior for almost all of the subwatersheds. However, staff is confident that this is a result of improvement in the accuracy and detail over the mapping used in preparing the 2007 report card. The increase in forested area likely also reflects the new inclusion of forested swamps, hedgerows and other forested features that weren't captured in the forest layer mapping that was used for the 2007 report card.

Moving Forward

For the next cycle of watershed reporting, MVC will incorporate information for forested areas from an in-house visually inspected dataset that is reviewed and cleaned to ensure topological correctness and data integrity. MVC is developing a comprehensive land cover layer based on a standard set of land cover features: wetland classification, water bodies, built-up areas, transportation features, pits and quarries, wooded areas, and agriculture. The goal is to produce up-to-date land cover data and a snapshot of the current state of a watershed. This snapshot will be based on a review of recent datasets viewed and evaluated on the most recent air photography, DRAPE. Continual updates (approximately every 5 years, following Provincial imagery strategies) will allow for an assessment of management practices and conservation strategies.

Groundwater Quality

Groundwater is an integral part of our ecosystem as a storage basin of water that has been filtered through many layers of soil and rock. This water then flows underground to outlets known as springs where it becomes part of the surface water system of creeks, ponds, and rivers. This balance of water flow can be disrupted in two major ways, either from drought reducing the amount of water filtering through the soil, or increased withdrawal of groundwater for human uses.

Groundwater wells are monitored in the watershed in partnership with MOE. More sites are needed to better understand the groundwater quality in the watershed.

The groundwater quality data MVC uses is collected for the Provincial Groundwater Monitoring Network (PGMN), a program of the Ministry of the Environment in partnership with Conservation Authorities.

The intent of the PGMN is the accurate assessment of current groundwater conditions, to measure changes in water levels (caused by climatic conditions or in response to human activities such as water takings), and to measure changes in water quality from natural or manmade causes. The first MVC PGMN well was drilled in 2003. There are a total of nine wells in the watershed with data loggers used to report on ground water levels. In 2006, five of the wells were outfitted with pumps so water samples could be sent to commercial labs for analysis. General groundwater chemistry is assessed using a variety of inorganic and organic solids, organic liquids and gases from the samples. Their presence, absence, and abundance help to identify general trends and changing conditions over time.

Indicators and Methodology

The groundwater is sampled for 30 variables, however only Nitrogen in the form of Nitrate + Nitrite, and Chloride levels are analyzed to determine the overall watershed report card score. This is because of their potential effect on human health, and because they are easily identifiable indicators that can be linked to other harmful sources of pollution. Table 6 shows the Scoring Index used for both.

Table 6: Groundwater Quality Scoring Index (Conservation Ontario, 2011)

Nitrite + nitrate mg/L	Chloride mg/L	Points	Grade
0-2.5	0-62.5	5	A
2.6-5.0	62.6-125.0	4	B
5.1-7.5	125.1-187.5	3	C
7.6-10.0	187.6-250.0	2	D
>10.0	>250	1	E

Nitrite + Nitrate (CO Guideline, 2011)

Although nitrogen does occur naturally in the environment at safe levels and is very useful to plants, too much nitrogen in drinking water can be an indicator of contamination. The concentration of nitrogen in groundwater can be significantly increased by anthropogenic activities such as excessive applications of fertilizer and manure, and leaky septic systems.

The Ontario (and Canadian) drinking water quality standard for nitrate + nitrite (as nitrogen) is 10 milligrams per litre (mg/L). Where nitrate and nitrite are determined separately, levels of nitrite above 1.0 mg/L (as nitrogen) can be unsafe for human consumption. A concentration of nitrate in water that is above the guideline can cause a potentially fatal condition for infants less than six months old (The Drop On Water - Nitrate, NSE, 2008). Laboratories typically report nitrate and nitrite together, however the nitrite component is usually relatively small compared to the nitrate component. The guideline recommended for fresh waters by the Canadian Council of Ministers of the Environment (CCME) is 2.9 mg/L nitrate (total as N).

Chloride

Chloride is a naturally occurring element that can be found at high concentrations (i.e., greater than the drinking water quality standards) under natural circumstances. The concentration of chloride in groundwater can be related to the type of rock the groundwater is coming from. Typically sedimentary rocks (e.g., evaporates) have higher concentrations of chloride. However, high concentrations of chloride can also be related to anthropogenic impacts (e.g. road salt, landfills). It can be difficult to determine whether the high chloride levels are due to natural or anthropogenic reasons so caution should be exercised when reporting on this parameter. A hydrogeologist should review the information to determine the most likely cause for the test results.

The Canadian Drinking Water Quality Guideline for chloride is an Aesthetic Objective (AO) of less than or equal to 250 milligrams per litre (mg/L). Drinking water and drinks prepared with water containing chloride may have a salty taste at concentrations as low as 100 mg/L. Most people find that water with more than 250 mg/L of chloride is unpleasant to drink. Chloride itself in drinking water is generally not harmful to human beings. At concentrations higher than 250 mg/L, the sodium associated with chloride may be a concern to people on sodium-restricted diets. It is recommended that people with concentrations of sodium over 20 mg/L in their drinking water contact their doctor to discuss how it could affect them. Chloride may also contribute to the total dissolved solids (TDS) in drinking water. This may affect the rate of corrosion of steel and aluminum. Chloride may cause corrosion of some metals in pipes, pumps, fixtures, and hot water heaters.

Monitoring Sites

The locations of the five groundwater monitoring wells in our jurisdiction are shown on Map 4 and are listed in Table 7 along with a description of their location.

Map 4: MVC Ground Water Monitoring Well Sites

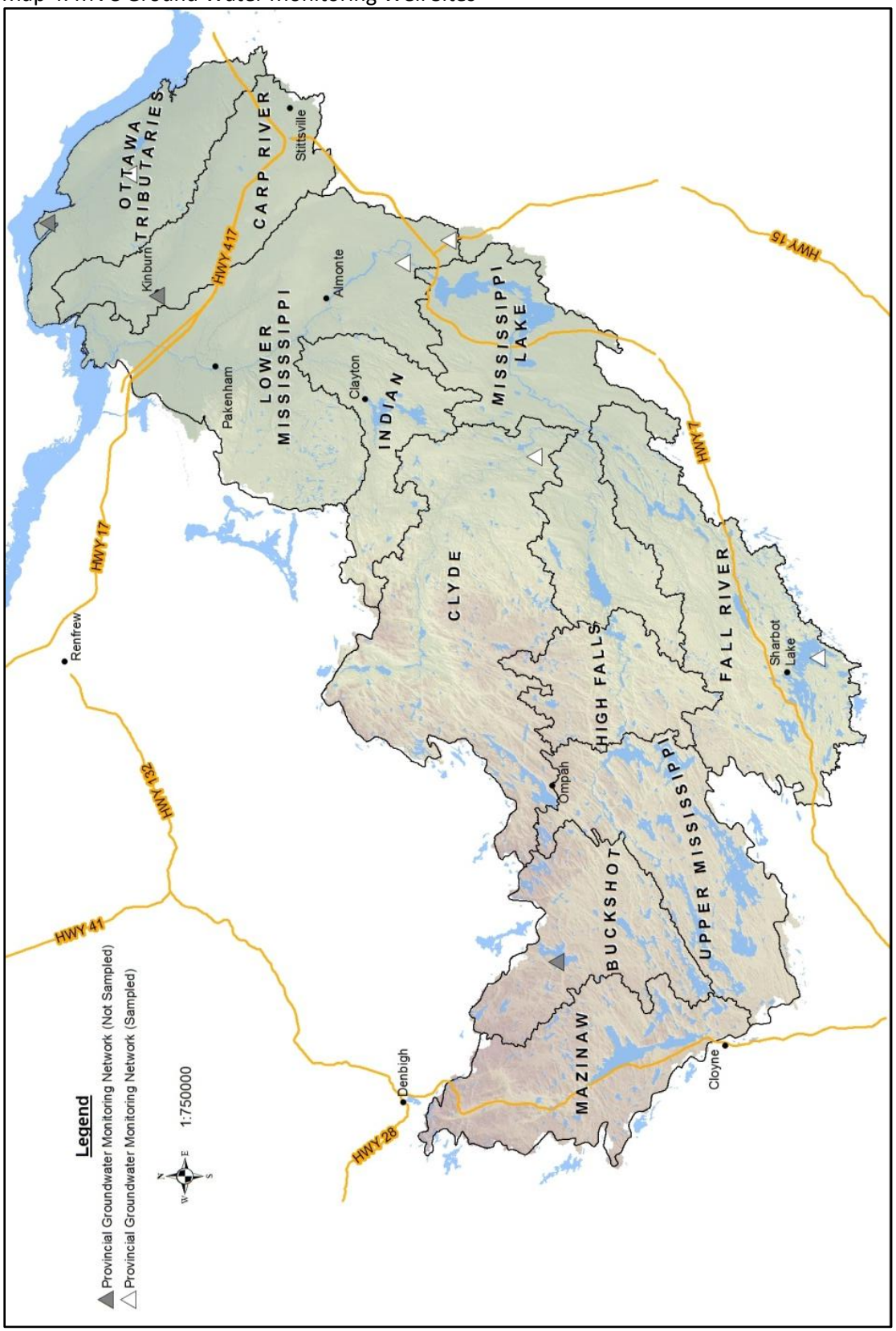


Table 7: Well Location and Site Description (Golder Associates, 2002).

Location	Bedrock Geology	Overburden Geology	Land use	Type of Aquifer
Sharbot Lake Oso And Olden Townships	Precambrian Crystalline Rock metamorphic and Igneous	- virtually no overburden - discontinuous thin layer of organic deposits in some areas	Predominantly forest and wetland; abundant rock outcrop; some cropland, hay and pasture	Metamorphic and Igneous Rock Aquifer
Village of Lanark Township of Lanark	Precambrian Crystalline Rock - metamorphic and igneous	virtually no overburden - discontinuous thin layer of organic deposits in some areas	Distributed between urban, cropland, hay and pasture, rock outcrop, and forest and wetland	Marble Aquifer
Black's Comers Township of Beckwith	Carbonate and Clastic Sedimentary Rock -March Formation - quartz sandstone, sandy dolostone and dolostone	virtually no overburden - discontinuous thin layer of organic deposits in some areas	Mostly forest and wetland; some urban, cropland, hay and pasture, and rock outcrop	Carbonate Rock Aquifer
Township of West Carleton	Carbonate and Clastic Sedimentary Rock - March and Oxford Formal/on - brown silly dolomite; minor grey sandstone in basal units	Medium grained sand with some silt, underlain by uniform blue-grey clay, upper sand and silt deposits removed to variable depths by fluvial erosion so in places clay Is exposed al surface, underlying clay unit includes lenses, bars and channel fills of sand and pockets of non marine silt that were formed during	Forest and wetland; some urban, cropland, hay and pasture	and Sand Overburden Aquifer
North end of Carleton Place Township of Ramsay	Carbonate and Clastic Sedimentary Rock - March Formation interbedded quartz sandstone, sandy dolostone and dolostone; some Oxford Formation dolostone	virtually no overburden - discontinuous thin layer of organic deposits in some areas	Predominantly urban; some hay and pasture and rock outcrop	Carbonate Rock Aquifer

MVC has collected water quality samples from these wells since 2006. As shown in Table 8 the sampling frequency varies between the five wells, with some having three records of data and some having five. Due to the lack of available long term groundwater quality data from these wells, only a statement of

current conditions can be made. The 2018 version of the report card will include a more thorough discussion of the groundwater results within our watershed, however, it will take at least 15 to 20 years to accumulate adequate data to determine trends.

Table 8: Number of Groundwater Samples, 2007-2011.

Location	Nitrite + Nitrate	Chloride
Blacks Corners	3	3
Carleton Place	4	5
Sharbot Lake	3	4
Lanark	4	4
Dunrobin	4	5

General observations of the data collected between 2006 and 2011 shows that the total Nitrate + Nitrate levels for all five wells is well below the relevant Provincial Water Quality Objectives and Guidelines. The Chloride concentrations are also well below the Provincial Water Quality Objectives and Guidelines in the wells at Blacks Corners, Sharbot Lake and Lanark. Slightly elevated Chloride levels measured at Carleton Place site may be attributed to a combination of its higher vulnerability due to a thin overburden layer and its location in a relatively built up rural area with estate lot development that is serviced by private on-site services. The monitoring well at Dunrobin is showing chloride concentrations that are well above the Provincial Water Quality Objectives and Guidelines. This well draws from a Carbonate Aquifer and Sand Overburden Aquifer in an area that is subject to rural estate development on private services (Golder Associates, September 2002).

It is important to keep in mind that the results from this testing does not reflect the private well supply of drinking water. This is because the sampling wells were intentionally located in areas of relative isolation from potential pollutants to provide data on background water levels, and background concentrations of naturally occurring organic and inorganic substances. These samples are analyzed for chemical quality only and do not include any bacteriological analysis. The monitoring program does not provide an indication of the presence or absence of bacteria in nearby private wells. Private well owners are encouraged to regularly test their drinking water. It is generally recommended that private wells are tested for bacteria every six months and for chemical parameters every two years. Programs such as Well Aware are available to assist landowners monitor their wells and well water. More information is available from your local public health unit.

Every effort is made to sample in a variety of locations to capture the data most reflective of the subwatershed.

Watershed Watch: Monitoring our Lakes

A key feature of the Mississippi Valley watershed is its abundance of lakes. The western part of the watershed is dotted with hundreds of lakes that support a diverse and thriving ecosystem, abundant recreational opportunities, and a vibrant cottage community. More and more people are moving to the lake year round. The MVC primary lake monitoring initiative, Watershed Watch, focusses entirely on collecting water quality and invasive species data from more than 40 of those lakes.

The objectives of the program are to accumulate reliable environmental data, both historic and current, and to determine the limits of which lakes can assimilate nutrient input. The data is used to encourage shoreline property owners to undertake restoration projects and to adopt sound stewardship practices.

Indicators and Methodology

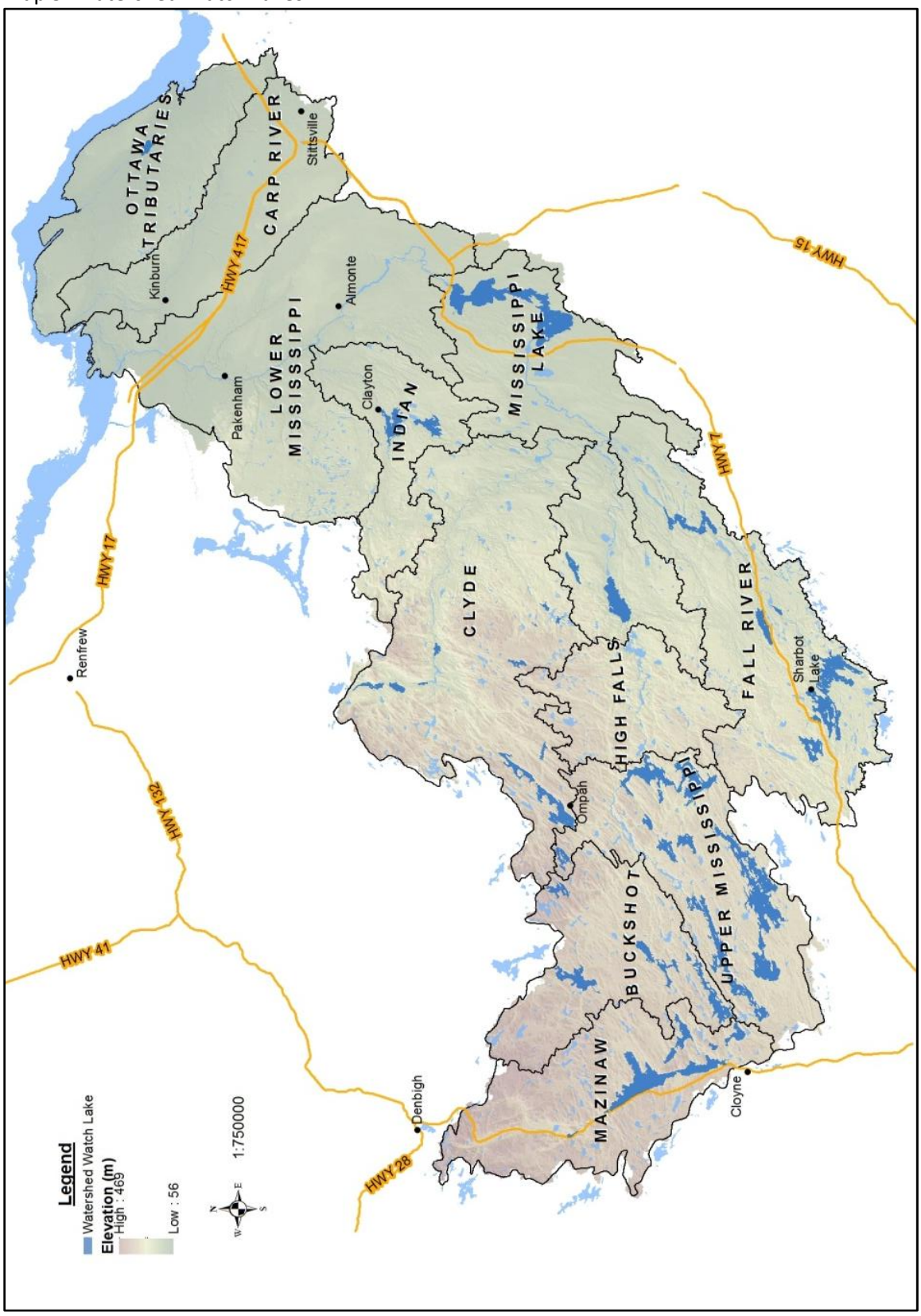
Watershed Watch (WW) samples the deepest point of 43 lakes, as well as sampling other deep basins within the larger lakes bringing total sampling stations to 62 sites. The WW lakes are shown on Map 5. The lakes are monitored in five year sampling cycles to identify and document long-term trends in water quality. The key parameters measured (total phosphorous, dissolved oxygen, temperature and water clarity) provide a simple, cost-effective means to quantify the extent of aging of the lakes.

Variables such as pH, water temperature, dissolved oxygen, water clarity, Chlorophyll a and phosphorous concentrations are monitored 3 times within the sample year to show seasonal transitions in the chemistry of the lake. The data that is gathered during sampling is documented in a summary report and posted on our website, as well as made available for cottage association meetings. Certain lakes have been fortunate enough in the past to have been adopted by Waste Management Canada, and Omya Canada Inc., who donated the money required to increase our sampling effort to 8 times within a given year, as well as increasing the number of times a lake is sampled within the 5 year cycle.

Phosphorous

As with our rivers, creeks and streams, total phosphorous has been used as the main indicator of surface water quality because total phosphorous concentrations are the best way to describe the nutrient levels of a lake. Phosphorous is the nutrient that controls the growth of algae in most Ontario lakes and waterways, because it is the limiting nutrient in most aquatic systems. A limiting nutrient means that if there is an excess of all the other nutrients needed for growth, and there are low phosphorous levels, growth rates are moderated. High levels can lead to: algae blooms, causing a decrease in the dissolved oxygen in the water and a decrease in the water clarity, which negatively impacts fish habitat. Cold water fish, such as trout, are the most sensitive to these changes.

Map 5: Watershed Watch Lakes



Phosphorous contamination occurs when pollutants such as detergents, soaps, pesticides, and fertilizers are used near the water and are subsequently washed into the waterway when it rains. This is exacerbated where there is little or no natural vegetation along shoreline to help filter these contaminants before they are flushed into the lake. Septic systems can be another source of nutrient contamination in water. Improperly functioning septic systems do not adequately remove nutrients and bacteria due to different factors including: improper sizing, broken piping, or direct discharge situations. Outdoor showers and greywater sources discharging to the ground carry soaps and detergents directly to nearby watercourses. It is important to ensure all water using appliances in a house or cottage are connected to a properly functioning septic system. This, along with a reduction or elimination of pesticide and fertilizer use, will help prevent harmful surface and groundwater contamination.

Clarity (Secchi Disc)

Clarity is not only important for the aesthetic quality of enjoying a lake; it can be an indicator of algae concentrations, and turbidity of the waterbody. It is measured by how deep sun's rays can penetrate the water. Sun rays are good for oxygen production by aquatic plants, which benefits the lake food chain and fish populations. Fish species survival can be affected by clarity because some of them, like the Northern Pike, are visual hunters and need clear water to be able to see their prey to be successful. Other fish such as the Brown Bullhead have other methods of gathering food and may not be affected by the waters clarity. Clarity is monitored by lowering a Secchi Disc into the water at the deepest point and recording the depth when the disc is no longer visible. Doubling this value defines the euphotic zone—the area of light penetration and thus greatest biological activity. The Euphotic zone is also the area from which the total phosphorous sample is taken.

Invasive Species

In partnership with the Ontario Federation of Anglers and Hunters (OFAH) MVC monitors for invasive species including Zebra Mussel veligers (larva), and Spiny Waterflea. Staff also educate shoreline residents to recognize and prevent the spread of these species. The lakes monitored for invasive species includes WW lakes and others across the watershed at the request of the property owners.

Results

The phosphorous, clarity, and invasive species results are shown below in Table 9. Four subwatersheds are not represented here as two of them do not have lakes, Lower Mississippi and the Carp River. High Falls flows into the sampling station at Dalhousie Lake in the next subwatershed, and the Ottawa River Tributaries subwatershed is monitored by the City of Ottawa through a different program.

By combining the clarity and euphotic phosphorous values for the deepest point in each lake a standardized trophic characterization can be given and status assigned. Trophic characterizations are broken down into three groups ranging from low concentrations of nutrients with a high clarity value to very high concentrations of nutrients with a low clarity value, oligotrophic, mesotrophic, and eutrophic. Some lakes naturally occur in these ranges; however when a lake known to exist at one state either becomes enriched with nutrients (euthrophic), or ends up void of nutrients (oligotrophic) the change in status prompts further investigation. Sometimes when a lake is found to be hypereutrophic, meaning the lake is super enriched with nutrients, it is generally due to human activity, and makes the waterbody nearly uninhabitable for fish due to lowered oxygen concentrations.

MVC uses the results from the spring sample to categorize trophic status of the lakes because the total phosphorous and secchi disc conditions in the lake after the ice has come off and before the wind has mixed the waters reflect the background conditions of the lake before plant growth and summer temperatures, among other factors, can affect the lake chemistry.

Table 9: Trophic Status Index used in Watershed Watch Analysis

Parameter	Oligotrophic	Mesotrophic	Eutrophic
Total Phosphorous (µg/L)	≤10	11-20	≥21
Secchi transparency (m)	≥5	3.0-4.9	≤2.9

Table 10 presents a summary of Watershed Watch lakes invasive species status, and trophic status as determined in Table 9 above.

Table 10: Summary of Invasive Species Sampling results and the trophic status results of Total Phosphorous and Secchi Disc.

5 Year Range	2002-2006	2007-2011	1998-2001		2002-2006		2007-2011	
Official Lake Name	Invasive species	Invasive species	Total Phos. (µg/L)	Secchi disk (m)	Total Phos. (µg/L)	Secchi disk (m)	Total Phos. (µg/L)	Secchi disk (m)
Ardoch Lake		ZM		M	O	O	E	O
Bennett Lake	ZM	ZM	M	M	O	M	M	M
Big Gull Lake	ZM + SWF	MNP		M	O	M	O	M
Big Lake								
Black Lake	MNP	ZM	M	O	O	O	M	M
Blue Lake		ZM		O	O	O	O	O
Bottle Lake		MNP						
Bowers Lake	MNP							
Buckshot Lake	MNP	MNP		O	O	O	O	O
Canonto Lake	MNP	MNP	O	O	O	O	M	O
Clayton Lake	MNP	MNP			M	O	M	O
Clear Lake		ZM		E	O	M	M	M
Clyde Lake		ZM+SWF			M	M	O	M
Crotch Lake	SWF	MNP	O	O	O	M	O	O
Constance Lake		ZM					E	
Dalhousie Lake	ZM	MNP	M	M	O	M	M	O
Fawn Lake	MNP	MNP	O	M	O	O	O	O
Flower Round Lake	ZM	MNP			E	O	O	M
Green Lake		MNP						
Grindstone Lake	MNP	MNP	O		M	O	O	O
Horne Lake	MNP	MNP			M	M	M	O
Joes Lake	MNP	ZM			M	M	M	M
Kangaroo Lake	MNP	ZM						
Kashwakamak Lk	MNP	MNP		O	O	O	O	M

5 Year Range	2002-2006	2007-2011	1998-2001		2002-2006		2007-2011	
Official Lake Name	Invasive species	Invasive species	Total Phos. (µg/L)	Secchi disk (m)	Total Phos. (µg/L)	Secchi disk (m)	Total Phos. (µg/L)	Secchi disk (m)
Kerr Lake	MNP							
Kishkebus Lake	MNP	MNP		M	E	M	M	E
Little Green Lake		MNP						
Mackavoy Lake		MNP		M	O	M	O	M
Malcolm Lake		ZM		O	M	O	E	M
Marble Lake	MNP	MNP		M	O	O	O	M
Mazinaw Lake	MNP			O	O	O	M	O
McCausland Lake	MNP	ZM		O		O	O	O
Mississagagon Lake	MNP	MNP		O	M	O	O	O
Mississippi Lake*	ZM	ZM			M	M	M	M
Mosque Lake	MNP	MNP	M	O	O	O	O	O
Paddy's Lake		MNP			E	E	M	M
Palmerston Lake	MNP	MNP	O		O	M	O	O
Patterson Lake	MNP	MNP	O	O	O	O	E	M
Pine Lake		ZM		O	M	M	O	O
Robertson Lake	ZM	ZM			O	O	O	O
Sand Lake	ZM	MNP	O	O	M	O	O	O
Shabomeka Lake	MNP	ZM		O	O	O	M	O
Sharbot Lake	ZM	ZM	M	M	O	O	M	O
Shawenegog Lake	MNP	MNP		M	O	M	O	O
Silver Lake	ZM	ZM		M	O	O	O	O
Sunday Lake	MNP	MNP	O	O	O	M	O	M
Taylor Lake	MNP	MNP			O	M	O	M
Upper Mazinaw Lake	MNP							
Upper Park Lake	MNP	MNP			M	M	M	M
White Lake	MNP	MNP	O	M	O	M	M	M
Widow Lake		MNP			M	M	M	M
Wolfe Lake	MNP	ZM						
Woods Lake	MNP							

Invasive Species: MNP= Measured not present ZM= Zebra Mussels present, SWF= Spiny Waterflea present

Trophic Status: O=Oligotrophic, M=Mesotrophic, E=Eutrophic

*Mississippi Lake results are the 75th percentile of the multiple years of samples within each 5 year reporting window. All other results shown are based on a single sample within the 5 year range.

Since this program was started in 1998 three rounds of sampling have been completed for most of the lakes. The trophic status results are shown in Table 10. It is recognized that for this report card, three sampling years of data per lake is not enough to draw any statically significant conclusions about the change in trophic status of our lakes. More repetitions of the sampling protocol are required to rule out seasonal variations affecting the results, so it is our goal for the next 5 years to increase the number of sampling years for 6 of our lakes that represent the outlets of various subwatersheds.

In 2006 MVC increased sampling frequency of Mississippi Lake to yearly. This was done because of concerns about potential changes in water quality as a result of more intensive development pressures and because, as the lake at the lowest on the drainage system, Mississippi Lake provides a good representation of what is happening to water quality on the broader watershed scale.

The Mississippi Lake results shown in Table 10 were derived by calculating the 75th percentile of the secchi disc and total phosphorous results from two samples in 2002-2006 and five samples in 2007-2011. These results show that the lake falls within the mesotrophic category and is not showing a change in status over time.

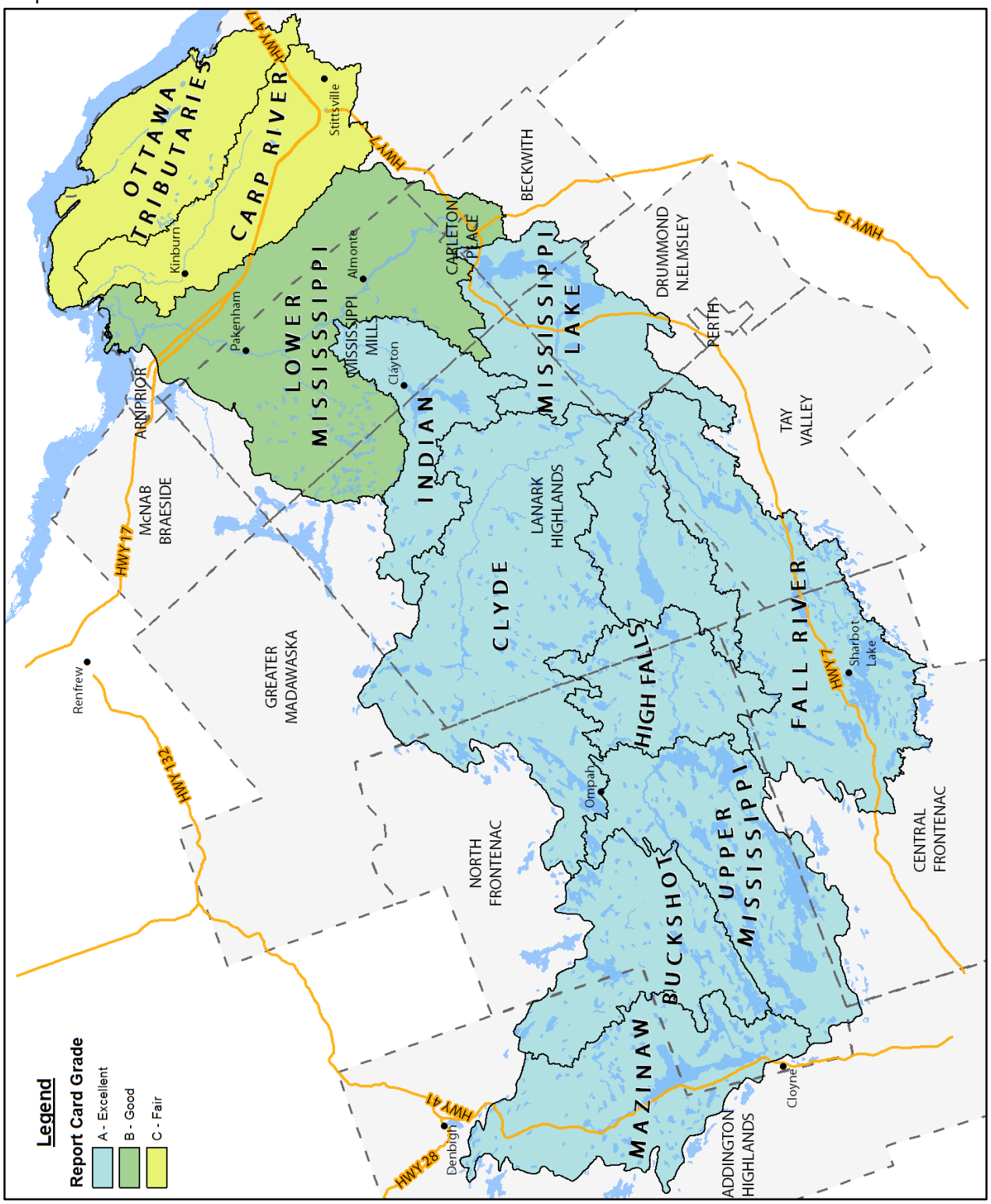
In the 2007-2011 reporting period Zebra Mussels were found in five lakes where they had not been previously identified, conversely none were found in five other lakes where they had been previously identified. These changes can be due to a number of factors such as: the organisms were not caught in in the samples; or the veligers did not survive to become breeding adults due to local environmental conditions. MVC is continuing to work with the OFAH to increase sampling to rule out these variables. Education and awareness programs have also been increasing over the last 5 years to teach residents on how to stop the spread of invasive species.

Summary/Conclusions

The data creates a baseline of values to gauge the changes in the Mississippi Valley watershed. Unlike other watersheds in more developed areas, we are very fortunate that many of the values are nearly ideal. This is a status to be proud of and the incentive to continue to receive high grades for future report cards.

Overall watershed health was calculated based on the surface water quality and forest conditions presented earlier in this document. Map 6 shows the overall grades for each of the eleven subwatersheds based on an average of the points for water quality and forest conditions as summarized in Table 11. Groundwater quality was not included in the calculations because existing groundwater data are preliminary.

Map 6: Overall Subwatershed Grades



The entire watershed scores very well, with an overall grade of A. This reflects the high amount of forest cover and generally unimpaired water quality throughout much of the region. When examined on a subwatershed basis, most of the upper watersheds received a grade of A for overall health; the Lower Mississippi subwatershed received an overall grade of B; and the Carp and Ottawa Tributaries subwatersheds received an overall grade of C.

Table 11: Overall Grades

	Surface Water Quality		Forest Conditions		Overall Score	
Subwatershed	Average Points	Grade	Average Score	Overall Grade	Average Total Score	Overall Grade
Mazinaw	5.0	A	5.0	A	5.0	A
Buckshot	5.0	A	5.0	A	5.0	A
Upper Mississippi	N/A	N/A	5.0	A	5.0	A
High Falls^	5.0	A	5.0	A	5.0	A
Fall River	4.0	B	5.0	A	4.5	A
Clyde	4.5	A	5.0	A	4.8	A
Indian River	4.0	B	4.7	A	4.4	A
Mississippi Lake^	5.0	A	4.7	A	4.9	A
Lower Mississippi *	4.0	B	4.3	B	4.2	B
Carp River *	3.0	C	3.7	B	3.4	C
Ottawa *	2.5	C	3.7	B	3.1	C
Overall Grade	**42.0**	**B**	**51.0**	**A**	**49.1**	**A**

The water quality in the numerous Mississippi Valley lakes remains generally good with most falling within the mesotrophic (mid-nutrient) range. The lakes that do not occur in this middle range are not too far in the extremes of nutrient poor, or nutrient rich. In an effort to control algae blooms it is important to ensure the lakes are not receiving the anthropogenic (human) excess of nutrients that puts the lake into the eutrophic (high nutrient) category by reducing or eliminating the surface run off of fertilizers, soaps, grey water, or septic leaching.

Typically, the contributing factors to lower grades in water quality are directly related to a reduction in vegetation cover in the riparian zone, an increase in impervious surfaces such as concrete and asphalt within the watershed, ongoing use of road salts and fertilizers, and lack of storm water management ponds. Riparian vegetation cover is a key factor in maintaining watershed health in both our urban and rural landscapes.

The overall health of the Mississippi Valley watershed declines as you travel from the headwater areas in the upper reaches to the more urban and developing areas located in the more developed east end of the watershed. This is not surprising. Typically watershed health decreases in urban areas and increases in undeveloped headwater areas. There are still significant areas of wetland, forest and riparian buffers in the headwater areas that protect water resources. Science and ongoing monitoring data clearly show that poor water quality is directly related to a decrease in individual and collective natural features within a watershed.

Although much of the watershed receives high grades we cannot become complacent about environmental protection and best management efforts. Striving to maintain and enhance protection efforts to preserve the environment in the best condition possible is the goal of MVC. Through increasing public awareness about the value of these features and implementing watershed management plans and education programs MVC can help to ensure the benefits of these natural resources are understood and protected.

Good stewardship and best management practices are essential in order to use and live on the land while protecting it. Areas that have received lower grades can be restored and protected to prevent them from sliding further down the grading scale.

What MVC is Doing

Education & Outreach

Mississippi Valley Conservation promotes a conservation ethic, the concept of stewardship, caring for our environmental resources in ways that will sustain them for future generations, and an awareness of the environment. We deliver education and information about conservation and the environment through Conservation Education Programs and Nature Camps which provide hands-on learning in a friendly, enjoyable outdoor environment.

An average of 7,000 students a year participate in our education programs, experiencing a variety of curriculum based hands-on programs for grades 1 through 12.

MVC facilitates and participates in various environmentally focussed events in and outside the watershed. Staff attend and participate in lake association meetings, community workshops, and other outreach opportunities to address specific concerns or discuss MVC programming in general.

Water Management

MVC monitors the effect of development and land use to assess watershed conditions. This is done through field monitoring, remote sensing and gathering and interpreting information on the status of water and water related natural resources on an ongoing basis. The careful monitoring of water levels ensures that a flood forecasting and warning service is ever-ready to help municipal officials and the general public take appropriate action in a flood emergency.

The Carleton Place dam is one of many on the Mississippi River system.

Flood Forecasting & Warning
Implementation of our Flood Forecasting & Warning Program protects watershed residents from the impacts of extreme rainfall and snow melt. This involves continuous monitoring of water levels, computerized flood forecasting, and monitoring of snow conditions. Using this information we provide local agencies and the public with information, advice, and advanced notice, so that they can respond to potential flooding and flood emergencies.

Development Review & Regulation/Permits
We provide an environmental review of development proposals submitted by municipalities, developers and the general public. We also administer Ontario Regulation 153/06 Regulation, MVC's Development, Interference with Wetlands and Alteration to Shorelines Regulation. By directing development away from important natural heritage features and flood and erosion prone areas, we reduce the risk to life and property that results from flooding and erosion and contributes to a healthier watershed.

Stewardship
MVC delivers several programs to landowners promoting natural heritage stewardship projects throughout the watershed. We provide free technical advice and some funding opportunities to private landowners for land and water stewardship projects including reforestation, agricultural Beneficial Management Practices, terrestrial and aquatic habitat restoration, and well decommissioning or upgrading.

Landowner Advisory Service (LAS)
The LAS is a land management-based initiative that allows landowners to access professional advice through the conservation authority on a variety of topics such as, forest, wetland, and habitat management for commercial, agricultural and recreational land uses. This is done through outreach programs such as public speaking within the community, seminars, workshops, providing literature, or in office and onsite meetings with land owners. MVC can also provide referrals to other organizations that can best meet the needs of the situation.


Stewardship projects such as tree planting help keep our water clean.

Source Water Protection
Source Water Protection is the first step in protecting drinking water and human health.
Mississippi Valley Conservation and the Rideau Valley Conservation Authority have been working together on source protection activities for municipal water supply systems that rely on groundwater.

Volunteer Monitoring Program
MVC has started a volunteer monitoring and stewardship program in the Carp Watershed to engage volunteers in collecting data about the watershed and participating in events directed at stewardship. The MVC monitoring department works closely with local Lake Associations to monitor the quality of the lake for all recreational uses such as swimming and fishing.

Lake Plans
MVC works with local Lake Associations to assist them in developing their own lake plans. A lake plan is a strategic action plan developed by the lake community to reflect and preserve the special character of their lake

Our three most popular conservation areas are the historic Mill of Kintail, Purdon Conservation Area, Canada's largest native colony of the Showy Lady's Slipper orchids and Morris Island Conservation Area, a distinctive group of islands in the Ottawa River.

Conservation Area Management
It is important to preserve areas of natural significance for residents and visitors to enjoy. Conservation Areas are managed with the primary goal of protecting significant natural heritage features and secondly to provide complimentary public use. MVC owns and manages 410 hectares of conservation area lands within the watershed.

Climate Change
This is a critical issue facing our watersheds today. We are engaged in long-range environmental planning with the best scientific information available. We see the impacts of a changing climate through our watershed planning and management activities, with particular focus on the implications to forestry, tree species diversity, water quality, flooding and aquatic species. MVC is working with many different public agencies, NGO's and landowners to provide adaptation plans and modify water management strategies to meet the challenges of the changing climate.

How you can help

Most of the land that lies within the Mississippi River watershed is privately owned and so it is up to these land owners to act as the front line of defence to help prevent a decrease in the quality of the streams, rivers, lakes, and forests that create the environment that currently exists and is receiving such high grades. MVC enjoys working closely with individual land owners and organized groups such as lake associations, naturalists, and stewardship comities to assist with this task. We can provide expert guidance on site specific issues, supply educational materials, and help bring groups together so that they are all using the same best management practices to balance their needs on the land and the need to preserve the quality of the ecosystem.

Whether or not you are a rural land owner, cottager, or an urban dweller, there are many things that you can do to help protect our watershed and maintain or restore its status as a clean and healthy environment.

Volunteers help us collect samples from our lakes through the Watershed Watch program.

Take part in Citizen Science, they have a variety of volunteer sampling programs that you can participate in on your own property. Check out www.naturewatch.ca for a list of current programs offered by the Canadian Nature Federation. These efforts helps supplement our sampling because you are the ones most familiar with the site, thus you are the ones who can best tell if something has changed over time. Citizen science and other volunteer programs help monitor these changes and put them on a standardized comparable scale making your observations useful and important to the watershed and the province.

You can be involved, here's how:

- Join or start a lake association (visit foca.ca)
- Get involved with a field naturalist group (visit ontarionature.ca)
- Plant shrubs and trees on your shoreline (call MVC)
- Pick up litter (it's easy)
- Conserve water (stop that drip)
- Keep livestock away from water bodies (fence near the water)
- Maintain septic systems and wells (protect your drinking water)

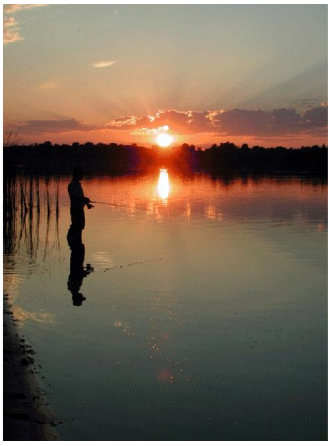
Contact MVC

MVC is a great source of information for these activities as well as an aid to get them done. For example our planning department is responsible for giving out advice and permits to insure that any work done in or near the water is handled in a way that will minimize the impact on the system.

We have a land owner advisory program that promotes best management strategies by allowing landowners access to professional site specific advice on forest and wetland management, for commercial, agricultural or recreational uses. We are a contact point for the Ottawa Rural Clean Water Program which provides financial assistance to rural landowners within the city's boundaries with the goal of protecting our surface and groundwater by replacing or upgrading wells, septic systems, chemical storage facilities, nutrient management plans, and educational initiatives; to name a few of the activities that are covered.

If you are not sure how to get started or if we can lend a hand visit our website www.mvc.on.ca for more information, or give us a call 613.259.2421. For more information about the Watershed Report Card or MVC programs in general contact Suzanne McFarlane at smcfarlane@mvc.on.ca or 613.259.2421 ext. 225.





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