DRAFT

2019

Backgrounder Two: People & Property

MISSISSIPPI RIVER WATERSHED PLAN

Backgrounder Series

Mississippi Valley Conservation Authority

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Note about mapping:

All maps in this report that bear the Mississippi Valley Conservation Authority logo were produced in part with data provided by the Ontario Geographic Data Exchange under License with the Ontario Ministry of Natural Resources and Forestry and the Queen's Printer for Ontario, 2019.

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The Mississippi River Watershed Plan

This report is the second in a series of four "Backgrounder Reports" that were prepared to support the development of the Mississippi River Watershed Plan. The reports examine various characteristics of the Mississippi River Watershed, looking at past and current conditions and, where possible, anticipating future changes on the landscape. They provide the basis for consultation and discussion with key stakeholders, and the broader watershed community, who are all partners in developing the Mississippi River Watershed Plan.

Backgrounder One: The Physical Environment provides a broad picture of the physical landscape of the Mississippi River watershed. It describes the physiography, geology, hydrogeology and climate. It also describes the rivers and lakes and how water levels are managed.

Mississippi River Watershed Plan Backgrounders:

One: The Physical Environment
Two: People & Property
Three: Natural Systems (Biotic)
Four: Asset Management

This second backgrounder, People & Property, examines man's presence on the landscape. It describes the historic settlement of the watershed and how that has shaped the current cultural landscape. It looks at settlement patterns and land uses, and their connection with the river and other features of the physical environment. It also examines municipal servicing of our urban areas and looks out how the rural areas without municipal water and wastewater services are managed. Key local economies that are reliant on the water resources and natural features of the watershed are also described. This document is intended to promote discussion about the future pressures that we must consider in determining how to move forward in managing the watershed in a sustainable way.

Watersheds and Subwatersheds

A watershed is a topographically defined area of land where the water within flows to a common point. Within a watershed, surface and groundwater are generally connected as water flows across the landscape through waterways or vertically through the various layers of soil and substrate. The information presented in this document and in each of the other Backgrounders is often presented in terms of the **"Upper Watershed"** and the **"Lower Watershed"** described on the next page. Information is also presented also presented by **subwatershed**. The Mississippi River Watershed[1] is divided into seven subwatershed areas (Figure 1). They include the catchment areas for the two largest tributaries, the Clyde River and the Fall River, with the remaining area divided into five "Mississippi River" subwatershed areas: the Upper Mississippi; the Central Mississippi; the Mississippi Lake area; the Lower Mississippi – Shield; and the Lower Mississippi – Lowlands.

[1] This plan focuses on the watershed area of the Mississippi River and does not include the lands within the MVCA's jurisdiction to the east that drain into the Carp River and smaller watercourses that flow directly into the Ottawa River.

Upper and Lower Watershed

There are frequent references throughout these documents to the “Upper Watershed” and “Lower Watershed”.

The **Upper Watershed** generally refers to the lands in the upstream/ southwest part of the watershed, upstream of where the Clyde and Fall River join the Mississippi River. It includes the Upper Mississippi, Central, Fall River and Clyde River subwatersheds.

The **Lower Watershed** generally refers to lands in the downstream/ northeast part of the watershed which include the Mississippi Lake, Lower Mississippi - Shield and Lower Mississippi – Lowlands subwatersheds

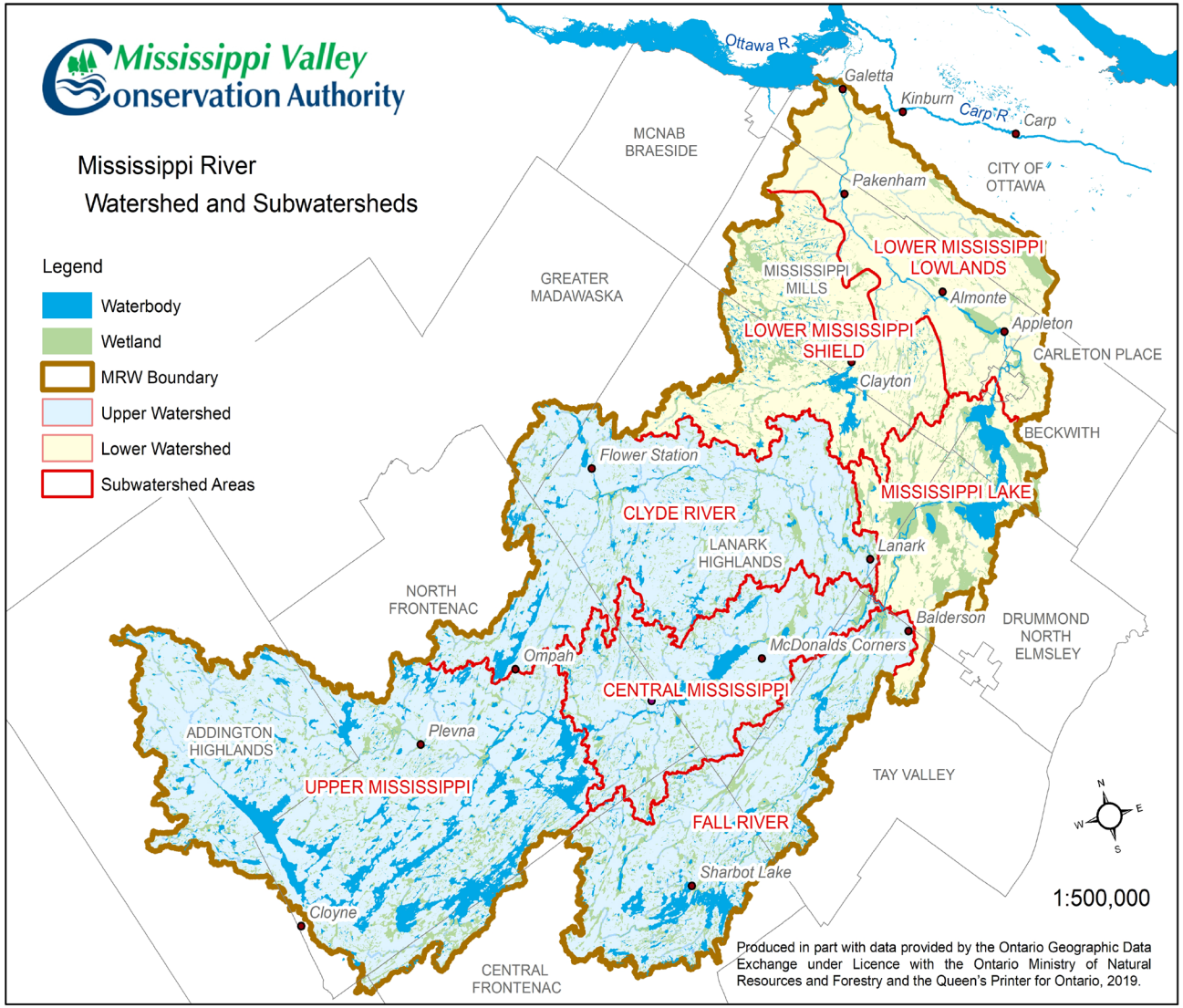

Figure 1: Mississippi River Watershed and Subwatersheds

Cultural History

Indigenous History

Anishinaabe peoples were the first to inhabit the Mississippi River Watershed and surrounding watersheds. Historically significant places in the watershed continue to hold sacred importance for indigenous communities. The early indigenous presence is marked by an extensive collection of pictographs on the face of Mazinaw Rock. It represents the largest visible collection of pictographs in Ontario. The only known concentration of indigenous habitation and camping sites in the watershed is also found at Mazinaw Lake (Wright and Engelbert, 1978). These, and finds near Crotch Lake, date back to the Middle and Late Woodland Periods (ca. 1000 B.C. to the Historic Period). The Mazinaw sites appear to have also been occupied from the Middle Woodland to Historic Fur Trade periods.

Older artifacts (e.g. spear points) dating back to the Laurentian Archaic period (ca. 5000 B. C. to 1000 B.C.) have been found in the Dalhousie Lake area. The Laurentian people represent the first substantial population of hunters and fishermen to live in Southern Ontario and their way of life was to have a vital impact upon subsequent events. (J.V. Wright, 1972, as cited in Keffer, M. 1986).

There are other less extensive findings from the Crotch Lake and Dalhousie Lake areas. The scarcity of findings elsewhere suggests that the central and upper watershed was not a major travel route during those times. It is also thought that archeological features may have been destroyed or covered over with the raising of water levels throughout parts of the river system.

The arrival of Europeans severely disrupted the life of indigenous peoples, as settlers overtook much of the land and resources.

KEY CONSIDERATIONS

A more complete historical account and natural resource information should be sought through engagement with Indigenous communities and individuals.

Archeological and historic sites predominate in close proximity to shorelines throughout the watershed, and will require identification and consideration in pursuing actions under the Watershed Plan.

European colonization transformed the natural landscape, clearing forests for agriculture and building dams along the river systems to manipulate flows for industry.

European Colonization

European settlers generally arrived after the War of 1812 as part of a wartime strategy and government programs aimed at establishing the 'Rideau Military Settlements'. The first were mostly British soldiers from disbanded regiments who settled around Perth. Two more waves of immigrants came from Scotland in 1820 and from Ireland in 1823. Those settled in and around the Village of Lanark. By 1830 Lanark County had a population of 10,000 largely concentrated in the eastern townships. The population of the western section was considered to have been 'not established' because of the unsuitability of the Canadian Shield to support agriculture.

The continued settlement of the watershed largely centered on the resources provided by the Mississippi River system. From 1820 on, the lumber trade opened up large parts of the watershed. Dams were built in the upper (southwest) watershed to raise the water levels enough to float timber downstream. Sawmills, grist mills, flour mills and timber slides were constructed along the waterways, and settlements such as Almonte, Appleton, Carleton Place, Blakeney, Lanark and Pakenham grew around them.

Where there was enough soil and water to provide for viable farming, land that had been cleared for lumber was put into agricultural use. Markets for agriculture products grew as towns increased in both number and size. Timber export reached its peak in the 1850's and subsequently declined, with farming then becoming the primary source of livelihood.

In the 1850's and 1860's the introduction of the railway improved accessibility of the area and stimulated some growth, especially in areas like Carleton Place and Almonte. Populations in the watershed steadily increased until around the turn of the century, at which point it began to decline. (Mississippi Valley Conservation Authority Interim Watershed Plan, 1983).

The municipal structure of the Mississippi River Watershed dates back to the early 1800's. Parts of Beckwith, Drummond and Tay Valley Township were among the first townships surveyed and settled between 1816 and 1818. The formation of the municipal wards to the north and west continued through to the early 1860's. When the Mississippi Valley Conservation Authority was first formed in 1968, the Mississippi River Watershed included 24 separate municipalities. Following municipal restructuring from 1997 to 2001, the watershed now includes one single tier (Ottawa), 4 upper tier and ten lower tier municipalities (Figure 2).

See Appendix A-Table A-1 for a list of the municipalities, their area, and the percentage of the total watershed area that each municipality represents.

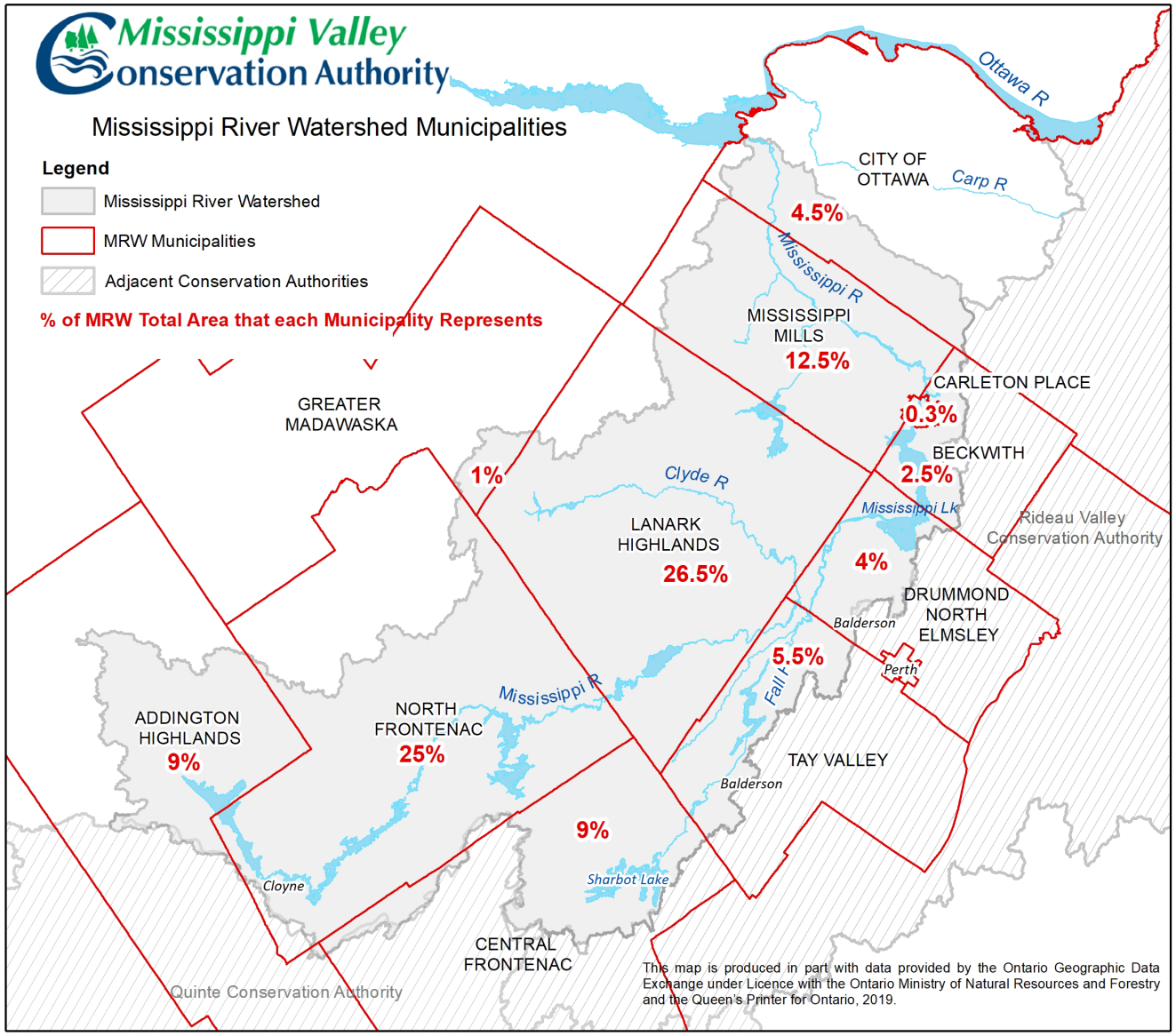

Figure 2: Municipalities in the Mississippi River Watershed

Current State of the Watershed

Land Cover

The Mississippi River Watershed reflects an underlying geology dominated by the Canadian Shield in the west, transitioning to the shale, limestone and sandstone plains of the St. Lawrence Lowlands in the east (see Backgrounder One: The Physical Environment, for more detail). Human settlement and land use are clearly connected to the characteristics and features of its diverse physical landscape.

The upper and central watershed, in the southwest, has a rugged landscape, covering a broad expanse of forested lands dotted by numerous lakes and rivers that make up the head waters of the Mississippi River. It supports an industry of forestry and thriving cottage communities. Through the central and lower (northeast) part of the watershed the Mississippi River passes through a number of small villages, crossing a mix of forested lands, farmland, woodlots, and rural housing. The lower (downstream) watershed has the growing urban areas in and around Carleton Place. It also features large expanses of cleared lands that are used for agriculture.

Figure 3 shows the generalized land cover across the watershed and Figure 4 provides the percent land cover by each category. A breakdown of land cover by subwatershed area is also provided in Appendix A: Table A-2.

Wooded lands are the predominant land cover, covering 62% of the watershed. The Canadian Shield area in the west has over 70% wooded land cover. In the east, where forests were cleared to make way for farming and development, it has 30% wooded land cover.

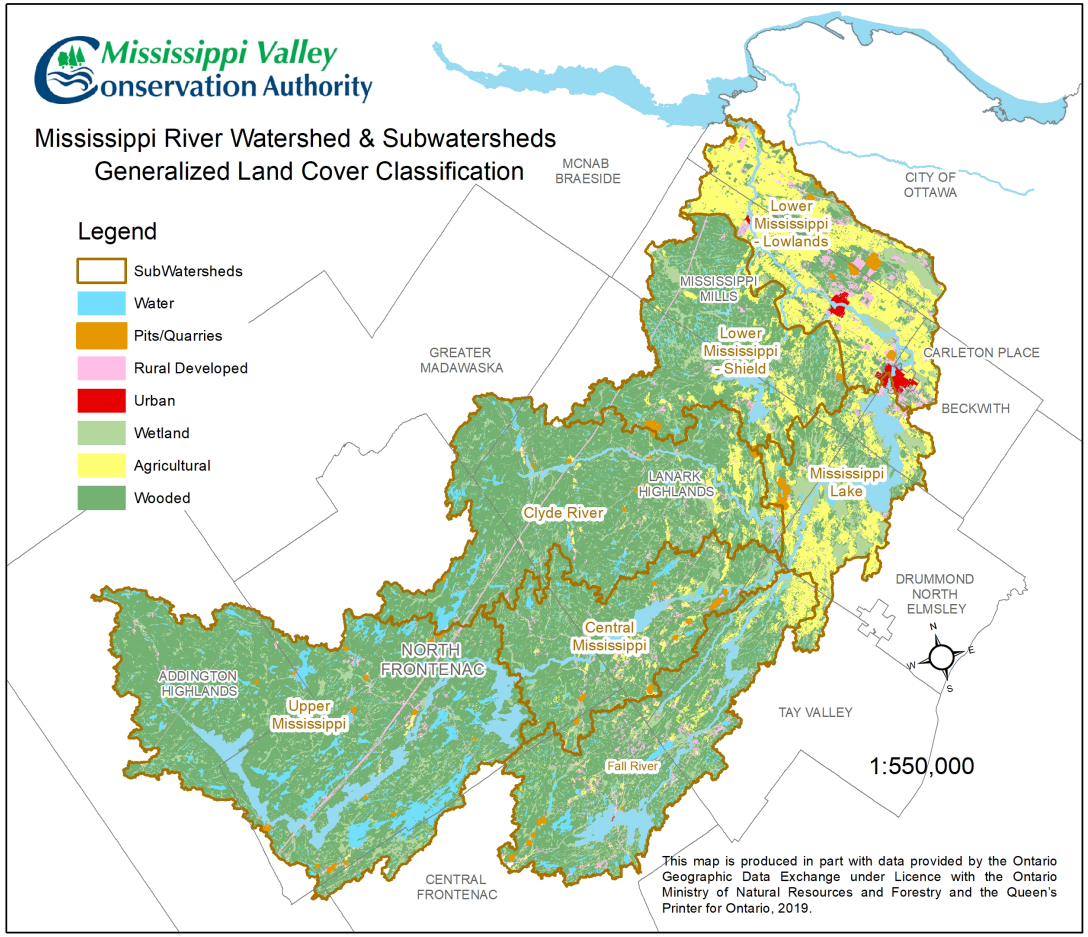

Figure 3: Generalized Land Cover in the Mississippi River Watershed

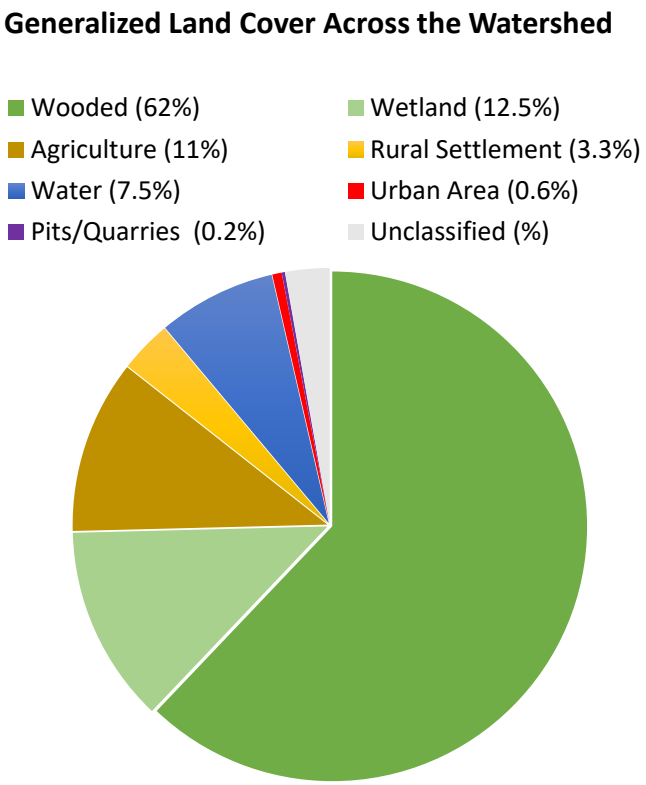

Figure 4: Percent Land Cover by Category

Wetlands are the second highest land cover at 12%. Large wetlands are concentrated around Mississippi Lake, with smaller wetlands relatively evenly distributed elsewhere in the watershed.

While agricultural lands cover only 11% of the overall watershed, in the lower (northeast) watershed where we find a thicker more varied soil cover, they cover 50% of the landscape. In the Upper Mississippi, where there is little to no soil, the agricultural land cover is very low.

Water covers about 7.7% across the overall watershed. The upper (southwest) Mississippi, where glaciers and meltwaters gouged and eroded the bedrock creating many lakes and ponds, has the most water at 13%. The lower (downstream) watershed, which has no lakes, has only 1.5% water cover.

Urban development, which includes villages, is concentrated in the lower Mississippi. Carleton Place and Almonte were established where the river offered power and the surrounding lands offered forestry and agriculture opportunities.

Urban growth of the lower watershed continues due to proximity to the City of Ottawa and ongoing agriculture and aggregate opportunities.

Population & Properties

Municipal

The 2016 population of the Mississippi River Watershed is estimated at 42,425[2]. The population by municipality is presented in Table 1. More than half reside in Carleton Place (25%) and Mississippi Mills/Almonte (30%). Shown in Figure 5, population densities reflect the historic settlement patterns and economic opportunities.

Table 1: Estimated Population within the Mississippi River Watershed

Upper Tier	Municipality	Estimated Population within the Watershed 2016*	Percent of Watershed Population
Lennox & Addington	Addington Highlands	310	0.7%
Frontenac	North Frontenac	1,531	3.6%
	Central Frontenac	1,428	3.4%
Lanark	Beckwith	3,929	9.3%
	Carleton Place	10,644	25.1%
	Drummond-North Elmsley	2,498	5.9%
	Lanark Highlands	5,095	12%
	Mississippi Mills	12,668	29.9%
	Tay Valley Township	1,466	3.5%
Renfrew	Greater Madawaska	100	0.2%
City of Ottawa		2,773	6.5%
	Estimated Total	**42,425**	100%

Source: Analysis of Statistics Canada 2016 Census using dissemination area

KEY CONSIDERATIONS

About 27% of residential properties are waterfront.

Flood susceptible areas are located around Dalhousie and Mississippi Lakes and parts of the river downstream.

Almost 500 houses and cottages are located in the 1:100 Year floodplain.

Seasonal populations in the upper watershed are estimated at 3 to 6 times the permanent population.

Higher densities of estate lot type development continue on private services (well and septic systems) in areas south of Carleton Place, presenting potential concerns with respect to groundwater availability and contamination.

”Grandfathering” of substandard setbacks from water for lots of record and redevelopment.

[2] The method used to estimate the watershed population is described in Appendix A Note 1. These estimates are for permanent residents only and do not include cottagers and other seasonal residents (see Page 12).

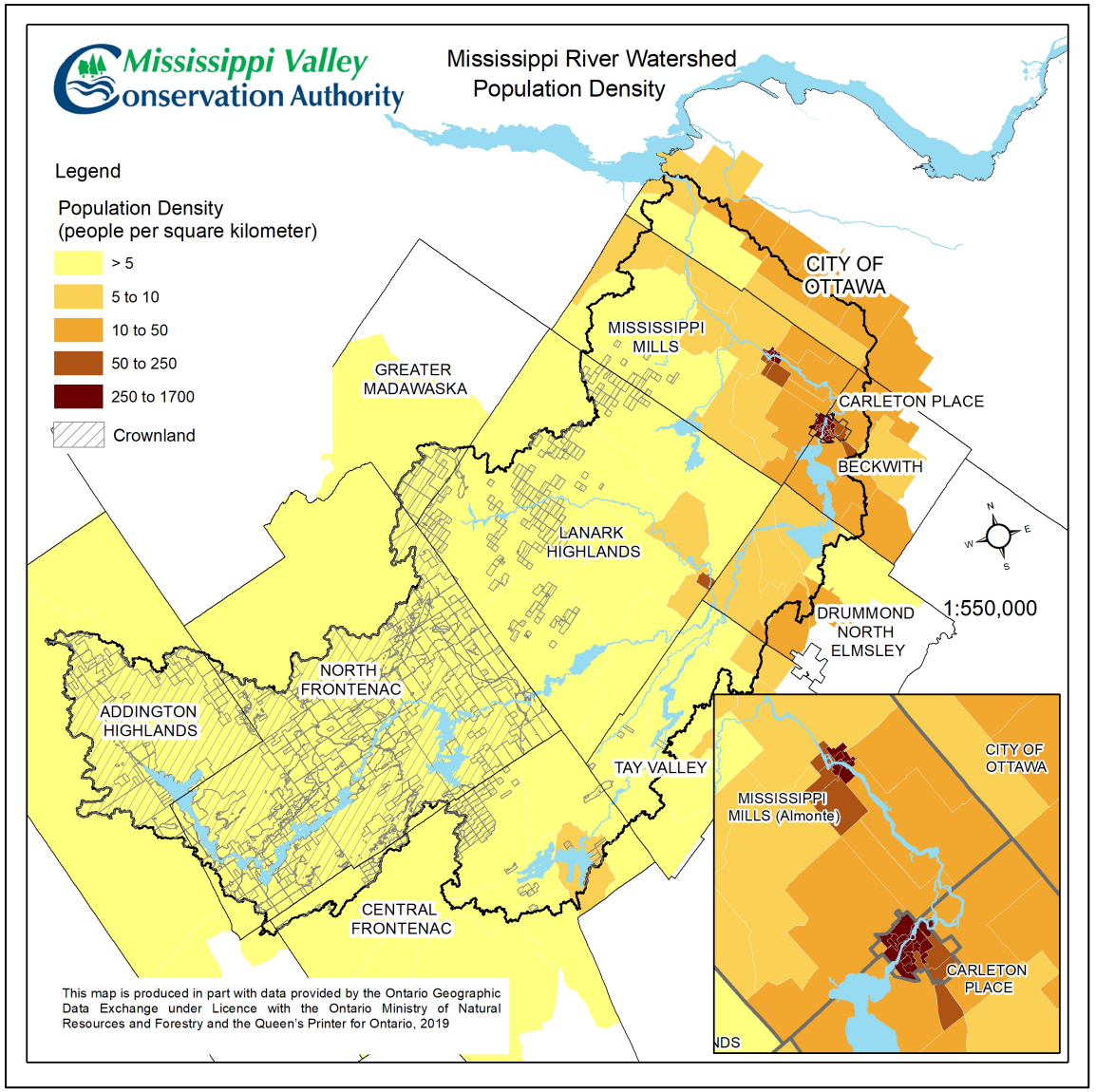

Figure 5: Population Density

Indigenous

The Ardoch Algonquin First Nation is an Anishnabek community that is located in the Madawaska, Mississippi and Rideau Watersheds. The Shabot Obaadjiwan First Nation[3] is north of Kingston with its areas also extending into the watershed.

The Ardoch communities' roots are in the families who wintered where the three rivers (Mississippi, Madawaska and Ottawa Rivers) came together. Those communities hold very strong relationships with their homeland and its natural environment, which go back thousands of years and have been preserved in traditional stories such as Wisakedjak. The Kchi-Mshìkenh, the great turtle whose head sticks out of the cliff at Mazinawgamìg (Bon Echo Park), is recognized as one of many sacred places within their homeland. The Manòmin (wild rice) at Ardoch is also a strong component of Ardoch's identity as a community. A plaque at Ardoch commemorates the struggle back in the early 1980's to preserve manòmin from commercial harvesters. (Ardoch Algonquin First Nation Website, http://www.aafna.ca/)

Seasonal Population

There is a large seasonal population (cottagers) that is not accounted for in the Statistics Canada Census data. Actual numbers are not available but estimates have been derived for Frontenac County, where cottage properties are prevalent. For the Township of Central Frontenac it is estimated the population increases by 250% during cottage season, and for North Frontenac it estimated to be almost six times the year round population (Watson & Associates, 2014). Much of the seasonal population comes from nearby urban areas such as Ottawa and Kingston.

See Appendix A: Table A-3 for data.

[3] Formerly known as the Sharbot Mishigama Anishinabe Algonquin First Nation and as the Sharbot Lake Algonquin First Nation.

Properties and Structures

Municipal assessment data for 2018 shows 31,610 properties in the Mississippi River Watershed. An estimated 8,510 (27%) of those are waterfront properties. In areas close to Ottawa, such as Mississippi Mills, Carleton Place and Mississippi Lake, considerable waterfront development is classified as permanent homes. In the upper, southwest part of the watershed significant seasonal cottage development still exists, with continued redevelopment and conversion towards permanent year round use.

Remaining vacant waterfront is largely crown land with little private land available for the creation of new waterfront lots. Waterfront development is therefore primarily in the form of intensification, through the expansion of existing developments and conversions from seasonal to year round use. Second tier ("back lot") development, behind the existing waterfront properties, is also an emerging trend in the waterfront areas. See Appendix A: Table A-4 for a summary of properties and waterfront properties by municipality.

A number of waterfront properties are water access only, either on islands or along lakeshores where there is no viable option to construct an access road. Challenges include issues with securing permanent docking facilities on the main land, and the disposal of septic waste, where a conventional septic system can't be placed on the property. Some use composting toilets and other's use holding tanks where septic pumpers provide barged services.

Many of the lakes in the upper watershed have a 66 ft. (20 m.) shore road allowance that was established at the time the crown land was severed and sold as waterfront lots. Over time some municipalities have allowed waterfront property owners to apply for closure of the shore road allowance that lies between their property and the waterbody. This has occurred on a piece meal basis throughout the upper watershed.

The number of structures throughout the watershed is presented in Appendix A: Table A-5. It also provides a summary of the number of structures within mapped flood risk areas, and within 30 metres of water (see side note).

There are an estimated 56,800 structures of various kinds within the watershed. Almost half of these are classified as "sheds", with the remainder representing mostly houses, cottages and detached garages. About 6900 structures are located within 30 metres of a waterbody, 3457 of those are houses and cottages. Almost 1500 structures are located within a mapped (1:100 Year) floodplain area and 497 of those are houses and cottages.

The 30 Metre Water Setback

A 30 metre water setback is the standard used in provincial guidelines and most municipal planning documents as the minimum distance needed to provide for protection of water quality and the aquatic environment. Much of MVCAs municipal plan review function is focused on reviewing and commenting on applications for development within the 30 metre setback. Some municipalities have invoked grandfathering provisions to implement earlier setback standards that fall below the 30 metre minimum.

Appendix A: Table A-5 provides the number of structures that are located within 30 metres of a water body.

Natural Hazards

Natural Hazards include flood hazards, erosion hazards, unstable soils and hazardous slopes. The watershed has some significant flood prone areas as well as some locations where potentially unstable soils present a slope failure hazard (see Backgrounder One: The Physical Environment). The *Provincial Policy Statement, 2020* (S.3.1), requires that municipalities identify and direct development away from these natural hazard areas[4]. Flood hazard areas are identified in the municipal Official Plans and Zoning By-laws based on mapping produced by MVCA.

MVCA Role in Natural Hazards/MVCA Regulation

In the review of planning applications, Conservation Authorities are the lead agency responsible for implementing the Natural Hazards policies. MVCA also addresses natural hazards through the implementation of its own "*Development, Interference with Wetlands & Alteration to Shorelines & Watercourses Regulation" (O.Reg 153/06).* Under this, MVCA regulates development and related activities in and near natural hazard areas such as shorelines, floodplains, unstable slopes, wetlands, and other hazardous lands (karst topography and Leda clay).

Regulation Limits

Regulation limits are used to delineate the areas where the MVCA Regulation applies. They are mapped according to criteria outlined in MVCA's *"Reference Manual for the Preparation of Regulation Schedules" (2005)***,** based on guidelines set out by Conservation Ontario and the Ministry of Natural Resources & Forestry (MNRF). The regulation limits are intended to capture three main components:

- Potential hazards associated with flooding: applicable only in areas where floodplain mapping has been produced
- Potential hazards associated with slope instability, stream bank and valley erosion, and erosion associated with meandering rivers or streams: applicable only in areas where floodplain mapping has been produced (the erosion hazard limits have been added to the floodplain mapping).
- Wetlands: applicable to all wetland areas that are greater than 0.5 Ha in size and where the wetland is hydraulically connected to a surface water feature[5].

Defining the Flood Hazard

In the Mississippi River Watershed the flood hazard **(floodplain)** is defined and mapped based on the 100 year flood. The **100 year flood** means that flood, based on an analysis of precipitation, snow melt, or a combination thereof, having a return period of 100 years on average, or having a 1% chance of occurring or being exceeded in any given year (PPS, 2014).

Around Mississippi Lake, the floodplain is managed under the **Two Zone Concept**, where the floodplain is divided into two parts: the floodway and the flood fringe. See Appendix A: Note 2b

[4] The PPS generally requires that development is directed outside of all flood hazard areas except for parts of the flood plain that are specifically identified as either a "Two-Zone Area" or a "Special Policy Area". In the watershed, Mississippi Lake is the only location where the Two-Zone concept is applied.

[5] When first approved in 2006, the MVCA adopted Implementation Policies for O.Reg.153/06 that restricted the regulation of wetlands only to Provincially Significant Wetlands. In 2017, to meet regulatory requirements, the MVCA adopted full implementation of the regulation to include all wetlands that meet this criteria.

In order to determine the regulated area along a watercourse, the flood hazard limit and the erosion hazard limits are both mapped, and the Regulation Limit is based on a 15 metre setback from the furthest landward limit of those two lines.

The regulation also applies along the shorelines of all waterbodies, including lakes, rivers, streams and creeks. There is no mapped Regulation Limit associated with these features.
The mapped Regulation Limit for flood hazard, erosion hazards and Provincially Significant Wetlands is shown in Figure 6. Mapping of the Regulation Limits for non-PSWs is not available.

Implementation of the MVCA Regulation

Policies to guide the implementation of the regulation are set out in the MVCA Development, Interference with Wetlands and Alteration to Shorelines and Watercourses - Regulation Policies (updated, 2015). The policies complement the Hazard Land policies for land use planning set out in Section 3.1 of the PPS. See Appendix A: Note 2a for definitions.

The regulation applies to:

- **Development**
- **Alterations to Shorelines & Watercourses**
- **Interference with Wetlands**

Crown land

Crown land makes up 770 km^2 of land area, or 21% of the total watershed area. Another 208 km^2 of crown land covers lakes and other bodies of water bringing the total crown land coverage (land and water) to 26% of the total watershed area. Where crown land is over a lake or river, the crown has jurisdiction over the bed of the waterbody.

Crown lands are classified and managed according to four categories: Provincial Parks, Conservation Reserves, Enhanced Management Areas and General Use Area (GUA). In the Mississippi River Watershed, Provincial Parks and Conservation Reserves make up 110 km^2 of the total crown land area and the remaining 660 km^2 fall under the category of General Use area. Except for the Burnt Lands Provincial Park, the crown land is all located on the Shield part of the watershed. The potential future sale of crown land by the province for residential or commercial development is an unknown.
Appends B2: Note 3 provides a description of the four categories of crown land.

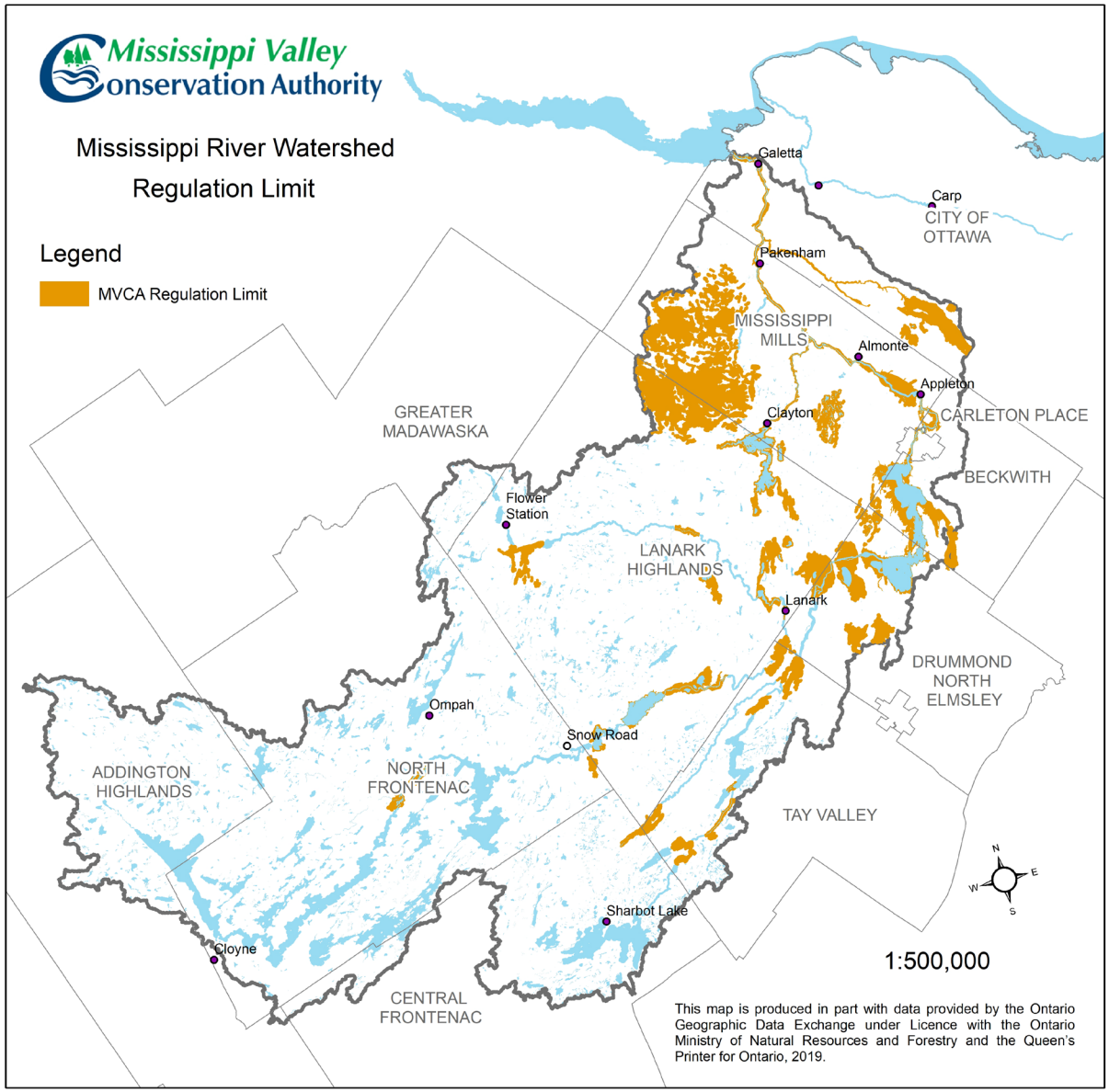

Figure 6: MVCA Regulation Limit

Drinking Water and Waste Water Treatment

Carleton Place and Almonte are the only two fully serviced (municipal water and sewer) settlement areas within the watershed. Combined, they account for 37% of the population. There are also a number of communal wells and designated facilities for nursing homes, schools, and similar facilities that supply drinking water to the public. The remaining population depends on private wells and septic systems.

Municipal and Private Drinking Water Supply

Almonte

The Town of Mississippi Mills supplies drinking water to Almonte from five municipal wells (Figure 7). Constructed between 1948 and 1991 the wells vary in depth from 38 to 79 metres drawing groundwater from the Nepean Sandstone Aquifer. Chlorine is added to the well water to disinfect it before it enters the distribution system. Excess water is stored in an elevated water tower for periods of peak demand. The water is consistently in compliance with Ontario Drinking Water Quality Standards with the exception of naturally occurring high levels of sodium. (www.mrsourcewater.ca/en/almonte)

Carleton Place

Water is supplied within the Town of Carleton Place by its water treatment plant (WTP) and distribution system. The WTP, built in the early 1900s, is located 900 metres downstream of Mississippi Lake and draws surface water from the Mississippi River (Figure 7). In the 1980s it underwent significant upgrades, followed by upgrades to the water treatment process in the early 2000's (D.Young pers.comm). Operation of the municipal water and wastewater facilities is carried out under contract by the Ontario Clean Water Agency (OCWA).

The WTP uses a coagulation/flocculation/sedimentation treatment process. Water is also stored in a clearwell (3,150 m^3) at the WTP and in an elevated water tower (3,200 m^3). It has a capacity of 12,000 m^3/day and averages about 4,460 m^3/day with a maximum daily average of 6,000 to 8,000 m^3/day (J.L Richards, 2018). The Town has initiated the planning process to undertake expansion to the Water Treatment Plant to accommodate the current and projected growth.

KEY CONSIDERATIONS

Mississippi-Rideau Source Protection Plan (MRSPP) addresses drinking water threats for the municipal water services but does not address private services.

About 2/3 of the watershed population is serviced by private wells and septic systems and falls outside of the scope of the MRSPP.

Settlement areas (villages, hamlets, etc.) with high concentrations of private septic systems and wells may be particularly vulnerable to well contamination.

Water for the Town of Carleton Place is drawn directly from the Mississippi River.

Almonte's water supply is drawn from an aquifer with good overall quantity and quality.

Carleton Place Water and Wastewater Treatment systems are both slated for expansion to accommodate growth.

Harmful Algae Blooms (HABs) pose a potential threat to surface water intakes, both private and municipal.

During the Level 3 drought conditions of 2016 the Carleton Place WTP experience an increase in demand that caused issues at the plant. In 2018, the Town undertook resiliency plans for both its WTP and its Waste Water Treatment Plant, to assess vulnerability of both facilities to climate change. The study concluded that the predicted effects of climate change will be largely addressed through the expansions required to accommodate future growth – an increase from 12,000 to 17,000 m^3/day to service growth to 2038. (J.L Richards, 2018).

The resiliency study largely focussed on anticipated impacts to water quantity and less on impacts to water quality and the potential increase in Harmful Algae Blooms (HABs) on Mississippi Lake and higher nutrient concentrations.

Communal Wells and Designated Water Facilities

Drinking water is also supplied by a number of communal wells within the watershed. Figure 7 shows 46 such facilities throughout the watershed. They service non-municipal facilities such as trailer parks, campgrounds/resorts, mobile home parks and churches. They also service municipal facilities such as community halls, township offices and sports complexes.

Private (individual) Residential Drinking Water Wells and Intakes

While almost two-thirds of the population obtain their water from private wells, the total number of private wells is not known. The Ministry of Environment, Parks and Conservation (MECP) Water Wells database (2013) identifies 12,964 private wells in the watershed. The actual number will be higher as both older and post-2013 wells are not included in those records (Figure 7).

Private Surface Water Intakes

The Source Protection Plan (Pages 18 to 20) does not address the use of surface water for a private drinking water supply. The watershed has an estimated 8500 waterfront properties, located mostly in the rural areas with no municipal services. Residents using private surface water intake could include both permanent and seasonal residents (cottagers). Most would also be discharging wastewater within 50 metres of a water body to septic facilities.

While well record data is incomplete, anecdotal and mapping information would suggest that a potentially high number of waterfront residents rely on a surface water intake, rather than a groundwater well, for their water supply. On Mississippi Lake in particular, where there are a large number of year round residents and where Harmful Algae Blooms (HABs) have been documented in recent years, the issue of surface water quality and the options and effectiveness of private surface water treatment are matters of growing concern. It is assumed

KEY CONSIDERATIONS CONT'D

Lanark Village has a documented history of private well contamination from nearby septic systems. This ongoing issue is recognized in background reports but not addressed in the policies of the MRSPP.

The MRSPP identifies most of the watershed as Highly Vulnerable Aquifer, which is highlighted as a concern for private wells in the rural parts of the region.

An unknown number of households draw their water from a surface water source (lake or river).

Most residential surface water treatment systems cannot adequately remove toxins associated with harmful algae blooms.

The MRSPP mapped Significant Groundwater Recharge Areas where surface conditions provide for rapid recharge of the aquifer. The plan recommends using Best Management Practices (BMPs) to prevent road salt and other contaminants from entering the aquifer.

Road salt is identified as a primary source of potential contamination of surface and groundwater . The Code of Practice for the Management of Road Salts (Env. Can 2002) should be considered

most of these households would utilize a residential water treatment system (ex. ultraviolet, reverse osmosis, carbon filter, etc.) to treat their drinking water supply, which are largely ineffective at treating toxins released from HABs.

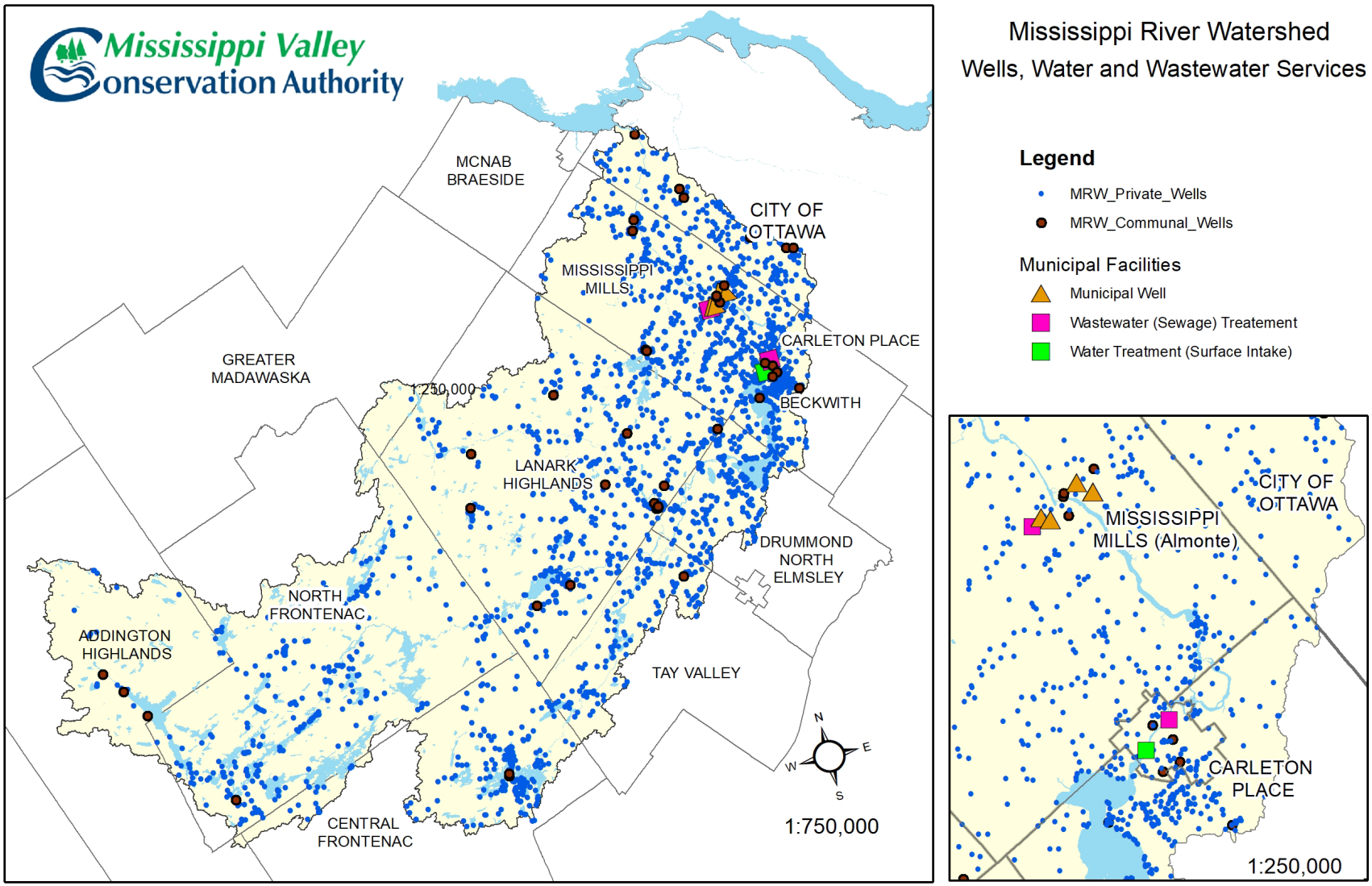

Figure 7: Wells, Water and Wastewater Services

Source Water Protection

In Ontario, the protection of drinking water falls under the authority of the Ministry of Environment, Conservation and Parks (MECP) through implementation of the *Clean Water Act, 2006*. A Drinking Water Source Protection Program was established to protect municipal sources of drinking water. Source Protection Regions were identified and local multi-stakeholder Source Protection Committees were established to oversee the development of local Source Protection Plans (SPP). The SPPs are required to identify four categories of vulnerable areas (see information box), where certain activities may be a threat to drinking water, and to include policies to address all drinking water threats[6].
See Appendix A: Note 4 for details.

Conservation Authority & Municipal Roles

The Mississippi River Watershed falls within the Mississippi-Rideau Source Protection Region, made up of the both the Mississippi and the Rideau Source Protection Areas, and encompassing the full area of jurisdiction under each of the two CAs. The MVCA and RVCA Boards of Directors are the Source Protection Authority for their areas and are responsible for supporting the development and implementation of the Mississippi-Rideau Source Protection Plan (MRSPP).

Municipalities are responsible for long-term implementation of the policies of the MRSPP which is managed largely through their development review and land use planning decisions. Support staff, including Risk Management Officials and Inspectors are based out of the RVCA office and support the municipalities in this role.

Four Types of Vulnerable Areas under *Clean Water Act*

- Wellhead Protection Area (WHPA)
  - around municipal wells - Almonte
- Intake Protection Zone (IPZ)
  - around municipal surface water intake – Carleton Place
- Highly Vulnerable Aquifer
- Significant Groundwater Recharge Area (SGRA)

In the Mississippi-Rideau Source Protection Plan (MRSPP, 2014) the vulnerable areas include WHPAs around the Almonte municipal wells, an IPZ for the Carleton Place municipal water intake, extensive areas of Highly Vulnerable Aquifer, and some pockets of Significant Groundwater Recharge Area throughout the watershed. See Appendix A: Note 4 for more detail about vulnerability score in each area

Almonte Well Head Protection Areas (WHPA)

The extent and vulnerability scores of the WHPAs around the five Almonte municipal wells is shown and described in Appendix A: Figure A-1.
The WHPAs for the two wells northeast of the river cover 520 Hectares that include commercial lands along March Road, rural lands and residential development in the form of estate lot subdivisions along Appleton Side Road. The WHPAs for the three wells on the southwest side of the river cover 280 Hectares that include rural lands, residential lands, the Almonte wastewater treatment facilities, and the municipal office. Vulnerability scores of 8 to 10 represent areas of significant vulnerability where the MRSSP policies regarding "significant threats" would apply.

[6] The *Clean Water Act* defines four categories of vulnerable areas. These areas are assigned vulnerability scores. The scores are based on the degree to which they are vulnerable to contamination and are used to determine what activities are considered to be a threat. Policies are put in place to address significant threats.

Carleton Place Intake Protection Zone (IPZ)

The Carleton Place Water Intake is located just downstream from Mississippi Lake. Appendix A: Figure A-2 shows the portions of the Carleton Place IPZ area with vulnerability scores of 8 to 10, representing the areas of significant vulnerability where the MRSSP policies regarding "significant threats" would apply. It extends 3 to 4 km upstream through mostly residential lands, fronting on or close to the shores of Mississippi Lake. It also includes transportation corridors running along the major roadways in the area (Highway 7 in particular), where a transportation related spill could quickly reach the surface water intake.

Village of Lanark

The Village has a population of approximately 869 (2001 census) who rely on private wells and septic systems. Historic water quality issues resulting from bacterial and nitrate impacts to private wells have been documented in the Village since 1979. Surveys conducted in 2000 found nitrate impacts in 75% of the wells sampled. Bacterial testing found 16% were unsafe and 8% with some level of bacteriological impacts. Work was done in 2005 to identify a potential location for a communal well supply northwest of the village (MRSPR, 2008). A work plan was set out to undertake delineation of wellhead protection areas and vulnerability scoring and to undertake a Threats and Issues Evaluation (MRSPP 2011). This work has not yet been done and the MRSPP does not directly address the Lanark Village drinking water issue.

Highly Vulnerable Aquifer

Almost the entire watershed is classified as having highly vulnerable aquifers except for some areas at the north (downstream) end of the watershed and around Balderson (see Appendix A: Figure A-3). This reflects a landscape that is dominated by shallow soil, large areas of exposed bedrock, and permeable overburden deposits

The predominance of highly vulnerable aquifer suggests that, over much of the watershed, contaminants could travel quickly into the aquifers and potentially cause risk to users drawing drinking water from those sources. This is a concern for private wells in the rural parts of the region where an estimated 63% of the permanent population use groundwater wells for their drinking water.

There is no requirement for prohibiting or requiring a Risk Management Plan for certain activities in these areas. The MRSPP does however include policies for managing Waste Disposal sites, encouraging the wise use of road salt, and promoting best management practices through education.

Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas are areas where gravel deposits or other soil features allow a significant amount of rain and snowmelt to infiltrate down into the groundwater. Wetlands also function as recharge areas under certain hydrologic conditions. The Mississippi-Rideau Source Water Protection Program derived mapping and estimates of groundwater recharge[7] (see Appendix A: Figure A-4).

[7] With limited well records for the area, the deficiency in data presented challenges in mapping and determining groundwater recharge contributions. The information regarding groundwater recharge throughout the watershed represents a best estimate based on the limited information that is available.

The resulting mapping of Significant Groundwater Recharge shows that these areas are generally sparsely scattered throughout the watershed, covering about 9% of the total watershed area. Wetland areas represent about one third of the total significant groundwater recharge area. For source protection planning, the Significant Groundwater Recharge Areas receive a score of 2 to 6 depending on the area's vulnerability. In these areas, except for DNAPLs, there are no activities that are categorized as a significant threat. The only MRSPP policies that apply are for encouraging the wise use of road salt and promoting best management practices through education.

This may also represent an area where further research and consideration is needed to provide for a better understanding of surface to ground water interactions.

Urban Runoff

Urban runoff is the surface runoff of precipitation in urbanized areas. Urban stormwater systems are designed to convey overland flow from the impervious surfaces created by urban development (roads, parking lots, rooftops and sidewalks) during rainfall and snowmelt events. Urban runoff can be a major cause of urban flooding when runoff amounts overwhelm the capacity of drainage systems, such as storm sewers. Triggered by events such as flash flooding, storm surges, overbank flooding, or snow melt, urban flooding can impact urban locations that are located outside of any formally designated floodplains and/or away from any body of water. Urban runoff can also be a major source of water pollution, particularly road salt.

Road Salt

Road salt is used to maintain safe road and property conditions in winter, but excess use and mishandling can be harmful to aquatic ecosystems, plants and wildlife; deteriorate infrastructure; and impair drinking water sources. Excess salt use on roads, parking lots, and sidewalks can cause the primary chemical components of road salts (e.g. chloride) to degrade the quality of water resources. Run-off resulting from the melting effect of road salt percolates through soil to reach groundwater resources or flows over land to surface water. Road salt is a key contributor of sodium and chloride in water supplies. Responsible road salt management (storage and application) can help reduce the negative environmental impacts of road salt and preserve the quality of drinking water. Municipal snow dumps can also be a significant source of road salt entering surface and groundwater.

The Government of Canada (Environment Canada, 2002) Code of Practice for the Application of Road Salts applies to organizations that use more than 500 tonnes of road salts per year (five-year rolling average); and organizations that have vulnerable areas in their territory that could be potentially impacted by road salts. It sets out recommendations for the development of a Salt Management Plan, best management practices (for alt storage, snow disposal and salt applications) and record keeping and reporting.

Water Taking Permits

Within Ontario, any use of more than 50,000 L/day requires a permit to take water (PTTW). The PTTW program is operated and enforced by the MECP which maintains a PTTW database listing all large water users and permitted water takings. It should be noted that the current PTTW database is only the maximum daily permitted water withdrawal amount and not the actually daily usage. It should also be noted that the terminology “water taking” is somewhat misleading in that in many instances, the permit holder is not actually “taking” water for the purpose of consumption, but are instead using the water as part of a process where it is diverted and cycled right back into the system. The power producers are one such example where they are running water through their turbines but are not actually “taking water” out of the system.

Appendix A: Table A-6 provides a list of current Permits to Take Water that are listed on the MECP website. While it provides an indication of some of the larger water users within the watershed, it isn't a measure of actual water consumption. The users with the highest daily allowances of surface and groundwater are generally the pit and quarry operations, with daily allowances ranging 455 to 24,880 m^3/day. The Town of Carleton Place water accounts the highest surface water allowance at 12,000 m^3/day, and the Town of Mississippi Mills accounts for the highest groundwater allowance also at almost 12,000 m^3/day.

Municipal Wastewater Treatment

There are two municipal sewage treatment facilities in the watershed, the Carleton Place facility and the Almonte facility, which both discharge into the Mississippi River. Combined they provide sewage treatment for about 37% of the population. The remaining 67% the population rely on private on-site sewage disposal systems (septic systems).

Almonte

The Town of Mississippi Mills constructed a new wastewater treatment facility in 2012 to replace the former wastewater lagoons plant servicing the Town of Almonte. The plant has capacity to serve the growth needs of Almonte through to beyond 2031. The plant also provides for treatment of septage materials which are pumped and hauled from private septic systems in the rural areas of Pakenham and Ramsay. Operation of the facility is carried out by the Ontario Clean Water Agency (OCWA). The new facility meets the current provincial water quality requirements for effluent discharges to the Mississippi River.

Carleton Place

The Carleton Place Waste Water Treatment Plant (WWTP) is located at the northeast end of town on the south side of the Mississippi River. It was originally built in the early 1970s and underwent major reconstruction in 1993. The rated capacity of the WWTP as per the MECP Certificate of Approval (C of A), is 7.9 MLD (average day flow) and 22 MLD (peak day flow). To accommodate projected growth, current capacity will need to be increased from 7.9 MLD to 11.8 MLD. This will require upgrades to certain components within the WWTP (J.L Richards 2018). With recent growth rates substantially higher than the projected 150 units/year, timing for the expansion is being adjusted and the Town is now initiating the process.

Current effluent discharge limits identified in the Certificate of Approval (C of A) are set at 1 mg/L for Total Phosphorus and 4 mg/L for Total Ammonia. It is expected that with the future expansion of the WWTP, more stringent limits[8] will be put in place by MECP that will necessitate the addition of tertiary treatment.

In 2018, the Town commissioned a Resiliency Plan study to assess the vulnerability of its water and waste water treatment plants to the impacts of climate change. The study

KEY CONSIDERATIONS

The Almonte Wastewater Treatment Plant has sufficient capacity to meet projected growth up to 2031.

Carleton Place is planning expansion of the Wastewater Treatment Plant to accommodate growth.

Growth and climate change are expected to place increased demands on water and wastewater requirements related to water availability and water quality (effluent discharge limits, water epidemiology, etc.)

Almost two-thirds of the watershed population relies on septic systems.

Failed systems can contaminate the groundwater, impair surface water quality in waterfront situations, and contribute to Harmful Algae Blooms (HABs).

The Highly Vulnerable Aquifer status throughout most of the watershed poses a risk of ground water contamination from septic systems, road salt and other pollutant sources.

[8] Total Phosphorus: 0.2 mg/L for June, July, August and 0.3 mg/L for the rest of the year. Total Ammonia: 3.63 m/L for June, July, August and 15 mg/L for the rest of the year.

concluded that the predicted effects on the WWTP are not considered to be overly severe, and should not result in significant additional investment beyond the upgrades needed to accommodate population growth (J.L Richards 2018). Additional recommendations centre on contingency planning for back up of power during prolonged outrages and providing for sufficient emergency bypass capacity.

Private Septic Services

An estimated two-thirds (67%) of the population rely on private on-site septic systems to dispose of and treat septic waste. The regulation of private residential septic systems falls to the municipality under authority of the *Building Code Act* (BCA, 1992). Part 8 of the *Ontario Building Code* (OBC) regulates the design, construction, operation and maintenance of sewage systems. The OBC regulation applies to systems with a design flow of less than 10,000 Litres/day, serving no more than one lot. Most municipalities have entered into an agreement with their local Health Unit or other authority to administer this function. Septic system permitting authorities are listed in Table 2.

Concerns centre on the proper functioning and maintenance of these systems. Failed systems can contaminate the groundwater and impair surface water quality in waterfront situations. The Highly Vulnerable Aquifer status throughout the watershed heightens this concern, particularly in rural settlement areas where there are concentrations of development on private wells and septic systems.

Table 2: Septic System Permitting and Re-inspection Programs within the Watershed

Upper Tier	Municipality	Septic Authority for Permitting and Regulations	Voluntary Reinspection Program	Mandatory Reinspection Program
Lennox and Addington	Addington Highlands	Kingston Frontenac Lennox and Addington Health Public Health (KFL&A Public Health)	No	No
Frontenac	North Frontenac		Yes (MRSSO, 2005)*	No
	Central Frontenac		Yes (MRSSO, 2011)	Yes, on specific lakes (MRSSO, 2019)
Lanark	Beckwith	Leeds, Grenville and Lanark District Health Unit (LGLDHU)	No	No
	Carleton Place		No	No
	Drummond-North Elmsley		Yes, outside MVCA (MRSSO, 2000)	No
	Lanark Highlands		No	No
	Mississippi Mills		No	No
	Tay Valley	Mississippi Rideau Septic System Office (MRSSO)	Yes (MRSSO)	Yes on specific lakes (MRSSO)
Renfrew	Greater Madawaska	in-house	No	
City of Ottawa		Ottawa Septic System Office	No	

*initiated in 2005 on Kashwakamak Lake only, expanded to other lakes over time

Septic System Re-Inspection Programs

The *Ontario Building Code* gives municipalities the power to implement mandatory septic re-inspection programs to carry out inspections of existing septic systems. Mandatory inspections can also be required within Source Protection Areas (pgs. 18 to 19)[9]. Under a mandatory program, property

[9] Septic systems within either the IPZ 8 or the IPZ 10 are required to have mandatory inspections every 5 years once the system is 5 years or older.

owners are required to participate in the program when their property has been identified. Under the voluntary component, the property owner can choose not to participate.

Three municipalities within the watershed implement a voluntary re-inspection program for waterfront properties. They include Central Frontenac, North Frontenac and Tay Valley Township. Central Frontenac and Tay Valley Township also implement a mandatory re-inspection programs on a number of lakes within their municipalities including Bennett, and Sharbot (west basin), and Silver Lakes in the Mississippi River Watershed. All three of these programs are carried out, under contract, by the Mississippi Rideau Septic System Office.

Solid Waste Management / Landfills

Most municipalities have lands designated for waste management uses. The locations of the known landfills within the Mississippi River Watershed are shown on Figure 8[10]. The mapping, based on information collected for the Mississippi-Rideau Source Protection Plan, includes both active and inactive (closed) landfill sites. Closed landfill sites are commonly used as transfer stations for the temporary deposit and storage of waste before transport to an active site. The location and status of landfill sites throughout the watershed will be updated as more current information in available.

Landfills present a potential source of contamination to surface and groundwater through the infiltration of leachate. Some natural attenuation of leachate may occur through the degradation of contaminants by microorganisms but cannot be relied upon to eradicate all contaminants. Lining and sealing of landfills, both active and closed, is a standard practice to prevent ground and surface water contamination.

Under the *Environmental Protection Act, 1990 (*S27) an Environmental Compliance Approval from the Ministry of Environment, Conservation and Parks is required for the establishment, operation, alteration or enlargement of a landfilling site. It also sets out requirements for the closure, maintenance and monitoring of the site. Municipalities are responsible for ongoing monitoring and annual reporting to the MECP.

KEY CONSIDERATIONS

As potential sources of both groundwater and surface water contamination there is a need for ongoing monitoring of active and inactive landfill sites.

Capacity management and the need for new facilities or improved surface and groundwater management

[10] This information is based on information that was collected for the Mississippi Rideau Source Protection Plan. More up to date information is being sought and will be included in a future revision or addendum to this document.

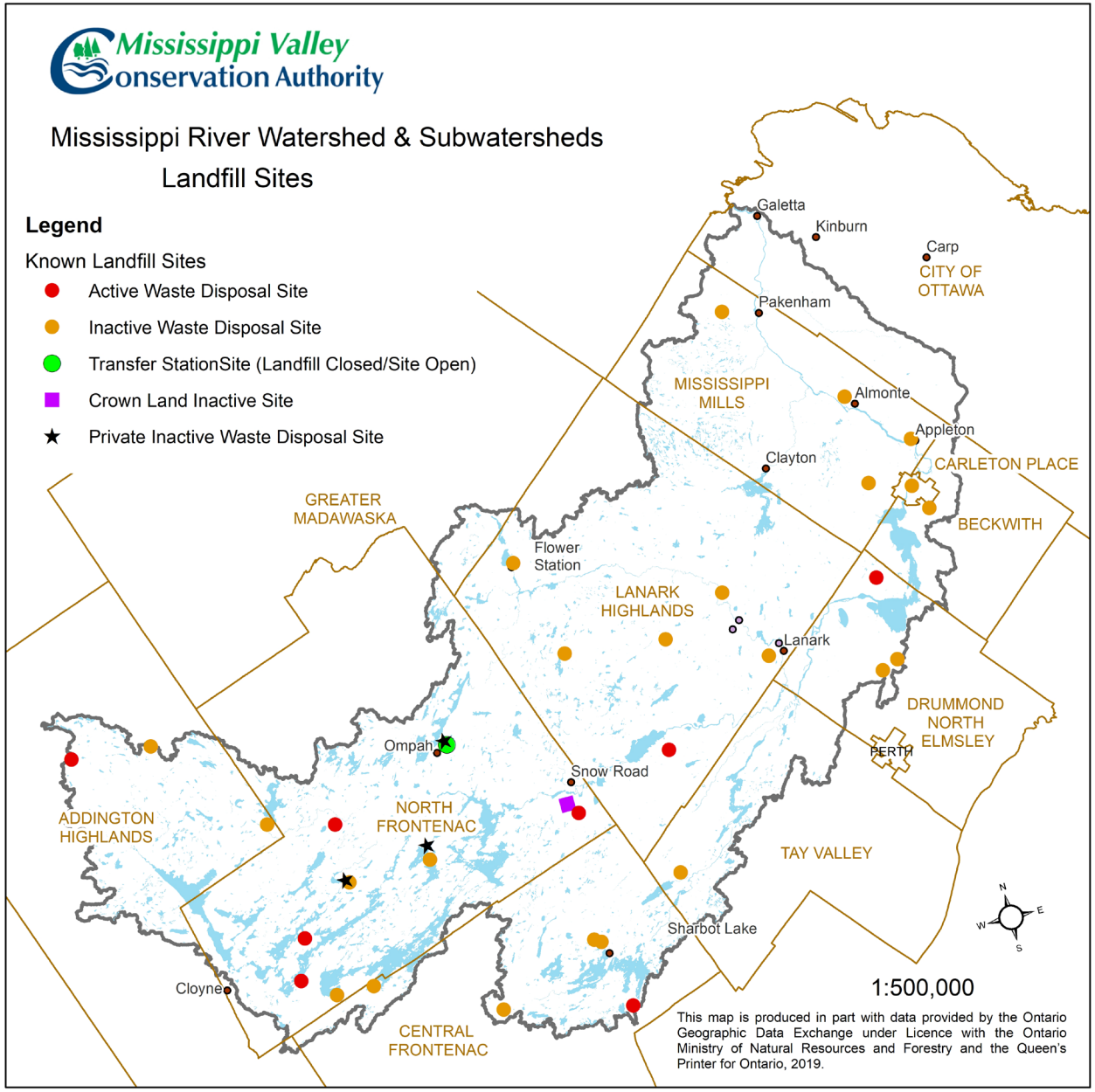

Figure 8: Landfill Sites

The Economy

Agriculture

While agricultural lands make up only 11% of the overall watershed, in the lower watershed downstream of Carleton Place almost 50% of the area is classified as agricultural. These lands support a broad mix of agricultural activity, including specialty beef cattle and other livestock production, grain and oil seed farming, maple syrup production, market gardens for fruits and vegetables, and a number of dairy farms and specialty farming operations. See Appendix A: Table A-7 for the breakdown of agricultural land by subwatershed.

Here and across most of the province, there has been a steady decrease in agricultural land, as much farming has become less economically viable and the lands have become fallow or have been converted to other uses. The Agricultural Census from 1991 to 2016 for Ottawa and Frontenac, Lanark and Lennox & Addington Counties confirms this steady decline. (Appendix A: Figure A-5).

The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) is currently undertaking a study of food, agriculture and economic opportunities in Lanark County. Preliminary findings indicate that the agri-food sector is a much larger presence in Lanark County than in other parts of the province. It is also noted that Lanark County has low farmland rental rates compared to farmland value, along with an availability of underutilized small parcels of farmland. This, combined with proximity to the city and the summer cottager and tourist markets, present great opportunity related to local food demand and small scale (market garden type) farming (OMAFRA, 2019).

The following general description of farming within the watershed is based on information for the 2006 to 2016 Agricultural Census for Lanark County. It therefore represents a broader geographical area that includes the county lands to the south where there are higher levels of agricultural activity.

While crop farming is the predominant land use (Appendix A: Figure A-5), having increased between 2006 and 2016, with over 40% of the agricultural land managed as crop land, it is well below the provincial average of 78%. Christmas trees, woodland and wetland, make up the second highest agricultural land use followed by natural pasture land, all of which showed a relative decline over the 10 year period.

KEY CONSIDERATIONS

Agriculture is shifting from livestock to cash crop farming, and towards land consolidation with removal of hedgerows and remnant forests, and increased tile drainage.

Recent assessments recognize Lanark County as having a significant opportunity related to local food demand and small scale farming (OMAFRA, 2019 study)

Climate change is expected to cause wetter winters and longer dry periods and a significant reduction in summer soil moisture.

Climate change will alter growing seasons, influence crop selection, and the likely introduction of new and possibly invasive species.

Ice storms and micro bursts associated with climate change can cause extensive and long-lasting damage to a Maple Sugar bush.

Figure 9 shows the changes in Lanark County farms by industry groups. While crop farming has remained predominant, it has shown a significant decrease in the last 10 years. Beef cattle ranching and farming, and dairy cattle and milk production, have also shown notable reductions. These decreases have been countered by an increase in percentage representation of oilseed and grain farming. Some of the traditionally smaller farm industries such as: greenhouse, nursery and floriculture; sheep and goat farming; vegetable and melon farming; and fruit and tree nut farming, have shown slight increases.

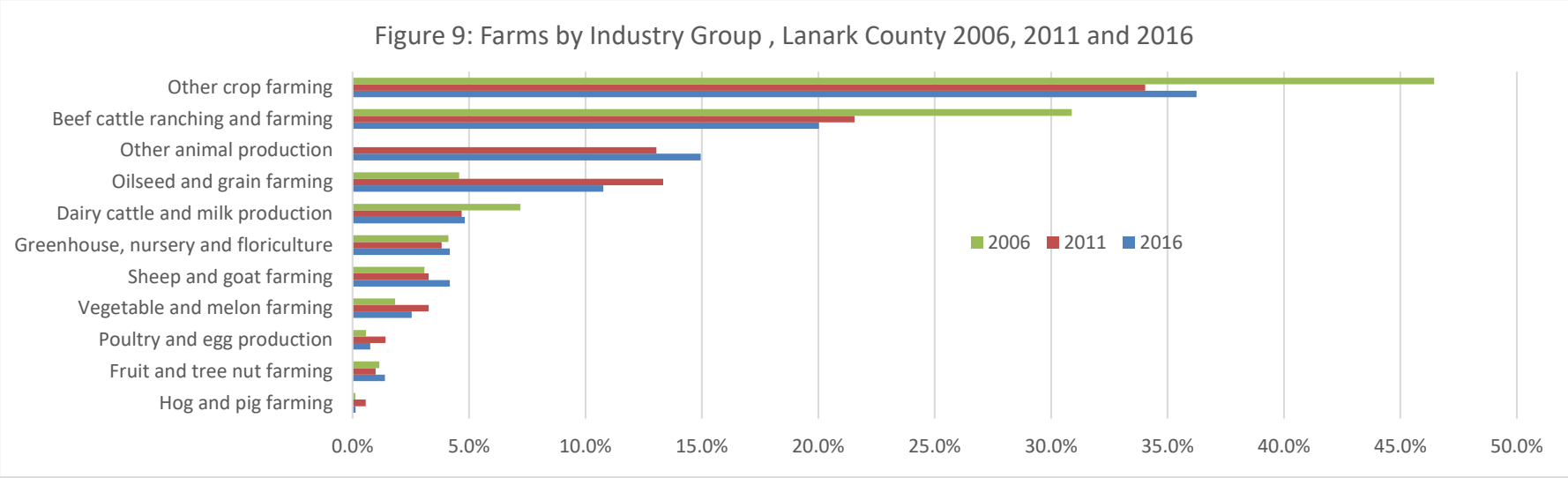

Figure 9: Farms by Industry Group

Crop farming remains predominant in Lanark County. Hay has historically been the predominant crop in this area and while it remains the primary crop it is being replaced with soybeans and corn. Fodder (silage) corn area, winter and spring wheat, oats, barley and mixed grains have remained relatively unchanged. See Appendix A: Figure A-6 and A-7 for Lanark County field crops from 2011 to 2016.

Irrigation, Tile Drainage and Climate Impacts

Irrigation and tile drainage are two key areas of concern in anticipating needs with regard to water usage and climate change. The increase in crop farming has led to increased drainage improvements on the landscape. While this allows farmers to access their lands earlier in the season, it also has repercussions in terms of over-drying the land. Climate change projections are predicting higher summer temperatures and evapotranspiration rates and lower precipitation. The result, more frequent and longer dry period and significantly lower soil moisture in the summer. Water demand for irrigation will be highest when water availability is at its lowest. The rapid movement of water off the land also promotes a flushing of nutrients into receiving waterbodies. Controlled tile drainage retrofits can be used to control runoff rates and reduce nutrient losses from tile drained fields by reducing the amount of drainage discharge from the tile drainage system during the growing season.

Changes in climate will also impact growing season, which could potentially change the makeup of the crop types and improve yields provided there is sufficient water available to grow the crops.

Maple Syrup Producers

Lanark County is one of the leading producers of maple syrup in Ontario and has been billed by the county as Maple Syrup Capital of Ontario.
The indigenous peoples of North America introduced the first European settlers to maple syrup and they used it as a common sweetener until cane sugar arrived around 1875. Maple syrup and sugar soon became one of the earliest agricultural crops produced in Lanark County. Only the eastern part of North America has the unique weather pattern that will trigger commercial flows of sap from sugar maple trees.

It takes 40 to 80 years for the trees to reach tapable size, but once established a sugar maple can live more than 200 years in favourable conditions. During a good sugaring season an average tap yields between 35 and 50 litres of sap, which will produce between 1 and 1.5 litres of maple syrup. A mature tree will generally have at least three taps. It takes an average of 40 litres of sap to make 1 litre of syrup. Year-to-year variations in the length of the season and sap flow can have a big effect on syrup production.

The Ice Storm of 1998 had devastating effects on the local Maple Syrup industry. Producers experienced tap reductions of at least 30 to 40 per cent. Ten years after the storm, trees with moderate damage were still not producing up to previous levels and many syrup producers would not have recovered without government financial assistance. Climate change impacts

Climate Impacts

Pests, diseases and invasive species are also a growing concern. A pest such as the Asian long-horned beetle could have a devastating economic impact on local forestry and maple syrup industries. With climate change these pests and other future threats of disease and infestation are expected to pose a serious challenge.

With the very specific requirements for successful maple syrup production in terms of tree size and age, and climate conditions, the industry could face other environmental challenges. Increased annual variations in length of tapping season and the occurrence of extreme weather events, such as the 1998 Ice Storm, can have profound effects on productivity and the overall health the maple sugar bush. A shift away from managing the sugarbush as a monoculture, to increased tree species diversity may help to reduce some of these impacts.

Forestry

Forestry and forest based industry has been an integral component of the watershed economy, particularly in the upper (southwestern) watershed. Shown in Figure 10, wooded lands make up 62% (2443 sq. km.) of the overall Mississippi River Watershed area. Forest cover amounts in all of the Canadian Shield dominated subwatersheds are very high, ranging from 66 to 78% of the total subwatershed area, whereas the lower (downstream) watershed is 29% forest. See Appendix A: Table A-8 and Table A-9 for the breakdown of forested land by subwatershed and by ownership.

The local economy and infrastructure was originally built largely upon the vast forest resources. The industry has undergone considerable change over recent decades. Most notably, with the reduced demand for pulp wood and the closing of the Domtar (Cornwall) paper mill in 2006, the market for low quality wood was substantially reduced.

In the watershed, the forest lands are mostly classified as tolerant hardwood, white pine mixed wood and immature forest. Although large tracts of land are forest covered, for the most part, the land is described as having only moderate capability for forestry, primarily due to soil limitations (MVCA, 1983).

The forested lands fall under provincial (crown), municipal (County) and private ownership. In the watershed 70% of the forests are privately owned, 28% are crown land and just under 2% are County owned.

Crown Land Forests:

The Ministry of Natural Resources and Forestry (MNRF) is responsible for protecting and managing Crown forest lands and resources (Figure 10). The forests are part of a provincially designated area, the Mazinaw-Lanark Forest Management Unit (FMU). Here, forest services are licensed to a private company, Mazinaw-Lanark Forest Inc. (MLFI). MLFI is owned and funded by local forest products companies and a group of independent loggers. Its role is to prepare, implement and monitor a forest management plan, annual work schedules and reports, and meet licensing obligations under the requirements of the *Crown Forest Sustainability Act, 1994*.

KEY CONSIDERATIONS

The Mazinaw-Lanark Forest Management Plan requires that, in any given year, no more than 2% of the Crown land forests within the management unit may be harvested.

The local industry has seen significant changes in recent decades, with reduced demand for pulp wood and a consumer movement away from local timber products.

Current forestry activities are vulnerable to the impacts of climate change including: extreme weather events, droughts, forest fire risk, and impacts to species composition.

Pests, diseases and invasive species are key concern, with the Emerald Ash Borer already having a marked impact.

In 2011, Mazinaw Lanark Forest Inc. produced a Mazinaw-Lanark Forest Management Plan (2011 to 2021). It requires that in any given year, no more than 2% of the Crown-land forests within the management unit may be harvested. Harvested areas, except for roads, landings and slash piles, must also be reforested. The Crown forests are restored primarily through natural regeneration, but some planting is done each year.
Appendix A: Note 3 provides information about crown lands in the Mississippi River Watershed.

Lanark County Community Forests:

In 2001, Lanark County assumed responsibility for the management of the Agreement Forests, renamed "Community Forests." In the watershed, Lanark County owns 27 properties (totaling 39.5 sq. km.) most of which are in the Township of Lanark Highlands. Their uses include, economic uses, such as timber harvesting, tourism and recreation, education and research, and Natural and cultural heritage. MVCA has a Memorandum of Understanding with the County of Lanark to provide professional forestry management services for the Community Forests (inventories, timber sales, management planning).

Privately Owned Forested Lands:

About 70% of the forested land in the watershed is privately owned and most of these properties are smaller than 80 hectares (200 acres). These forests contribute to the economy of the county through timber harvesting, firewood, maple-syrup production and the tourist and recreation industries. They will also provide a wide range of ecological benefits. The province offers a Managed Forest Tax Incentive Program that provides a reduction in property tax to landowners who commit to following a managed forest plan.

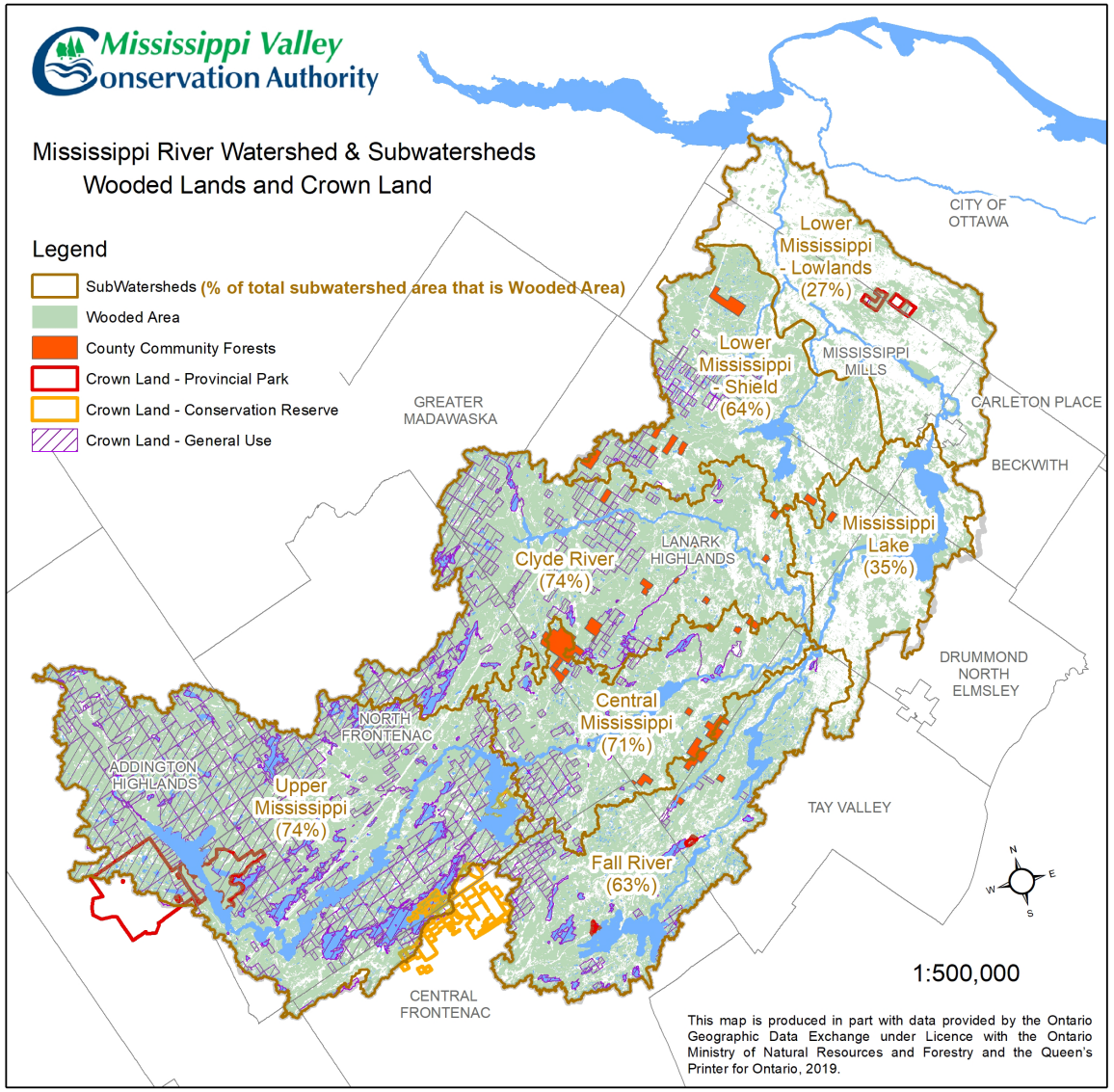

Figure 10: Wooded Lands and Crown Land

Forestry Concerns

The introduction of pests, diseases and invasive species is of primary concern within the local forestry sector. The Emerald Ash Borer is taking hold in the Ottawa and Lanark County forests and is expected to continue its spread west into the rest of the watershed. This species is already having a devastating impact on local woodlots. Other invasive species are on the rise and are expected to move into the watershed in coming years.

Changing trends in the market and economy are also having an impact on the forestry sector, as consumers move away from locally sourced material from local sawmills to big box suppliers. The industry is also susceptible to the unpredictability of the broader national and global markets.

Like agriculture, changes in climate and related extreme events may also have a profound effect on the health of the local forest resources. Prolonged dry seasons and droughts, microbursts and hurricanes, and ice storms all have severe and lasting impacts on forest health. Changes in temperature and growing seasons are expected to impact species composition. The implications of this are yet to be understood. The increased risk of forest fires is also a growing concern.

Aggregates and Mining

Mineral production in the watershed consists of non-metallic, industrial minerals and aggregates (any combination of sand, gravel or crushed stone). These aggregate deposits were originally left along the edge of the melting glacier, along former marine beaches and carried by the meltwaters beyond the ice margin. Described in Backgrounder One: The Physical Environment, the watershed has a number of such deposits near Balderson, Lanark and Snow Road.

KEY CONSIDERATIONS

Lanark Highlands has the largest share of high quality aggregate.

As good-quality sand and gravel is depleted there has been an increase in quarry operations.

Water taking for aggregate operations is mostly for dewatering purposes.

Production:

Regulation of aggregate extraction falls under the *Aggregate Resources Act,* with permits and licenses administered through the MNRF. Typically there is very little chemical processing or waste material with aggregate production. Also, while aggregate producers are among the top water users in the watershed, the Water Taking Permits are usually to allow for dewatering of the quarry site, where the pumped water is released back into the surface and groundwater supply. Water is used for cleaning of aggregates is directed to settling ponds before being released back into the system. A hydrogeological assessment is required for permit and licence applications involving extractions within or near the water table.

Aggregates:

Pits and quarries are spread throughout the watershed (Figure 11), with most of the larger sites in the east (Lanark County and Ottawa). Although mineral aggregate deposits are plentiful, they are fixed-location, non-renewable resources that can be exploited only in those areas where they occur and up until they are depleted.

The Township of Lanark Highlands has 87 per cent of Lanark County's total supply of sand and gravel and 98 per cent of its high-quality aggregate (classes 1 and 2). (LCSC, 2008). Other parts of the County, with fewer and poorer quality gravel deposits must haul high-quality aggregate from Lanark Highlands or obtain it from bedrock sources. An increasing percentage of aggregate is supplied from quarry licenses, indicating that good-quality sand and gravel deposits close to markets are being depleted.

Some of the larger Pit and Quarry operations in the watershed include: large sand and gravel pits north of Lanark (Cavanagh and Arnott); a limestone quarry east of Almonte (Cavanagh); a sand and stone quarry east of Perth (Tackaberry); sand and gravel pits north of Maberly (Crains); east of McDonald Corners; and at Snow Road (Gemmills).

Mining:

Mining operations in the watershed include:

- OMYA Tatlock Quarry: calcium-carbonate quarried and trucked to OMYA processing plant on Hwy 7 outside of MVCA.
- OMYA Omega Blue Marble Quarry: next to Tatlock quarry - contains calcitic marble in white, pink-buff and blue that has been mined for dimension stone since 1962.
- Magnetite Mine: North Frontenac, north of Palmerston Lake.

Uranium Exploration:

Local concern about water quality protection and mining arose as a result of uranium exploration within the watershed covering almost 12,000 hectares in North Frontenac Township and the Township of Lanark Highlands. The potential health risks of uranium exploration and mining have caused significant concerns within and outside of the county.

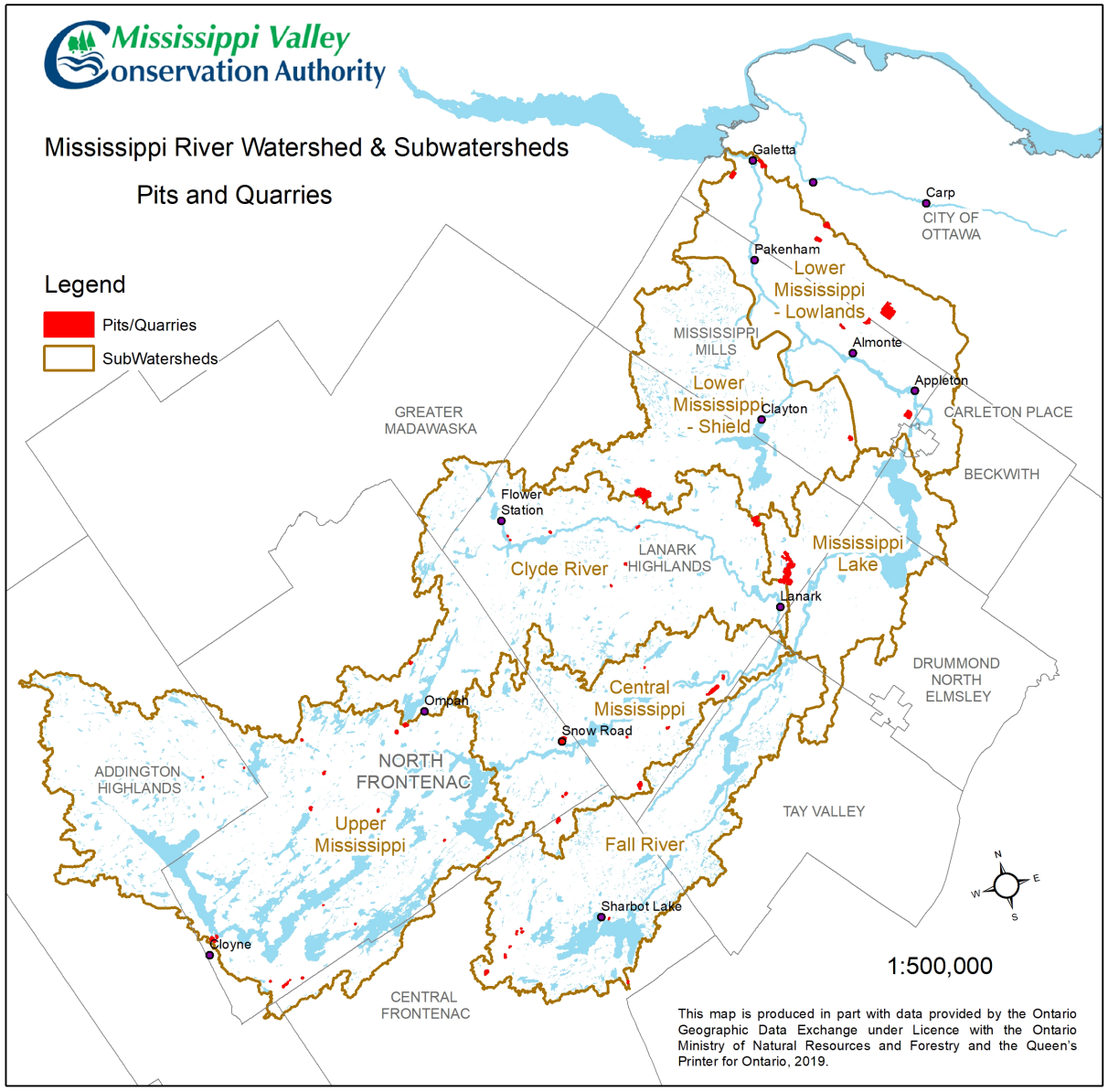

Figure 11: Pits and Quarries in the Mississippi River Watershed

Tourism, Hunting and Angling

Tourism in the Mississippi River Watershed is largely focussed around the recreational opportunities provided by the many lakes and rivers, and the vast areas of crown land. These features offer prime year-round recreational activities including fishing, hunting, camping, canoeing, boating on the larger lakes, and as well as snowmobiling and skiing opportunities in the winter. It provides the basis for an important industry, particularly in the upper part of the watershed where numerous tourist based businesses depend on outdoor recreation activities and attractions. These businesses rely on healthy waters and ecosystems and are also vulnerable to the impacts of climate events and fluctuating water flows and levels.

Sport fishing and hunting are popular forms of recreation in the watershed enjoyed by many throughout most of the year. The presence of both cold and warm water fisheries expands the opportunity to attract a greater number and range of sport fishers. Hunting, also popular, provides opportunity for big game, small game and waterfowl activities. Non-consumptive wildlife use (wildlife viewing, sketching, photography, bird watching and other aesthetic uses) are also increasing in popularity. A number of waterfront based businesses such as resorts, camps, fishing expeditions, marinas and canoe/boat rentals, rely on the features provided by a clean and healthy ecosystem.

Camping and crown land recreational opportunities are more prevalent in the western section of the river above Dalhousie Lake. The four provincial parks, (Bon Echo, Sharbot Lake and Silver Lake and Fitzroy), provide aver 1000 campsites as well as day use opportunities. There are also number of private campgrounds and fishing lodges mostly on lakes in the upper watershed.

In addition to the Provincial Parks, North Frontenac Parklands provides for waterfront camping on crown land on 11 lakes in the Madawaska and Mississippi River Watersheds. The campsites, which are mostly water access only[11], are managed by the Township of North Frontenac under agreement with the MNRF. The North Frontenac Parkland lakes that fall within the watershed include: Big Gull (27 sites), Crotch (76 sites), Kashwakamak (19 sites) and Govan (10 sites), for a total of 132 campsites.

KEY CONSIDERATIONS

Tourism is largely focused on recreation with strong ties to lakes and rivers.

Fishing and hunting are among the most popular attractions, particularly in the upper watershed.

Climate change impacts could include:

- water level fluctuations (lower summer water levels) ;
- changes to the fishery (species/recruitment);
- degradation of water quality (nutrient enrichment and algae);
- increased invasive species; and
- increased fire hazard.

In 2015, MVCA undertook a study to assess climate change implications for small waterpower facilities in the Mississippi River Watershed (Lehman, et.al. 2015). It measure the impact predicted changes in climate and water flow may have on the ability to meet water management objective for summer recreation water levels. The current baseline success rate in meeting recreational objectives is 80%. The study predicts that it may be expected to decrease to a future success rate of 33% to 53% (Lehman, P. et. al. 2015)

[11] There are some drive-in sites on most of the lakes including Crotch Lake.

Hydro-Electric Power

The Mississippi River has long been used as a source of power, to float timber and to power sawmills, grist mills, and textile mills. Dams in the upper (southwest) watershed were originally built solely for lumber transport purposes. In the lower river system, towns such as Carleton Place, Almonte, Pakenham and Appleton thrived where dams were built for textile and grist mills. Over time, a number of these dams were adapted for the generation of hydro-electric power (Water Management Strategy, Background Report, MVCA, 2003).

Shown on Figure 12 there are twelve water control structures along the Mississippi River that were considered within the scope of the Mississippi River Water Management Plan (MRWMP). Five of these structures are power generating (Table 3). The total installed capacity from these 5 Hydro-electric plants is just under 11 megawatts however, average annual production is roughly half that amount. Total hydro power produced varies from year to year depending on the amount and timing of precipitation (rain/snow) in the watershed. Appendix A: Note 5 provides descriptions of the five hydroelectric generating stations.

Table 3: Hydro Generating Stations on the Mississippi River

Control Structure	**Owner**	Capacity (MegaWatts)
High Falls G.S.	Ontario Power Generation (OPG)	2.4
Appleton G.S.	TransAlta	1.3
Enerdu G.S. (Almonte)	Enerdu	1
Almonte G.S.	Mississippi River Power Corp.	4.6
Galetta G.S.	TransAlta	1.6

In 2006, the *Mississippi River Water Management Plan* (MRWMP) was developed by MNRF, MVCA and the hydro producers in accordance with the *Lakes and Rivers Improvement Act, 1990*. The plan documents operating ranges and management strategies for the major hydraulic structures along the river system. It specifies the upper and lower limits of water levels and flows within which the dam/water control structures must be operated to remain in compliance. The plan also includes goals and objectives for protection of species at risk and other ecological features.

KEY CONSIDERATIONS

There are five run-of-the-river power generating stations on the Mississippi River system.

As run-of-the-river stations, hydro production is limited to what the flow in the river can provide.

Climate change assessments for 2011 to 2100, predict that under low flow conditions, hydro energy production could decrease by 9% to 23%.

Operating conditions contained in the Mississippi River Water Management Plan (MRWMP) require update to address predicted changes in weather patterns arising from climate change.

Update of the Water Management Plan may be needed to address predicted changes in water flows and levels at different times of year.

In 2015, MVCA undertook assessment of the implications of climate change for small waterpower facilities in the Mississippi River Watershed (Lehman, et.al. 2015). It determined that changes in flood risk could range from a decrease of 7% to an increase of up to 40% while low flow conditions consistently showed a decrease of 28% to 62%. As hydropower on the Mississippi River is contingent on stream flow conditions, the resulting energy production is projected to decrease by 9% to 23%. Reservoir performance in meeting summer recreation water level objectives was found to decrease from the current baseline success rate of 80% to a future success rate of 33% to 53% (Lehman et. al. 2015).

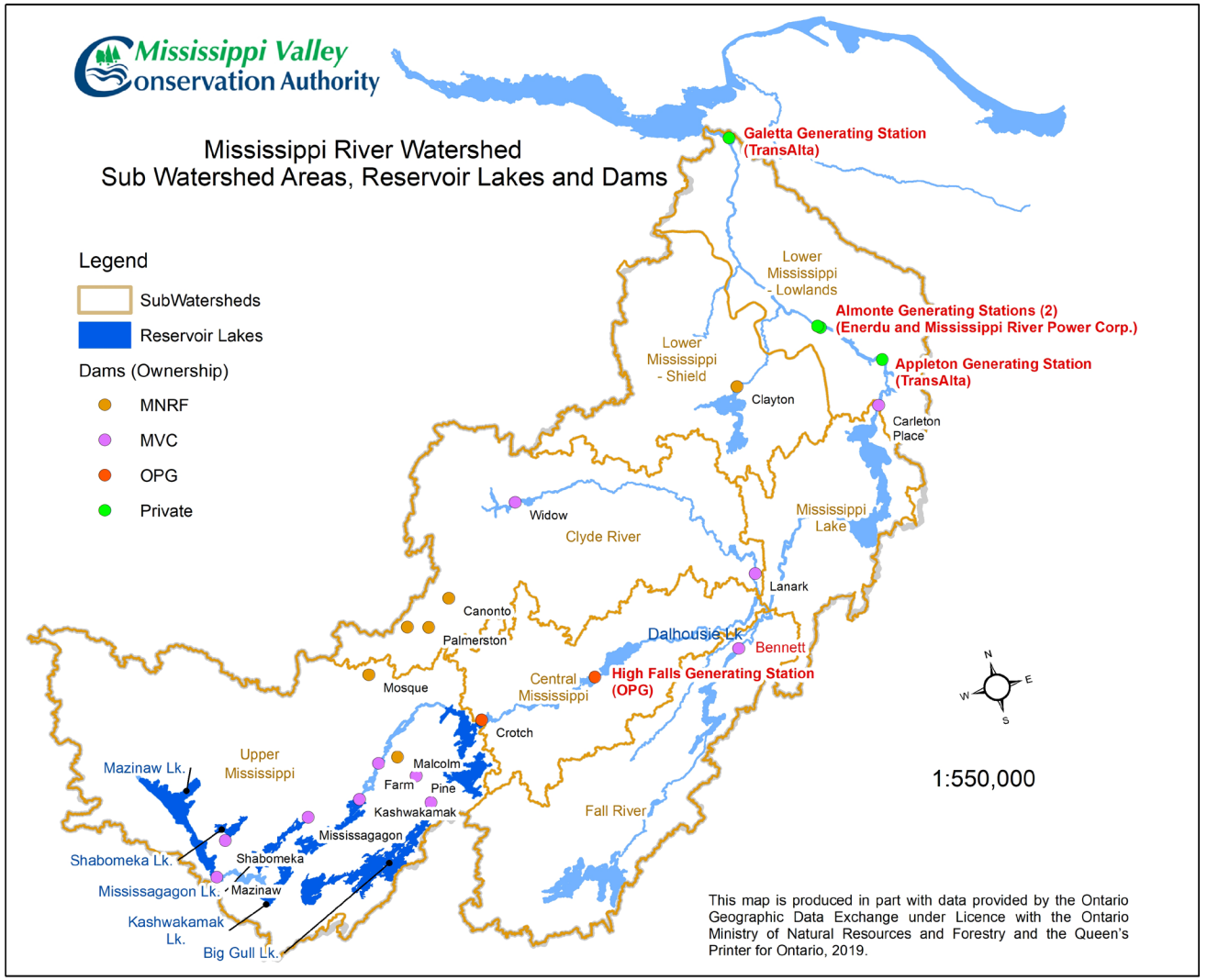

Figure 12: Mississippi River Dams and Hydro Generating Stations

Governance

Watershed Management encompasses a vast system of overlapping interests, from managing water taking for consumption, commerce and industry, to maintaining water levels and access for navigation, to natural hazard management and the protection of the ecology and natural systems. As shown in Figure 13, Mississippi Valley Conservation Authority (MVCA) is one of many organizations that have a role in watershed management. Counties, municipalities, and the provincial and federal government all have regulatory responsibilities that impact water resources. Key service delivery partners also include the academic community, environmental NGOs, lake and community associations, and citizen volunteers. And, perhaps most importantly, all landowners and people acting as employers, employees, and private citizens govern their own actions, and act as stewards of the watershed.

Table 4 identifies the most relevant documents that influence water management within the watershed. As a subwatershed within the St. Lawrence - Great Lakes water basin, the Mississippi also falls under the purview of the International Joint Commission (IJC.)

Figure 13: Water Resource Management Partners

KEY CONSIDERATIONS

Multijurisdictional nature of watershed management calls for collaborative planning.

It is up to each jurisdiction to implement actions within their mandate.

Coordinated policy and action will become increasingly important under changing climatic conditions.

Federal Interests and First Nations

At the local level, the federal government is largely focused on the *Navigation Protection Act 1985,* the *Fisheries Act 1985*, and the *Species at Risk Act 2002.* Transport Canada addresses matters related to navigable waters, and Environment and Climate Change Canada the other two. For some projects, the federal *Impact Assessment Act 2019* may apply, and is administered by the Impact Assessment Agency of Canada. The Mississippi Lake National Wildlife Area and The Mississippi Lake Migratory Bird Sanctuary are located within the watershed , and are administered by Environment and Climate Change Canada.

Table 4: Relevant legislation, regulations and guidelines

Federal & First Nations
Algonquin Land Claim (Agreement in Principle ratified in 2016)
Canada Wildlife Act, R.S.C., 1985
Canadian Environmental Assessment Act , S.C. 1992
Crawford Purchase and Treaty 27 and 27 ¼
First Nations Land Management Act (1999)
Fisheries Act (R.S.C., 1985, c. F-14)
Migratory Birds Convention Act, 1994, S.S. 1994
Navigable Waters Protection Act (R.S.C., 1985)
Species at Risk Act (2002)
Provincial
• D-5-4 Individual On-Site Sewage Systems and D-5-5 Private Wells
• Section 34 Permits to Take Water
• Section 53 Certificates of Approval for SWM facilities
Aggregate Resources Act (1990)
Building Code Act (1992)
Clean Water Act (2006)
Endangered Species Act (2007)

Provincial
Environmental Assessment Act (1990)
Lakes and Rivers Improvement Act (1990) (LRIA)
MNR/MMAH/CO Memorandum of Understanding (2001)
Ontario Water Resources Act (1990)
Planning Act (1990)
Provincial Policy Statement (2020)
Public Lands Act (1990)
Water and Wastewater Guidelines:
Mississippi Valley Conservation Authority
Conservation Authorities Act (1990)
• O.Reg.153/06 governs permitting of development in regulated areas
Municipalities (including Counties and Regional governments)
Administer Ontario Building Code
Administer Ontario Drainage Act
Approval of applications under *Planning Act*
Siting and maintenance of roads and roadside ditches
Siting and operation of municipal drinking water, sewage, stormwater, and solid waste systems and facilities

The federal government and Indigenous communities are in the midst of addressing longstanding land claims. The Algonquin Land Claim involves negotiations between the Algonquins of Ontario, the Government of Canada and the Government of Ontario. It covers a territory of 36,000 km^2, with lands in the Mississippi River Watershed, including several large tracts in the Township of North Frontenac. The *Algonquins of Ontario Agreement-in-Principle* was ratified in 2016 and signed by the Ontario Minister of Indigenous Relations and Reconciliation, the Minister of Indian and Northern Affairs

Canada, and the Algonquin Negotiation Representatives. Another stage of negotiations and consultations is required before a final agreement is ratified. (See Appendix A: Figure A-8 for a map of treaty areas). Until that time, Indigenous communities within the watershed may exercise rights and privileges to which they believe they are entitled, and should be engaged throughout development of the Watershed Plan to ensure awareness and respect of those matters.

Province of Ontario

The province has a multitude of legislation, regulation, policies and guidelines that address land use planning, source water protection for drinking water, surface and ground water taking and discharges, natural resources and natural heritage features. Provincial roles and partnerships in watershed management are extensive, falling under a number of Acts and associated regulations, guidelines and programs as outlined in Table 5.

Table 5: Relevant Provincial Legislation and Associated Guidelines

Legislation	Primary Purpose	Lead & Assisting Roles
Planning Act (1990)	To provide for a land use planning system led by provincial policy.	Municipalities are approval authorities; MVCA is a commenting agency. Under the *Planning Act,* Conservation Authorities are recognized as a "public commenting body," and must be notified of municipal policy documents and planning and development applications made under the *Planning Act.*
Provincial Policy Statement (2020)	Municipal land use planning decisions must be consistent with matters of Provincial interest outlined in the PPS; advice, comments, or submissions provided by an agency of the government, that affect a planning matter, must be consistent with the PPS.	Ministry of Municipal Affairs and Housing (MMAH)/municipalities; Ministry of Environment, Conservation and Parks (MECP) - Surface and Ground Water; Ministry of Natural Resources & Forestry (MNRF) – Natural Heritage: Conservation Authorities - Natural Hazards
MNR/MMAH/CO Memorandum of Understanding (2001)	To delegate responsibility to CAs for upholding the natural hazards section of the PPS, under the provincial "one window" planning system; to outline roles in the review of Special Policy Areas (SPAs) under Section 3.1 of the PPS.	Conservation authorities where the Province is not involved; for SPAs, MNRF and MMAH; conservation authorities participate in SPA review. Note: MVCA has no Special Policy Areas.
Environmental Assessment Act (1990)	To provide for the protection, conservation, and wise management of the environment; applies to public sector projects and major private sector projects.	MECP; MVCA provides technical review.
Lakes and Rivers Improvement Act (1990) (LRIA)	To provide for the management, protection, preservation, and use of the waters of the lakes and rivers of Ontario and the land under them.	MNRF; MNRF reviews for requirements under the LRIA and MVCA reviews the project as per its Section 28 Regulation.

Table 5: Relevant Provincial Legislation and Associated Guidelines

Legislation	Primary Purpose	Lead & Assisting Roles
Water and Wastewater Guidelines: D-5-4 Individual On-Site Sewage Systems: and D-5-5 Private Wells	D-5-4: To provide technical guidance in assessing the potential for unacceptable groundwater impacts resulting from the use of individual on-site sewage systems, D-5-5: to provide technical guidance in assessing the potential for unacceptable groundwater impacts resulting from the use of individual on-site sewage systems.	MECP: Where an agreement is in place, MVCA will ensure that development uses the applicable principles and guidelines.
Ontario Water Resources Act (1990) – Section 34 Permits to Take Water – Section 53 Certificates of Approval for SWM facilities	To provide for the conservation, protection and wise use and management of Ontario's waters; an MOE Permit is required for water takings (ground and/ or surface) of over 50,000 litres per day; an MOE Certificate of Approval is required for stormwater management facilities.	MECP; For Permits to Take Water, MVCA is notified of permit applications.
Endangered Species Act (2007)	To identify and protect species at risk and their habitats, protection and recovery.	MECP; MVCA may direct proponents to MECP (MVCA does not screen under the ESA but may provide data to the Province if available).
Clean Water Act (2006)	To protect existing and future sources of drinking water. Specifically, to protect the quality and quantity of drinking water at its source.	MECP; MNRF: municipalities and conservation authorities. Mississippi Source Protection Committee.
Public Lands Act (1990)	Outlines the use, management, sale and disposition of crown lands and forests; also empowers the Province to construct and operate dams on waterways throughout the Province.	MNRF; MVCA works with MNRF to coordinate applications review and permit process where MVCA Regulation also comes into play. .
Building Code Act (1992)	Governs standards for the construction and demolition of buildings and sewage systems (Section 8)	Municipalities
Aggregate Resources Act (1990)	MNRF responsible for granting licenses to extract aggregate resources.	MVCA reviews and comments directly to MNRF with respect to aggregate license applications and amendments. Aggregate operations are exempt from MVCA O.Reg 153/06 and permits for extraction are not required from the MVCA.

Municipalities

In Ontario, land use planning is governed by the *Planning Act* and through the implementation of the Provincial Policy Statement (PPS, 2014). While the Ministry of Municipal Affairs and Housing (MMAH) is the lead agency responsible for overseeing land use planning, municipalities and counties make planning decisions at the local level.

To accommodate reductions in Provincial plan review services at the local level, municipalities have engaged the Conservation Authorities in providing advisory support for a number of other environmental features and concerns above and beyond Natural Hazards. This includes technical review and advice on Natural Heritage features such as wetlands, groundwater features, stormwater management, and lake capacity. In some jurisdictions, the

municipalities and Conservations Authorities have entered into Memorandums of Agreement to formalize the specifics of the CAs expanded plan review function. MVCA, along with neighboring CAs, is part of two such agreements, one with Lanark County and one with the City of Ottawa. See Appendix A: Note 6 for Memorandums of Agreement details.

While there is no formal written agreement with Frontenac, Lennox & Addington and Renfrew Counties, MVCA provides planning support to the Townships of North Frontenac, Central Frontenac and Addington Highlands upon request, primarily providing technical review and advice on Natural Heritage Features and lake capacity.

Mississippi Valley Conservation Authority

Conservation Authorities (CAs) are community-based watershed management agencies, mandated by the province and governed by municipally appointed Boards to provide "programs and services designed to further the conservation, restoration, development and management of natural resources." To this end, the MVCA serves four key roles:

- System-wide monitoring and analysis and the facilitation of coordinated resource management across the 11 municipalities;
- Water control management including operation of 18 dams in the watershed, flood forecasting, the administration of a flood and drought notification system, and flood and erosion control;
- Administration of a permitting system to mitigate risks to people, property and natural resources within designated regulated areas, and to regulate development in and adjacent to wetlands; and
- Commenting responsibilities for Section 3.1 of the PPS under delegated authority from the province.

Under O.Reg. 153/06, MVCA regulates development and other activities in and near regulated areas such as shorelines, floodplains, unstable slopes, wetlands, and other hazardous lands. This and other regulations under the *Conservation Authorities Act* are currently under review by the Province. Conservation Authorities are also identified as a "public commenting body," under the *Planning Act* and therefore must be notified of municipal policy documents and planning and development applications made under the Act, as outlined in Table 6.

Table 6: MVCA role in Planning and Regulations

Conservation Authority Role	Mandated by the Province	On Behalf of Municipalities (MOU Agreements)
Comment	**All Planning Applications:** 1. Comment on Natural Hazards (Section 3.1 *Provincial Policy Statement*)	**Planning Applications:** 2. Comment on Natural Heritage (Section 2.1 PPS) 3. Comment on Hydrogeology (Section 2.2 PPS) 4. Comment on Stormwater Management (Section 2.2 PPS)
Approve	**Development, Interference with Wetlands and Alterations to Shorelines and Watercourses:** • Sec 28 *Conservation Authorities Act*	**Septic Systems:** • Part 8 *Ontario Building Code* **Source Water Protection:** • Part 4 *Clean Water Act*

The MVCA is also well positioned to facilitate collaboration among partners in various aspects of watershed management. Existing collaborations include:

- The Mississippi-Rideau Septic System Office (page 22) which partners with Rideau Valley Conservation Authority to assist municipalities in delivering inspection services for private septic systems;
- The Mississippi-Rideau Source Protection Plan (page 18), also a partnership between MVCA, RVCA and the municipalities in delivering a source water protection program throughout the watershed.

Environmental Groups

There are numerous environmental and stewardship groups within the watershed that undertake a variety of stewardship, monitoring, research and education and outreach activities. Groups that MVCA has worked with include:

Almonte Fish and Game Association
Eastern Ontario Certified Forest Owners Group
Eastern Ontario Model Forest
Eastern Zone Stewardship Councils
Friends of the Tay Watershed
Frontenac Arch Biosphere Reserve
Lanark County Municipal Trails Corporation
Lanark County Stewardship Council
Lanark Fish and Game Conservation Club
Mississippi Madawaska Land Trust
Mississippi Valley Field Naturalists
Scouts Canada
Watersheds Canada

There are also about 20 lake associations in the watershed MVCA frequently partners with to deliver aspects of its stewardship and monitoring programs.

Academia

MVCA benefits from being in close proximity to several academic institutions including Carleton University, Ottawa University and Queens University and Algonquin and Fleming Colleges. With a variety of environmental programs, these institutions are looking for field research and education opportunities in close proximity.

Most recently, Queens University, MVCA and the Mississippi Lake Association partnered on a research project to examine factors affecting the incidence of Blue-Green Algae occurrences. Carleton University has also undertaken research projects in partnership with the MVCA and the Rideau Valley Conservation Authority to examine conditions contributing to algae and aquatic vegetation growth on a number of lakes throughout both watersheds. In addition MVCA has hosted Co-op students from both Algonquin College and Fleming College to work on mapping and environmental monitoring projects.

Volunteer Sector

Property owners within the watershed enjoy the benefits of a diverse and healthy watershed. They also rely on the surface and groundwater for their drinking water supply. With an estimated 8,510 waterfront properties throughout the watershed, many property owners have a vested interest in the health of the river, lakes and surrounding watershed. Lake Associations and individuals participate in various MVCA programs directed at maintaining or improving the health of the water. Volunteer activities include water quality and invasive species monitoring, shoreline naturalization projects and fish habitat enhancement projects. Many volunteers and volunteer groups also work independently of MVCA in carrying out environmental work.

Lake Planning

Lake planning is a tool used by lake communities to identify values and issues impacting the lake, and to develop and implement actions aimed at maintaining those values and addressing those issues. While lake plans hold no regulatory status, they provide an official document that can be used by lake communities to inform local policy and decision making with respect to lake related concerns. Key outcomes of the lake planning process are the engagement of the lake community and the development of partnerships with the Conservation Authority, municipality and others.

MVCA assists in the development and implementation of Lake Plans by providing information, technical advice and planning advice. Since 2010, MVCA has assisted in the development of lake plans for the following lakes:

- Canonto - Canonto Lake Stewardship Plan, 2012
- Kashwakamak – Kashwakamak Lake Sustainability Plan, 2016
- Malcolm/Ardoch – Malcolm Ardoch, 2016
- Mississippi Lake – Mississippi Lake Plan, 2015

In the Mississippi River Watershed, Lake Plans have also been prepared for Patterson Lake (2011) and Sharbot Lake (2013).The development of these lake plans has strengthened MVCA's partnerships with those lake communities and has facilitated the implementation of various stewardship and research initiatives.

Growth Pressure on the Watershed

Population Growth - Past

Table 7 shows the actual population growth, based on Census data, for each municipality for the five years between 2011 and 2016. It presents both the population and growth across the entire municipality and the estimated municipal populations with the Mississippi River Watershed. The municipalities in the east (Beckwith, Drummond/North Elmsley, Carleton Place, and Mississippi Mills) showed the highest population growth over the five years, ranging from 6.5 to 14.8%. All were above the provincial 5 year average of 4.6%. The western municipalities showed lower growth, while Addington Highlands and Central Frontenac showed declines in population.

Comparing the population growth rates for the entire municipality to the growth within just the watershed part of the municipality, shows that a large part of Beckwith and most of Drummond North Elmsley's growth is within the Mississippi River Watershed. For Ottawa, substantial growth has taken place in the serviced urban areas resulting in an overall growth rate of 5.8%, whereas for the more rural parts of the City within the watershed, the population grew by only 1.1%.

KEY CONSIDERATIONS

Beckwith, Carleton Place, Drummond /North Elmsley and Mississippi Mills have experienced relatively high growth rates, which are projected to continue over the next 20 to 25 years.

Areas under development pressure contain some of the largest wetlands and recharge areas. Improper development could impact hydrologic conditions.

High growth will result in increased water demand and impact the water budget, particularly in areas already vulnerable to the impacts of climate change.

Removal of remnant forest and riparian buffers in high growth areas can lead to: increased soil erosion, impairment of water quality; reduced terrestrial and aquatic habitat; and impaired ecological functioning.

Table 7: Population Growth from 2011 to 2016 for Entire Municipality and for the Population within the Watershed

		Entire Municipality (including areas outside of watershed)				Estimated Population for Area within watershed			
		Population		% Change		Population*		% Change	
Upper Tier	**Municipality**	**2011**	**2016**	**5 year**	**Ave Annual**	**2011**	**2016**	**5 year**	**Ave Annual**
Lennox & Addington	Addington Highlands	2532	2323	-7.7	-1.5	355	310	-12.6	-2.5
Frontenac	North Frontenac	1832	1898	2.2	0.4	1472	1531	4.0	0.8
	Central Frontenac	4546	4373	-4	-0.8	1475	1428	-3.2	-0.6
Lanark	Beckwith	6986	7644	9.4	1.9	3424	3929	14.8	3.0
	Carleton Place	9809	10,644	8.5	1.7	9809	10644	8.5	1.7
	Drummond-North Elmsley	7485	7773	3.8	0.8	2231	2498	12.0	2.4
	Lanark Highlands	5128	5338	4.1	0.8	4878	5095	4.5	0.9
	Mississippi Mills	12385	13163	6.3	1.3	11893	12668	6.5	1.3
	Tay Valley Township	5571	5665	1.7	0.3	1441	1466	1.7	0.3
Renfrew	Greater Madawaska	2485	2518	1.3	0.3	93	100	7.9	1.6
City of Ottawa		883391	934243	5.8	1.2	2744	2773	1.1	0.2
					Total:	**39814**	**42425**	**6.6**	**1.3**

*estimate - calculation based on population density within dissemination areas

Population Growth - Projected

Population projections for each of the watershed municipalities are presented in Table 8. These represent the most recent growth projections and allocations that were calculated for the upper tier Official Plans. It also shows the population projection for the Province of Ontario calculated by the Ontario Ministry of Finance.

Ontario's population is projected to grow by 30% over the 25 year period between 2011 and 2036 and Eastern Ontario by 23%.

Lanark County projections exceed the provincial projections with very high growth rates for a number of its municipalities. Carleton Place and Beckwith projected to almost double in population between 2016 and 2038. Drummond/North Elmsley and Mississippi Mills are projected to increase by 60% over that same time period.

City of Ottawa projections for its rural area are 32% for the 25 year time frame between 2011 and 2036.

The Frontenac municipalities, and Greater Madawaska are projected to grow by about 20% between 2011 and 2036. Addington Highlands has the lowest projected growth at 11% over that same 25 year period.

A number of municipalities include population projections in their Official Plans that may differ from the County projections presented here.

Table 8: Provincial and Municipal Population Projections

Municipality		**Projected Increase**	
	2011	**2036**	**Percent**
Ontario^	13,263,500	17,205,200	30%
Eastern Ontario^	1,750,000	2,161,400	23%
Lanark County*	**2016**	**2038**	**Percent**
Beckwith	7,644	14,262	87%
Carleton Place	10,644	20,964	97%
Drummond North Elmsley	7,773	12,549	61%
Mississippi Mills	13,163	21,122	60%
Lanark Highlands	5,338	7,507	41%
Tay Valley	5,665	7,097	25%
Lanark County Total	**59,918**	**96,443**	**61%**
Frontenac County~	**2011**	**2036**	**Percent**
Central Frontenac	4,795	5,790	21%
North Frontenac	1,955	2,320	19%
Frontenac County Total	**27,900**	**33,200**	**18%**
Lennox & Addington^	**2011**	**2036**	**Percent**
Addington Highlands	2,532	2,823	11%
Lennox & Addington County Total	**41,824**	**51,217**	**22%**
Renfrew County**	**2016**	**2041**	**Percent**
Greater Madawaska	2,599	3,109	20%
Renfrew County Total	**104,000**	**110,200**	**5%**
City of Ottawa***	**2011**	**2036**	**Percent**
Rural	91,000	117,000	29%
Ottawa Total	**921,000**	**1,214,000**	**32%**

*+Ontario Ministry of Finance * OPA No 8 to County of Lanark, 2019 ~ Watson & Assoc. 2014*
*^County of Lennox and Addington Official Plan, 2016 **County of Renfrew Official Plan, 2003*
***OPA 180 to the City of Ottawa Official Plan, 2017*

Settlement Areas

Growth within the watershed has been distributed between the expansion of the built-up urban (serviced) areas such as Carleton Place and Almonte, and the more rural (unserviced) areas through estate lot subdivisions and a scattered form of rural "strip development" along the roadways.

The *Provincial Policy Statement (2020)* requires that "Settlement Areas" (such as cities, towns, villages and hamlets) are identified as the areas for growth and development, and that the municipalities designate such lands in their Official Plans. Shown in Figure 14 and listed in Table 9, the watershed has 26 settlement areas identified in the municipal Official Plans. With the exception Carleton Place (pop. 10,644), Almonte (pop. approx. 5,039) and the Village of Lanark, which has a population of 696 (2011 Census) the remaining "settlement areas" each currently have less than 500 people.

Table 9: Official Plan Designated Settlement Areas with Mississippi River Watershed

Municipality	Settlement Areas (Towns, Villages, Hamlets)
North Frontenac	Ardoch, Harlowe, Ompah, Plevna, Snow Road Station and Cloyne (just outside of watershed)
Central Frontenac	Sharbot Lake
Beckwith	Blacks Corners
Drummond North Elmsley	Balderson, Drummond Centre, Innisville, Fergusons Falls
Lanark Highlands	Elphin, Hopetown, Lanark, McDonald's Corners, Middleville, Poland, Watson's Corners
Tay Valley	Balderson, Fallbrook, Maberly
Mississippi Mills	Urban: Almonte Rural: Appleton, Blakeney, Clayton, Pakenham
Carleton Place	entire municipality is a settlement area
Ottawa	no rural settlement areas within watershed

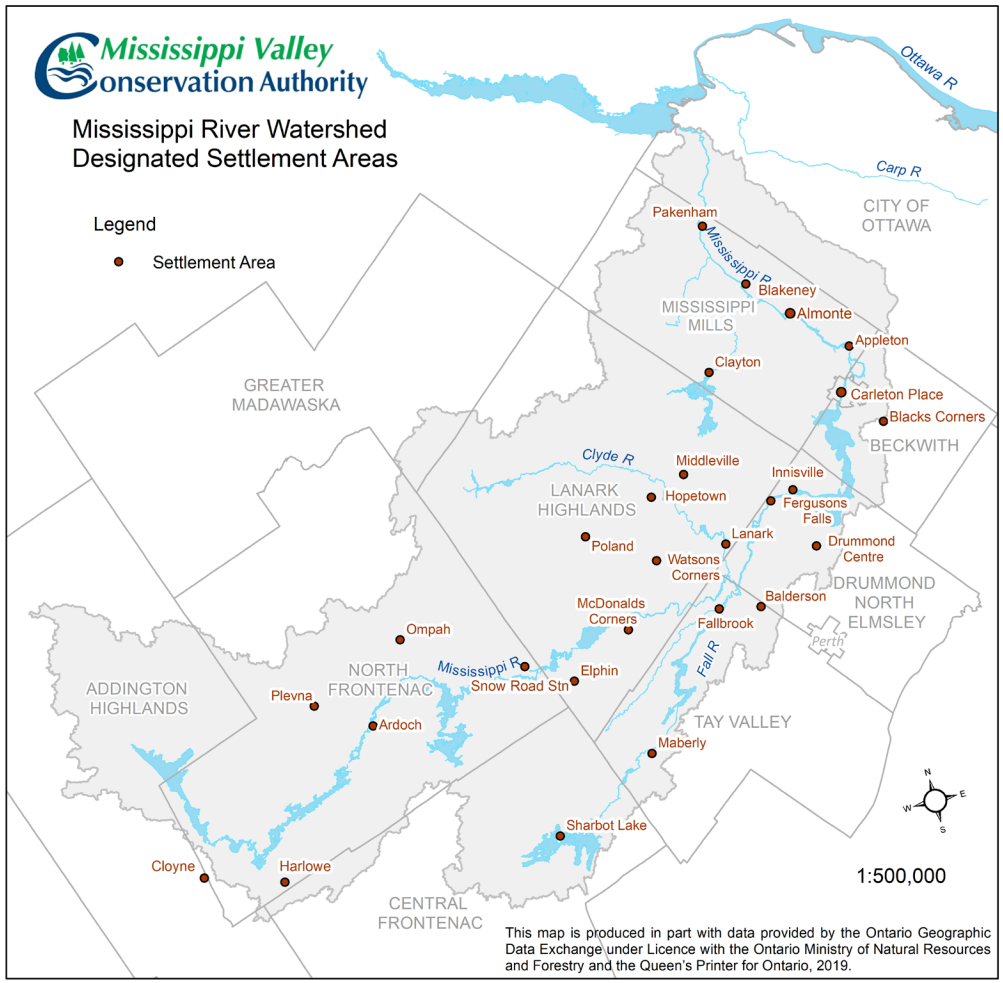

Figure 14: Designated Settlement Areas

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Appendix A
For Backgrounder Two: People &Property

Mississippi River Watershed Plan

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Table A-1: Mississippi River Watershed Municipalities and Areas

Upper Tier (County)/ Single Tier*	Municipality	Total Size (km^2)	Area Within Watershed	% of Municipality within Watershed	Percent of total Watershed Area
Lennox & Addington	Addington Highlands	1418.3	338.7	24%	9.1%
Frontenac	North Frontenac	1327	933.9	70%	25.1%
	Central Frontenac	1105.1	331.7	30%	8.9%
Lanark	Beckwith	252.3	84.0	33%	2.3%
	Carleton Place	10.3	10.3	100%	0.3%
	Drummond-North Elmsley	400.2	148.9	37%	4.0%
	Lanark Highlands	1100.6	982.6	89%	26.4%
	Mississippi Mills	529.1	474.1	90%	12.7%
	Tay Valley Township	598.8	206.1	34%	5.5%
Renfrew	Greater Madawaska	1120.4	37.2	3%	1.0%
City of Ottawa*		2812.3	176.7	6%	4.7%

Table A-2: Land Cover by Subwatershed Area

	Entire Watershed	Upper Mississippi	Central Mississippi	Clyde River	Fall River	Mississippi Lake	Lower Mississippi - Shield	Lower Mississippi - Lowlands
Area (km^2)	3734	1032	395	664	487	301	424	431
Wooded (%)	62.1	73.5	70.5	74.4	63.3	34.6	63.7	27.3
Wetland (%)	12.5	10	13.1	10.4	14.6	20.8	15.8	8.9
Agriculture (%)	11	0.2	3.7	3.8	5.9	27.5	8.9	48.8
Water (%)	7.5	13.1	5.5	4.6	8.8	8.9	4.4	1.5
Rural Development (%)	3.3	2	3.7	2.6	4.4	2.3	1.9	7.8
Urban Area (%)	0.6	0.1	0.2	1.4	0	0.4	0.1	2.1
Pits & Quarries (%)	0.2	0.1	0.2	0.1	0.1	0.4	0.3	0.6
Unclassified (%)	2.8	1	3.1	2.7	2.9	5.1	4.8	3.1

Note 1: Methodology for Estimating Population within the MRW

For the purposes of this report it was decided that the Dissemination Areas provided for the most accurate way of estimating the population within the watershed. A **dissemination area** (DA) is the smallest standard geographic **area** for which all census data are disseminated (Stats Canada). Since the population densities can vary significantly throughout a municipality (with combinations of towns, villages and rural area), the DA data provides for a more refined estimate of population than one based solely on the broader population totals that Statistics Canada presents for each municipality. The population estimates simply represent the Total Population for the Disseminations Areas multiplied by percentage of the total area of the DA that's falls within the watershed. It is acknowledged that this methodology could result in a slight over-estimate where the dissemination area captures a built up area (i.e. village, hamlet, densely populated feature) outside of the watershed area, or a slight underestimate where the dissemination area is for the most part sparely populated except for in areas falling within the watershed boundary.

Seasonal Population

Table A-3: Seasonal Population Estimates for Frontenac County

Population	**Year Round Population**	**Seasonal Population**	**Total**	**% Population Increase resulting from seasonal**
Central Frontenac	4,795	7,400	12,195	254%
North Frontenac	1,955	9,400	11,355	580%
Frontenac County**	27,900	29,600	57,500	206%

(Source: Watson & Associates, 2014.)

Property Counts

Table 2 presents the total number of properties in each municipality as well as the number of those properties that are waterfront. It also shows the population (permanent residents) of each municipality expressed as a percentage of the total population within the Mississippi River watershed. This is presented to provide a general measure of seasonal versus year round use.

Table A-4: Properties and Waterfront Properties in the Mississippi River Watershed

Upper Tier	Municipality	No. of Properties	%of Total MRW Properties	% of Total MRW Population*	Number of Waterfront Properties	% of Total Waterfront Properties
Lennox & Addington	Addington Highlands	740	2	<1	376	4
Frontenac	North Frontenac	5068	16	4	3010	35
	Central Frontenac	2445	8	3	958	11
Lanark	Beckwith	2162	7	9	667	8
	Carleton Place	4251	13	25	130	2
	Drummond-North Elmsley	1867	6	6	610	7
	Lanark Highlands	5447	17	12	1530	18
	Mississippi Mills	6623	21	30	608	7
	Tay Valley Township	1504	5	4	487	6
Renfrew	Greater Madawaska	32	<1	<1	16	<1
City of Ottawa		1471	5	7	118	1
	Estimated Total	**31610**			**8510**	

Source: 2018 Assessment Data (GIS), Statistics Canada 2016 Census data

Structures in the MRW

Table A-5: Structures in the Mississippi River Watershed

Structure Type	Within the MRW		Within MVCA Regulation Limit	Within Mapped Floodplain	Within 30 Metres of a Main Waterbody
	No.	% of total structures	No.	No.	No.
Shed	24695	43.4	3090	637	2204
House	15799	27.8	2198	409	1253
Cottage	4328	7.6	283	88	2592
Garage	2795	4.9	365	73	127
Barn	2447	4.3	91	1	12
Solar	1746	3.1	18	1	6
Camp (ex. Hunt camp)	708	1.2	55	0	24
Silo	661	1.2	13	0	4
Business	518	>1	32	3	26
Derelict	289	>1	20	0	7
Boathouse	214	>1	38	34	209
Greenhouse	104	>1	16	1	8
Power Facility	96	>1	9	5	6
School	63	>1	3	0	3
Municipal	59	>1	2	1	2
Church	52	>1	4	0	0
Tower	52	>1	2	0	0
Dam	23	>1	7	6	23
Retirement Home	18	>1	1	0	4
Stream Gauge	11	>1	3	1	10
Fuel	9	>1	1	0	0
Condominium	8	>1	0	0	3
Other	2197	3.9	477	231	417
Total	**56892**	100	**6728**	**1491**	**6940**

For the “structures within 30 metres of a waterbody”, the waterbody assessment was based on all of the lakes, major rivers and major creeks and streams, but not on the multitude of smaller streams throughout the MRW.

Note 2a: MVCA Regulation

Conservation Authorities have regulations, issued under the *Conservation Authorities Act*, to regulate development and other activities in and near natural hazard areas such as shorelines, floodplains, unstable slopes, wetlands, and other hazardous lands, such as karst topography and Leda clay.

The MVCA Regulation was first approved in 1990 as O.Reg 19/90, MVCA's *"Fill, Construction and Alteration to Waterways"* Regulation. In 2006, following amendments to the Conservation Authorities Act, the regulation was replaced with the current O.Reg 153/06, MVCAs "*Development, Interference with Wetlands and Alterations to Shorelines and Watercourses" Regulation.* O.Reg 153/06 conforms to a provincial template (generic) regulation that is used by all CAs to provide for consistency across the province. Under the regulations, development is prohibited in designated areas unless permission is granted by the CA. Depending on the specifics of the development proposal, the landowner/developer may need a permit similar to a building permit to do work such as constructing buildings or placing fill in these areas.

Flood Hazard Limit: As described in Section HAZ.1, the flood hazard in the MRW is determined based on the 100-Year Flood Level. The areas where engineered floodplain mapping has been used to establish regulation limits are listed in Table 3. Flood plain mapping is generally limited to urban areas and rural built-up areas such as Mississippi Lake and the Village of Lanark.

Erosion/Slope Hazard Limit: The regulation of hazards associated with slope instability, stream bank and valley erosion, and meander belt erosion is also limited only to those areas where floodplain mapping has been produced. Erosion hazard limits are defined based on soil type, slope height and proximity to the watercourse. They are also further defined based on whether the river or stream valley is classified as "*apparent*" or "*non-apparent*".

Wetland Regulation Limits: Regulation Limits for the interference with wetlands part of the regulation are based on a 120 metre setback from all Provincially Significant Wetlands and a 30 metre setback from all other wetlands that meet with the criteria of being greater than 0.5 Ha in size and where the wetland is hydraulically connected to a surface water feature.

Alterations to Shorelines and Watercourses: There is no mapped regulation limit for the alterations to shorelines and watercourse component; instead the regulation applies to all shorelines and watercourses that meet a set definition. This component applies to activities involving the straightening, changing, diverting, or interfering with the existing channel of a river, creek, stream or watercourse, including: road crossings, bridges, culverts; channel realignments, diversion dams, weirs, etc.; shoreline rehabilitation projects; and shoreline stabilization projects and repairs (rip rap treatments, retaining walls, etc.).

Implementation of the MVCA Regulation:
Policies to guide the implementation of the regulation are set out in the MVCA Development, Interference with Wetlands and Alteration to Shorelines and Watercourses - Regulation Policies (updated, 2015). The policies complement the Hazard Land policies for land use planning set out in Section 3.1 of the PPS.
The regulation applies to the following activities:

i. **Development**

Development activities are regulated in all hazardous lands, wetlands and lands adjacent to wetlands as delineated by the Regulation Limit and are shown on map schedules prepared by the Authority. The Regulation applies to the following development activities as defined under the Conservation Authorities Act:

a) the construction, reconstruction, erection or placing of a building or structure of any kind;
b) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure;
c) site grading; or
d) the temporary or permanent placing, dumping or removal of any material, origination on the site or elsewhere. *(Conservation Authorities Act, R.S.O. 1990 Chapter 27, S. 28)*

ii. Alterations to Shorelines and Watercourses

Activities that are regulated include straightening, changing, diverting or interfering with the existing channel of a river, creek, stream or watercourse.

iii. Interference with Wetlands

Interference with wetlands includes any development activities as listed above that may result in impacts to the hydrologic or hydrogeologic function of the wetland.

The flood and erosion hazard component of the regulation applies only to those areas within the MRW where floodplain mapping has been prepared. In areas where there is no floodplain mapping, yet a flood and/or erosion hazard may potentially exist, the plan review process and policies of the PPS must be relied upon to address hazards. For these areas, records of historic high water levels are used to assist in determining the extent of the potential flood hazard.

The alterations to shorelines and waterways component applies to all waterbodies and streams throughout the watershed.

The wetlands component applies to all wetlands within the watershed that are greater than 2 Ha in size and hydrologically connected to another surface water feature. In implementing the regulation a distinction is made between the development activities that can be regulated within the wetland and the development activities that can be regulated with the 120 metre and 30 metre adjacent lands. Within the wetland, the regulation applies to any development activity that meets the definition outlined in the supporting policies. Within the 120 metre and 30 metre adjacent areas, the regulation applies to any development activity under the definition **that may result in impacts to the hydrologic function of the wetland.**

Note 2b: Two –Zone on Mississippi Lake

Under the Two-Zone concept for floodplains, the floodplain is divided into two zones, the floodway and the flood fringe. As illustrated in Figure 3, the floodway comprises the more hazardous portion of the floodplain where, because of higher flood depths and velocities, new development is

prohibited. The flood fringe is the less hazardous, where shallower flood depths and lower velocities allow for a certain types and scales of development subject to flood proofing measures being put into place. The Two-Zone concept is implemented for Mississippi Lake through both the municipal planning documents (Official Plans and Zoning By-laws) and through the MVCA Regulation. The implementation of the Two-Zone policies around Mississippi Lake comprises a substantial component of the municipal plan review and regulations workload for MVCA.

Note 3: Source Water Protection

The MRSPP identifies nineteen specific categories of prescribed drinking water threats including road salt, fuel and commercial fertilizer, they are listed in full in Appendix B2-4: List X. Except for Dense Non-aqueous Phase Liquids (DNAPLs)*[12], these prescribed threats are only categorized as a "significant threat" in areas with a vulnerability score of 8 to 10. Where an activity that is identified as a significant threat is proposed, a Risk Management Plan must be prepared by the proponent of the project to outline what measures are in place to reduce or eliminate the risk that a certain activity will contaminate municipal drinking water. Risk Management Inspectors or Official (similar to a Building Inspector or Official) are designated to support and implement this process. The requirements for areas with a score less than 8 are listed in Appendix B2-4 List X,

In the MRW the vulnerable areas include Wellhead Protection Areas (WHPAs) around the Almonte municipal wells, an Intake Protection Zone (IPZ) for the Carleton Place municipal water intake, extensive areas of Highly Vulnerable Aquifer, and some pockets of Significant Groundwater Recharge Area throughout the watershed.

Almonte Well Head Protection Areas (WHPA)

The WHPAs for the two wells northeast of the river cover 520 Hectares that include commercial lands along March Road, rural lands and residential development in the form of estate lot subdivisions along Appleton Side Road. The WHPAs for the three wells on the southwest side of the river cover 280 Hectares that include rural lands, residential lands, the Almonte wastewater treatment facilities, and the municipal office. Areas with a vulnerability score of 8 to 10 represent the areas of significant vulnerability where the MRSSP policies regarding "significant threats" would apply. The WHPAs for the two wells on the N/E side of the river show less extensive areas of vulnerability than the three wells on the S/W side. The N/E side wells both have just the small areas immediately around each wellhead that have a vulnerability score of 10, with the remainder of the WHPAs scoring 6 and 4. The WHPAs on the S/W side of the river include fairly extensive areas with vulnerability scores of 8 and 10.

Carleton Place Intake Protection Zone (IPZ)

The Carleton Place IPZ covers an area of 790 Hectares (Ha), 455 Ha of which is on land and 335 Ha of which is over the waters of Mississippi Lake and the Mississippi River. The area extends about 3 to 4 km upstream and includes mostly residential lands, fronting on or close to the shores of Mississippi Lake. It also includes transportation corridors running along the major roadways in the area, where a transportation related spill could quickly reach the surface water intake.

[12] Dense non-aqueous phase liquids (DNAPLs) are chemical compounds that are denser than water and do not dissolve readily in water.

Village of Lanark

The Village has a population of approximately 869 (2001 census) who rely on private wells and septic systems. Historic water quality issues resulting from bacterial and nitrate impacts to private wells have been documented in the Village since 1979. Surveys were conducted in 1986, 1987, 1999, and 2000 to sample and assess well water throughout the village. The most recent survey conducted in 2000 sampled 329 wells and found nitrate impacts in 75% of the wells sampled, with 14% exceeding, and 27% approaching, the provincial criterion of 10 mg/L nitrates. Bacterial testing found 16% of the wells were unsafe and 8% showed some level of bacteriological impacts. Similar results were documented in the previous surveys.

A hydrogeologic evaluation for future municipal groundwater supply for the village was conducted in 2005 (Golder, 2005). It identified a potential location for a communal well supply approximately 2.2 km northwest of the village and estimated that four to six wells would be required to produce adequate supply for the village (MRS PR, 2008). The Mississippi Valley Source Protection Assessment Report (2011) set out a work plan for the Future Lanark Water Supply to undertake delineation of wellhead protection areas and vulnerability scoring and to undertake a Threats and Issues Evaluation (MRSPP 2011). This has not yet been done and there are no policies in the MRSPP that directly address the Village of Lanark drinking water issue.

Highly Vulnerable Aquifers

The predominance of highly vulnerable aquifers means that, over large parts of the watershed, contaminants could travel quickly into drinking water aquifers and potentially cause real risk to users drawing drinking water from those sources. This is a concern for private wells in the rural parts of the region (MRSPP, 2014). Since groundwater from private wells is the source of drinking water for an estimated 63 percent of the permanent MRW population, this could present an area of significant concern.

Highly Vulnerable Aquifers are assigned a vulnerability score of 6, meaning that under the Source Protection Plan, no activities (except DNAPLs) can be considered a significant threat. There is therefore no requirement for prohibiting or requiring a Risk Management Plan for certain activities within these areas. For areas such as this, with a vulnerability score less than 8, the MRSPP does include policies for:

- Managing Waste Disposal sites in Highly Vulnerable Aquifers
- Encouraging the wise use of road salt
- Promoting best management practices through education.

With the high ratio of rural development on private services, this may present an area where further research and consideration is needed.

Significant Groundwater Recharge Areas

Background assessment for the Mississippi Rideau Source Water Protection Program derived mapping and estimates of groundwater recharge as part of the Tier 1 Water Budget. With limited well records for the area, the deficiency in data presented challenges in mapping and determining groundwater recharge contributions. The information regarding groundwater recharge throughout the MRW represents a best estimate based on the limited information that is available.

The resulting mapping of Significant Groundwater Recharge, presented in Figure 4, shows that these areas are generally sparsely scattered throughout the watershed, covering about 9% of the total watershed area. Wetland areas represent about one third of the total significant groundwater recharge area.

For source protection planning, the Significant Groundwater Recharge Areas receive a score of 2 to 6 depending on the area's vulnerability. In these areas, except for DNAPLs, there are no activities that are categorized as a significant threat. The only MRSPP policies that apply are for encouraging the wise use of road salt and promoting best management practices through education.

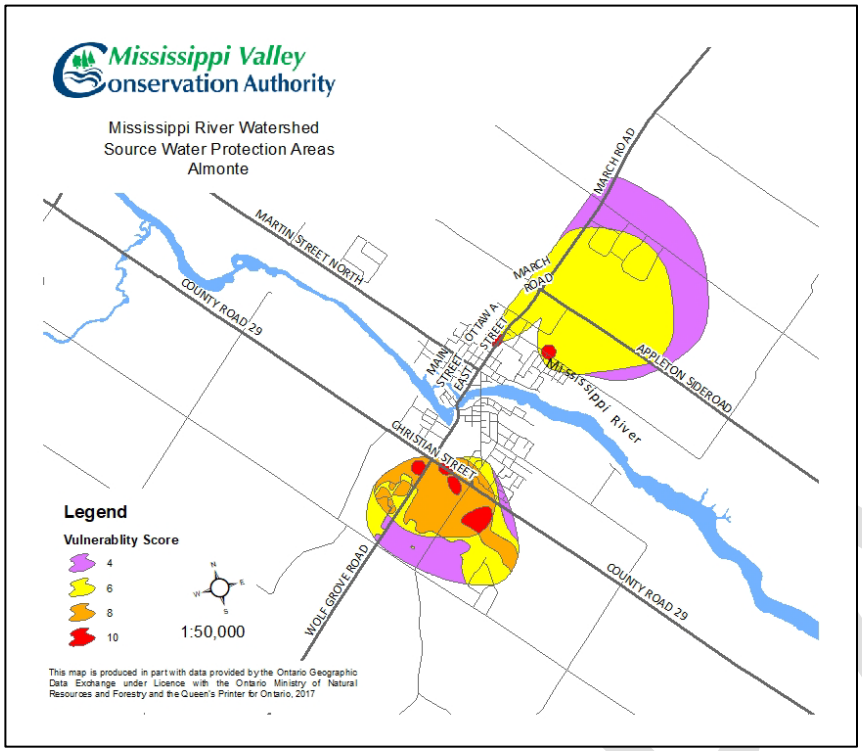

Figure A-1: Almonte Wellhead Protection Areas

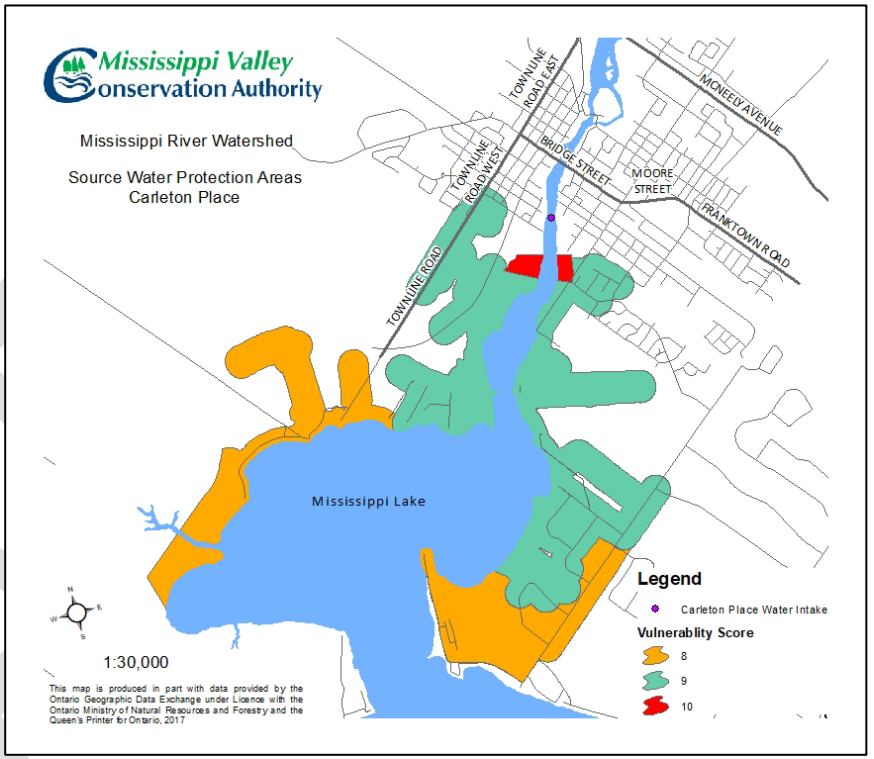

Figure A-2: Carleton Place Intake Protection Zone

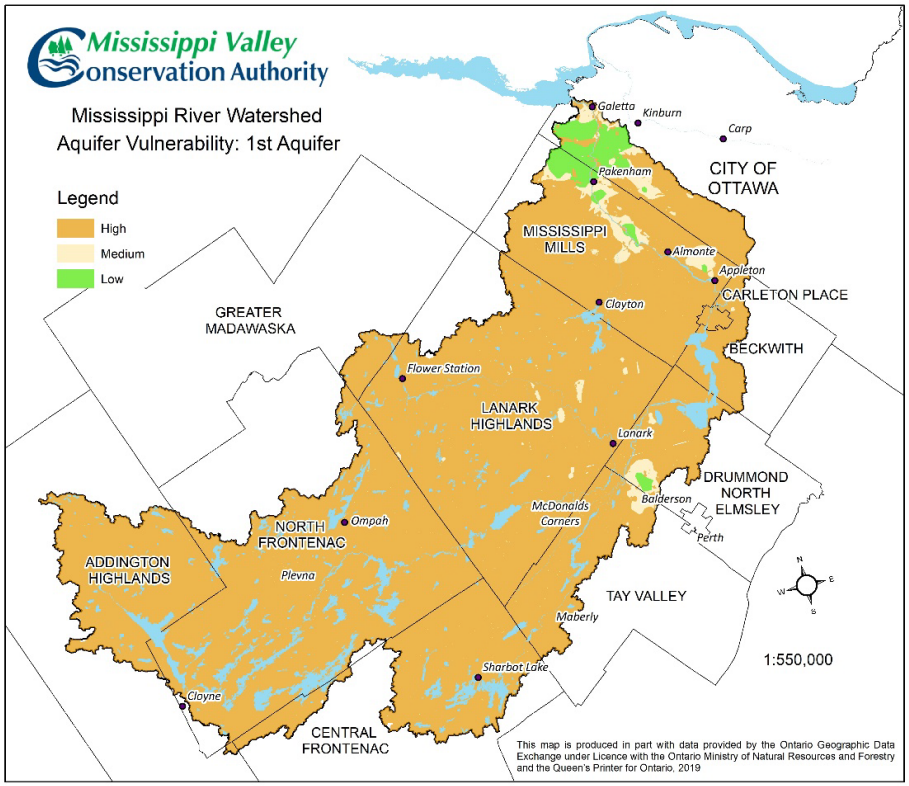

Figure A-3: Generalized Aquifer Vulnerability

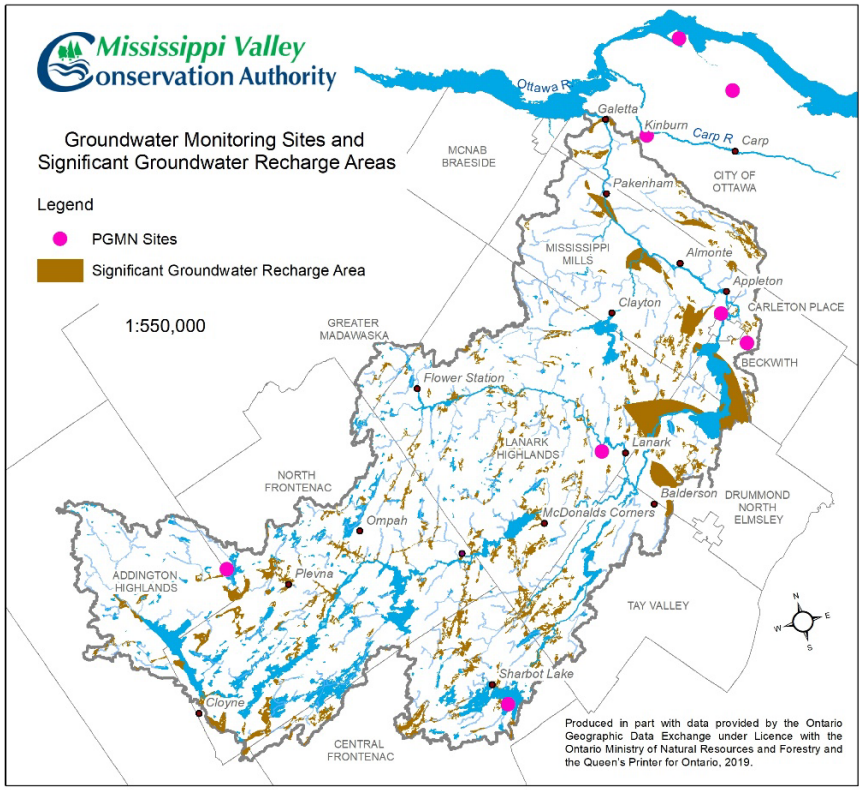

Figure A-4: Significant Groundwater Recharge Areas and Provincial Groundwater Monitoring Sites

Table A-6: Permits to Take Water

Municipality	Permit Holder (some with multiple permits)	Purpose	Max Taking (m^3/day)	Water Source
Campgrounds				
North Frontenac	MNRF/Bon Echo Park	Water Supply	3	Surface & Ground
			3	
			270	
Tay Valley	MNRF/Silver Lake Park	Water Supply	88	Ground
Construction Industry				
Carleton Place	1470424 Ontario Inc.	Dewatering	5,000	Surface & Ground
			7,000	
Mississippi Mills	Houchiami Construction	Dewatering	850	Surface & Ground
Mississippi Mills	Menzie Almonte	Dewatering	768	Surface & Ground
			459	
Mississippi Mills	Cavanagh Concrete	Manufacturing	400	Ground
			108	
Pits and Quarries				
Lanark Highlands	OMYA	Dewatering	13,680	Ground
		Aggregate Washing	13,690	
	Cavanagh-Pine Grove	Dewatering	867	Surface & Ground
		Aggregate Washing	455	
Mississippi Mills	W. Carleton Sand & Gravel	Dewatering	20,563	Surface & Ground
			10,282	
Ottawa	Cavanagh - Burnt Lands	Dewatering	24,883	Surface & Ground
			700	
			455	
		Aggregate Washing	6,000	
Ottawa	Cavanagh - Galetta SR	Dewatering	455	Surface & Ground
Commercial - Aquaculture, Agriculture, Golf Courses				
Central Frontenac	MNR- White Lake Hatchery	Aquaculture	15,120	Surface
North Frontenac	Tooley, Jeff (Plevna)	Aquaculture	72	Surface & Ground
			2,974	
			389	
			1,654	
D/North Elmsley	Mississippi Berries	Fruit Orchard	864	Surface
Mississippi Mills	Paul Ralph	Fruit Orchard	157	Surface
Lanark Highlands	Blue Heron Golf Course	Irrigation	273	Surface & Ground
		Water Supply	5	

Table A-6: Permits to Take Water

Municipality	Permit Holder (some with multiple permits)	Purpose	Max Taking (m^3/day)	Water Source
Mississippi Mills	Mississippi Golf Club	Irrigation	1,637	Surface & Ground
		Water Supply	40	
Mississippi Mills	Pakenham Golf Course	Irrigation	261	Ground
		Irrigation	1,560	
Mississippi Mills	Scottish Glen Gold Course	Irrigation	2,528	Surface & Ground
		Irrigation	293	
Mississippi Mills	Mt Pakenham Ski Resort	Snow making	5,891	Ground
Municipal Water Supply, Water Treatment				
Carleton Place	Town of Carleton Place	Water Supply	12,000	Surface
Mississippi Mills	Town of Mississippi Mills	Water Supply	818	(Total: 11,972) Ground
			1,958	
			835	
			8,362	
Power Producers				
Mississippi Mills	Mississippi River Power Corp	Power Production	3,110,400	Surface
Mississippi Mills	Canadian Hydro Developers	Power Production	3,500,000	Surface
Mississippi Mills	Enerdu Power Systems	Power Production	1,209,600	Surface
Source: https://www.ontario.ca/environment-and-energy/map-permits-take-water				

Agriculture

Table A-7: Agricultural Land by Subwatershed

SubWatershed	Total Area	Agricultural Lands	% of Subwatershed	% of MRWs total Area
	($km^{2)}$		%	
Upper Mississippi	1028	2.2	0.2%	1%
Central Mississippi	395	15.2	3.9%	4%
Clyde River	664	26.8	4.0%	6%
Fall River	486	29.7	6.1%	7%
Mississippi Lake	294	93.0	31.6%	21%
Lower Mississippi - Off Shield	432	226.3	52.4%	52%
Lower Mississippi - On Shield	425	41.5	9.8%	10%
Total	3724	435.0	17%	100%

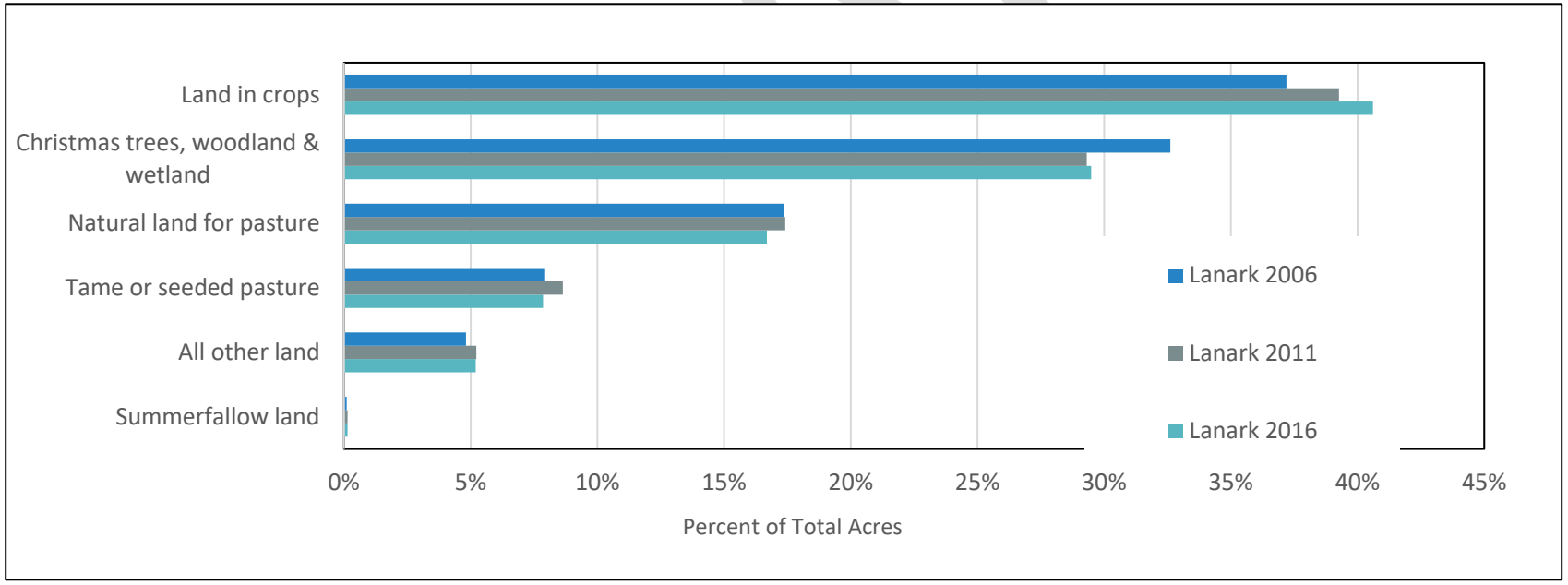

Figure A-5 : Agricultural Land Use In Lanark County, 2006, 2001 and 2016

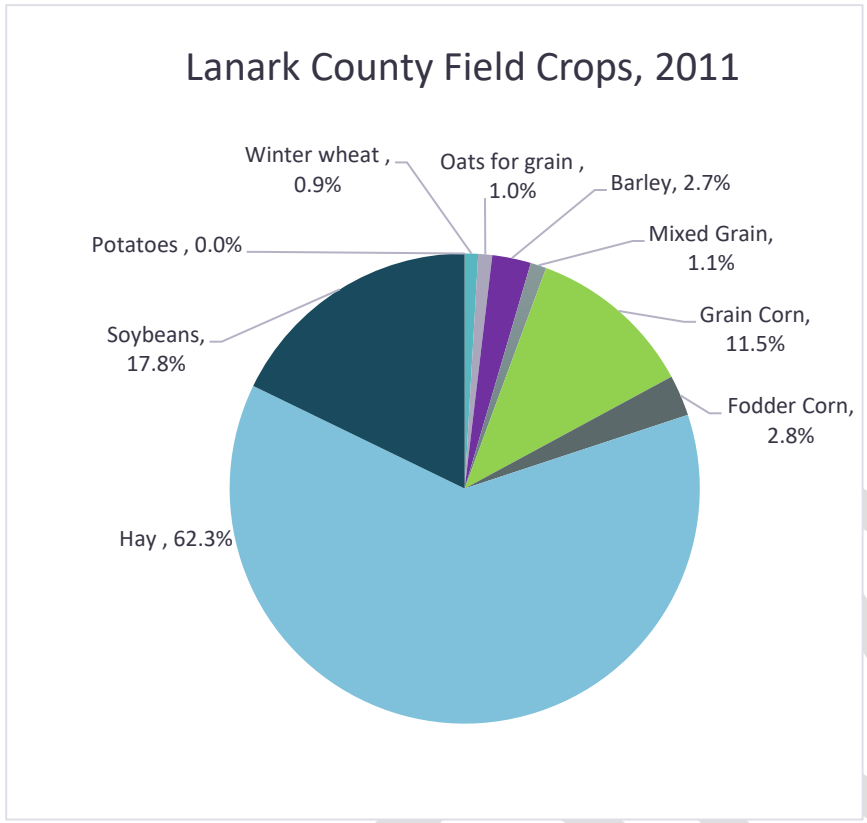

Figure A-6: Lanark County Field Crops, 2011

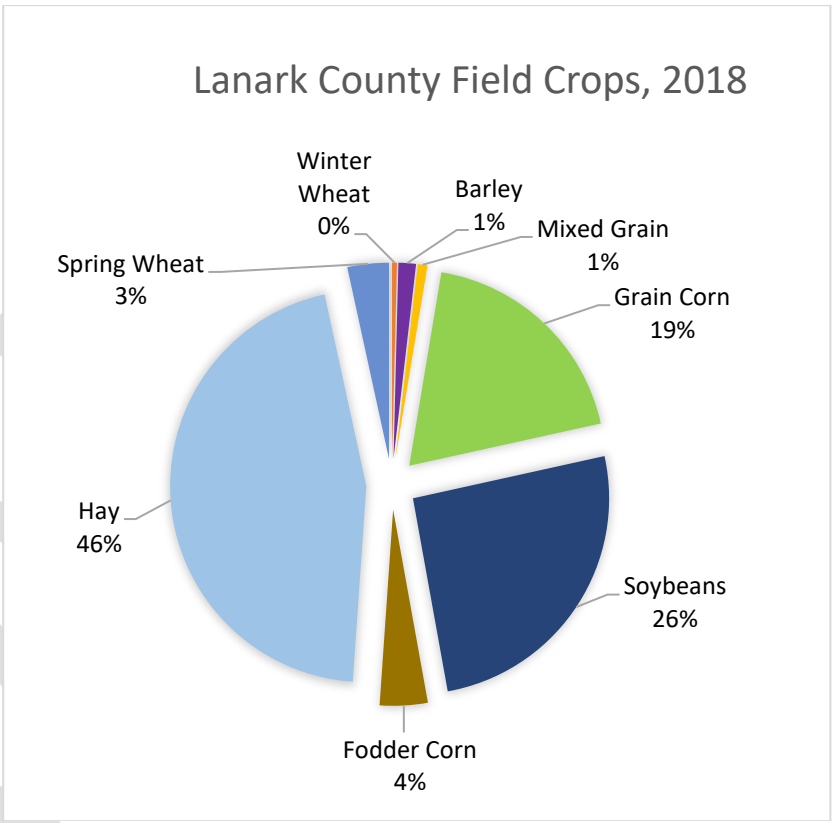

Figure A-7: Lanark County Field Crops, 2018

Table A-8: Wooded Area by Subwatershed

SubWatershed	Total Area	Forested Land Area	Forested Land as % of Total Subwatershed
	($km^{2)}$		%
Upper Mississippi	1028	774.65	75%
Central Mississippi	395	292.97	74%
Clyde River	664	517.54	78%
Fall River	486	321.21	66%
Mississippi Lake	294	117.75	40%
Lower Mississippi - Off Shield	432	124.02	29%
Lower Mississippi - On Shield	425	291.15	69%
Total	**3724**	**2439.27**	**66%**

Table A-9: Ownership of Wooded Areas

	km^2	%
Crown Land	689	28
County Community Forest	39.5	2
Private Lands	1710.5	70
Total Wooded Area	**2439**	100

Note 4: Crown Land, Conservation Areas and Natural Reserves

There are variety of public lands throughout the MRW that are owned and managed by different public bodies and that provide a range of functions, from education, recreation and tourism opportunities to conservation and protection of special natural features. The main categories of public lands are defined below. The MRW has four Conservation Areas, extensive areas of General Use Crown Land, four Provincial Parks, two Conservation Reserves, and one National Wildlife Area. There are also a number municipally owned parks and public areas scattered throughout the watershed.

Crown Land - Provincial
Owned by the Province of Ontario and managed by the Ministry of Natural Resources and Forestry (MNRF) under the *Public Lands Act, t*he primary land use designations for crown land include: Provincial Park; Conservation Reserve; Forest Reserve; Provincial Wildlife Area; Enhanced Management Area; Wilderness Area; and General Use area. The MNRF establishes permitted land uses for a specific area, such as: recreational hiking; ATV use; commercial fur harvesting; power generation. In 2019 Provincial Parks and Conservation Reserves became the responsibility of MECP.

Provincial Parks: are public lands set aside under the *Provincial Parks Act* and *Conservation Reserves Act (2006)* to protect natural, cultural and recreational environments and provide outdoor recreation opportunities for the general public. They are managed by Ontario Parks, a branch of the MNRF. There are six classifications of provincial parks, selected according to their representation within each region.

Conservation Reserves: protect significant natural and cultural features while providing opportunities for compatible traditional activities (e.g. fishing, hunting, and trapping). Regulated under the *Provincial Parks and Conservation Reserves Act,* they are also important for scientific research and environmental monitoring.

Enhanced Management Area (EMA): a crown land designation used by MNRF, they are not subject to the same detailed plans as other categories of crown land. EMAs are primarily intended to provide a framework for the development of area-specific policies through local planning.

General Use Area (GUA): The GUA designation is the default designation where no other specific designation has been applied. The majority of Crown lands currently fall into the general use designation. It is the most flexible Crown land use designation however GUAs can have specific land use policies. A full range of resource and recreational uses can be permitted in GUAs. However, the GUA designation does not mean that all uses and activities must be permitted.
General Use Area Crown Land in the MRW

The General Use Area (GUA) designation is the "default" designation where no other specific designations have been applied. Most of the Crown Land in the MRW falls under the GUA category, which applies to 660 km^2 or 86% of the entire 770 km^2 of Crown Land. Under Agreement with MNRF, the Township of North Frontenac manages 184 established campsites on the crown land around a number of lakes. The campsites were originally established through the Mississippi River Canoe Route and as a result all of the sites are water access only and many are located on islands. Camping is allowed by permit from May 1st to October 31st.

In the 1950's the Province started to subdivide and sell waterfront cottage lots throughout the region. Many of the lakes in the Upper Mississippi River are still surrounded by large amounts of crown land. Examples are listed in table X. In addition to providing large tracts of natural "recreational" lands, the crown land buffers the impact of shoreline development by reducing the overall density of development around the perimeter of the lake.

Note 5: Hydroelectric Generating Stations

High Falls G.S.

The High Falls Generating Station is a run-of-the-river[13] consisting of two major components, the generating station and a concrete control structure having four sluices and an overflow weir. The generating station has the total capacity to discharge 14.3 m^3/s. OPG endeavors to maintain water levels within the operating range of 187.00 m and 187.56 m while producing power from the available streamflow. The plant has a maximum plant output of 2.4 megawatts.

Appleton G.S.

The Appleton Generating Station is a run-of-the-river structure with no forebay or storage capabilities, which impacts only the section of the river approximately 0.5 km upstream of the dam. The generating station can pass a maximum flow of 35 m^3/s through the plant and any excess must be spilled through the stoplogs or over the weir. Flashboards are installed in the summer on the weir to increase head in the river to maximize hydro production and are removed in late fall. The Appleton G.S. has a maximum plant output of 1.3 megawatts. The station has a total drainage area of 2932 sq. km and has no storage capacity. The operation of the Generating Station only impacts a 0.5 km section of river upstream of the dam.

Enerdu Generating Station (Almonte)

The Enerdu Generating Station is also a run-of-the-river operation that consists of a powerhouse with an overflow weir. This facility was originally built in 1842 as the Wylie Flour Mill and was used to grind grain into flour. Flashboards (0.40 m on weir and 0.50 m across river) are added in the summer to increase the head at the dam. The Enerdu Generating Station has a maximum plant output of 0.35 megawatts. The dam can pass approximately 14 m^3/s through the generating station with excess water being spilled over the weir. The station has a total drainage area of 3012 sq. km. and maintains levels except under extremely low flows from the dam to the tailrace of the Appleton Dam, which is a distance of about 9 km. The dam has limited storage capabilities due to the rock outcrop approximately 0.5 km upstream of the dam.

Mississippi River G.S.

The Mississippi River Power Generating Station is located 150 m downstream of the Enerdu Generating Station in the Town of Almonte. It is a run-of-the-river operation and has a maximum plant output of 2.4 megawatts. The station consists of a power house with a debris bypass stoplog sluice and an overflow weir. The hydro station can pass approximately 34 m^3/s, with excess flows going over the falls beside the generating facility or down the chancery channel and over Willards Falls. The Mississippi River Power G.S. has a total drainage area of 3012 sq. km. and only influences levels in the bay between Enerdu and this structure.

[13] Run-of- the-river generation facilities have little or no upstream storage and therefore inflows match outflows at these facilities. Hydro production is based on whatever flow is available in the system.

Galetta Generating Station

This station is a run-of-the-river operation, and the dam can pass approximately 30 m^3/s through the generating station, with excess flows passed through the control section or over the weir. The Generating Station uses only the water that the river delivers. Flashboards are installed once low flows exist to provide additional head in the river to maximize power production. The Galetta Generating Station has a total drainage area of 3684 sq. km and influences water levels from Galetta through to the falls in Pakenham, and has limited storage capabilities. During high flows, the bridge immediately downstream of this plant creates a backwater effect on the tailrace. This can result in a quick and substantial increase in water levels in the tailrace area of the plant. It has a maximum plant output of 1.6 megawatts.

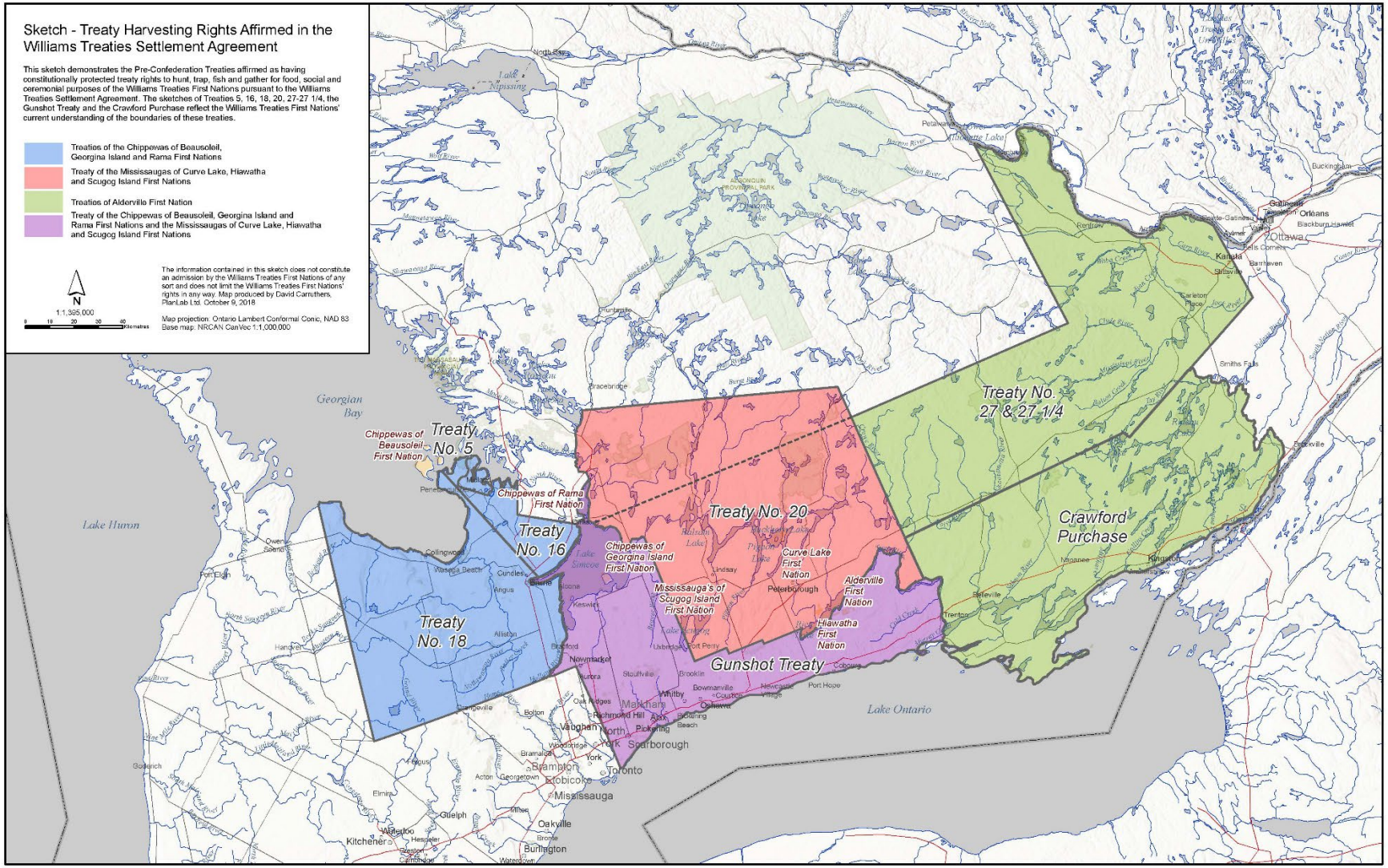

Figure A-8: Treaty Areas

Note 6: Memorandums of Agreement

Lanark County

MVCA, along with the Rideau Valley Conservation Authority (RVCA), have a Memorandum of Agreement with the County of Lanark for the review of planning applications within their areas of jurisdiction. Under this agreement, the CAs provide technical review of:
Hydrogeological reports, terrain analysis studies, rural servicing options reports and cumulative impact studies to support development on private services (except in the Township of Beckwith);
Environmental Impact Statements for wetlands, ANSIs*, fish habitat**, wildlife habitat, woodlands, etc.;
Studies to support applications affected by environmental constraints including organic soils and unstable slopes;
Hydrogeological components of any site specific study resulting from transfer of provincial review functions;
Site drainage plans including stormwater management reports and sediment and erosion control plans;
Flood plain management issues;
Lake capacity modeling assessments.
*though specified in the Agreement, the review of ANSIs is done by MNRF. **though specified in the Agreement the review of fish habitat is done by DFO.

City of Ottawa

MVCA, along with RVCA and the South Nation Conservation Authority also have a Memorandum of Understanding with the City of Ottawa for the review of planning applications within their areas of jurisdiction. Under this agreement the CAs review technical reports for impacts on surface water and groundwater features, and natural hazard interests, for the following*:

- Private Servicing for Water and Sewage (ex. Hydrogeological and Terrain Analysis Servicing Review Studies, Well Inspection Reports, etc.)
- Municipal Servicing for Water and Sewage (scoped Hydrogeological Studies, Scoped Existing Conditions Hydrogeological and Water Budget Studies, Conceptual/Preliminary Servicing and Detailed Design for Water and Sewage, etc.)
- Aggregate Resources Act Applications (Scoped Existing Conditions Hydrogeological and Water Budget Studies)
- Natural Hazards (all studies for Hazardous Lands and Hazardous Sites)
- Surface Water/Headwater Features
- Aquatic Habitat
- Provincially Significant Wetlands
- Other Wetlands

*according to specific parameters outlined in the MOU