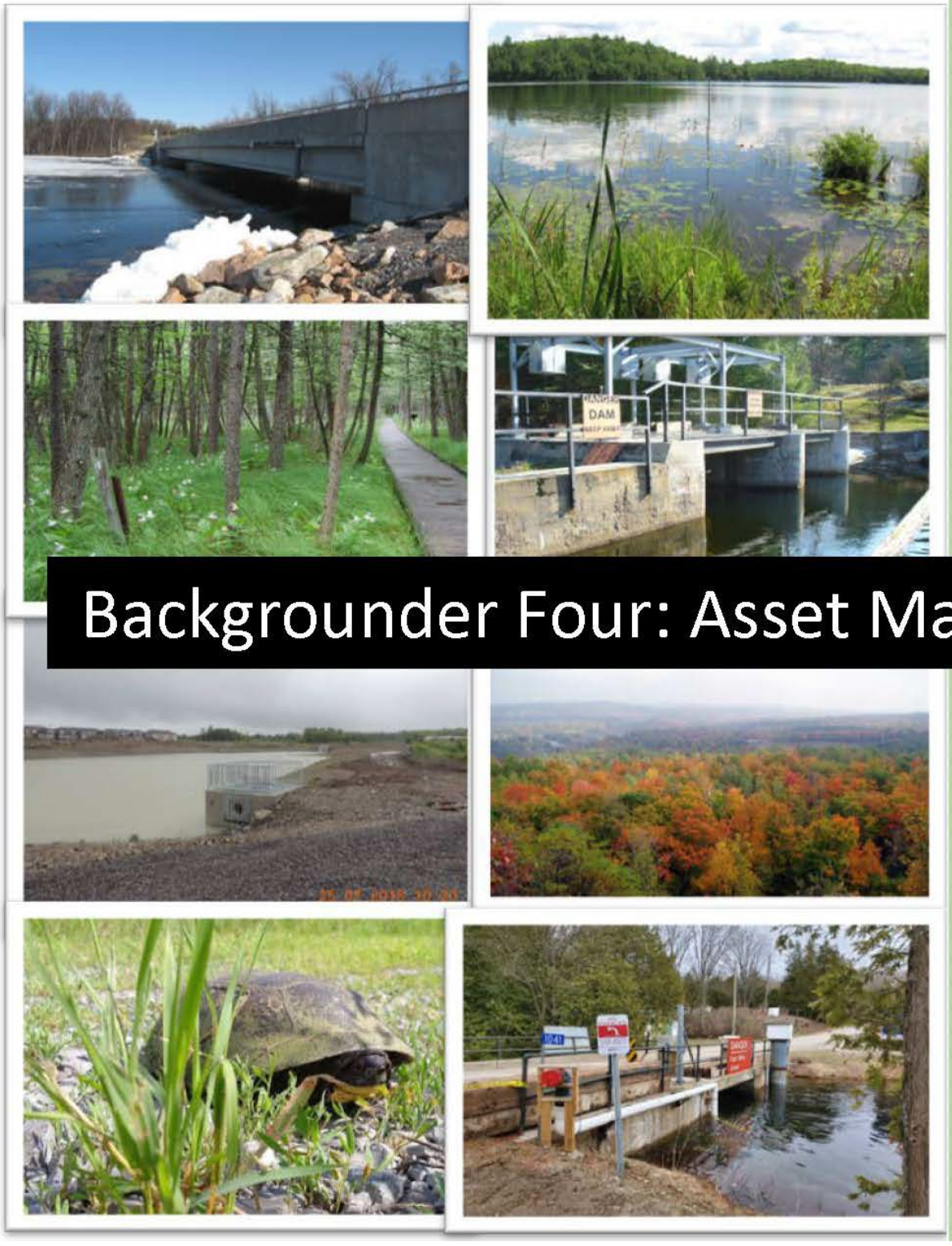


2020

DRAFT

Backgrounder Four: Asset Management

MISSISSIPPI RIVER WATERSHED PLAN

Backgrounder Series

Mississippi Valley Conservation Authority

BLANK PAGE

Table of Contents

List of Figures

List of Tables

The Mississippi River Watershed Plan

This report is the fourth 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.

Mississippi River Watershed Plan Backgrounders:

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

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.

Backgrounder Two: People & Property, examines the human 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 at 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.

Backgrounder Three: Natural Systems, presents information about the natural environment. It looks at natural heritage features such as wetlands, areas of natural and scientific interest (ANSIs), woodlands and natural heritage systems. It also looks at species at risk, the health of our aquatic environment, fisheries and some stressors in the natural environment like invasive species.

Backgrounder Four: Asset Management, discusses how a host of water and other natural resources are managed in the watershed. This document looks at not just traditional hard infrastructure such as dams, weirs, and stormwater facilities, but also natural assets such as conservation areas, wildlife, and small specific water management systems that fall under the umbrella of low impact development (LID) techniques.

These documents are 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

The Mississippi River Watershed Plan project focusses on the full watershed of the Mississippi River as shown in Figure 1.

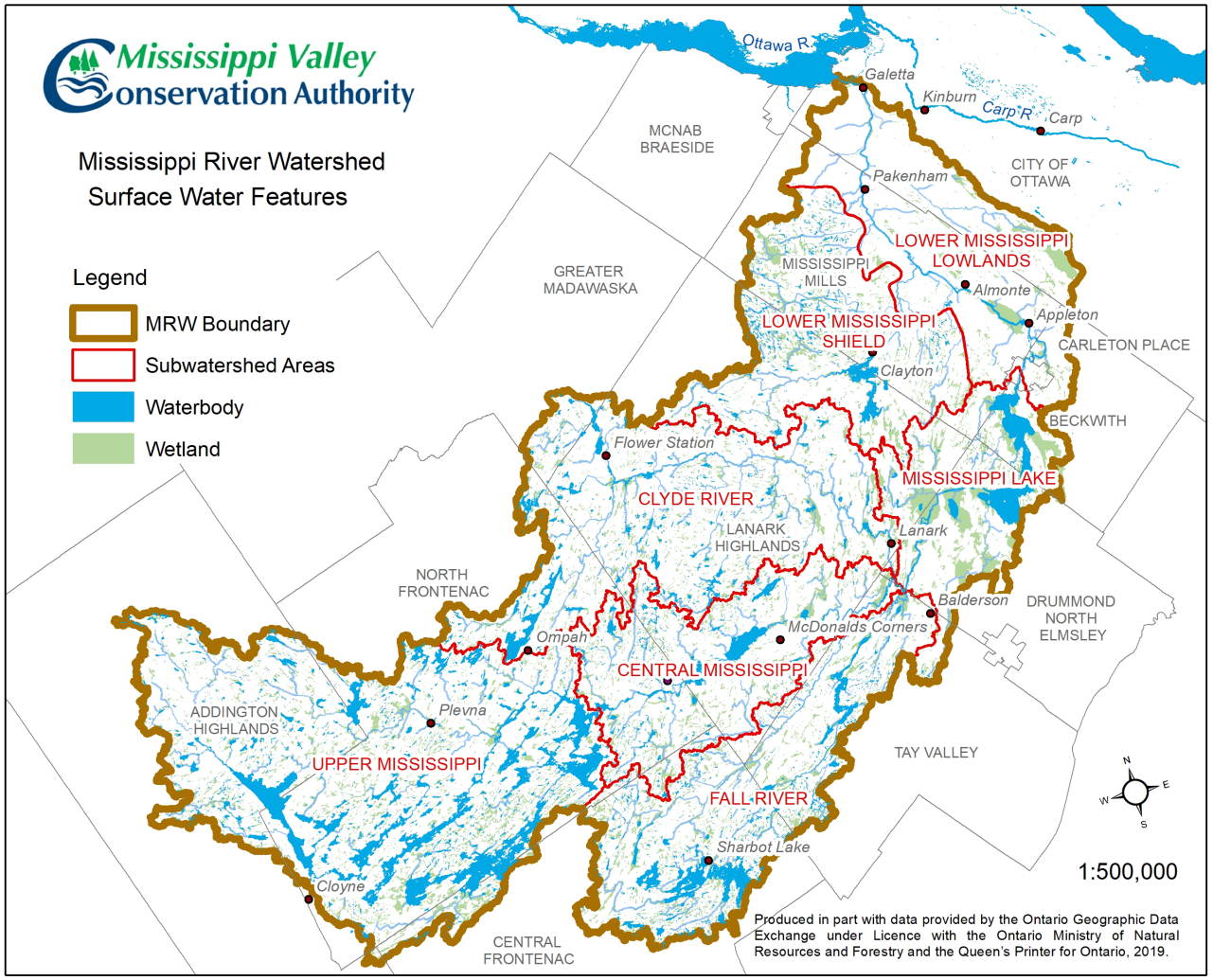


Figure 1: Mississippi River Watershed

Asset Management

*An **asset** is anything tangible or intangible that can be owned or controlled with the expectation that it will provide a benefit.*

Per the *Conservation Authorities Act* of Ontario, this document examines both built and natural assets that:

- "in the event of a natural hazard, might jeopardize the health or safety of persons or result in the damage or destruction of property"
- "further the conservation, restoration, development and management of natural resources"

Traditionally, asset management was confined to conducting regular maintenance and repair of built assets and depreciating their value over time for accounting and taxation purposes. To varying degrees, this also included setting aside money in reserve funds to pay for major repairs and to replace those assets as they aged. Over time, asset management evolved to include detailed assessment of how an asset was used to determine the most cost-effective way to operate, maintain, and replace it.

Today, asset management can also address natural assets, and establish clear policy objectives, decision-making processes, customer service levels, and training programs to ensure that everyone who controls or influences a built or natural asset has and knows their roles and responsibilities. This Federation of Canadian Municipalities (FCM) illustration shows the key elements of its asset management training program.

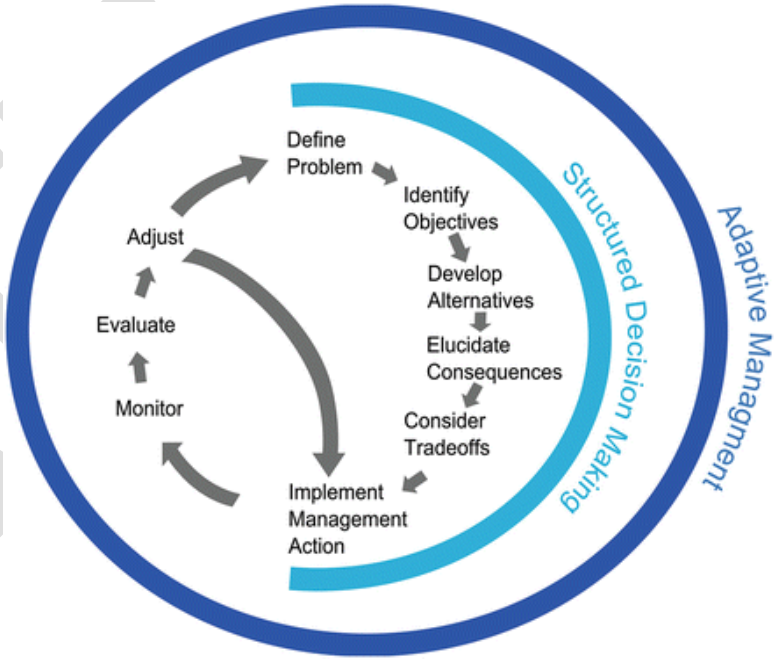
The conditions underlying the push by FCM and others for improved asset management include the following:

- Growing financial demands on governments and agencies to replace aging and maintain a growing number of built assets
- Diminishing quantity and quality of natural assets as land and natural resources are consumed, and impacted by pollution and settlement
- Growing demand by ratepayers for more and better services, and improved accountability and transparency
- Increasingly unpredictable extreme weather events associated with climate change, and their physical, social, and financial impacts
- The limited financial resources of governments, households and industry to withstand environmental, social, and economic shocks
- Recognition that many environmental, social, and financial risks can be mitigated through good asset management

Adaptive Management

Adaptive management: *a type of natural resources management in which decisions are made as part of an ongoing science-based process….involves testing, monitoring, and evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings and the needs of society. Results are used to modify management policy, strategies, and practices.*

Source: USDA et al. *Unified Federal Policy for a Watershed Approach to Federal Land and Resource Manage*ment, October 18, 2000



Source: Craig R. Allen et al. *Adaptive Management of Rangeland Systems*, 14 April 2017.

Adaptive management is very similar to the quality assurance Continuous Improvement model[1] used by organizations around the world, which is founded on the plan-do-check-act (PDCA) cycle:

Plan: Identify an opportunity and plan for change.
Do: Implement the change on a small scale.
Check: Use data to analyze the results of the change and determine whether it made a difference.
Act: If the change was successful, implement it on a wider scale and continuously assess your results. If the change did not work, begin the cycle again.

In both Adaptive Management and Continuous Improvement, feedback loops are used to determine whether the current approach is working, and to adjusted actions as needed to ensure that desired outcomes are achieved. This document examines key natural and built assets in the watershed and outlines how they are currently managed. It aims to show how asset management, adaptive management, and coordination amongst property owners, asset owners, municipalities, the province, MVCA and others are needed to ensure sustainable natural resource management and protection of people and property from natural hazards in the Mississippi River watershed.

[1] https://asq.org/quality-resources/continuous-improvement

Dams

The Mississippi River drops approximately 271 m over 195 km and has numerous structures that are considered "dams" under the provincial *Lakes and Rivers Improvement Act*, RSO 1990.

> ***Dam*** *means a structure or work forwarding, holding back or diverting water and includes a dam, tailings dam, dike, diversion, channel alteration, artificial channel, culvert or causeway.*

By this definition, any structure that can restrict or divert flow is considered a "dam" including not just traditional dams and weirs, but also culverts and bridges. All restrict or redirect flow by altering the bed and banks of the watercourse (as shown in Figure 2) and must be designed to ensure adequate flow and erosion control, and to maintain ecosystem functions. This section of the Backgrounder deals with both types of dams:

- Water Control Structures: designed specifically to alter and control water elevations and flow; and
- River Crossings: structures that alter the river channel for the purpose of road, rail and other utility crossings.

KEY CONSIDERATIONS

Any river crossing including dams, culverts and bridges can restrict flow and cause localized flooding.

Twelve of 23 water control structures are operated per the 2006 *Mississippi River Water Management Plan*.

Six major road crossings impair flow of the river. Another 11 road crossings are known to have flooded or experienced washout during the past thirty years.

Private roads are vulnerable to flooding and can inhibit growth potential due to requirements for safe access.

There is limited storage capacity in the watershed; most is located in the upper third of the watershed. None of the downstream structures provide usable storage.

The Crotch Lake dam was rebuilt in 1999 and provides the most storage capacity. It is operated to maintain 5 m^3/s baseflow in the river year-round.

Most other dams and weirs are nearing or have reached the end of their lifecycle.

Operation of the system is expected to become more challenging as a result of increased land development and changing climatic conditions.

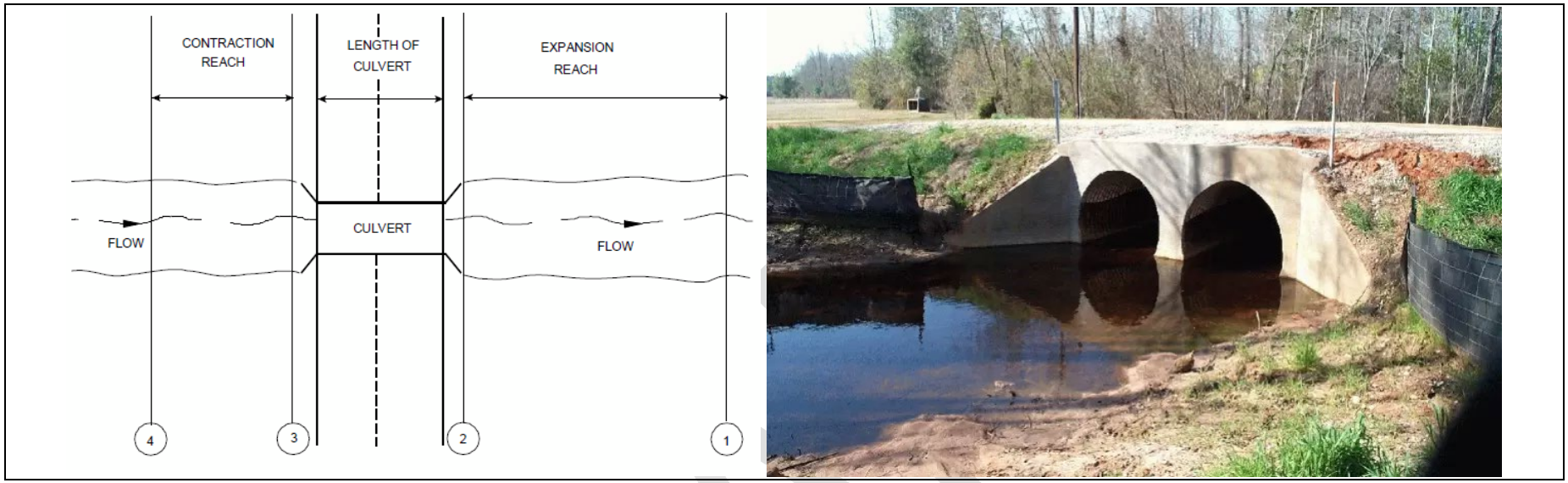


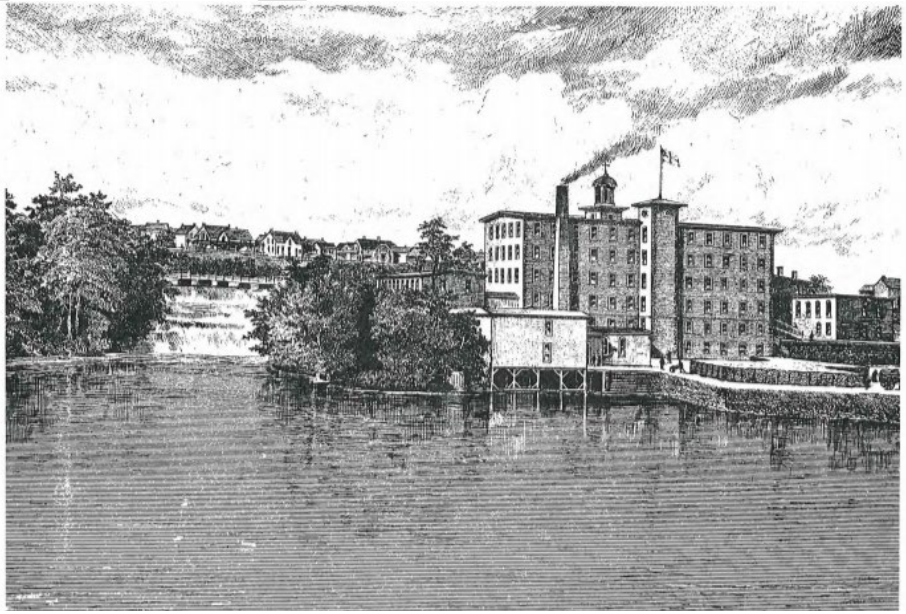
Figure 2: River Crossings act as dams

Source: https://knowledge.civilgeo.com/knowledge-base/hec-ras-culvert-cross-section-locations/

Water Control Structures

Within the Mississippi River watershed there are 23 water control structures that are owned and/or operated by MVCA, the Ministry of Natural Resources and Forestry (MNRF) and the four power producers[2]. The location of these are shown on Figure 3. Most small structures, located in the western portion of the watershed, were either built in the 1800s to maintain enough water in the system to allow timber to be floated downstream, or the 1950s and 1970's to support recreational activities and fisheries. [3] Larger facilities were built for power generation either to serve historic mills or feed the power grid. In the early 1980s, other dams were identified, mostly small and derelict and on private land.[4]

Small: Palmerston Lake Dam, present day



Large: 1877 Illustration of the falls and Mill in Almonte

[2] Power producers on the Mississippi include Ontario Power Generation (OPG), Enerdu Power Systems Ltd., Mississippi River Power Corp. and TransAlta Corp. There are an undetermined number of other small private dams on the system.
[3] *Mississippi River Water Management Plan*, 2006
[4] Ibid.

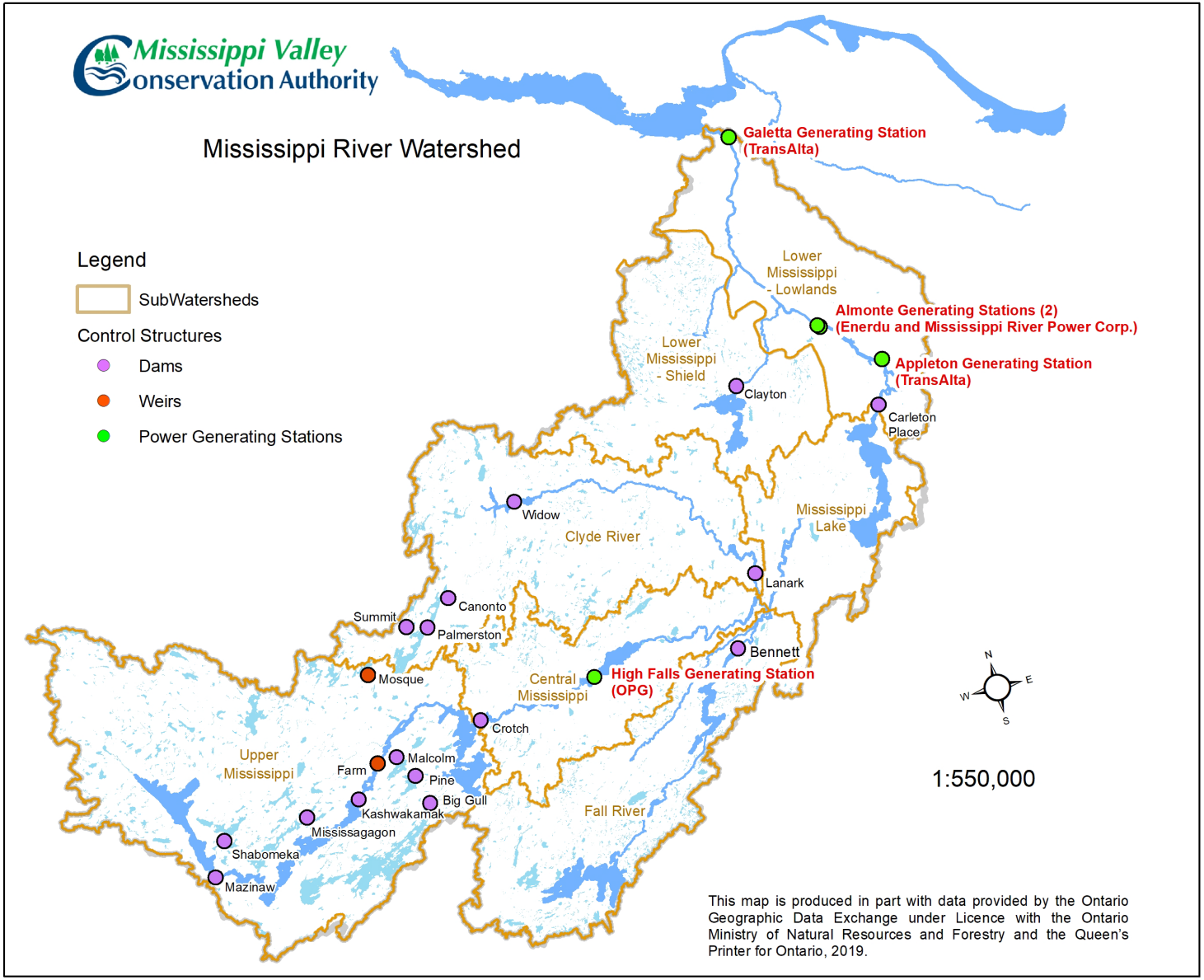


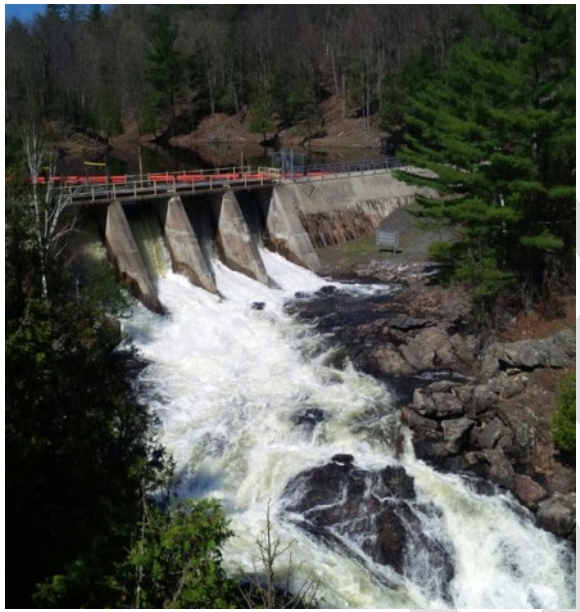
Figure 3: Dams, Weirs and Generating Stations on the Mississippi River, 2020

System Operations

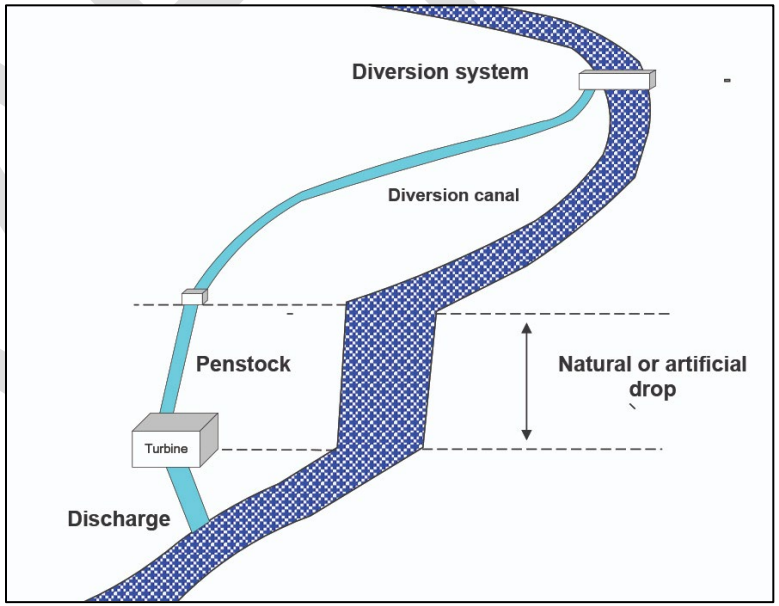
Table 1 lists the 12 structures that are operated in accordance the *Mississippi River Water Management Plan*, 2006. The Plan was developed per the *Guidelines for Waterpower*, 2002 and approved by the province under the *Lakes and Rivers Improvement Act*, RSO 1990. The remaining 11 MVCA, MNRF and power producer-owned structures are either on tributaries or are weirs without stoplogs or other mechanisms to alter flow, and cannot be "operated".

Run-of-river hydro plants rely on existing flows to generate electricity. A dam or weir is used to direct a portion of flow to the turbine. Water is not stored behind the dam. Larger generating facilities that hold water back have reservoirs for future use.

Five of the 12 structures are run-of-river[5] power generation stations that channel a portion of river flow and do *not* provide any or much storage, as shown in Table 1.



High Falls Diversion Dam



How run-of-river hydro systems work [6]

[5] Definition source: https://energyeducation.ca/encyclopedia/Run-of-the-river_hydroelectricity
[6] Diagram source: https://www.ee.co.za/article/run-river-hydropower-systems.html

Table 1: Water control structures operated per the 2006 *Mississippi River Water Management Plan*

Upstream ↓ Downstream	Name	Owner	Drainage Area (ha)	Usable Storage[7] (ha m)	Installed Generating Power (MW)[8]
	Shabomeka Lake Dam	Mississippi Valley Conservation Authority	4,100	0	
	Mazinaw Lake Dam	Mississippi Valley Conservation Authority	33,900	1,793	
	Kashwakamak Lake Dam	Mississippi Valley Conservation Authority	41,700	1,911	
	Mississagagon Lake Dam	Mississippi Valley Conservation Authority	2,200	0	
	Big Gull Lake Dam	Mississippi Valley Conservation Authority	13,500	1,524	
	Crotch Lake Dam	Ontario Power Generation (OPG)	103,000	5,859	
	High Falls Generating Station	Ontario Power Generation	123,300	0	2.9
	Carleton Place Dam	Mississippi Valley Conservation Authority	287,600	0	
	Appleton Generating Station	TransAlta Renewable	293,200	0	1.3
	Enerdu Generating Station	Enerdu Power Systems Ltd.	301,200	0	1.0
	Almonte Generating Station	Mississippi River Power Corporation	301,200	0	4.6
	Galetta Generating Station	TransAlta Renewable	368,400	0	1.6

The usable lake storage is all located in the upper watershed (Figure 4). Crotch Lake represents the only significant reservoir on the Mississippi River and has relatively limited storage capacity. For example, the Madawaska River has about twice the drainage area of the Mississippi watershed but it's Bark Lake Reservoir is almost six times larger than Crotch Lake. Mazinaw, Kashwakamak and Big Gull combined provide about the same storage volume as Crotch Lake.

A **hectare meter** (ha m) is equivalent to 1 ha of land filled to 1 meter deep, or 10,000 m^3 of water.

The Crotch Lake dam is operated by the MVCA on behalf of OPG and is drawn down twice a year to maintain minimum flows in the river for ecological purposes and electricity generation while mitigating peak flows during flood season.

During the winter months, water is released from Crotch Lake to maintain a minimum flow of 5 m^3/s. By March, the reservoir is almost empty and available to provide maximum storage during the spring freshet. As the freshet begins, logs are placed in the dam to fill the lake and mitigate downstream flooding. Once the lake level reaches 240.00 MASL there is no storage remaining and all excess flow is passed downstream. This can flood several flood damage centers including Dalhousie and Mississippi Lakes, Carleton Place, Appleton and Pakenham.

Following the freshet, the lake is gradually drawn down over the summer months to maintain a minimum flow of 5 m^3/s. Following Thanksgiving weekend, the fall drawdown begins in the upper watershed. As the upper lakes are lowered to their winter settings, excess water is used to fill Crotch Lake in preparation for winter operations.

There is no storage located on the Clyde River and consequently Lanark Village and Cedardale are vulnerable to flooding.

[7] Storage greater than 1,500 ha m.

[8] Scott Newton, Manager Mississippi River Power Corp. source for MW information

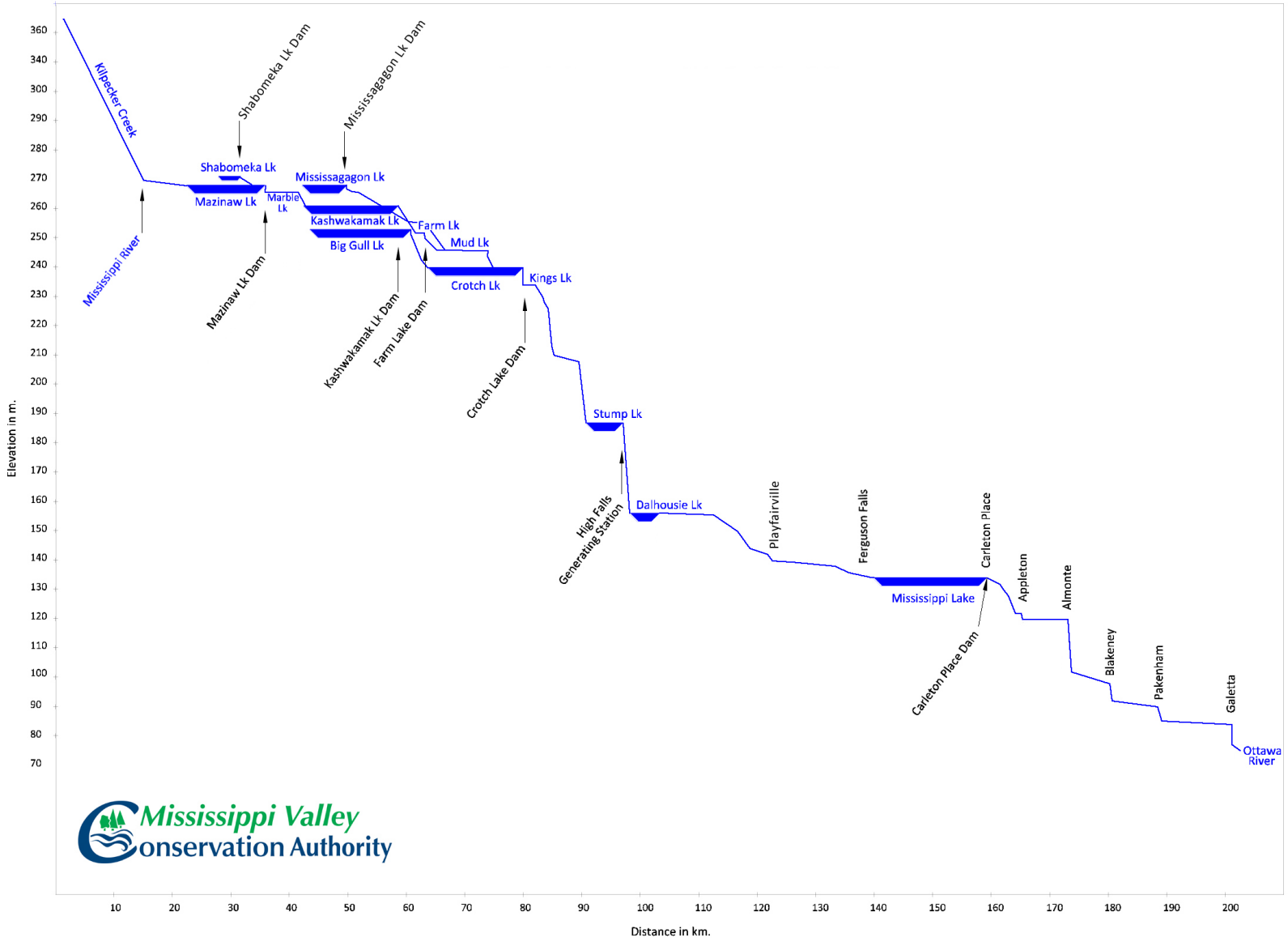


Figure 4: Mississippi River Elevation and Storage Profile

On all other lakes, water levels are lowered in the fall to accommodate the subsequent spring freshet and managed in the spring to achieve summer target levels. Approximately 140 mm of precipitation[9] from rainfall and snowmelt are needed to achieve summer target levels.

Once water is released downstream, it can only be replaced by base flow and precipitation. For this reason, operators are constantly balancing the risk of releasing too much water in the event of a drought, against the risk of retaining too much water should there be an extreme wet weather event. Achieving and maintaining target levels is anticipated to become more challenging under changing climatic conditions.

Any changes to the operating regime set out in the 2006 Water Management Plan must be submitted to the province for approval. Depending on the nature and scale of the proposed change, the province may engage other facility operators, the general public, and indigenous communities to comment on the proposal.

Independent review of the 2019 flood events

"Based on an analysis of the information available for all of the systems that experienced flooding in 2019, nothing points to human error or the negligent operation of water control structures as the cause of the flooding. The sheer amount of water (snow and rainfall) on the landscape directly contributed to the flooding. Measures taken by water managers everywhere were effective in reducing the magnitude of flooding and associated damages throughout the drainage basins."

Doug McNeil, Provincial Special Advisor

Asset Condition and Renewal

MVCA regularly carries out inspections of its water control structures. Most of the facilities are nearing or are at the end of their lifecycle and will require major repair or replacement within the next 10-15 years. As of 2020, the current 10-year capital plan identifies capital works on the following dams, with a total value over $3.6 million. This poses a significant cost to member municipalities and taxpayers, but also provides an opportunity to review current system design to identify potential improvements and efficiencies. For example, there are numerous small facilities owned by MVCA or the province that provide very localized control and may not provide enough benefits to justify the cost to replace them; or may warrant an alternative funding model to better align the distribution of costs and benefits. Alternatively, there may be an opportunity to increase storage capacity within the watershed or improve operational flexibility and safety during renewal of the facilities.

- Shabomeka Lake Dam
- Mazinaw Lake Dam
- Kashwakamak Lake Dam
- Big Gull Lake Dam
- Mississagagon Lake Dam
- Farm Lake Dam
- Pine Lake Dam
- Carleton Place Dam
- Lanark Dam
- Widow Lake Dam
- Bennett Lake Dam

[9] *Mississippi River Water Management Plan*, 2006

Storage Capacity

There is approximately 11,087 ha m of usable lake storage capacity, all located upstream of the Crotch Lake dam. Without any storage reservoirs in the lower two-thirds of the watershed, there is limited opportunity to store or mitigate flows from excessive precipitation and runoff. Consequently, riverine flooding downstream of Crotch Lake is common. Most flood damage centres have flood plain mapping that identify areas of risk.

The financial and social impacts of flooding have increased over time as shoreline settlement intensified and cottages were renovated to become year-round homes. Filling of wetlands, the loss of forest cover and increased urbanization all contribute to an increase in runoff volume due to decreased infiltration and natural storage. The frequency and intensity of drought and flooding are expected to increase as a result of changing climatic conditions. Therefore, an examination of opportunities to increase water storage is needed, including options to:

- maintain and enhance natural storage (woodlands, wetlands, grasslands)
- increase on-site storage (e.g. tile drainage recovery, permeable pavers, cisterns, infiltration pits, swales)
- increased stormwater storage (e.g. stormwater facilities)
- increase in-river storage (dams and reservoirs)

Reduce run-off

Retain run-off

KEY CONSIDERATIONS

Wetlands are a natural means of storing vast amounts of water and recharging aquifers. An estimated 65% of wetlands have been lost in the lower watershed.

Bioswales, infiltration pits, and other on-site storage systems reduce run-off volumes and river pollution.

Tile drain recovery systems store agricultural run-off and can reduce nutrient use and soil erosion.

Areas developed before the 1980s have limited or no stormwater management.

Natural Storage

Natural features such as wetlands, forests and windrows help to reduce peak flows by intercepting and storing surface runoff, thereby facilitating infiltration and groundwater recharge. They also provide slope stabilization and erosion control functions.

Wetlands regulate water levels—storing water in wet periods and releasing it in dry periods—easing flood and drought impacts. Protection and enhancement of these assets, particularly in proximity to urban settlements, can mitigate flood and drought impacts. A study by Ducks Unlimited Canada (DUC)[10]estimates that Southern Ontario[11] has lost approximately 72% of its pre-European Settlement (c1800) wetlands. The DUC findings suggest an estimated 65% decline in pre-settlement wetland in the lower watershed with some higher losses near growing communities.

[10] Ducks Unlimited Canada (DUC). 2010. Southern Ontario wetland conversion analysis: final report. Ducks Unlimited Canada, Barrie, ON.

[11] Southern Ontario is Ontario's Mixedwood Plains Ecozone including the counties of south of Lake Huron and Georgian Bay as well as the counties of Simcoe, Victoria, Peterborough, Hastings, Lennox & Addington, Frontenac, Leeds, Lanark, Ottawa-Carleton, Russel, Prescott and all counties to the south.

Scotch Corners Wetland[12]

LID features at Tanger Outlets, Ottawa[13]

On-site Storage

Low impact development (LID) can significantly reduce the amount of stormwater discharged to the Mississippi River and its tributaries in urban areas. Assets such as vegetated bioswales, infiltration pits, permeable pavement, and rain gardens can all "slow the flow" and reduce the impacts of flooding and water pollution while providing resiliency in the event of a drought.

Similarly, tile drain recovery systems on farms can reduce agricultural run-off, reduce irrigation and fertilizer requirements, and provide resiliency in times of drought. Nutrient run-off from larger farms is regulated via the *Nutrient Management Act*, 2002 and O.Reg. 267/03. Introduction of this legislation significantly improved awareness and adoption of nutrient and animal best management practices to reduce impacts on surface and ground water systems. There remains opportunity to enhance implementation of farm nutrient and drainage practices in the watershed.

[12] Photo by Awakebutterfly - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=56829220
[13] Photo source: google.com/maps

Stormwater Management Facilities

Provincial land use planning laws require developers to demonstrate how a property will be developed to protect structures from flooding, prevent alteration of run-off patterns onto adjacent properties, ensure that flow rates do not exceed pre-development rates, and to mitigate the impacts of suspended solids and E.coli on receiving waterbodies. This can include the provision of communal stormwater facilities. Urban settlements developed prior to the 1980s lack many of these facilities and largely discharge uncontrolled and untreated stormwater to streams and rivers. Only developments constructed since the 1980s have these controls, with the design, operation and effectiveness of these systems improving over time. Today, many older facilities no longer operate as designed and require lifecycle replacement to reinstate their former capacity and meet current standards. There is a need to not only build new facilities to service growth, but also to retrofit older communities to increase stormwater storage capacity and treatment.

Lake Reservoirs

This form of water storage is the most challenging to build and alter because of the scope and significance of its potential impact on the landscape, aquatic life, landowners, and recreational uses both upstream and downstream. At this time, Crotch Lake Dam represents the greatest opportunity to increase storage capacity. The Crotch Lake Dam consists of a single 3.36 m wide concrete sluice gate and a 110-meter long weir. The weir is a rock filled gabion construction that is designed to be overtopped when water levels exceed 240.00 m. Once the lake level exceeds 240.20 m, access to the dam from the access road becomes hazardous and the dam can only be accessed by helicopter.[14]

Overtopping of Crotch Lake Weir, Spring 2019

The current configuration allows water levels on Crotch Lake to fluctuate up to 3 m twice a year to augment downstream flows and provide storage for spring runoff.[15] Several alternative operational approaches were considered during development of the 2006 Water Management Plan, however, none of the options included changes to the dam structure itself. Major work on the dam last occurred in 1999 at which time alternative designs were considered by the owners, Ontario Power Generation (OPG). The expected life of the existing gabion weir is 40-60 years depending upon maintenance practices.[16] Any changes in design capacity would need to be done with the full support and cooperation of OPG, and in compliance with the provincial environmental assessment process for hydro facilities[17].

Further study is required to determine if there are opportunities to create additional storage capacity or new reservoirs in the watershed.

---

[14] *Mississippi River Water Management Plan*, 2006

[15] Ibid.

[16] https://inis.iaea.org/search/search.aspx?orig_q=RN:31028646

[17] Requirements may include: Class Environmental Assessment (*Environmental Assessment Act)* , Archaeological Assessment and/or Cultural Heritage Evaluation Report *(Ontario Heritage Act), Lakes and Rivers Improvement Act* (LRIA) permit, Fisheries and Oceans Canada (DFO) review (*Fisheries Act)*, approval under *Canadian Navigable Waters Act* (CNWA), Permit to Take Water *(Water Resources Act)*.

River Crossings

There are numerous major public road crossings of the Mississippi River and its main tributaries. During the spring 2019 flood, the following road crossings impaired flow of the spring freshet and may have exacerbated local upstream flooding:

- MacDonalds Corners Bridge (No. 12) (Lanark Highlands Twp.)
- Bow Lake Road Bridge (Lanark Highlands Twp.)
- Hwy. 511 Bridge on the Clyde River, Lanark Village (Lanark Highlands Twp.)
- Bridge Street Bridge, Carleton Place (Riverbed more than the bridge)
- Lavant-Darling Road at outlet of Joes Lake (Lanark Highlands Twp.)
- Deachman's Bridge at outlet of Kerr Lake (Lanark Highlands Twp.)

Roads known to be susceptible to flooding

Incidents of flooding including washouts are known to have occurred within the past thirty years on the following roads. Not all the roads are near the river, but due their intersection with tributary flows can become flooded when run-off exceeds the design capacity of the culverts. Different classes of roads require different crossing capacities and municipalities are responsible for setting the design capacities for their roads.

- 509 at Antoine Creek (North Frontenac)
- K&P Trail (Lanark Highlands)
- Appleton Road at Appleton (Town of Mississippi Mills)
- Flower Station Road (Lanark Highlands Twp.)
- Lavant Darling Road at Joes Lake (Lanark Highlands Twp.)
- Bow Lake Road (Lanark Highlands Twp.)
- Pine Grove Road in Lanark (Lanark Highlands Twp.)
- Deachman's Bridge (Lanark Highlands Twp.)
- Rosetta Road in Lanark (Lanark Highlands Twp.)
- 9th Line Beckwith (Beckwith Twp.)
- Private Roods around Mississippi Lake (Beckwith, Drummond/North Elmsley and Mississippi Mills Twps.)

Bridges and culverts can also reduce ecosystem functioning and linkages between habitats that support different stages of life. For example, a poorly designed culvert can impede upstream migration during critical times in the lifecycle of some fish species. Road crossings also represent a significant source of salt and grit to the waterway that impair habitat quality.

Private Roads

Private roads that serve waterfront properties are particularly vulnerable to flooding and pose a safety risk to residents as many are within the flood plain and do not meet construction standards for municipal roads. During the 2019 spring flood, many private roads are known to have flooded, with numerous homes or cottages rendered inaccessible except by boat.

For safety reasons, municipal emergency services do not generally travel on roads where water is 30 cm (1 ft) or deeper as vehicles can become buoyant, flooded or fall into unseen crevasses. For this reason, provincial regulations authorize the MVCA to withhold permit approval in areas where the flood plain exceeds access road elevations by more than 30 cm, regardless of the elevation of the subject property.

Flooding of a private road - Mississippi Lake, Spring 2019

Conveyance Assets

Surface water run-off and groundwater discharges enter the Mississippi River either directly or via another natural watercourse, a constructed ditch or drain, or via a sewer—often a combination of these. The method of conveyance influences the flow rate, temperature, and quality of water discharged to the river. Generally, the less "hard" the conveyance method, the greater the opportunity for infiltration and E. Coli die-off, flow and temperature moderation, nutrient uptake, and a lower amount of suspended soils discharged.

Natural Watercourses

There are an estimated 7,205 km of natural watercourses[18] in the watershed. Approximately 68% are creeks, streams and rivulets on private property that are managed by individual property owners. Owners of land with natural watercourses have the following riparian rights[19]:

> A **watercourse** means an identifiable depression in the ground in which a flow of water regularly or continuously occurs; *(Conservation Authorities Act, 1990)*

- the right to drain their land into the natural watercourse; and
- the right to use the water for domestic purposes provided usage is reasonable.

Riparian landowners cannot:

- take all the water in the watercourse and deprive downstream riparian property owners of their right to the water;
- block or interfere with the natural flow of the water;
- construct an impervious wall, berm or dyke along a property boundary to prevent water coming onto their property.

The MNRF and the MVCA are responsible for the management of watercourses when there is a proposal to alter the waterway. Municipalities and the courts may become involved in landowner disputes. Landowners must exercise care of these assets, adhering to all applicable laws. Wherever possible, landowners are encouraged to maintain the watercourse in its natural

KEY CONSIDERATIONS

Flow enters the river overland or via natural or altered watercourses and sewers.

All watercourses and sewers are subject to environmental regulations.

Most natural watercourses are on private property.

Many watercourses in the lower watershed have been altered.

Buried systems—storm sewers and culverts have limited capacity and can surcharge causing local flooding.

Ditches serving public roads are managed by the province or municipality and are funded by all taxpayers.

Ditches on private property are paid for and managed by individual property owners.

Drains established under the *Drainage Act* typically serve multiple properties, are paid for by those landowners, and are managed on their behalf by the municipality.

[18] Definition source: http://www.omafra.gov.on.ca/english/landuse/drain-eref/natural.htm
[19] Ibid.

state, establish natural buffer strips to minimize impacts from adjacent land uses, and to keep livestock out of the watercourse. While many landowners follow these best management practices, there is a need for more broadscale implementation to mitigate impacts on the river and water uses.

Ditches versus Drains

Particularly in the lower watershed, many natural watercourses have been straightened and relocated to serve farming needs, facilitate drainage away from roadways and structures, and to drain lands for development. Ditches within road rights-of-ways are owned and managed by a municipality, a county, or the province. All ditches are the responsibility of their property owner, who must comply with provincial laws and obtain a permit from the MVCA or local municipality depending on the nature of the work and local by-laws.[20]

By comparison, drains petitioned for under the *Drainage Act*, RSO 1990 are jointly owned by the property owners that they serve and are maintained by the municipality. Commonly referred to as "Municipal Drains", the engineering, construction and maintenance of these drains is paid for by the property owners within the benefitting area (catchment) of the drain.

Drainage works under the *Drainage Act* includes a drain, improvements to a natural watercourse, and works necessary to regulate the water table or water levels on land or in a drain, reservoir, lake or pond, and includes a dam, embankment, wall, or protective works.

Municipalities are responsible for approving the designation of a municipal drain in consultation with the MVCA, commissioning its design and construction, allocating and recovering costs from landowners, and for maintaining the works as specified by the Engineer's report. Landowners are responsible for payment of their share of costs and notifying the Drainage Superintendent when maintenance is needed.[21]

Sewers and Pump Stations

There are two primary types of sewers in the watershed:

- Storm sewers that convey rainwater, snowmelt, and irrigation and other run-off from properties and pavement to a natural watercourse or stormwater facility; and
- Sanitary sewers that convey wastewater from homes, businesses, and institutions to a sewage treatment plant prior to discharge to a natural watercourse.

[20] Some municipalities adopt Site Alteration By-laws to prevent landowners from altering a property prior to obtaining required land use planning approvals. Permits are required from the MVCA where land lies within or adjacent to a "regulated area" under the *Conservation Authorities Act*, RSO 1990.
[21] http://www.omafra.gov.on.ca/english/engineer/facts/92-035.htm

All sewers have limited capacity and can back-up or overflow causing localized flooding when design conditions are exceeded.[22] Sewer systems are designed to flow by gravity with pump stations used at intervals to overcome topographic/drainage constraints. Ownership and responsibility for sewers and pump stations depends on their location. The property line usually delineates the limits of municipal control and liability, with responsibility for maintenance, repair and replacement of sewers and pump stations on private property resting with landowners.

As of 2019, Carleton Place had 68 km of water main and sewers, 52 km of storm sewers, and eleven pump stations located throughout the collection system[23]. While all pump stations have alarms, two lack back-up power, and several had no overflow capabilities meaning that they can handle peak design flows, but nothing in excess of that under extreme wet weather events.[24] As of 2016, Mississippi Mills had 23 km of storm sewers, 31 km of sanitary sewers and 6 pump stations.[25]

Critical Assets and Vulnerable Populations

There are no hospitals, emergency response facilities, or public works yards located in known floodplains. However, there are several public and private assets located within or near the floodplain, or that require water to operate and are potentially vulnerable due to changing climatic conditions. While all hydro stations except the Almonte Generating Station are privately owned, they provide power to the local grid and could benefit the community in the event of problems with the main power supply.

Water and Wastewater Facilities

- Carleton Place Water Purification Plant
- Carleton Place Sewage Treatment Plant
- Almonte Communal Wells
- Almonte Sewage Treatment Plant

Hydro Power Facilities

- High Falls Generating Station
- Appleton Generating Station
- Enerdu Generating Station
- Almonte Generating Station
- Galetta Generating Station

Other

- Carleton Place Town Hall
- Kingston, Frontenac Lennox & Addington Health Unit
- Old Almonte Town Hall

Schools and community centres are often used during emergencies, and homes for the aged require special evacuation procedures. There are a number of public facilities located in proximity to the river and its tributaries but at elevations higher than would be at risk during a flood event.

[22] Many local storm sewers are designed to accommodate a 5-year design flow at or below 80% full. More intense events will surcharge the pipe.
[23] This includes water mains and sewers that are not currently in use but are in place and available for future development
[24] Communal Sewage Inspection Report, MOEE, 2012 (https://carletonplace.ca/photos/custom/Communal%20Sewage%20%20Inspection%20Rep.pdf)
[25] https://www.mississippimills.ca/en/townhall/resources/AssetManagementStrategy-AppendixEJan19.pdf

Private Assets

All properties within the watershed have the potential to experience localized flooding from drainage blockages and excessive run-off; and impacts to wells from surface and ground water contamination. Asset management practices can have a significant impact on individual properties.

There are approximately 8,500 waterfront properties in the watershed[26] whose use and value are dependent in part on habitat and water quality as well as water levels, and that are vulnerable to riverine flooding.

Shorelines and Retaining Walls

The Crown owns the majority of lake and riverbeds but many properties within the watershed have title under water. Over the years waterfront property owners have invested in constructed retaining walls to protect the waterfront from erosion due to water level fluctuations, wave and flow impacts. Concrete and rock retaining walls are expensive and temporary fixes. They are vulnerable to the impacts of major storms, ice damage and the effects of time, causing them to eventually weaken and fail.

Shoreline hardening interrupts natural shoreline processes and impacts habitat by interfering with the transition area between land and water, where many species find food, shelter and rear their young. Hardened shores can also degrade water quality by removing the filtration function of a natural shoreline and can actually increase erosion processes by deflecting wave energy to other properties.

Shoreline erosion can often be prevented with a naturalized vegetated buffer and a sloped shoreline treated with a combination of rock and deep rooted vegetation.

Erosion protection incorporating vegetation along shoreline.

KEY CONSIDERATIONS

Many waterfront properties have title under water.

Fixed assets at the shoreline are a source of conflict in the management of water levels and storage in the system.

Retaining walls, docks, and boathouses are vulnerable to major storms and ice damage.

Maintaining summer season water levels to service these assets is expected to become more challenging with increasing climate variability.

There is believed to be significant demand for additional public boat launch facilities in the watershed.

[26] Based upon 2018 GIS Assessment Layer representing all properties fronting onto a lake, river and major tributaries. This number does not include properties with small streams, creeks or ditches flowing through or adjacent to the property.

Docks, Boat Houses, Boat Launches and Marinas

Most waterfront properties have a fixed or seasonal dock and there are also an estimated 214 boat houses in the watershed. There are 10 known marinas, 60 municipal or provincial boat launches, and an unknown number of boat launches associated with private recreational properties. With large amounts of waterfront in private ownership and limited public access to the waterways, there is a significant demand and need for accessible public boat launches.

Structures within the floodplain can become unmoored and pose a physical risk to downstream structures and rescue vehicles. Such structures will become increasingly vulnerable to more frequent periods of below and above average water levels, which could impact their usefulness and associated property values and revenues. Fixed docks, marinas, and boat houses may also become more vulnerable to ice damage as system operations are adjusted to address winter thaws and rainfall, and lower lake summer levels.

Under both normal and extreme wet weather events, boat houses and marinas can pose an environmental hazard if fuels, lubricants and other materials they house do not meet proper storage requirements. Partially submerged fuel tanks and vehicles, and floating debris and containers of various nature were observed during the spring 2019 flood, posing a risk to both the river system and domestic water supplies.

Spring 2019 flood damage

Nature Conservation Assets

Table 2 lists national wildlife areas, nature reserves, conservation areas and provincial parks in the watershed and includes private properties managed by non-profits such as Ducks Unlimited and the Mississippi-Madawaska Land Trust for conservation purposes. In total, over 18,000 ha of woodlands, wetlands, and other lands are protected for conservation and associated recreational purposes in the watershed as shown on Figure 5. This list does not include urban parks and beaches as those sites are generally manicured and not in a natural state.

Aerial view of the Mill of Kintail Conservation Area

KEY CONSIDERATIONS

Approximately 4.7% of land in the watershed is protected for conservation or recreational purposes.

Most conservation land is held by the province, the County of Lanark, and the Mississippi Madawaska Land Trust.

Crown land makes up 21% of the watershed, with land use policy reports or plans, and forest management plans governing its use.

Large tracts of crown land abutting lakes and rivers help to protect shoreline habitat integrity.

A 20-meter wide municipally owned road allowance surrounds many lakes. Sale and development of the ROW can impede water level operations, degrade shoreline habitat, and limit opportunities to increase storage.

Forests on private property are not regulated or managed to the same degree as crown lands.

There is ongoing removal of forests on private land without offsets in the watershed.

Eastern Ontario Model Forest engages landowners to implement sustainable woodlot management.

Wildland fires are expected to increase in number and complexity.

Table 2: Areas of Nature Conservation within the Mississippi River Watershed

Name	Location	Landscape Type(s)	Size (ha)	Owner/Operator
North Frontenac Dark Sky Preserve	North Frontenac Twp.	night sky		North Frontenac Township
Bon Echo Provincial Park (and Mazinaw EMA)	North Frontenac Twp.	woodland and lakeshore	6596	MNRF
Crotch Lake Reserve (proposed)	North Frontenac Twp.	woodland and wetland	374	
Crotch Lake Enhanced Management Area	North Frontenac Twp.	woodland and wetland	7766	
Hungry Lake Conservation Reserve	Central Frontenac, North Frontenac Twp.	woodland and wetland	3518	
Sharbot Lake Provincial Park	Central Frontenac Township	woodland and lakefront	80	
Silver Lake Provincial Park	Tay Valley Twp	woodland and lakefront	43	
Mississippi Lake National Wildlife Area[27]	Drummond/North Elmsley Twp.	woodland, lakeshore and wetland	307	Environment and Climate Change Canada
Mississippi Lake Migratory Bird Sanctuary				
Blueberry Mountain at cliffLAND	Lanark Highlands Twp.		505	Mississippi Madawaska Land Trust
Byrne Big Creek Nature Reserve	Lanark Highlands Twp.			
Clydelands	Lanark Highlands Twp.	wilderness	40	
High Lonesome Nature Reserve	Mississippi Mills (Pakenham)	upland forest, meadow and wetland	80	
Keddy Nature Sanctuary	Drummond/North Elmsley Twp. (DNE)	forest , wetland and rock ridges	214	
Poole Family Nature Sanctuary	Drummond/North Elmsley Twp.		1078	
Lanark County Community Forest sites	Lanark Highlands, Mississippi Mills and DNE	pine plantations, other forested lands, wetland, etc.	Approx. 4000	Lanark County Community Forests
K&P Trail	North Frontenac	multiuse trail	65 km long	MVCA
Mill of Kintail Conservation Area	Mississippi Mills	wooded, meadow and recreation	68	
Palmerston Canonto Conservation Area	North Frontenac	woodland, lakeshore	105	
Purdon Conservation Area	Lanark Highlands Twp.	woodland and wetland (bog)	25	

[27] The Mississippi Lake National Wildlife Area and the Mississippi Lake Migratory Bird Sanctuary designations prevent hunting within their boundaries.

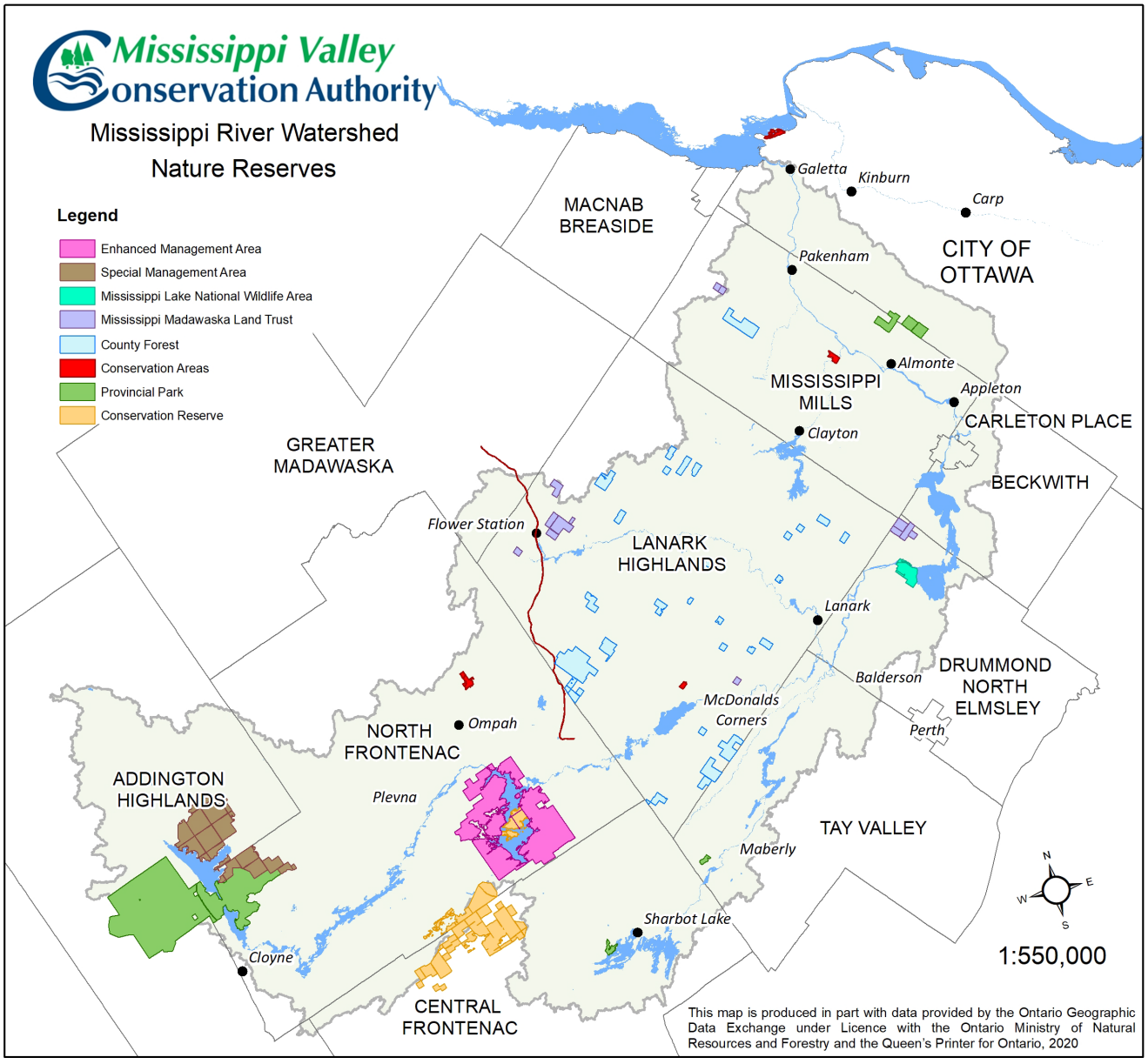


Figure 5: Nature Conservation Areas in the Watershed

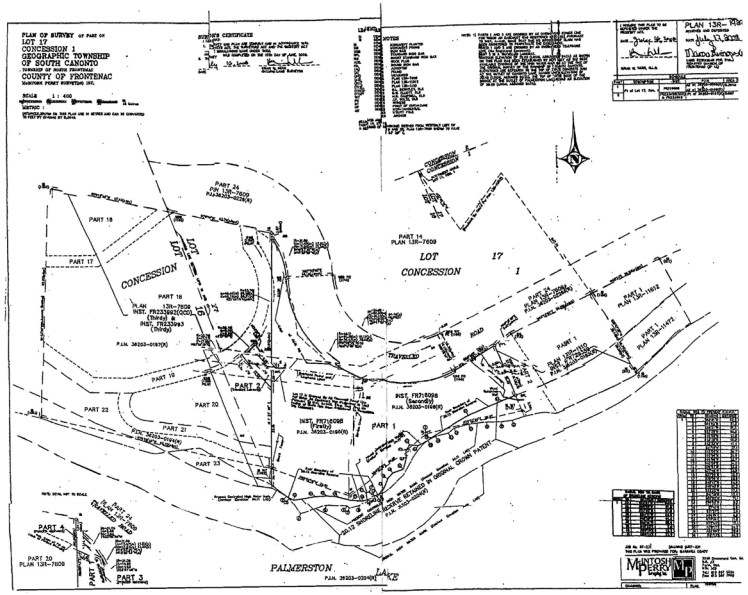
Crown Land & Municipal Waterfront Rights of Way

As described in Backgrounder 2, most crown land is owned by the Province and managed by the Ministry of Natural Resources and Forestry (MNRF) under the *Public Lands Act, RSO 1990.*[28] Crown land makes up 770 km^2 or 21% of land in the watershed. Another 208 km^2 of crown land covers the beds of lakes and other waterbodies bringing total coverage to 26% of the watershed. Most crown land is in the upper watershed and on the Shield, with a limited number of parcels including Burnt Lands Provincial Park located in the lower watershed, off Precambrian Shield.

A land use policy report or plan is available for all crown land in the watershed, with varying levels of detail and land preservation including whether the land is eligible for potential sale. Examples in the watershed include: Enhanced Management Area E1a: Crotch Lake, C3: Hungry Lake Conservation Reserve, P8e: Bon Echo Provincial Park[29], and a variety of parcels in Lanark County managed together as General Use Area G411- Area B. Figure 5 shows that Provincial Parks and Conservation Reserves make up 110 km^2 of crown land with the remaining 660 km^2 categorized as General Use Area.[30]

Many lakes in the upper watershed are still surrounded by large tracts of crown land that serve as natural recreational areas and, by default, limit shoreline development and density around lakes. O.Reg. 161/17 allows some public occupancy and the construction of specifically listed structures without permit on many of these areas. Anything falling outside the regulation is subject to review and approval by the MNRF. There are less than 10 provincial officers responsible for monitoring compliance and issue permits on Crown land within the watershed.

In the 1950s, the Province began to subdivide and sell waterfront cottage lots throughout the region, and established a 20-metre wide municipal shore road allowance around many lakes. Some municipalities have subsequently allowed the purchase of the "shore road allowance" by abutting property owners to merge the shoreline area with their holdings. This can cause constraints in the manipulation of water levels and protection of shoreline habitat integrity, and limit future opportunities for increasing reservoir capacity.



Typical Municipal Shore Allowance

[28] *The State of Ontario's Protected Areas Report*, 2011 provides an assessment the effectiveness of provincial programs.
[29] https://www.ontario.ca/page/bon-echo-provincial-park-management-plan
[30] Source: https://www.ontario.ca/page/crown-land-use-policy-atlas

Forests and Forestry

Forests are found on crown land, private land, on land managed by conservation trusts, and municipal and county properties. Approximately 62% of the watershed is forested, with roughly a 30/70 split between crown land and private property.

Regulation of privately-owned woodlands is carried out at the discretion of individual municipalities, and through administration of federal and provincial environmental protection and environmental assessment legislation. As shown in Figure 6, most of the Mississippi watershed lies within Ecoregion 5E-11 . The *Provincial Policy Statement (2020),* which states that "development and site alteration shall not be permitted in significant woodlands in Ecoregions 6E and 7E", does not apply to Ecoregion 5E-11. The current regulatory framework generally permits removal of forests on private property unless the stand is deemed significant under other legislation.[31] Organizations such as the Eastern Ontario Model Forest (EOMF) and Ontario Woodlot Association (OWA) train and assist private and public woodlot owners and forestry operators to develop and implement sustainable forest management plans.[32]

The Managed Forest Tax Incentive Program (MFTIP), landowners who get their property classified as 'Managed Forest' pay 25% of the municipal tax rate set for residential properties with at least 4 ha of forested lands. The property owner must prepare and follow a 10-year Managed Forest Plan approved by a Managed Forest Plan Approver.

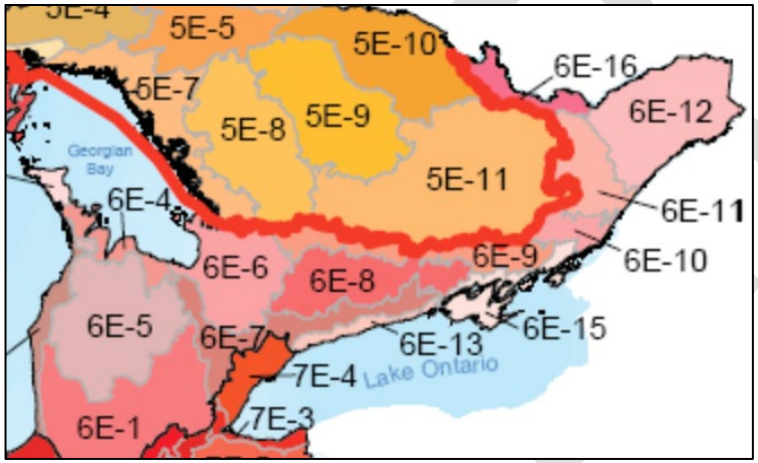


Figure 6: Provincial Ecoregions[33]

Baird Trail – Lanark County Community Forest

[31] For example: an Area of Natural and Scientific Interest, provincially significant wetland, or critical habitat to an endangered species.
[32] https://www.eomf.on.ca/programs/certification
[33] Source: https://files.ontario.ca/eso_figure02.png

The *Crown Forest Sustainability Act* (CFSA), *Declaration Order MNR-75*[34], and the *Public Lands Act, RSO 1990* are key tools used to manage forests on crown land and divide the province into forest management units (FMU), each with a forest management plan. Almost the entire Mississippi River watershed falls under the 2011-2021 *Lanark-Mazinaw 140 – Forest Management Plan* (FMP) as shown in Figure 7. The province licensed in 1998 to Mazinaw-Lanark Forest Inc., a consortium of companies, to carry out management activities.[35] The plan is renewed with public input every 10 years and is slated for update in 2021.

Legislation requires all harvested areas on crown land to be regenerated. MNRF, industry, and independent third parties monitor and assess implementation practices and activities, and conduct audits at the management unit level. Ontario receives payments from the forestry sector in the form of stumpage charges to support these activities and to fund renewal programs through:

- The Forest Renewal Trust - provides long-term sustainable funding of eligible silviculture work carried out on crown lands where forest resources have been harvested; and

- The Forestry Futures Trust - funds silvicultural activities to respond to unforeseen events such as natural disturbances, licensee insolvency, intensive stand management and insect pest control.

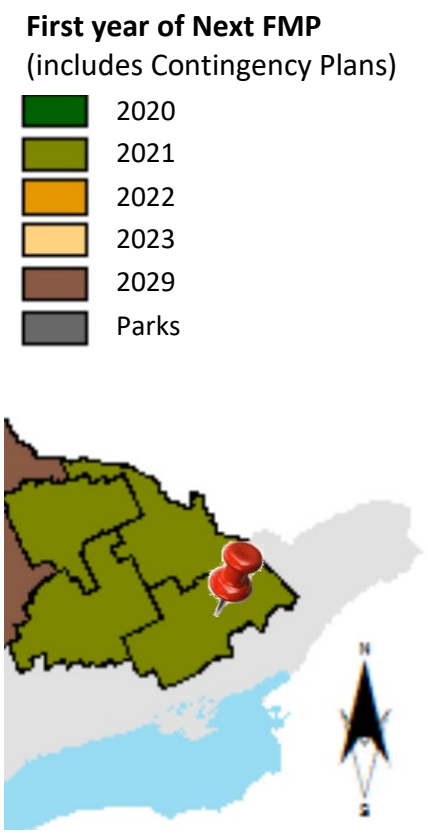


Figure 7: Forest Management Unit 140 Source: www.ontario.ca

Wildland Fire Management[36]

Most of the Mississippi River watershed lies within the Northeast Fire Region of the provincial *Wildland Fire Management Strategy*, 2014. The Strategy sets the following goals:

- Prevent loss of human life and injury.
- Prevent and mitigate losses, economic disruption and social disruption; and
- Promote the understanding of the ecological role of fire and use fire to benefit resource management.

[34] Environmental Assessment Requirements for Forest Management on Crown Lands in Ontario
[35] https://www.mlfi.org/images/documents/mu140_2011_fmp_p1_txt_sum-web.pdf
[36] Information in this section is largely sourced from the *Ontario Wildland Fire Management Strategy*, 2014

The Strategy states that the likelihood and challenge of responding to wildland fires in Ontario is expected to increase because:

- population expansion and industrial activity will mean more people living and working in areas of high wildland fire potential;
- climate change is expected to result in more variable and extreme weather patterns that may result in longer and more severe fire seasons in some areas;
- changes in the duration and extent of drought and forests damaged by wind, insects and disease will create more complex situations for wildland fire managers as they support diverse land management objectives.

The MNRF has produced a dataset "Fire – Potential Hazardous Forest Types for Wildland Fire" that can be used as a coarse scale assessment of areas with the greatest potential for risks associated with high to extreme wildland fire.

The Wildland Fire Assessment and Mitigation Reference Manual (MNRF, 2017) includes information on the wildland fire policies, risk assessment and mitigation, and guidance on land use planning. [37]

Examples of where a wildland fire *may* be monitored are:

- Fires that are distantly located from communities, homes, or timber supplies;
- Fires in provincial parks and conservation reserves to maintain or enhance ecological integrity;
- Fires on islands and peninsulas;
- Fires burning toward water or wetlands; and
- Fires burning damaged fuels such as trees damaged by storms or killed by insects.

Dry hydrant at Palmerston Lake Dam

Fire Suppression Assets

MNRF Sudbury is the Emergency Control Centre for the region and manages response coordination for wildland fires located on crown Land; however, initial response is primarily by municipal fire departments until such time that MNRF can provide the necessary resources to the location. Wildland fires located on private property are the responsibility of municipal fire services with support from MNRF if required. All lakes, rivers, streams and wetlands in the watershed may be used as a water supply for emergency response where municipal water supply is unavailable.

[37] Ontario Ministry of Natural Resources. April 2017. Wildland Fire Assessment and Mitigation Reference Manual in support of Provincial Policy Statement, 2014. Toronto: Queen's Printer for Ontario.

Corridors/Linkages

Corridors are linear features that allow movement between various features. They can be both man-made (e.g. transportation and utility corridors, fence rows) or natural (e.g. river and stream valleys, and escarpments).

Natural corridors (also referred to as “linkages”) are continuous strips of mostly uninterrupted green space joining two or more larger areas of wildlife habitat. Natural linkages allow for the safe movement of wildlife between different landscapes for foraging, reproduction, and colonization, and facilitate interbreeding of plants and animals and maintenance of viable populations. Man-made features can act as barriers to wildlife migration between natural landscapes and interrupt those linkages.

The lower Mississippi Watershed has seen extensive fragmentation of natural habitats. Over time, large areas of forest and wetland have been drained and harvested resulting in isolated remnant landscapes with limited connection between them. Once gone, it is very difficult to re-establish natural corridors, particularly on private property.

The Natural Heritage Systems approach, discussed in Backgrounder Three, encourages the re-establishment of natural corridors and linkages to support biodiversity and a healthy watershed. For example, a man-made corridor like a remnant railbed that is no longer used for rail transport can evolve into a semi-natural corridor.

Figure 7 shows some of the major semi-natural man-made corridors that cross the Mississippi River Watershed. Preserving and enhancing these linear features for wildlife use is increasingly important due to continued development of the watershed.

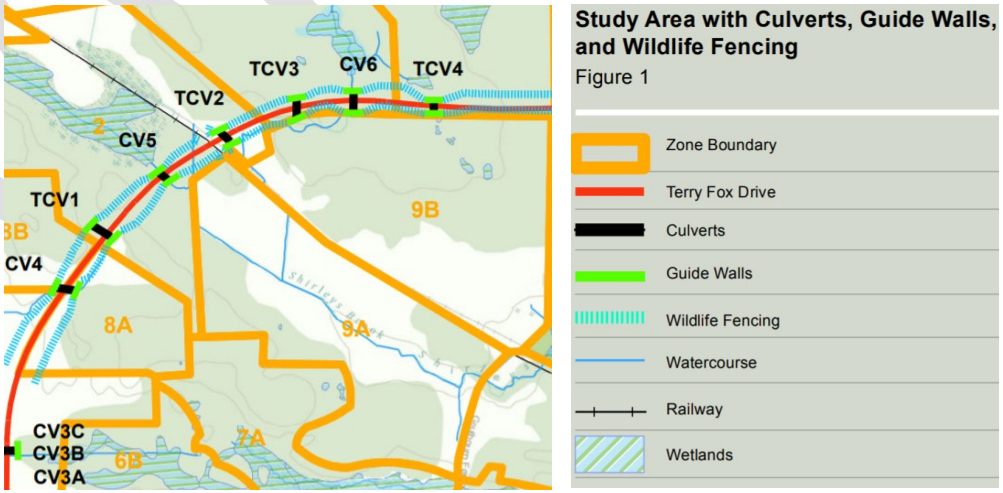
KEY CONSIDERATIONS

The watershed has large areas of interior forest with the potential for the establishment of contiguous wildlife corridors.

The establishment and protection of wildlife corridors/linkages is challenging due to fragmented land ownership.

Land management practices of utility corridors can be modified to protect and enhance their value as wildlife corridors (e.g. “greening of hydro corridors”)

Transportation corridors can be designed and managed to allow for the safe movement of wildlife.



Wildlife crossings beneath Terry Fox Drive, City of Ottawa Source: http://roadsandwildlife.org/

Roads: Roadways are the most prevalent corridors on the landscape. While they provide connectivity for humans, they are a barrier and pose a danger to wildlife and thereby decrease natural connectivity. Roadways can be managed and designed to accommodate wildlife passage and limit wildlife mortality. Measures include: route selection, exclusion fencing, eco-passages, grading practices, signage, etc. This is most easily done and economical at the design stage.

Railways (turned into trails): the watershed has several major decommissioned rail lines that provide 140 kms of semi-natural linkages. Sections of these railbeds, including the Trans Canada Trail in Carleton Place and the K&P Trail in the western watershed are managed as multi-use recreational trails.

Fencerows: provide wildlife with shelter and food as well as a corridor for travel. Many fencerows are being removed to make way for residential development and as part of the consolidation of larger scale agricultural operations.

Utility Corridors: Above ground utility corridors, such as hydro corridors, also offer semi-natural linkages that are used by wildlife to move between natural spaces. The Mississippi River watershed has 243 km of hydro corridor as shown in Figure 7.

Located in S-W Ontario, *The Meadoway* is the largest initiative to date to manage a Hydro One transmission corridor for wildlife and community use.

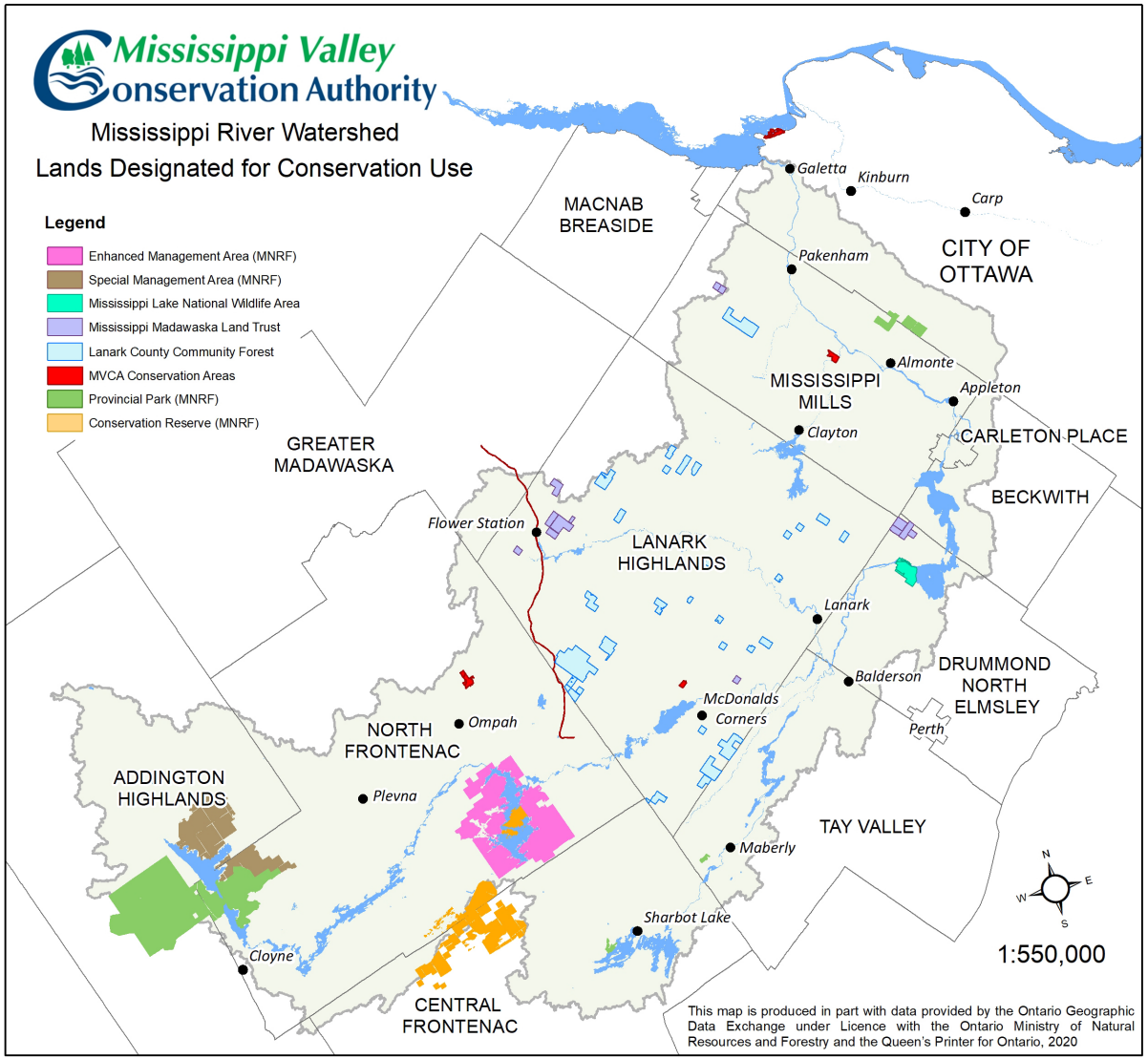


Figure 8: Major Corridors and Trails in the Mississippi River Watershed

Wildlife Asset Management

Wildlife management is a shared responsibility amongst all levels of government but is primarily the responsibility of the Province which actively monitors populations, sets quotas and issues licences for harvesting, and leads some species recovery plans. Indigenous communities perform a similar role in parallel or in partnership with other governments and may harvest wildlife in accordance with their rights.

In many cases, a federal law sets the framework for the provinces and territories to implement. However, in Ontario, most applicable regulations and management plans fall under the provincial *Fish and Wildlife Conservation Act*, 1997 (FWCA).

Fish

Fisheries are a matter of federal interest and are managed in accordance with *Ontario Fishery Regulations*, 2007, under the *Fisheries Act*, RSC 1985. The regulation delegates to the province several responsibilities including the preparation of management plans and issuance of licences.

Sport Fishing Licence Tag:
Intended for anglers who want to keep most fish caught.

Conservation Fishing Licence Tag:
Intended for anglers who want to live-release most fish caught.

Most of the Mississippi River watershed lies within Fisheries Management Zone 18 (FMZ 18) and is subject to a 2016 management plan that sets harvest limits by species, size, and time of year for both sport fishing and conservation fishing. The FMZ 18 Plan is based upon field monitoring carried out by the MNRF primarily under its Inland Lakes Broad-scale Monitoring Program[38], with support from the public, partner organizations such as MVCA, Indigenous communities and non-government groups. The 2016 Plan was based upon field work carried out on 9 lakes in the Mississippi watershed (on more than 30 lakes across Zone 18) between 1992 and 2012 and is scheduled for review in 2021 (once every five years.)

KEY CONSIDERATIONS

Fisheries Management Zone 18 sets harvest limits by species, size, and time of year based upon regular monitoring by the province and partners.

There are five Fish Sanctuaries in the watershed the are 'No Fishing' zones during the spring.

A hatchery near Sharbot Lake is used to stock local lakes.

Hunting of game is managed by the province based upon results of species monitoring.

Hunting of waterfowl is managed by the federal government based upon annual assessments.

Species at Risk are protected under federal and provincial regulations but there is significant gap in program effectiveness.

Recovery plans are largely implemented by non-governmental organizations.

Monitoring and mitigation of non-native invasive species are largely carried out by non-governmental organizations and researchers.

Conservation activities in the watershed are supported by resources centred outside the jurisdiction including provincial water quality monitoring programs, Ferguson Tree Nursery, and the Eastern Ontario Model Forest.

[38] https://www.ontario.ca/page/broad-scale-monitoring-program

The province has established five Fish Sanctuaries in the watershed, listed below, which are "No fishing" zones from March 1 to Friday before the second Saturday in May. The watershed is also fortunate to house one of nine provincial fish culture stations and community hatcheries that is used to stock several lakes and streams in the watershed.[39]

Fish Sanctuaries:

- Crotch Lake and Mississippi River - Palmerston Township, from Sidedam Rapids to north shore of Skull Island including McLean's Bay
- Dalhousie Lake and Mississippi River - Dalhousie Township, within a 300 m radius of the bridge of the Township road crossing the Mississippi River where it enters Dalhousie Lake
- Indian River and Clayton Lake - within a 300 m radius of the Command Bridge crossing the Indian River where it enters Clayton Lake (Lanark Township)
- Mississippi River - Drummond Township, from 240.8 m west of Main Street in Innisville to Mississippi Lake
- Mississippi River - Pakenham Township, between the falls in the Town of Almonte and upstream side of bridge on Lanark County Road 20

Commercial fishing is permitted in accordance with the province's *Strategic Plan for Ontario Fisheries*, 2015[40] but is very limited in Eastern Ontario and none are known in the Mississippi River watershed.

Game and Waterfowl

The Mississippi River Watershed falls within several Wildlife Management Units (WMUs) established under O. Reg. 32/06 per the FWCA, 1997, as shown in Figure 8.[41] Each management unit has customized hunting regulations that specify what can be hunted, when, and how. WMU quotas and seasons are reviewed periodically to set limits on the hunting of moose, white tailed deer, elk, black bear, small game[42], wild turkey, wolf and coyote. Annual allocations are based upon species monitoring by the province with assistance from the hunting community.

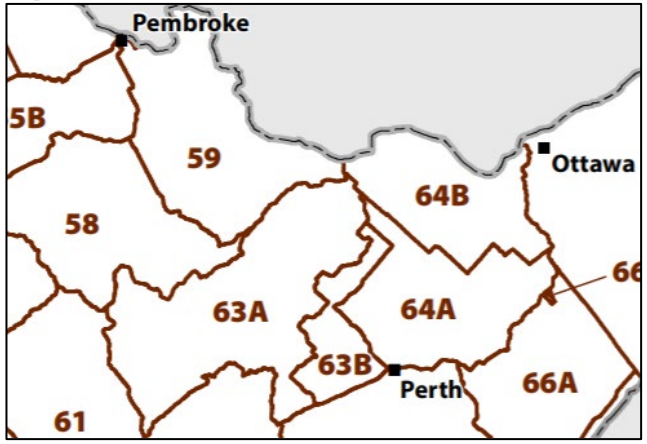


Figure 9: Wildlife Management Units

[39] Stocked locations can be found at: https://www.gisapplication.lrc.gov.on.ca/FishONLine/Index.html?site=FishONLine&viewer=FishONLine&locale=en-US
[40] https://docs.ontario.ca/documents/4538/ontarios-provincial-fish-strategy.pdf
[41] WMU 61, 62, 63, 64, and 67; map source: https://www.ontario.ca/page/find-wildlife-management-unit-wmu-map#section-6
[42] Arctic fox, raccoon, opossum, red fox, skunk, and weasel are considered furbearing mammals, and can be harvested using a small game licence.

The Canadian Wildlife Service (CWS), a branch of Environment and Climate Change Canada (ECCC) is responsible for the conservation of migratory birds in Canada and ensuring sustainable hunting of these birds. Hunting regulations for migratory game birds are reviewed and amended biennially by ECCC, with input from the provinces and territories, and other stakeholders. The population status of migratory game birds is assessed on an annual basis to ensure that the regulations are appropriate, and amendments can be made between review periods, if necessary, for conservation reasons.

A federal Migratory Game Bird Hunting Permit (MGBHP), Wildlife Habitat Conservation Stamp, and an Ontario small game licence are required to hunt migratory game birds. The CWS publishes season dates and bag limits mid-summer in the Migratory Birds Hunting Regulations Summary.

Mississippi Lake National Wildlife Area (NWA) and Mississippi Lake Migratory Bird Sanctuary

The Mississippi Lake National Wildlife Area (NWA) and Mississippi Lake Migratory Bird Sanctuary are designated to protect habitat for staging waterfowl in the watershed.

Recreational boating and sport fishing within the Mississippi Lake National Wildlife Area (NWA) and use of the NWA boat launch are permitted between Dec 16 to Sept 14 between sunrise and sunset. Public access to the NWA is for day use only, with activities limited to seasonal recreational boating from the boat launch and sport fishing.

These activities are prohibited between Sept 15 and Dec 15 except for directly accessing Mississippi Lake. [43] To provide a safe, undisturbed refuge for staging migratory waterfowl, recreational boating and sport fishing in McIntyre Creek and McEwen Bay is also prohibited Sept 15 through Dec 15. The public may directly access Mississippi Lake (outside the NWA) and a portion of the Mississippi River (within the NWA) from the NWA boat launch on McIntyre Creek. No lead sinkers are permitted to be used for fishing in the NWA[44].

[43] More detailed information can be found on page iii here in the Mississippi Lake NWA Management Plan. https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/locations/mississippi-lake.html

[44] More detailed information can be found on in the Mississippi Lake NWA Management Plan.

Species at Risk

Backgrounder 3 provides a list of species at risk in the watershed. Federal and provincial governments share responsibility for developing and implementing measures to protect species at risk. Four organizations have primary responsibility for species and habitat monitoring, reporting, and the development of recovery strategies and management plans for species at risk in Ontario:

- The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) supports Environment and Climate Change Canada (ECCC) in establishing, implementing, monitoring and reporting on national recovery and management plans; and
- The Committee on the Status of Species at Risk in Ontario (COSSARO) performs similar roles to support the Ministry of Environment, Conservation and Parks (MECP) at the provincial level.

Information regarding the status of endangered species is collected and tracked by federal and provincial governments, Indigenous communities, research institutions, and environmental non-governmental organizations (ENGOs). Key databases used by these organizations include:

- Natural Heritage Information Centre (NHIC): part of the Ontario Government, collects data on species of conservation concern, rare plant communities, wildlife concentration areas, and natural areas. https://www.ontario.ca/page/natural-heritage-information-centre
- The Reptile and Amphibian Atlas collects observations of all Ontario reptiles and amphibians.
- iNaturalist: an online Citizen Science species identification and reporting tool. https://www.inaturalist.org/

There are an estimated 30 species at risk in the watershed some of which have recovery and management plans.[45] The challenge is in their implementation due to resource limitations at all levels of government, conflicting classifications and priorities, and ongoing development pressures.

Blanding's Turtle—endangered or threatened?

In Ontario, Blanding's Turtle is assessed as Threatened due to the inferred rate of population decline over three generations. Federally, COSEWIC recently reclassified the Blanding's Turtle as Endangered, based on the inferred population decline of 60% in line with the wetland loss. However due to the lower rates of wetland loss and threats in the northern portion of its range, the amount of overall wetland loss in the province is more likely in the range of 30 to 50%. Blanding's Turtle populations in other provinces (Quebec, Nova Scotia) are much smaller and at a higher risk of extinction than in Ontario.

Committee on the Status of Species at Risk in Ontario, 2017

[45] The Forest Gene Conservation Association of Ontario, through Rideau Valley Conservation Authority, provides a Butternut Recovery Program in this area.

Non-native Invasive Species

As noted in Backgrounder Three, there are numerous non-native invasive species affecting valued habitats in Ontario, and specifically in the Mississippi Valley watershed. Table 3 lists known monitoring and mitigation actions being carried out by various organizations.

Table 3: Known Invasive Species Programs

Monitoring Programs	Mitigation Programs	Organizations
• OFAH's Invading Species Hotline, collects reports of aquatic and terrestrial invaders. Supports community engagement in identification, prevention and management. • Citizen scientists reporting sightings to Eddmaps.org/Ontario or inaturalist.org	• Numerous "Prevent the Spread" campaigns • Species-specific removal and management efforts	• Ontario Federation of Anglers and Hunters • Ontario Invasive Plants Council • various Lake Associations • Mississippi Valley Field Naturalists • Conservation Authorities • Other ENGOs

Supporting Assets and Resources

There are several key resources that support the management and conservation of assets within the watershed including the following:

- White Lake Fish Culture Station, Sharbot Lake – used as a hatchery site by the province since the 1930s to stock lakes within and outside the watershed.
- Ferguson Tree Nursery, Kemptville – provides locally grown trees and shrubs that are hardy for replanting under tree planting programs offered by area municipalities and conservation authorities.
- Eastern Ontario Model Forest, Kemptville – provides advisory and certification services to foresters in the watershed.
- MECP Lake Partner Program – provides free testing of water samples obtained by lake associations
- MECP Provincial Water Quality Monitoring Program – oversees regular and comprehensive water quality sampling of 10 sites in the watershed.