

SOUTH NATION  
CONSERVATION  
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## SNC Watershed-based Resource Management Strategy

December 2024



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## Executive Summary

**Land Acknowledgement:** South Nation Conservation would like to acknowledge that our jurisdiction is within the unceded, traditional territory of the Algonquin people also known as the Anishinaabe people. We would also like to acknowledge that this area is also the traditional and treaty lands of the Haudenosaunee people.

**Purpose and Framework:** The Watershed-based Resource Management Strategy (WBRMS) by South Nation Conservation (SNC) meets the requirements of the *Conservation Authorities Act* and Ontario Regulation 686/21. It outlines SNC's guiding principles, objectives, and the regulatory framework governing its programs and services. As part of the development of the Watershed-based Resource Management Strategy, SNC identified and evaluated gaps, risks, and opportunities that may have an impact on effective program and service delivery.

**Guiding Principles:** SNC's strategy is driven by an integrated watershed approach, and the following principles:

1. Integrated Watershed Approach
2. Collaboration
3. Fostering Understanding
4. Stewards of the Watershed
5. Adaptability
6. Accountability

**Watershed Characterization:** SNC's jurisdiction covers 4,480 km<sup>2</sup> in Eastern Ontario, including the South Nation River Watershed. The region's physiographic features, sub-watersheds, settlement history, and land use patterns are detailed, highlighting the transition from pre-European to post-European settlement and the current mix of urban and rural areas.

The watershed characterization also details natural hazards like droughts, flooding, and erosion within the SNC jurisdiction. It emphasizes the importance of managing water resources, including surface water and groundwater, and outlines the challenges posed by climate change.

Natural heritage systems are networks of interconnected natural features such as forests, lakes, rivers, agricultural lands, and wetlands. It outlines forest cover loss as an ongoing concern with less than 28% overall forest cover in 2014. The importance of wetlands in providing crucial ecological and hydrological functions, such as mitigating the effects of flooding and drought by capturing and slowly releasing water, is also noted. Habitat and species rely on these natural heritage features to live and thrive in Eastern Ontario.

**Existing Knowledge:** SNC staff rely on a variety of different sources of information to complete their work. Existing technical studies, data from monitoring programs, guidelines and procedures, agreements, geospatial data, and legislation directly support program delivery across program areas is detailed in Appendix A - Existing Technical Studies, Monitoring Programs, and Other Information Directly Supporting Program Delivery.

SNC is aware of the limitations of a perspective dominated by western science and colonial traditions, engaging in opportunities to learn more about Indigenous cultures, traditions, local

knowledge, and alternative ways of understanding the natural world. SNC will continue to work with local Indigenous communities and with members of the Eastern Ontario First Nations Working Group (EOFNWG) to integrate First Nations knowledge and culture into its programs and services.

**Programs and Services:** SNC's programs are categorized into:

- **Category 1: Mandatory Programs** - These include natural hazards management, planning and regulations, protecting drinking water sources, and conservation lands management.
- **Category 2: Municipal Programs** - Provided at the request of municipalities. *Note, this category is not detailed in this version of the WBRMS, as municipal agreements do not currently include the required provision for inclusion in the WBRMS. This category will be addressed in future versions of the WBRMS.*
- **Category 3: Other Watershed Programs** – Programs recommended by South Nation Conservation and supported by all member municipalities. Funded through levy and other sources, focusing on landowner stewardship, education and outreach, and conservation land securement.

The Strategy provides an overview of Category 1 and Category 3 programs and services. It includes details on SNC owned natural hazard related infrastructure, programs to management natural hazards, delegated planning and regulations roles under the *Conservation Authorities Act*, conservation authority responsibilities under the *Clean Water Act*, and provincially delegated monitoring programs. SNC conservation lands are also outlined, noting the separate SNC Conservation Areas Strategy also in development.

Landowner stewardship and outreach and conservation land securement are outlined as Category 3 programs and services.

Category 2 programs are not currently detailed in this version of the Strategy.

**Consultation and Collaboration** The strategy was developed with input from various stakeholders, including former standing committees, a new Watershed Advisory Committee, and the Eastern Ontario First Nations Working Group. Public engagement was also sought through online platforms and media outreach.

**Programs and Services Assessment:** As part of the development of the Watershed-based Resource Management Strategy, SNC identified and evaluated gaps, risks, and opportunities that may have an impact on effective program and service delivery.

From this assessment, risks and opportunities were identified as financial, strategic, compliance, operational, reputational, and climate change risks. Several risks and opportunities for enhancing program effectiveness, securing funding, and improving public education and engagement are outlined with potential timelines and financial considerations.

**Periodic Review** The strategy will be reviewed every five years to adapt to evolving political, socio-economic, and environmental conditions, ensuring it remains relevant and effective.

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## Land Acknowledgement

South Nation Conservation (SNC) works within Turtle Island, now called Canada. We recognize and deeply appreciate the relationship, past and present, that Indigenous Nations have with the lands and waters. SNC acknowledges that Indigenous practices of land stewardship have created the clean waters and healthy forests, meadows, and wetlands that benefit and enrich the lives of all Canadians. As shared stewards of Ontario's land and water resources – along with our First Nations partners - SNC appreciates and respects the history and diversity of the land and its peoples and are grateful to have the opportunity to meet and work in this territory.

As SNC works towards reconciliation, we would like to acknowledge that our jurisdiction is within the unceded, traditional territory of the Algonquin people also known as the Anishinaabe people. We would also like to acknowledge that this area is also the traditional and treaty lands of the Haudenosaunee people and also acknowledge the other First Nations, Metis, and Inuit peoples in Canada.

In the spirit of the “Dish with One Spoon Treaty”, under which many of our lands operate, SNC recognizes our own responsibility to protect and steward the environment for future generations. We also recognize and affirm our responsibility to uphold the United Nations Declaration on “the Rights of Indigenous peoples” and the “94 Calls to Action” of the Truth and Reconciliation Commission through our work.

## 1.0 Purpose

South Nation Conservation (SNC) has prepared this Watershed-based Resource Management Strategy (WBRMS) to meet the provisions set out under Section 21.1 of the *Conservation Authorities Act* (CA Act) and Ontario Regulation 686/21 (Mandatory Programs and Services).

The Strategy sets out the guiding principles and objectives of SNC and its Programs and Services. The Strategy will assist SNC with enhancing the delivery of its Programs and Services while assessing any issues and identifying risks that impact the effective delivery of these programs and services. It also identifies opportunities for future programs, services and actions that will help SNC meet its objectives and long-term goals.



## 2.0 Regulatory Framework

Section 21.1 of the CA Act sets out the Mandatory Programs and Services which must be delivered by all conservation authorities; these are described in more detail under Ontario Regulation 686/21. Section 21.1.1 of the CA Act refers to the Municipal Programs and Services that conservation authorities are permitted to provide under agreement with its member municipalities. Section 21.1.2 sets out the Other Programs and Services that conservation authorities are permitted to deliver.

Subsection 12(1) paragraph 3 of the Regulation requires all conservation authorities to prepare a "watershed-based resource management strategy" in accordance with subsections 12(4) through (9).

In addition, each Conservation Authority was required to have a transition plan in place by December 31<sup>st</sup>, 2021 and create an inventory of programs and services by February 28<sup>th</sup>, 2022.

SNC's inventory lists programs and services delivered as of February 2022 and programs and services SNC intends to deliver in the future. As per the Act, Programs and Services are divided into categories as follows:

- **Category 1: Mandatory Programs and Services** required by regulation (s21.1 of the Act). These programs are funded through municipal levy and include:
  - Programs and services related to the risk of natural hazards;
  - Programs and services related to the conservation and management of lands owned or controlled by the authority;
  - Programs and services related to the authority's duties, functions and responsibilities as a source protection authority under the *Clean Water Act, 2006*; and
  - Programs and services related to the authority's duties, functions and responsibilities under an Act prescribed by the regulations.
- **Category 2: Municipal Programs and Services** provided at the request of a municipality (s21.1.1 of the Act). These programs can be funded through government and other agency grants and/or municipal funding under a memorandum of understanding or agreement with the municipality.
- **Category 3: Other Watershed Programs and Services** the Conservation Authority determines are advisable (s21.1.2 of the Act). These programs can be funded through self-generated revenue, user fees, government and other agency grants, donations, etc. Any use of municipal levy requires an agreement and would be subject to cost apportionment.

The WBRMS focuses on Category 1: Mandatory Programs and Services as per Ontario Regulation 686/21. Category 3: Other Watershed Programs and Services is also included as SNC municipal cost-apportionment agreements contain the necessary provision for including these programs and services within the WBRMS.

SNC's current Category 2: Municipal Programs and Services agreements do not currently have the required provision for inclusion in the WBRMS; these programs and services will be addressed in future versions of the WBRMS.

### 3.0 Summary of Consultation

South Nation Conservation (SNC) engaged with partners and stakeholders during the development of the Watershed-based Resource Management Strategy (WBRMS) through a variety of outreach activities.

Former Standing Committees (Clean Water, Communications, Fish & Wildlife, and Forestry) provided ongoing feedback to SNC programs and services for over twenty years. Committee memberships varied but was generally comprised of the following representatives: community groups, public citizens, First Nations, agriculture, forestry, industry, media, municipalities, government, and Board members.

The Standing Committees governance structure was redeveloped in 2023, with the four Committees dissolving and a new Watershed Advisory Committee formed in early 2024. The new Committee is comprised of 26 members to capture the scope of stakeholders represented in previous advisory committees to support the development and implementation of SNC's environment programs and services. SNC worked with this new multi-stakeholder Committee to provide input and feedback to the WBRMS since their inaugural meeting in April 2024.

SNC has been working together with the Mohawk and the Algonquin Nations for over 20 years. The Eastern Ontario First Nations Working Group (EOFNWG) was created so partners could work more closely with each other, on the ground, within shared territories. EOFNWG is non-political and co-chaired by South Nation Conservation, Plenty Canada, and Mohawk Council of Akwesasne's Environment Program. The EOFNWG uses its diverse compliment of members, bringing their experience and knowledge, to work collaboratively to address and guide environmental issues and management plans in Eastern Ontario. SNC will work with members and local communities to integrate more Indigenous traditional knowledge into the WBRMS and SNC's programs and services.

SNC engaged the public and partner organizations through a dedicated online webpage. The draft WBRMS was posted for four weeks in November-December 2024. SNC provided an online feedback survey to gather stakeholder comments. A press release to local media and posts on various social media platforms (Facebook, X, Instagram, LinkedIn) invited the public to review and provide input to the WBRMS.

The public engagement for both the draft Watershed-based Resource Management Strategy and the draft Conservation Lands Strategy were held in tandem with a shared feedback survey. Below is a summary of some of the feedback highlights:

- Tree planting efforts being undermined by clearcutting activities.
- Balancing land use changes with environmental improvement opportunities.
- Ensuring regulatory programs can help protect significant natural features.
- Managing and restoring wetland habitat and ensuring connectivity of natural areas.
- Opportunities to improve water quality and forested/vegetated riparian areas along watercourses.
- Opportunities to support reintroduction of slowly dispersing species at protect Species at Risk.
- Enhanced opportunities and promotion to support private landowner stewardship.
- Ensuring forest management activities are completed sustainably and to improve biodiversity.

- Review of hunting, trapping and land lease opportunities on SNC land.
- Protection of drinking water supply and groundwater aquifer recharge areas.
- Improved access and additional recreational opportunities at Conservation Areas.
- Recognition of First Nation partnerships and two-eyed seeing approach.
- Enhanced promotion of conservation land securement efforts.
- Revenue generation and fundraising needs.
- Recognition of First Nation partnerships and two-eyed seeing approach.
- Enhanced promotion of conservation land securement efforts.
- Revenue generation and fundraising needs.

Feedback generally related to questions or comments on SNC programs and services and did not impact the prescribed requirements of the WBRMS.

Several comments submitted through the online survey related to topics outside SNC's legislative authority and mandate; jurisdiction for these comments is under a municipal or provincial government (e.g., removal of forest cover; carbon sequestration, and pollution). These comments will be considered in the context of landowner stewardship and outreach when these programs are reviewed by the Watershed Advisory Committee to provide program content and delivery recommendations to the SNC Board of Directors.

In addition to the online survey, comments were also gathered from the SNC Watershed Advisory Committee at their November 26<sup>th</sup>, 2024 meeting. Several comments for the WBRMS related to the draft 'Settlement' section under Watershed Characterization. Based on feedback, a significant edit was made to this section between the November and December drafts of the WBRMS. In early December, SNC received the draft Archaeological Screening Report Bear Brook Watershed, City of Ottawa and the United Counties of Prescott and Russell report. The report was prepared by True North Archaeological Services for the Bear Brook Watershed Study.

While commissioned for the Bear Brook Watershed Study, this archeological summary provides context for the region, with a focus on the area of Ottawa and the United Counties of Prescott and Russell. An excerpt from this report replaced the previous text in the 'Settlement' section of the December 2024 draft WBRMS. Future versions of the WBRMS will be updated as new archeological and Indigenous traditional knowledge are gathered for sub-watersheds throughout SNC's jurisdiction.

## 4.0 About South Nation Conservation

SNC has a strong history in watershed management and leadership in environmental planning. SNC is a not-for-profit agency established under the Conservation Authorities Act of Ontario in 1947 and is one of Ontario's 36 Conservation Authorities with decades of practical experience protecting the local environment and engaging communities.

**Our Vision:** Improved Water Quality for a Healthy Ecosystem: Our vision encompasses water levels which satisfy the needs of humans and the environment, healthy rivers and natural shorelines, and safe wastewater management practices.

**Our Mission:** To ensure that the management of natural occurrences, natural resources, and human activities results in the protection or improvement of water resources.

**Our Expertise:** Conservation is our core competency. SNC offers natural resource management and planning expertise to help our partners contribute to a healthy region. These contributions include forest, wetland, wildlife, fisheries, urban trees, floodplain, natural hazards, and water management. Community education and engagement initiatives are also an important component of our conservation efforts.

**Working Together:** Located in Eastern Ontario, SNC's jurisdiction encompasses 4,480 km<sup>2</sup> across 16 member municipalities including:

- |   |   |
|---|---|
| City of Ottawa  | United Counties of Stormont, Dundas, and Glengarry  |
| United Counties of Prescott-Russell   | <ul style="list-style-type: none"><li>• Township of North Stormont</li><li>• Township of South Stormont</li><li>• Township of North Dundas</li><li>• Municipality of South Dundas</li><li>• Township of North Glengarry</li></ul> |
| <ul style="list-style-type: none"><li>• City of Clarence-Rockland</li><li>• Township of Alfred and Plantagenet</li><li>• Municipality of Casselman</li><li>• Russell Township</li><li>• Nation Municipality</li><li>• Township of Champlain</li></ul> | United Counties of Leeds and Grenville  |
|   | <ul style="list-style-type: none"><li>• Township of Edwardsburgh/Cardinal</li><li>• Township of Augusta</li><li>• Municipality of North Grenville</li><li>• Township of Elizabethtown/Kitley</li></ul>                            |

SNC carries out its mandate to manage the natural resources in the watershed with the help of many forward-thinking individuals, groups, and agencies.

SNC's Board of Directors, which oversees SNC's budget, programs, and services, is comprised of 12 appointed representatives from 16 member Municipalities within the jurisdiction.

The Board of Directors membership includes representatives from the City of Ottawa (4), the United Counties of Prescott and Russell (3), the United Counties of Stormont Dundas and Glengarry (3) and the United Counties of Leeds Grenville (2).

SNC's Watershed Advisory Committee was established in 2024 and is comprised of 26 members who capture the scope of stakeholders represented in previous advisory committees to support the development and implementation of SNC's environment programs and services. This Committee reports to SNC's Board of Directors and supports the development of SNC Strategies.



*Figure 1: South Nation Conservation's Board of Directors (2024).*

## 4.1 Guiding Principles

Guiding principles establish the fundamental approach that drives the decision-making of the Conservation Authority. These guiding principles have been established to meet the requirements of Ontario Regulation 686/21 and provide the context for the objectives outlined in this Strategy:

1. Integrated Watershed Approach	There is an interdependence in all we do, including connections between land, water, and people. SNC is committed to a comprehensive systems approach, interconnecting Indigenous traditional knowledge with western science, which is fundamental to healthy watersheds and communities.
2. Collaboration	SNC's jurisdiction spans multiple Indigenous territories, watersheds, and municipal boundaries. SNC is committed to an inclusive approach that entails working with people (Indigenous and non-Indigenous), communities, and partners to promote, protect, and sustain a healthy, resilient ecosystem.
3. Fostering Understanding	SNC is committed to building and sharing knowledge and connecting people to the land and nature. Understanding this interdependence is essential for a healthy ecosystem.
4. Stewards of the Watershed	SNC, along with all jurisdiction residents, are stewards of the lands and waters. SNC is committed to a sustainable development approach that meets today's needs without compromising the health of the lands and waters for future generations.
5. Adaptability	Climate change brings unique opportunities and challenges to Eastern Ontario. SNC is committed to creating resiliency with local communities and municipal partners. SNC will continue to explore and develop innovative approaches to meet the changing climate.
6. Accountability	SNC strives to operate an efficient and fiscally responsible organization that is transparent, responsible, and promotes a healthy, positive, and inclusive workplace.

## 4.2 Objectives

Under the umbrella of the above guiding principles, SNC has identified the following objectives to guide delivery of Mandatory Programs and Services (Category 1) and support Other Programs and Services (Category and 3). Category 3 programs are essential to the support and delivery of Category 1 programs and services. Conservation lands, landowner stewardship, and public education and outreach are integral in science-based watershed knowledge and decision-making processes which incorporate traditional knowledge.

- To avoid, reduce, or mitigate potential risk to public health and safety, and to property.
- To mitigate potential risk to drinking water sources and ensure a sustainable and clean water supply for today and future generations.
- To characterize groundwater and surface water resource systems and other natural resources/systems, which regulate natural hazard processes and provide drinking water sources, while supporting the hydrological and ecological integrity of the watershed.
- To protect, maintain, and secure SNC-owned lands for public safety, natural heritage protection, Indigenous food sovereignty and traditional medicines, outdoor recreation, and socio-economic health.
- To research and identify potential solutions for addressing key resource issues, advocating for government funding and policies to address these issues, and adapting/developing programs and services as required.
- To educate and engage communities within the SNC jurisdiction to promote awareness of natural hazards and watershed health, and to encourage the protection and restoration of land and water resources through stewardship action.
- To continue to build relationships and actively partner with Indigenous communities and organizations to better integrate traditional knowledge into SNC's programs and services.

## 5.0 Watershed Characterization

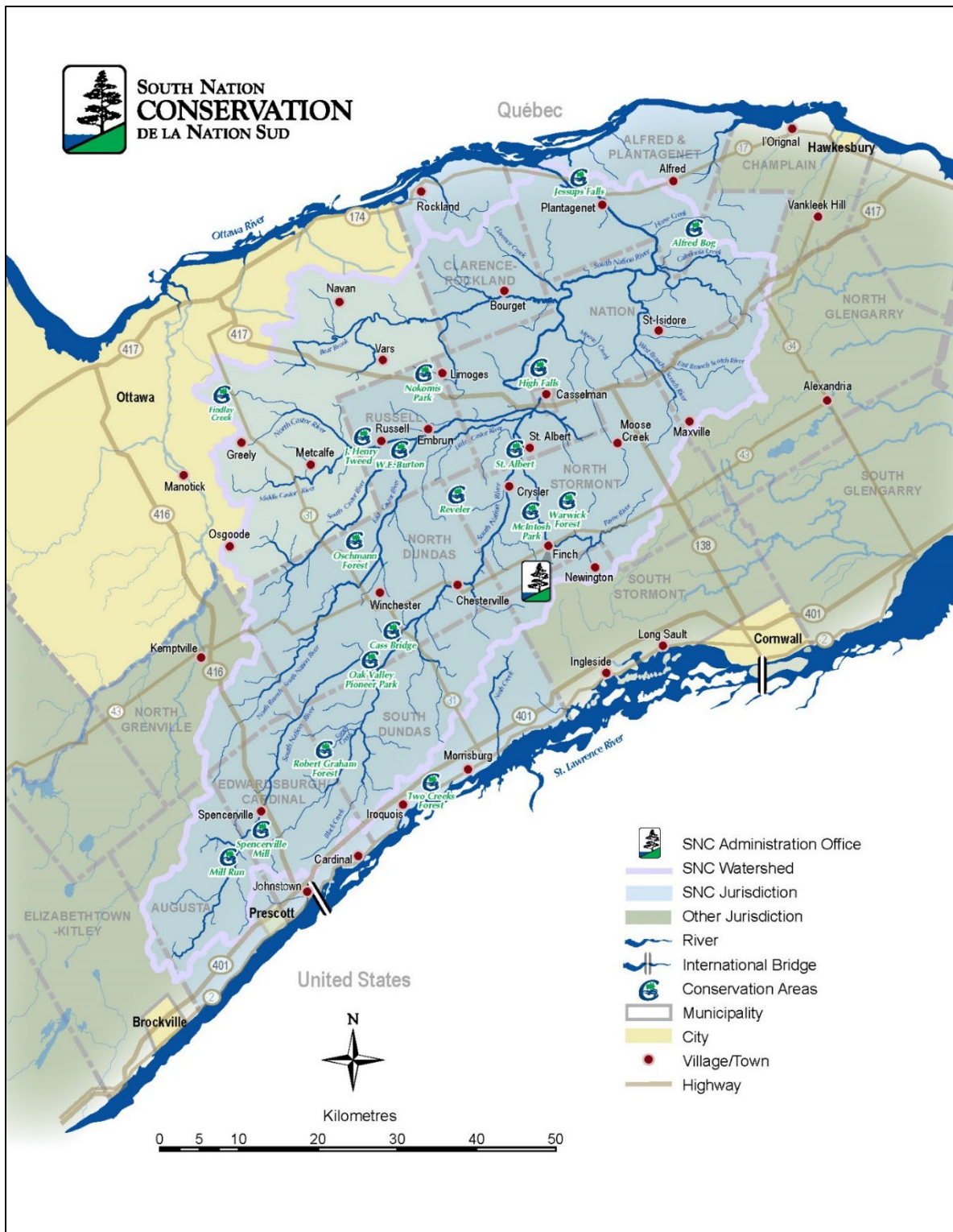
### 5.1 Jurisdiction

South Nation Conservation's (SNC) jurisdiction (Figure 1) is located within the City of Ottawa, and the Counties of Leeds and Grenville, Stormont, Dundas and Glengarry, and Prescott and Russell. This region lies within the unceded, and traditional territory of the Algonquin people also known as the Anishinaabe people. This area is also the traditional and treaty lands of the Haudenosaunee people.

The jurisdiction includes the South Nation River Watershed, which flows in a north-easterly direction from the headwaters near Brockville to Plantagenet before discharging into the Ottawa River. The South Nation River Watershed is approximately 3,900 km<sup>2</sup> and topography descends a total of 80 m in elevation over the 180 km length of the main South Nation River channel.

Since 2005, SNC has undergone several jurisdiction expansions at the request of its member municipalities, with these additional areas, the jurisdiction now encompasses 4,480 km<sup>2</sup>. SNC's jurisdiction includes shorelines and tributaries of the St. Lawrence and Ottawa Rivers in several municipalities.





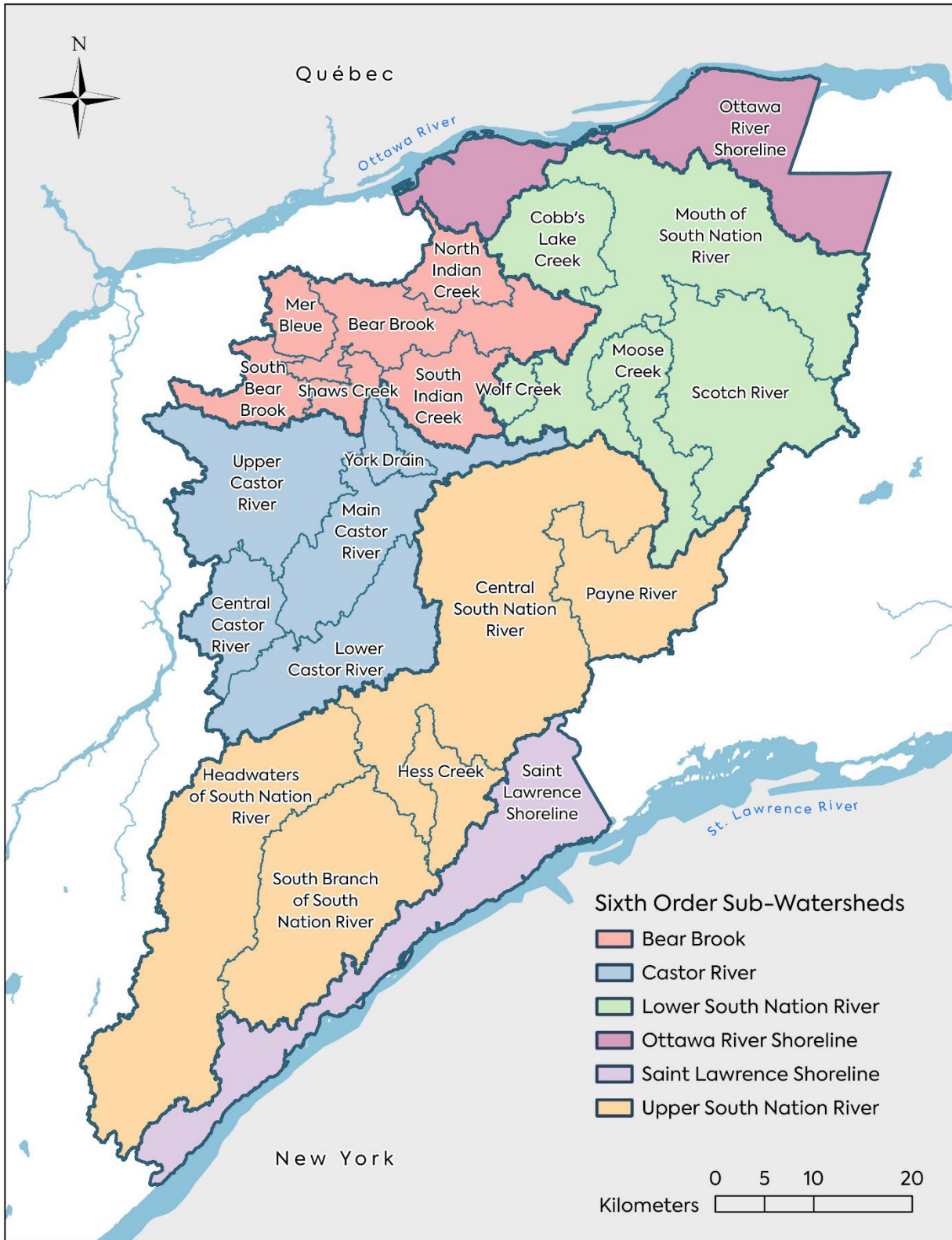
**Figure 2.** South Nation Conservation jurisdiction in Eastern Ontario.



## 5.2 Sub-watersheds

The table below summarizes the major sub-watersheds within SNC’s jurisdiction, including main tributaries to the South Nation, Ottawa, and St. Lawrence Rivers. The map in Figure 3 outlines these sub-watersheds within SNC’s jurisdiction.

<b>Sub-Watershed</b>	<b>Major Rivers and Tributaries</b>
Upper South Nation	<ul style="list-style-type: none"> <li>• South Nation River</li> <li>• North Branch South Nation River</li> <li>• South Branch South Nation River</li> </ul>
Middle South Nation	<ul style="list-style-type: none"> <li>• South Nation River</li> <li>• Hess Creek</li> <li>• Payne River</li> <li>• Butternut Creek</li> <li>• Little Castor Creek</li> </ul>
Castor	<ul style="list-style-type: none"> <li>• Castor River</li> <li>• South Castor River</li> <li>• Middle Castor River</li> <li>• East Castor River</li> <li>• North Castor River (including Findlay Creek and Shields Creek)</li> </ul>
Bear Brook	<ul style="list-style-type: none"> <li>• Bear Brook</li> <li>• South Bear Brook</li> <li>• North Indian Creek</li> <li>• South Indian Creek</li> <li>• McKinnon’s Creek</li> <li>• Shaw’s Creek</li> </ul>
Lower South Nation	<ul style="list-style-type: none"> <li>• South Nation River</li> <li>• Moose Creek</li> <li>• East Branch Scotch River</li> <li>• West Branch Scotch River</li> <li>• Cobb’s Lake Creek</li> <li>• Dickenson Creek</li> <li>• Horse Creek</li> <li>• Caledonia Creek</li> <li>• Paxton Creek</li> </ul>
Ottawa River	<ul style="list-style-type: none"> <li>• Atocas Creek</li> <li>• Clarence Creek</li> </ul>
St. Lawrence River	<ul style="list-style-type: none"> <li>• Nash Creek (<i>formally Hoasic Creek</i>)</li> <li>• Doran Creek</li> <li>• Flagg Creek</li> </ul>



**Figure 3: Sub-watersheds (5<sup>th</sup> and 6<sup>th</sup> order) within the SNC jurisdiction**

### 5.3 Physiographic Region

The SNC jurisdiction's topography is highly influenced by bedrock valley systems. The landscape is undulating to rolling with well-formed drumlins (hills of sediments from former glacial ice) and till ridges; intervening low areas are commonly flooded with level clay deposits or swamps.

SNC's jurisdiction was once covered by a temporary inlet of the Atlantic Ocean, known as the Champlain Sea, which was created by retreating glaciers during the end of the last ice age. The Champlain Sea at one time covered the lands that are now known as the provinces of Quebec and Ontario, as well as parts of New York and Vermont in the United States. As this glacier retreated, sediment was deposited between the Ottawa and St. Lawrence River, creating vast clay plains which ultimately formed today's distinct landscape.

The location of these unique plains (Figure 4) should be considered when evaluating the current condition of forest communities and wetlands within the SNC jurisdiction. Additionally, the following terms from Cathy Keddy's *Forest History of Eastern Ontario: Information Report NO.1* (1993), have been included to provide a definition of the physiographic units found within SNC.

**Smith's Falls Limestone Plain:** This is the largest and most continuous tract of shallow soil over limestone in southern Ontario. Due to gentle gradients, drainage is poor, and wetlands are numerous. Remnants of old marine beaches often provide the only areas of deep soil for cultivation or for road construction materials.

**Edwardsburg Sand Plain:** The bedrock and most of the boulder clay are covered by sand. The sand surface is largely level with hummocks or ridges in some places. The soils are acid and deficient in nutrients.

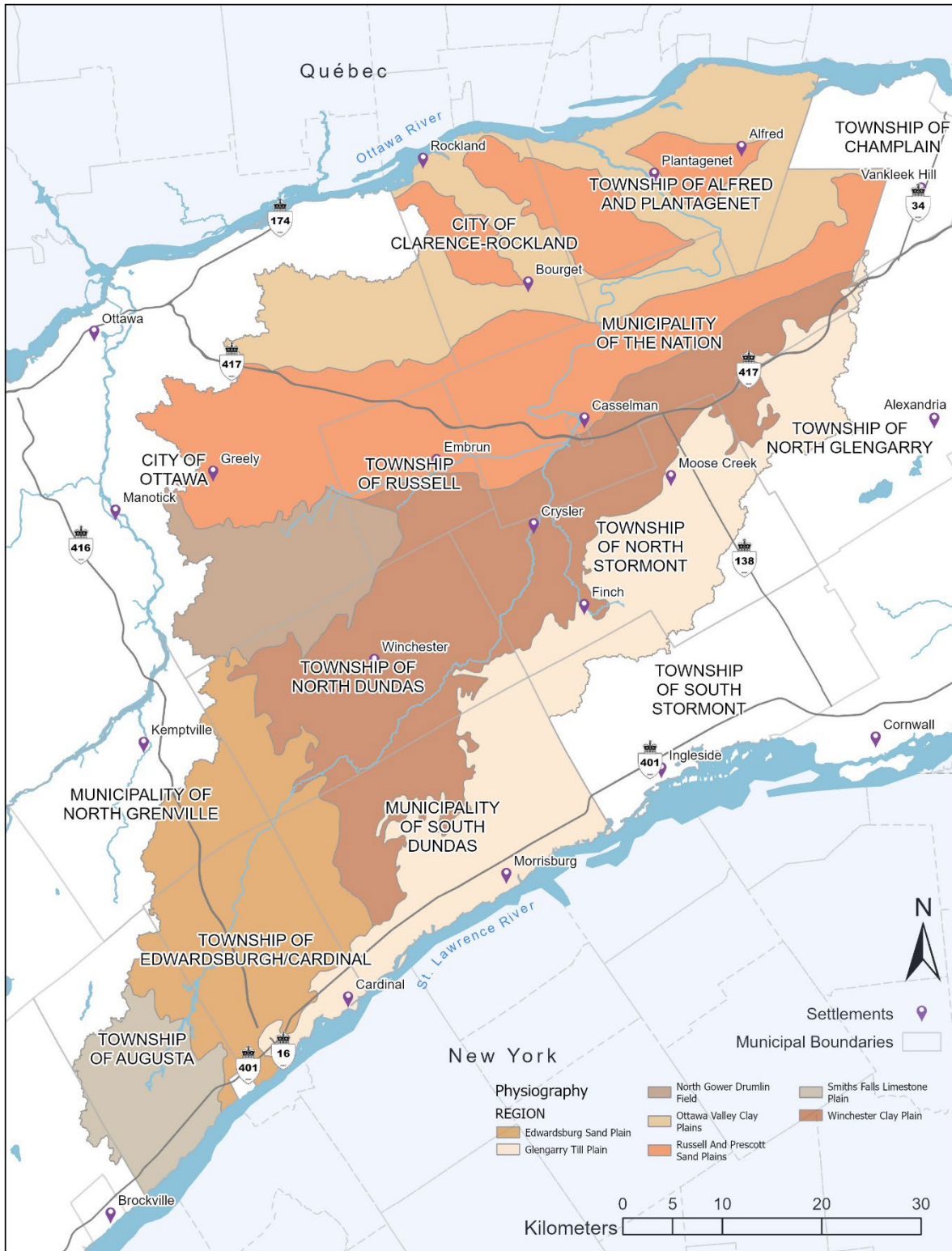
**Russell & Prescott Sand Plains:** Old deltaic deposits have created sand plains. The sand texture varies from coarse in the north to fine in the south. It reaches a maximum depth of around 9 m. Soils are well-drained with the water issuing from river bluffs into clay valleys.

**Ottawa Valley Clay Plain:** The clay plain is interrupted by ridges of rock or sand. The proportion of acid soil is greater than in the Winchester Clay Plain.

**Winchester Clay Plain:** Although clay plains dominate, they are punctuated by other features such as till protrusions, low drumlins, bars and beaches. The soils are generally poorly drained.

**North Gower Drumlin Field:** Drumlins arise from a clay plain. While the drumlins have good drainage, the clay soils are poorly drained.

**Glengarry Till Plain:** The undulating to rolling surface consists of drumlins with clay flats. The loamy till is often less than 8 m deep, but does reach a depth of 30 m. Its stoniness is noticeable.



**Figure 4: Physiographic regions within the South Nation Conservation jurisdiction.**

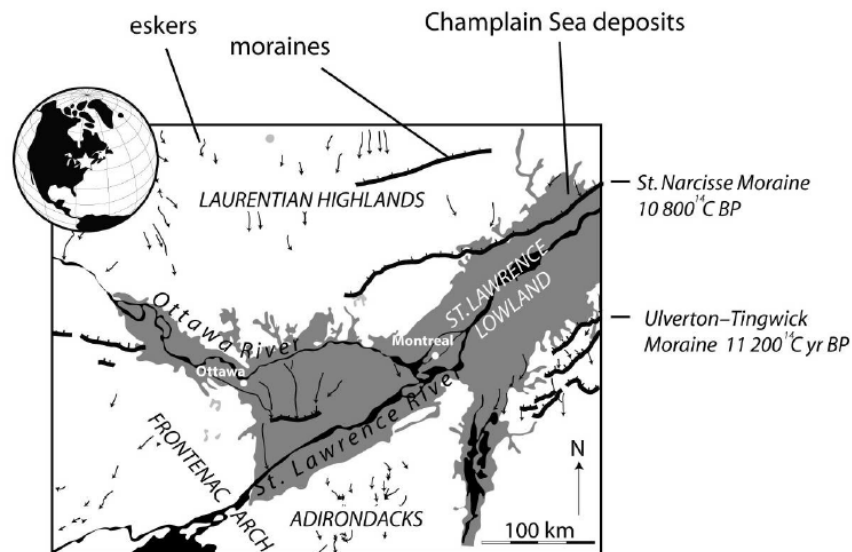
## Champlain Sea

Also of note, the Champlain Sea once covered a significant portion of the SNC jurisdiction. The development of the Champlain Sea sediments (late Pleistocene deposits) of the Ottawa Valley lowland area have been described extensively by Gadd (1976,1977,1985) and others, as being formed during the sequence of events described below.

Initially a glacial advance (Late Wisconsin) occurred in Eastern Ontario. During this time, a single till sheet, and other glaciofluvial sediments were deposited. There is no date available on the maximum phase of this glaciation. Deglaciation, coupled with a short period of proglacial conditions, was then responsible for the local accumulation of rhythmically layered sediments of silt and clay, and further glaciofluvial sediments. The Ottawa basin was undergoing deglaciation approximately 12,000 years ago (Fulton and Richard, 1986). The manner in which deglaciation may have occurred is not discussed here.

Deglaciation was followed by the submergence of the Ottawa and St. Lawrence Valley lowland areas by the marine waters of the Champlain Sea. The Sea may well have been in contact with the ice margin which was retreating in a northerly direction. Deep water sedimentation into this glaciomarine basin produced grey clays and silty clays during this period.

Subsequent uplift or rebound of the land surface after the removal of the ice resulted in the regression of the Champlain Sea and a transition to freshwater conditions within the Ottawa Valley. During this period of development several deltas were formed. These deltas moved seaward, following the regressing sea. The delta sediments include laminated silty clays with sand lenses, silty sand and sand displaying channel structures. The Champlain Sea existed from about 12 000 to 10 000 years BP (before the present) (Fulton and Richard, 1987). The historic location and extent of the Champlain Sea (taken from Russell et al., 2011) is illustrated in Figure 5.



**Figure 5:** The historic location and extent of the Champlain Sea (taken from Russell et al., 2011).



## 5.4 Settlement History

The following section on settlement history is an excerpt from the draft *Archaeological Screening Report Bear Brook Watershed, City of Ottawa and the United Counties of Prescott and Russell*, prepared by True North Archaeological Services in 2024 for the Bear Brook Watershed Study.

While commissioned for the Bear Brook Watershed Study, this archeological summary provides context for the region, with a focus on the area of Ottawa and the United Counties of Prescott and Russell. Future versions of the WBRMS will be updated as new archeological and Indigenous traditional knowledge are gathered for sub-watersheds throughout SNC's jurisdiction.

### Regional Indigenous Context

The following historical narrative is intended to provide a general overview of the interpreted land use during the "Pre-Contact and Post-Contact Periods" within the Bear Brook Watershed and surrounding vicinity. This historical overview generally reflects inferences and interpretations based on archaeological and historical interpretations primarily made by non-Indigenous representatives.

This section is intended to provide a general historical overview that can be referenced when determining the potential for archaeological resources within the current project study area. The text and comments below, including the cited references, may reflect archaeological literature within general publications, but may not represent the opinions of those Indigenous communities whose history it is purported to reflect.

### Paleo Period (13,000 – 9,000 BP)

The Paleo Period represents a temporal classification developed by archaeologists and does not reflect any inferences of initial human habitation. This period extends from around 13,000 years before the present (BP), when glacial ice began to recede within the modern-day area of the Ottawa Valley.

Following the period of deglaciation, the Ottawa Valley was inundated by the Champlain Sea, which is interpreted to have extended from Rideau Lakes in the south, along the Ottawa Valley and St. Lawrence areas and terminating around Petawawa in the west (Watson 1999a). The exact western boundary is undetermined as current elevation levels reflect the isostatic adjustment of the land following the melting of the glaciers and cannot be used to determine the exact location of the Champlain Sea at the time of its existence (Chapman and Putnam 1984). The eastern portion of the sea extended into the Atlantic Ocean.

During the Early and Middle Paleo Periods (13,000 – 9,500 BP) the Bear Brook Watershed would have remained inundated by the Champlain Sea, although as the Champlain Sea receded during the Late Paleo Period (9,500 – 9,000 BP) it is likely that people migrated along the changing waterfront landscape where vegetation was being re-established (Watson 1999a). The ridges and old shorelines of the Champlain Sea and early Ottawa River channels reflect areas most likely to contain evidence of Paleo Period land use in the region. Archaeological and geological investigations in the Ottawa Valley have indicated these early sites may be identified within the 550 ft (167.6 m) or higher contour topography, although additional research may be required to confidently assess this correlation (Kennedy 1976).

By the Late Paleo Period (9,500 - 9,000 BP), enclosed coniferous forests with some minor deciduous elements became established in eastern Ontario, with contemporary populations traversing large territories in response to seasonal resource fluctuations. The transition to the Late Paleo Period also included projectile points comprised of smaller unfluted projectiles along with lanceolate parallel flaked stemmed and non-stemmed Plano points, while hunting strategies may have transitioned from communal groups to more individualized pursuits (Ellis and Deller 1997).

The identification of Paleo Period sites in the Ottawa Valley region has been hindered by the erosion of accessible locations during the environmental changes associated with the transition from the Late Paleo Period to the succeeding Archaic Period. The potential use of watercraft by Paleo Period inhabitants (Jodry 2005; Engelbrecht and Seyfert 1995) and evidence for the abundance of marine resources (Robinson 2012; Loring 1980) raises the possibility of land use within accessible landscapes such as those exposed as isolated islands above the 167 m elevation contours. As the Ottawa River delta prograded eastward during the regression of the Champlain Sea (Fulton et al 1987), these isolated exposed landscapes would have been impacted by periods of overflow from glacial Lake Agassiz. The inundation of flood waters from the glacial lake may have caused significant erosion (Fulton and Richard 1987), with another possibility being that the sediment transport facilitated by the moving water may have buried cultural materials within these potential occupation areas.

Evidence suggesting land use within the Ottawa Valley during the Paleo Period includes the recovery of two bi-facially fluted projectile points found near the Rideau Lakes that would have been situated near the contemporary Champlain Sea shoreline (Watson 1999b) and an isolated projectile point near Quyon, Quebec (Laliberté 1991), with additional interpretations of Paleo Period material identified during archaeological investigations near Greenbank Road (Swayze 2003), Albion Road and Rideau Road (Swayze 2004). No Paleo Period archaeological sites have been registered within the Bear Brook Watershed. The closest site with a potential Late Paleo Period component is situated just over 23 km west of the project area where several lithic artifacts interpreted to represent a contemporary campsite have been recovered at the Holy Spirit site (registered as Borden Number BhFx-33) (MCM 2024).

### Archaic Period (9,000 – 2,950 BP)

During the Early Archaic Period (9,000 – 8,000 BP), a gradual increase in atmospheric humidity in conjunction with warmer summers influenced the environmental landscape within the general study area vicinity. Fossil pollen and spore identification from sedimentation cores lifted from Lovesick Lake provide evidence of climate change, with jack pine forests becoming dominant during the beginning of the Early Archaic Period (Teichroeb 2007). Land use within the Ottawa Valley increased during this early environmental transition, with evidence of an Early Archaic Dovetail projectile point recovered in the Ottawa area (Pilon and Fox 2015) confirming contemporary land use within the regional landscape.

Concurrent with the environmental evolution were notable diagnostic technological changes including the appearance of side and corner-notched projectile points used for hunting. Other significant innovations included the introduction of ground stone tools such as celts and axes, which may reflect an emerging woodworking industry.

Populations in Ontario during this period primarily utilized maritime landscapes during the spring, summer and fall seasons with large base camps on islands, near river mouths, and on

the shores of embayment's where a variety of flora, fish, and wild fowl resources could be obtained. Smaller hunting and specialized campsites were also established in the uplands and along smaller watercourses. The waterways were the preferred method of travel, and many burials are located along these waterways (Taylor 2015), as well as the traditionally visited islands. Access to islands and mainland shorelines would have been facilitated by a variety of contemporary watercraft such as bark canoes, skin boats and dugout canoes (Monk 1999).

Indigenous community members utilized watercraft to travel along navigable waterways such as the Ottawa, Gatineau and Rideau River systems to meet, trade and exchange information. These waterways represented the historical highways facilitating the movement of both people and materials through the general study area vicinity. Archaeological discoveries made in the area around the Ottawa River system and associated tributaries illustrate the existence of an extensive, continent-scale network of communication and trade with the discovery of a variety of raw materials used for stone tool production including Ramah chert from the tip of Labrador, Mistassini quartzite from the centre of Québec, Hudson's Bay Lowland chert from the region bordering Hudson Bay, abundant Onondaga chert obtained from the Onondaga Escarpment region south and west of Lake Ontario, as well as distinctive Mercer and Burlington Formation cherts from modern-day Ohio and Illinois (Pilon and Boswell 2015).

The Ottawa River and tributary waterways were also an important route for the movement of copper, either through direct trade between individual groups, or through expeditions to Lake Superior to access local copper deposits (Chapdelaine et al 2001). Copper artifacts similar to those documented on Allumette Island in the Ottawa River have been discovered in Wisconsin, Michigan, New York State and Manitoba (Kennedy 1970). This commodity, as well as other tradable goods, were presumably transported by canoes and other vessels along regional waterways.

The Ottawa Valley was also one of the primary corridors that facilitated the transmission of technological information and techniques (Kennedy 1970). Artifacts representative of the expanding trade network included "birdstones" which were small, bird-like effigies usually manufactured from green banded slate, as well as marine shell artifacts from the Mid-Atlantic coast that are frequently encountered in burial contexts (Ellis et al 2009; Ellis et al 1990).

Sites with Archaic components that demonstrate this expanding trade network include Morrison's Island and Allumette Island in the Outaouais region of the Ottawa River (Clermont and Chapdelaine 1998; Clermont 1999; Chapdelaine et al 2001), sites identified at Lac Leamy near the junction of the Gatineau and Ottawa Rivers, and also in the Rideau Lakes area (Watson 1982). Additional significant sites with Archaic Period components along Ottawa Valley waterways that were likely influenced by these trade routes include Jessup Falls near the mouth of the South Nation River and at Spencerville near the source of the South Nation River (Daechsel 1980).

During the Middle Archaic Period (8,000 – 4,000 BP) the trend towards more diverse toolkits continued, as the presence of netsinkers and fish weirs reflect the importance of fishing within the contemporary subsistence strategy. It was also during this period that stone tools specifically designed for the preparation of wild plant foods were crafted and when 'bannerstones' were first manufactured, which are carefully crafted ground stone devices that served as a counterbalance for atlatls or spear-throwers (Ellis 2013).



The diverse trade relationships may have also influenced the transition from seasonal expeditions across large areas to more centralized occupation within smaller areas that provided the opportunity to facilitate interaction with those conducting trade, whether it was “down-the-line” or controlled by individuals interacting directly with different groups (Kennedy 1970). Another noticeable attribute during the Middle Archaic Period is the increased reliance on local, often poorer quality, chert resources for manufacturing projectile points (Ellis 2013). While groups traversed larger territories during the Paleo and Early Archaic Periods and were able to visit primary outcrops of high-quality chert at least once during their seasonal round, during the Middle Archaic Period groups traveled within comparatively smaller territories that did not always possess a source of high-quality raw materials. In these instances, lower quality resources that had been previously deposited by the glaciers in the local till and river gravels were utilized.

Trade connections across vast territories continued into the Late Archaic Period (4,000 – 2,950 BP), when the trend towards decreased territory size and a broadening subsistence strategy continued. Late Archaic Period sites have been discovered in greater numbers compared to Early and Middle Archaic Period sites, suggesting the local population was rapidly expanding (Laliberté 1998a; Burse et al ND). It is during the Late Archaic Period that the first defined cemeteries are identified, as prior to this period individuals were typically interred close to the location where they died. During the Late Archaic Period, when an individual died while their group was away from the territorial cemetery, the remains would be kept until the group returned to the home cemetery where they could be interred (Kennedy 1966; Pilon and Young 2009). Consequently, it is not unusual to find disarticulated skeletons, or even skeletons lacking minor elements such as fingers, toes or ribs, in Late Archaic Period burial pits.

Burial grounds such as those at Morrison and Allumette Islands which were also important junctions for trade have been theorized to have provided strong symbolic claims over a local territory and the surrounding resources (Laliberté 1998a). These burial grounds are often located within areas of elevated topography containing well-drained sandy and gravel soils adjacent to major watercourses or on exposed islands.

Sites with Archaic Period components along the Ottawa River have been noted at Aylmer Island (Sowter 1915), Chaudière Falls (Pilon and Boswell 2015), Lac Leamy (Paterson 2020), the Sawdust Bay 2 site near Arnprior (Daechsel 1981), a site at Constance Bay that was observed to be “partially submerged” with material interpreted to be “possibly Late Archaic” (MCM 2024) and the BiFw-14 site on the north shore of the Ottawa River (Arkeos 1993). No Archaic Period archaeological sites have been registered within the Bear Brook Watershed. The nearest Archaic Period archaeological site is the Sawmill Creek Findspot (BiFv-5) located approximately 2.5 km west of the watershed. It consisted of a single isolated projectile point (MCM 2024).

### Woodland Period (2,950 – 500 BP)

The Early Woodland Period (2,950 – 2,200 BP) is distinguished from the Late Archaic Period primarily by the introduction of ceramic technology. The early ceramic containers were thick walled and friable, suggesting they may have been primarily used in the processing of nut oils by boiling crushed nut fragments in water and skimming off the oil (Spence et al 1990). These early vessels were not easily portable, and their fragile nature suggests they may have required regular replacement. There have also been numerous Early Woodland Period sites identified

where ceramics were absent from the recovered assemblage, suggesting ceramic vessels may not have been completely integrated within the daily lives of Early Woodland Period populations.

Besides the addition of ceramic technology, the cultural affinity of Early Woodland Period inhabitants shows a great deal of continuity with the preceding Late Archaic Period. For instance, birdstones continued to be manufactured, although the Early Woodland Period varieties have "pop-eyes" that protrude from the sides of their heads (Spence et al 1990). Another example of general continuity from the terminal segment of the Archaic Period is represented by the thin, well-made projectile points, although the Early Woodland Period variants were side-notched rather than corner-notched, giving them a slightly altered and distinctive appearance (Spence et al 1990).

Middle Woodland Period inhabitants appear to have utilized ceramic technology more extensively, with vessels often decorated with impressed designs covering the entire exterior surface and upper portion of the vessel interior with styles incorporating elaborate decorative patterns and distinctive elements. Many of the decorative techniques are representative of specific regional populations as well as specific date ranges (Laliberté 1999) with vessels manufactured during the Middle Woodland Period often incorporating diagnostically distinctive features. Additionally, ceramic decoration shows the emergence of a distinct regional stylistic tradition in the area of southern Quebec (Gates St-Pierre and Chapdelaine 2013).

In terms of settlement and subsistence patterns, the Middle Woodland Period (2,200 - 1,100 BP) provides a demarcation point from the Archaic and Early Woodland Periods. While Middle Woodland Period inhabitants continued to rely on hunting and gathering to meet their subsistence requirements, an increased consumption of fish became an important component of the contemporary diet. Some Middle Woodland Period sites have produced thousands of bones from spring spawning species such as walleye and sucker. Food sources such as shellfish, tree nuts and a proliferation of plant greens and seeds were exploited, and the seasonal variety and relative dependability of these foods encouraged population increases in many areas. Additionally, the presence of carbonized corn in Middle Woodland Period ceramics indicates the crop may have been obtained through exchange with peoples living to the south or was being cultivated on a small scale (Gates St-Pierre and Chapdelaine 2013).

The land use patterns reflected from archaeological investigations of Middle Woodland Period sites generally reflect densely occupied locations that appear on the valley floor of major rivers, often producing sites with extensive artifact deposits. Unlike earlier seasonally utilized locations, many Middle Woodland Period sites appear to have functioned as base camps, occupied periodically over the course of the year and situated to take advantage of the greatest number of resources. These large semi-permanent habitations show a reduced degree of mobility compared to earlier periods (Gates St-Pierre and Chapdelaine 2013). There are also numerous small upland Middle Woodland Period sites, many of which can be interpreted as special purpose camps where localized natural resources were exploited (MCR 1981).

During the Late Woodland Period, the Ottawa Valley appears to have been a zone of interaction between Iroquoian speaking populations to the south who primarily relied on domesticated crops and Algonquian speaking groups to the north who continued a predominately hunter-gatherer lifestyle. The Huron peoples along the north shore of Lake Ontario had moved to the Lake Simcoe – Georgian Bay region, leaving the area of eastern Ontario, except for some small Algonquin groups, generally unoccupied by the time early French explorers arrived in the area

around the beginning of the 17th century. Conversely, six St. Lawrence Iroquoian villages dating to ca. 1400 AD have been found in the Spencerville area reflecting the dichotomy in the settlement patterns between the Ottawa Valley and the St. Lawrence region to the south.

The increased population and semi-nomadic lifestyle prevalent within the Ottawa Valley during the Woodland Period are reflected in the distribution of sites documented along the Ottawa River and surrounding navigable waterways. The importance of the Ottawa River as a transportation route, as well as an area of resource and subsistence extraction, through this period is reflected in the number of known archaeological sites identified on both sides of the river (Sowter 1915; Kennedy 1964; Laliberté 1998b; Laliberté 1998c; Pilon 2005). No Woodland Period archaeological sites have been registered within the Bear Brook Watershed, with the closest site represented by the multicomponent BiFw-101 site located along the Rideau River approximately 6 km to the northwest.

Early contact with European settlers at the end of the Late Woodland Period resulted in changes to the traditional lifestyles of many Indigenous populations, influencing settlement size, population distribution, and material culture. The introduction of European-borne diseases also significantly increased mortality rates, resulting in a drastic decrease in population size (Warrick 2000).

### European Contact and Post-Contact Period

The Algonquin Nation had long been established along the Ottawa River and its tributary valleys when the French arrived in the area. Samuel de Champlain met with several Algonquin representatives in 1603 shortly after he established the first permanent French settlement on the St. Lawrence River at Tadoussac (AOO 2013), with Étienne Brûlé generally acknowledged as the first European to pass through what is now the Ottawa Valley area when he portaged at the Rideau Falls in 1610 and with the aid of Algonquin guides proceeded to explore the interior of Canada (AOO 2013).

Another French expedition led by Nicholas de Vignau traveled along the Ottawa River through the Ottawa Valley area in 1611 (Pendergast 1999), followed by Samuel de Champlain in 1613 who led the French voyageurs from Montreal to Morrison Island along the Ottawa River (Croft 2006), which was commonly known as the Grand River (Kichi Sibi in Algonquin) or the River of the Algoumequin (Pilon 2005).

Champlain again encountered Algonquin community members in the Ottawa Valley area in 1615, with many living in regional groups around the Madawaska River, Muskrat Lake, along the Ottawa River above and below Morrison Island, and also along the Mattawa River to Lake Nipissing (AOO 2013).

The Algonquins spent much of the year in small groups within family or band territorial limits with hunting territories shared by male family members (Speck 1915; Pendergast 1999). Hunting territories were bounded by natural features such as rivers or lakes. During winters, Algonquin families hunted large game such as deer or moose and trapped beaver (Morrison 2005). During summers, family groups would gather at larger camp sites including Morrison Island and Lac Leamy (Pilon and Boswell 2015).

The French established a relationship with the Algonquin communities around the Ottawa Valley that provided an opportunity to monopolize the early fur trade as the two groups developed close relations throughout the 17th century (Trigger and Day 1994). The Algonquins role as

intermediaries between other Indigenous groups made them ideal allies for the fur trade (Holmes 1993). The colonial economic wealth stimulated by the French fur trade in the early 17th century promoted the rapid expansion northward, with the Ottawa River providing the opportunity to transport goods to the western trading posts on the lakes by canoe, which could not be accomplished by the larger sailing vessels operating on Lake Ontario (Adney and Chapelle 2014).

Competition for furs increased existing tensions between the Algonquin communities and their Indigenous neighbours including the Haudenosaunee Nations, residing to the south around the St. Lawrence River and Lake Ontario areas. The 17th century saw a long period of conflict known as the Beaver Wars between the Algonquin and the Haudenosaunee communities that resulted in the significant disruption of trade. Mohawk raids against Algonquin villages in the Upper Ottawa and St. Lawrence Valleys resulted in the abandonment or destruction of many Algonquin villages (Trigger and Day 1994). Some Algonquin's found refuge in French settlements such as Trois-Rivieres, Quebec City, Sillery, and Montreal while others may have relocated to interior locations along the Ottawa River's tributaries (Holmes 1993). At the end of the 17th century, the Haudenosaunee were driven out of much of southern Ontario by the Mississauga though they continued to occupy areas within eastern Ontario on a seasonal basis.

In 1701, representatives from the Haudenosaunee and more than 20 Anishinaabeg Nations assembled in Montreal to participate in the Great Peace negotiations, sponsored by the French Governor Calliere (Johnston 2006; Johnston 2004). A peace treaty between the Anishinaabeg and the Kanien'kehá:ka (Mohawk) was agreed to once again share in the bounty of the territory as partners (One Dish, One Spoon), although this partnership was strained by the "Great Imbalance" represented by the fur trade with European capitalists (Monague 2022).

The resulting treaty document signed at Montreal was not the only record made of the Peace between the Anishinaabeg and the Haudenosaunee. At a council held at Lake Superior, the Haudenosaunee secured peace by delivering a wampum belt to the Anishinaabeg. This belt was carried by successive generations of leaders who were charged with remembering the meaning of symbols worked upon the shell beads and each generation had a responsibility to renew the peace forged by their ancestors (Johnston 2006).

Between 1712-1716, Algonquin communities continued to utilize the Ottawa Valley and were also observed along the Gatineau River with the primary Haudenosaunee occupation located south of the St. Lawrence River (Holmes 1993).

Following the Seven Years' War in the mid-18th century, the defeat of the French, Algonquin, and their allies by the British and the Haudenosaunee resulted in the further loss of Algonquin hunting territories in southern Quebec and eastern Ontario as the British seized former French colonies. Shortly after the French abandonment around the Great Lakes, English merchant Alexander Henry ventured into the Great Lakes area where he communicated with Anishinaabeg leader Minavanana in September 1761.

Henry was informed that the English would suffer retaliation for Anishinaabeg war losses unless the English King made peace with them, with many of the former French forts in the Great Lakes region within Anishinaabeg control. In response, King George III issued a Royal Proclamation on 7 October 1763 acknowledging that Indigenous Nations residing on all lands outside the boundaries of the settled colonies "not having been ceded to or purchased by Us,

are reserved to them, or any of them, as their Hunting Grounds” (Reimer 2019, p. 38). The territory reserved for Indigenous Nations encompassed the entire Great Lakes region and peace was secured following discussions between the British and more than 1,500 Anishinaabeg leaders at Niagara Falls in July 1764 where the alliance was sealed by two magnificent wampum belts (Johnston 2006).

The extension of Quebec’s boundaries in 1774 through the Quebec Act and the use of the Ottawa River as the boundary between Upper and Lower Canada following the 1791 Constitution Act separated the traditional Algonquin lands between two colonial government administrations (AOP 2012). This legislative act does not seem to have negatively influenced trade between the British and local Indigenous communities as the recovery of European trade goods (e.g., iron axes, copper kettle fragments and glass beads) from Indigenous sites throughout the Ottawa River drainage basin provides evidence of the extent of contact between the Indigenous communities and the European explorers traversing the Ottawa River during this period.

The 19th century saw significant European immigration into the Ottawa Valley. The Crown largely ignored Algonquin complaints about European encroachment on their hunting territories. Although some Algonquins tried to rent their lands to individual immigrants, the practice was soon ended when the Crown granted patents to the European immigrants who were occupying Algonquin lands as renters (Holmes 1993).

As Indigenous peoples were forced from their traditional hunting territories, many turned to the wage- labour economy where they made significant contributions to the development of Canadian industry (Fernandez and Silver 2017). This includes the role of Algonquin men in transporting goods and furs from the Ottawa River to Moose Factory (Inksetter 2021). A consequence of the participation of Algonquin men in the fur trade were significant changes in settlement patterns. As the men set off on their journey north, the women and children would remain around trading posts until the men returned. While summer gatherings had long been an Algonquin cultural practice, these gatherings were larger. When Catholic missions began to be established at the trading posts, Algonquin converts were encouraged to bury their dead at Catholic cemeteries and were spending up to three months a year living at the trading posts. The importation of European foods further led to the development of a semi-sedentary lifestyle as some Algonquin families began planting potatoes and sending their children to schools.

A reserve was purchased for use by the Algonquins in Golden Lake in 1873, now known as Pikwàkanagàn (AOO 2013; Holmes 1993). The Kitigan Zibi Anishinabeg First Nation was established in the 1850s and is located approximately 100 km north of Ottawa (Kitigan Zibi 2021). Additional reserves and settlements for the Algonquin community members were also established in Quebec during the mid- 20th century, although these reserves only secured a small fragment of what once had been the original homeland of the Algonquins (AOO 2013).

The Indian Act of 1876 framed the relationship between the Government and Indigenous peoples as paternalistic and the Department of Indian Affairs was granted the authority to manage Indigenous lands, resources, and money. The Department of Indian Affairs also had the authority to determine who could be classified as Indigenous (INAC 2011). The goal of the Indian Act was to erase Indigenous autonomy to force their integration into Canadian society. Residential schools and the adoption of Algonquin children by non-Indigenous families during the mid-20th century resulted in further discrimination and erosion of rights (AOP 2012).

## 5.5 Regional Population Projections

The City of Ottawa (southern and eastern portion) is the largest urban centre within the SNC jurisdiction. The population is estimated to increase by 40% over the next 20 years, the City's Official Plan projects a population for 2046 at 1,410,000 people. There were 429,000 households in 2021, this is expected to increase to 591,000 by 2046. Ottawa's expansion areas are focused within the area of SNC's jurisdiction.

The United Counties of Prescott and Russell has also seen tremendous growth over the past 30 years. Official Plan population projections estimate growth to increase from 98,180 people (2021) to 125,000 in 2046. Forecasted household growth to 2046 is highest in municipalities close to the Ottawa expansion areas; including Township of Russell, Municipality of Casselman, and the City of Clarence-Rockland.

The United Counties of Stormont, Dundas and Glengarry Official Plan estimates a population growth of 2,424 people by 2036; increasing from 67,634 (2016) to 70,058 (2036). Highest population growth is projected within the Township of North Dundas, followed by the Municipality of South Dundas; with a net change in growth between 2016 and 2036 at 1,522 people and 484 people, respectively.

The United Counties of Leeds and Grenville has four municipalities all or partially within the SNC jurisdiction; Township of Edwardsburgh Cardinal, Township of Augusta, Township of Elizabethtown-Kitley, and the Municipality of North Grenville. Official Plan population projections estimate an increase of 6,325 people from 2011 to 2031; however, much of this increase is outside of the SNC jurisdiction. Population increase within the SNC jurisdiction is approximated at 25% of this total projected growth.

## 5.6 Land Use

Regional landscape changes occurred through the 19<sup>th</sup> century with forestry operations driving the economy from land clearing incentives for European settlement and with white pine, which accounted for 50% of the region's old-growth forests, being the preferred timber for ship masts.

By the start of the 20<sup>th</sup> century little old growth forests remained and municipalities were left with 10 - 30% forest cover, which contributed to severe flooding, droughts, erosion, and poor land management practices.

The region's main economic driver transitioned to agriculture, which is well served in the fertile and productive clay plains found throughout the region. Tile draining and other agricultural improvements have further increased productivity and allows many producers earlier access to land generally susceptible to flooding in one of the flattest landscapes in Ontario.

The main rural land use is agriculture. Commercial and industrial uses related to a rural economy are also located in rural areas. Resource-based economic activity, such as licensed pits and quarries, also exist. Urban settlement areas are a mixture of land uses - residential, commercial, industrial and schools, churches, parks and recreational facilities. Natural areas are found throughout the jurisdiction and include forests and wetlands.

SNC completed a land cover update in 2023 with funding through the Flood Hazard Identification and Mapping Program (managed by Natural Resources Canada) for the jurisdiction. The update was primarily to support natural hazard mapping and modeling projects.

Land cover was updated using 2019 aerial imagery and 2021 LiDAR data and includes LiDAR corrected watercourses across the SNC jurisdiction. A summary of current land cover classification for the SNC jurisdiction and also for each upper tier municipalities is provided in the tables below. Figure 6 illustrates the land cover classification across the SNC jurisdiction.

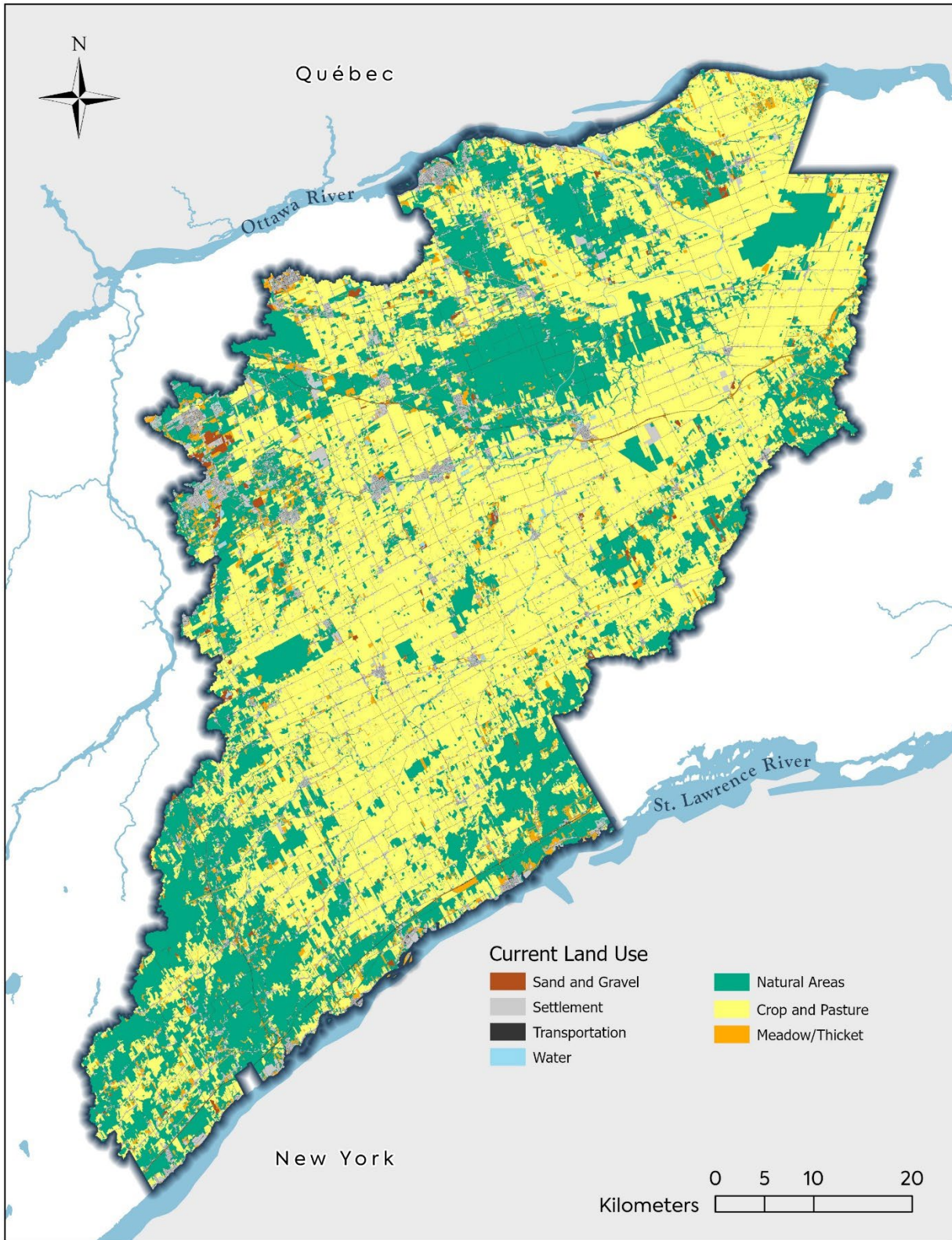
**Table 1:** Current land cover classification, as a percentage, for the SNC jurisdiction.

<b>Current Land Cover Classification</b>	<b>Percentage (%)</b>
Aggregate	0.48
Settlement	6.17
Transportation	2.92
Water	0.53
Natural Areas	34.58
Crop and Pasture	51.43
Meadow/Thicket	3.89

**Table 2:** Current land cover classification, as a percentage, by upper tier municipalities.

<b>Current Land Cover Classification</b>	<b>Percentage (%) of Current Land Cover Classification by Upper Tier Municipalities</b>			
	<b>Leeds and Grenville</b>	<b>Stormont, Dundas and Glengarry</b>	<b>Prescott and Russell</b>	<b>City of Ottawa</b>
Aggregate	0.36	0.36	0.27	1.41
Settlement	6.27	4.59	5.96	10.53
Transportation	2.86	2.68	2.83	3.77
Water	0.16	0.41	0.82	0.52
Natural Areas	59.46	27.37	31.28	35.48
Crop and Pasture	26.75	60.95	55.94	41.68
Meadow/Thicket	4.15	3.62	2.90	6.61





**Figure 6: Current Land Cover Classification in the SNC Jurisdiction**



## 5.7 Climate

The SNC jurisdiction exhibits a humid continental climate and is characterized by four distinct seasons, cold, snowy winters, and warm, humid summers. The climate is influenced by several factors including:

- mid to high-latitude location in the Northern Hemisphere;
- inland location far from ocean influences;
- proximity to the Great Lakes and the St. Lawrence River; and
- varying topography.

Mean temperatures vary significantly according to season. Precipitation is evenly distributed through the year, with slightly higher precipitation between April and October.

The frequency and magnitude of extreme weather will continue to increase throughout the 21<sup>st</sup> century due to human-induced climate change (Intergovernmental Panel on Climate Change, 2021).

In an impact assessment report, completed by SNC in 2021, changing climatic and land use variables were demonstrated to significantly impact river flow regimes within the South Nation River Watershed. According to 2050 timelines, flows will increase by as much as 80% in some catchments due to the cumulative impacts of urbanization and climate change.

Research also shows that the warmer, moister climate is expected to increase the frequency of severe hydrologic anomalies in the region, including droughts, with hot events occurring more frequently and intensely, while cold events will be less frequent and weaker (Alodah, 2015).

The main impacts facing the SNC jurisdiction in the next 50 years may include:

- Increased overland flooding due to increases in the intensity, duration, and frequency of extreme weather events;
- Declines in water quality resulting from increased flows, erosion, and conversion of natural cover (forest, wetland) to other land uses;
- Decreased precipitation during summer months, combined with higher temperatures, resulting in less water availability during the low flow season;
- Increased temperature through winter months, resulting in increased winter runoff, reduced capacity for snowpack storage, and reduced infiltration and storage in the soil; and,
- Increased frequency, duration and magnitude of extreme weather events exposing communities to increased risk.

The SNC jurisdiction is already experiencing the effects of climate change. In recent years, Eastern Ontario has experienced rising air temperatures and a shift from traditional spring high flows to more mid-winter melts. Years with warmer winters has resulted in rain events that required winter operations of the Chesterville Dam.

Short duration, high intensity, rain events cause high flows and localized flooding in late spring, summer, and into the fall. The jurisdiction has also experienced intense winds, a May 2022 derecho storm, and freezing rain/ice storms, most notably in January 2024 and the 1998 Ice Storm.

## 5.8 Water Resources

### Surface Water

Surface water is abundant across the SNC jurisdiction due to the flat landscape and low permeability of soils, leading to the presence of many wetlands, streams, and water features. An extensive network of tile drainage and municipal drains also exists across the SNC jurisdiction due to the presence of marine clay and the need improve water conveyance to facilitate agricultural production and other human land uses.

The flat, clay-based watershed, with relatively low forest cover, contributes to reduced water quality as overland flow from land use activities enters watercourses that lack vegetated buffers to help trap sediment and nutrients. As a result of the environmental and economic land use conditions, including decreased forest and wetland cover and water quality, phosphorous loading in the South Nation River was found to be two to four times above the Provincial Water Quality Objective and contained some of the poorest water quality in Ontario.

SNC's State of the Nation Watershed Report Card (2023) concluded that phosphorus levels routinely exceed the Provincial Water Quality Objective (0.03 mg/L), while benthic invertebrate communities range from reference (unimpaired) condition to poor (impaired) condition depending on location. Sites in good stream health tend to have good forest cover, especially along the banks of the rivers (riparian area). Sites requiring improvement typically have low forest cover and are prone to erosion and sedimentation.

An additional parameter of concern in surface water is chlorides. Chloride levels have shown consistent increases across the watershed, with the highest concentrations observed in the more urbanized areas within the jurisdiction.

The volume of water across the SNC jurisdiction varies from year to year and is largely dependent on weather. Flows are higher during wet years and lower during dry years. Flows also vary month to month, with spring typically bringing the highest flows when large quantities of water are released due to snow melt and rainfall during the spring freshet. Flooding is driven by weather events, and monitored through SNC's Flood Forecasting and Warning Program, which benefits from a surface water-groundwater hydrologic flow forecasting model and extensive monitoring network that involves collecting information on water levels, flows, and precipitation amounts.

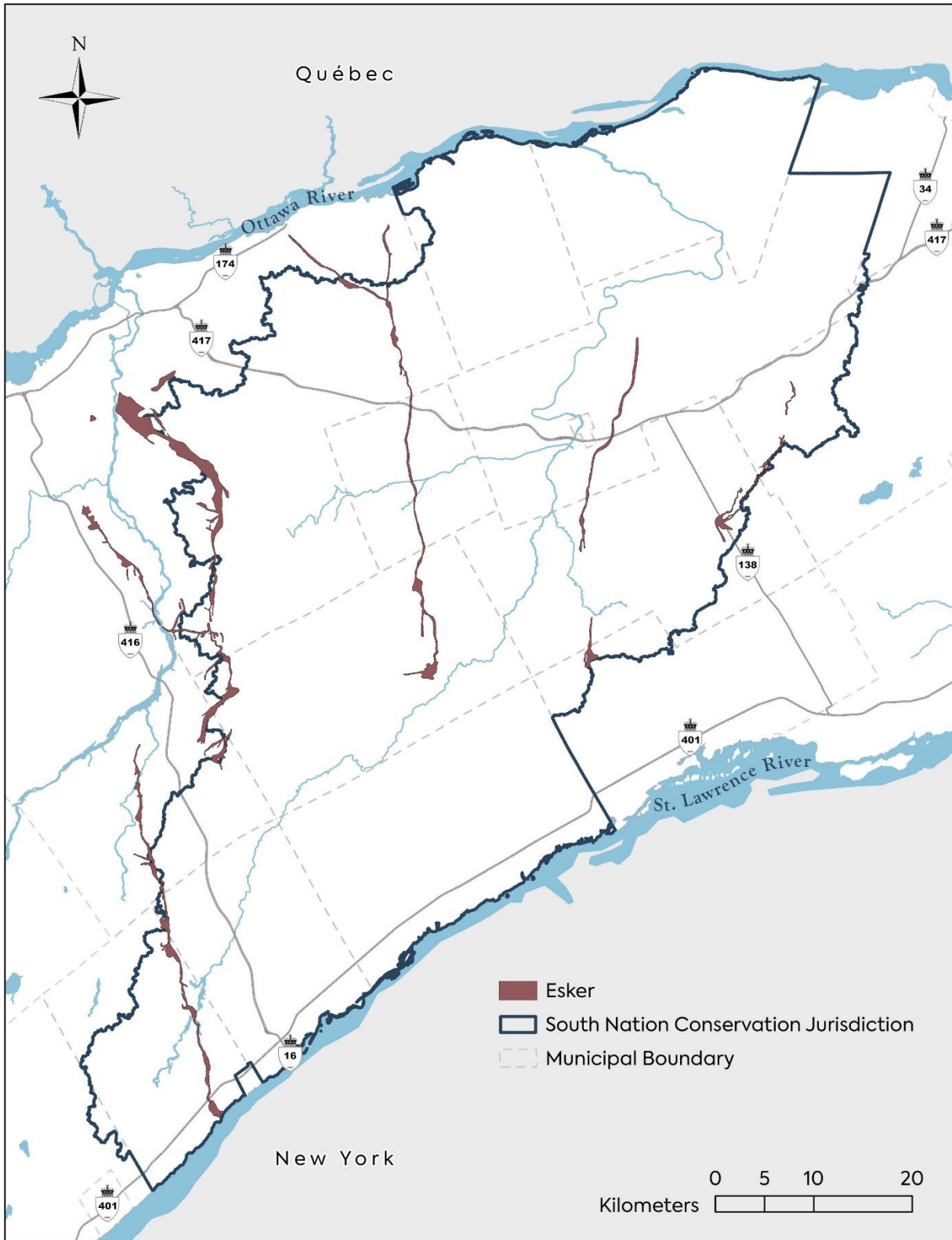
Over much of the year, flow sustained in rivers and streams across the SNC jurisdiction is supplied from groundwater or discharged from wetlands. This portion of the flow regime is referred to as baseflow. Increasingly, low water conditions are being observed in summer months during periods of reduced precipitation. Research has identified the importance of groundwater and subsurface flow to sustaining ecosystem services in rivers during periods of drought, along with other economic services (i.e., agricultural production).

### Groundwater

Groundwater is a valuable resource that is important to public health and the economic well being of many communities. It is a major source of water supply for public, private, agricultural, industrial, commercial and municipal uses. Groundwater also plays a major role in maintaining the health of aquatic ecosystems. The occurrence, movement, and quality of groundwater are strongly influenced by physiography and geology.

Eighty-nine percent of groundwater extracted within the SNC jurisdiction comes from wells screened within bedrock aquifers; this includes wells whose screens partially penetrate the bedrock situated within the bedrock contact zone aquifer. Bedrock in the jurisdiction is made up of a series of Paleozoic sandstone, limestone and shale units, with most of the production coming from the upper portion of bedrock where weathering is dominant and there exists a greater density and larger openings of fractures.

The other eleven percent of groundwater is extracted from overburden sources. The overburden includes glacial deposits made up of tills and moraines deposited during the advance and retreat of the Laurentide Ice Sheet, glaciofluvial deposits produced by meltwater streams escaping from the glacier (esker complexes), shallow water (sand and gravel) and deep water (silt and clay) glaciomarine deposits, deltaic and fluvial deposits from early phases of the Ottawa River and recent deposits. The esker deposits are a significant source of municipal drinking water in the jurisdiction. Eskers are winding ridges of sand and gravel, unrelated to surrounding topography, and derived from glacial processes. Several eskers are located throughout the jurisdiction as depicted in Figure 7.



**Figure 7. Esker locations within the SNC jurisdiction**

Regional groundwater recharge was reported in the *Eastern Ontario Water Resources Study Final Report*, prepared by CH2MHILL in 2001, and was described as follows. Groundwater recharge refers to the portion of precipitation flow downward to the saturated portion of an aquifer. Recharge of an aquifer is important to quantify as it limits the maximum (theoretical) amount of groundwater that can be sustainably extracted from the aquifer. Groundwater flow can be summarized as a process whereby water flows from areas of high potential (elevation) to areas of low potential (elevation). The high potential areas represent recharge areas where groundwater flow is generally downwards into an aquifer, such as topographic highs. Areas of low potential are discharge zones where groundwater flow is generally upwards towards surface water features such as streams. Aquifers lose water by discharge to surface water features.

The Champlain Sea deposits in the United Counties of Prescott and Russell and the City of Ottawa have the least amount of recharge to the contact zone aquifer, while more permeable deposits throughout Eastern Ontario have moderate to high values of recharge. The highest values of recharge occur on topographic highs where the largest downward gradients exist and in areas of thinner and/or permeable overburden such as in southwest Stormont, Dundas, and Glengarry and near Maxville.

Groundwater recharge and discharge was mapped through an analysis of the vertical hydraulic gradients and the hydraulic conductivity in the preparation of the *Raisin-South Nation Source Protection Region – Watershed Characterization Report*. Within the shallow flow regime, groundwater recharge and discharge occurs at a very local scale; recharge occurring within topographically higher regions, and discharge occurring tens of metres to a few kilometres farther down gradient in ditches or small streams. In a slightly deeper groundwater flow regime associated with deeper overburden deposits and a shallow bedrock interface, recharge occurs in areas of higher topography and in areas where the overburden materials are generally permeable and are connected to the deeper system.

The *Watershed Characterization Report* noted and identified where several key areas of groundwater recharge is likely to occur. These regions consist of relatively thin overburden and/or more permeable materials; two key areas are the Edwardsburgh Sand Plains and the Prescott-Russell Sand Plains. Groundwater recharge to the deep system has been identified to be originating from regions west of the South Nation River Watershed within the Rideau Valley Conservation Authority where the Nepean Sandstone and other more permeable bedrock units are located at ground surface.

Generally, groundwater flow within the esker will be parallel to its length. When evaluating the direction of groundwater flow at a smaller scale in the vicinity of eskers, it is imperative that more detailed data be included to better characterize groundwater flow within and surrounding the esker deposits.

Groundwater quality has been monitored across the SNC jurisdiction through several different studies, including long-term monitoring of Provincial Groundwater Monitoring Network wells, and the collection of Ambient Groundwater Geochemical and Isotopic Data for Southern Ontario, 2007–2019 (Ontario Geological Survey, 2021). Studies have shown that deglaciation at the end of the last ice age, and the presence of the inland arm of the Atlantic Ocean, known as the Champlain Sea, has had a lasting impact on Eastern Ontario's geology. As deglaciation occurred and the Champlain Sea retreated, it left behind vast amounts of glacial deposits rich in minerals, including salts like chloride. Over thousands of years, these minerals have leached

into the soil and bedrock, gradually increasing the natural background levels of chloride in groundwater.

Key findings of the Eastern Ontario Water Resources Study (2003); noted that throughout Eastern Ontario, the primary reported concerns related to water quality were inorganic compounds, which come from the geologic material the water flows through. These compounds (e.g., sulphur, iron) are aesthetic parameters (non-health related drinking water objectives) which can be treated with readily available technology.

## 5.9 Natural Hazards

### Droughts/Low Water

As a consequence of changing climatic conditions, the SNC jurisdiction has been experiencing more severe drought conditions than has historically been observed. Most apparent in 2012, Eastern Ontario experienced an extended period of low rainfall and high temperatures. As a result, the South Nation River Watershed had one of the lowest surface water levels recorded in the last 50 years.

A significant portion of the jurisdiction relies on groundwater as a drinking water source (municipal and private wells). During drought conditions, SNC receives numerous reports of private wells drying up, requiring property owners to supplement their water supply.

### Flooding

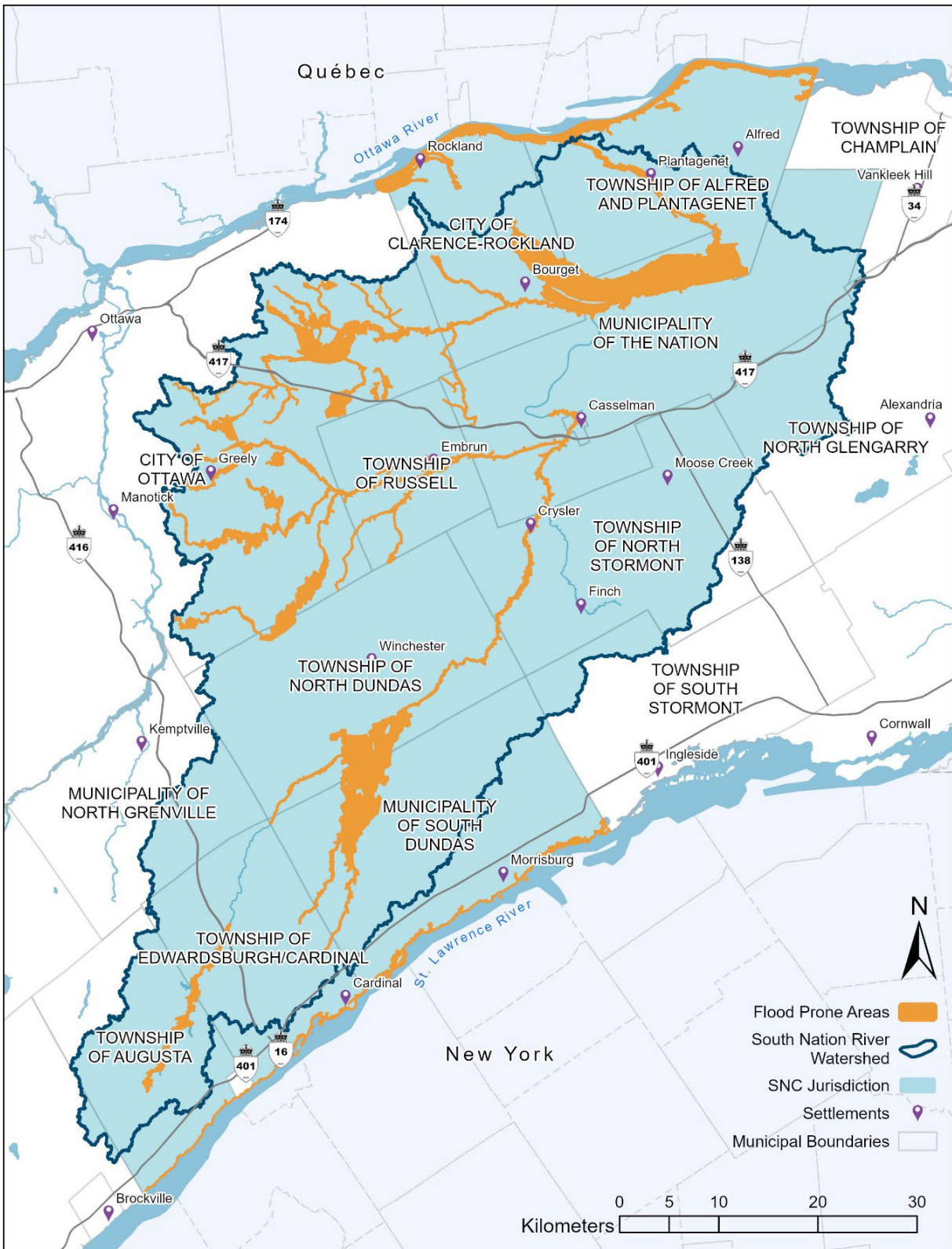
Flooding is normally associated with spring runoff but can occur at any time of the year. The flat nature of the SNC jurisdiction creates flood prone areas, which are low-lying areas that are susceptible to flooding (Figure 8). Within SNC's jurisdiction, there are six flood prone areas, including:

- Brinston - Oak Valley Area (North & South Dundas)
- Plantagenet - Fournier Area (Nation & Alfred-Plantagenet)
- Bear Brook Area (Cumberland & Clarence-Rockland)
- South Castor Area near Vernon (Osgoode)
- Middle Castor Area upstream of Metcalfe (Osgoode)
- Lords Mills (Augusta & Edwardsburgh Cardinal)
- St Lawrence River
- Ottawa River

The SNC jurisdiction saw two major flood events in recent years, 2017 and 2019, along sections of the St. Lawrence River and Ottawa River. This flooding was due to extreme precipitation, combined with rapid snow melt. These floods caused millions of dollars in damages to residents and businesses within the City of Ottawa and United Counties of Prescott and Russell, as well as the municipalities of South Dundas, Edwardsburgh/Cardinal, and Augusta along the St. Lawrence River.

Most flooding along the South Nation River is in the flood prone areas and associated with ice jams during spring runoff and ice melt. However, nuisance flooding can also occur throughout the year following extreme rain events.





**Figure 8:** Map of flood prone areas within South Nation Conservation's jurisdiction.

## Erosion and Unstable Slopes

In Eastern Ontario, the interplay of geological and hydrological conditions significantly contributes to erosion and unstable slopes, presenting challenges for both infrastructure and environmental sustainability. The varied topography, characterized by valleys and sedimentary deposits, creates conditions where rainfall and runoff can lead to substantial soil erosion.

The presence of sensitive soils, particularly glaciomarine clays, like Leda clay, exacerbates the instability of slopes. These clays, when saturated, can lose cohesion and lead to retrogressive landslides, particularly on slopes exceeding eight meters in height. The combination of these geological factors with human activities, such as land development and deforestation, further increases vulnerability to erosion and slope failure, making it imperative to monitor these areas closely.

Effective management of erosion and unstable slopes requires a multidisciplinary approach that incorporates advanced geotechnical engineering principles and rigorous scientific research. Utilizing modern tools such as LiDAR and remote sensing technologies allows for comprehensive mapping and analysis of slope stability, enabling the identification of potential failure zones. Additionally, implementing erosion control measures such as vegetation restoration, terracing, and the installation of drainage systems can mitigate the effects of heavy rainfall and surface runoff. Integrating sustainable land-use practices with engineering solutions enhances slope stability and protects infrastructure.

Fostering a collaborative effort among scientists, engineers, and policymakers can lead to the development of resilient strategies to address the complexities of erosion and slope instability in Eastern Ontario, ultimately safeguarding both human communities and the natural environment.

### *Karst*

Unstable bedrock sites in Eastern Ontario are typically karst formations, which are landscapes shaped by the dissolution of limestone and dolomite bedrock by water. Named after the Karst region in Yugoslavia, these formations develop as water flows over and infiltrates the soluble rock, leading to features such as sinkholes, trenches, and underground caverns. The character and scale of karst formations vary widely, influenced by factors including the acidity of surface water, the rock's dissolution rate, the density of fractures and fissures, the depth at which water percolates from the surface to the water table, and the presence of impermeable layers above or below the limestone or dolomite. These formations create complex subsurface networks that can lead to sudden ground subsidence, posing stability challenges for infrastructure and development.

### *Potential Retrogressive Landslides*

Landslides are quite common in slopes composed of materials deposited when the area was submerged thousands of years ago, by the Champlain Sea. The landslides can be small, comprising less than 50 cubic metres of earth, or large involving several hundred thousand cubic metres of material.

A twenty-kilometre section of the South Nation River within The Nation Municipality between the Village of Casselman and the former Hamlet of Lemieux is subject to large scale retrogressive landslides. This area – identified as the Casselman to Lemieux Potential Retrogressive Landslide Area (Figure 9) has been the subject of decades of geotechnical studies.

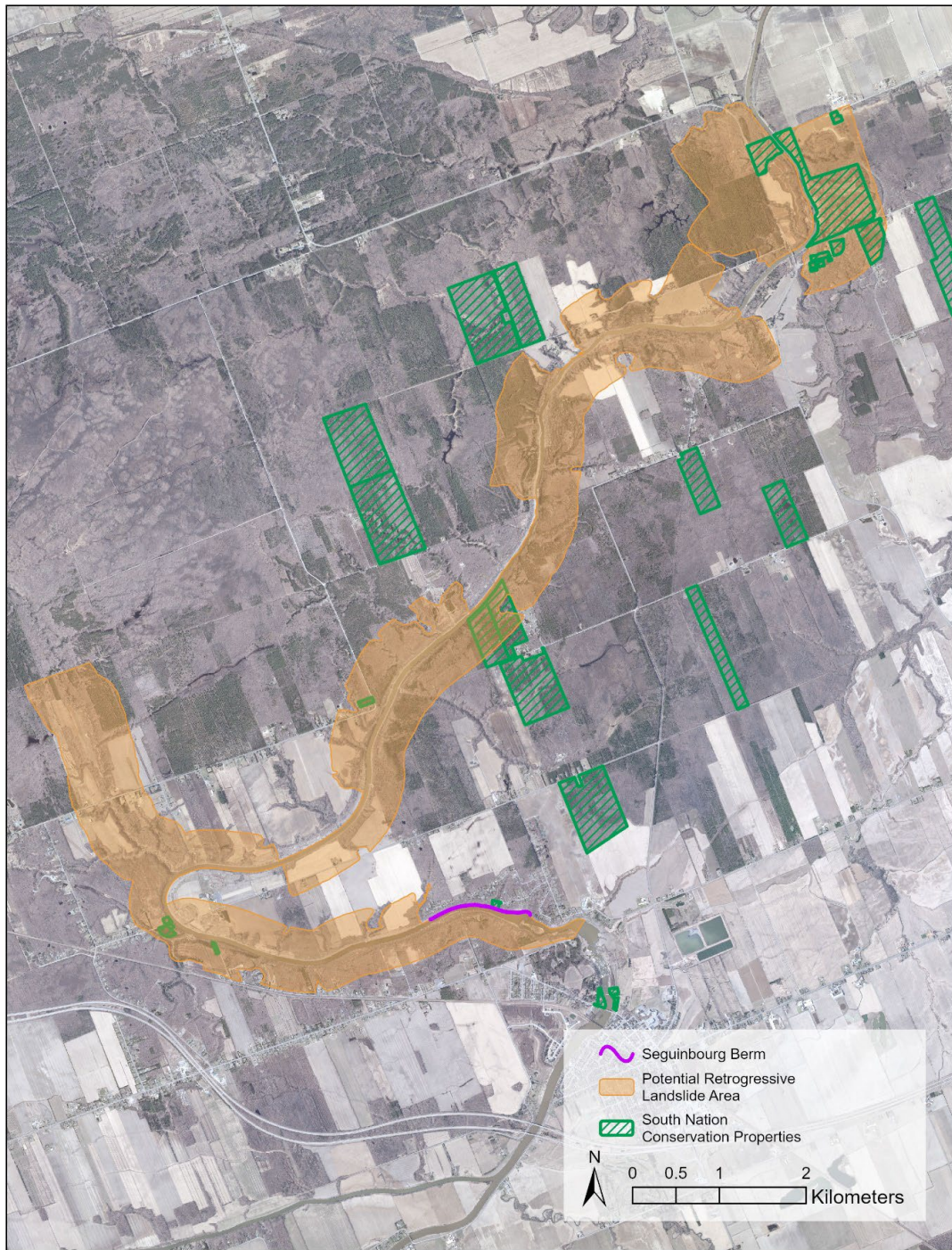


Geotechnical and historical data conclude that a major retrogressive landslide could occur in the potential retrogressive landslide area at any time, endangering lives and resulting in the loss of buildings, infrastructure, and land.

Since 1850, five large retrogressive landslides have been documented between Casselman and Lemieux and the scars of an additional seven or eight older retrogressive landslides are evidence that the process has been ongoing for a considerable time. The two most recent major retrogressive landslides occurred in 1971 and 1993.

On May 16, 1971, 4.5 km upstream of the hamlet of Lemieux, a large clay flow destroyed 28 hectares of farmland. The landslide left a scar 750 m wide with a headward retrogression of 450 m. About 6 million cubic metres of sediment flowed into the South Nation River, damming the river for months.

The most recent landslide on June 20, 1993, occurred two years after the hamlet of Lemieux was abandoned and residents were relocated because of the efforts of South Nation Conservation. The failure involved 2.5 to 3.5 million cubic metres of sand, silt, and clay flowing into the South Nation Valley, inundating 3.3 km of the valley bottom and damming the South Nation River for four days. The landslide created a scar 320 m wide, 680 m in length, and 10 to 20 m deep.



**Figure 9:** Map of the Casselman to Lemieux Potential Retrogressive Landslide Area and SNC property acquisitions (1989 – 2021).

## 5.10 Natural Heritage

A natural heritage system is a network of interconnected natural features and areas such as forests, lakes, rivers, agricultural lands, and wetlands. These systems help conserve biological diversity, maintain ecological functions (e.g., movement corridors for wildlife, endangered species habitat) and sustain ecosystem services that we all depend on (e.g., pollination, clean water, flood damage reduction).

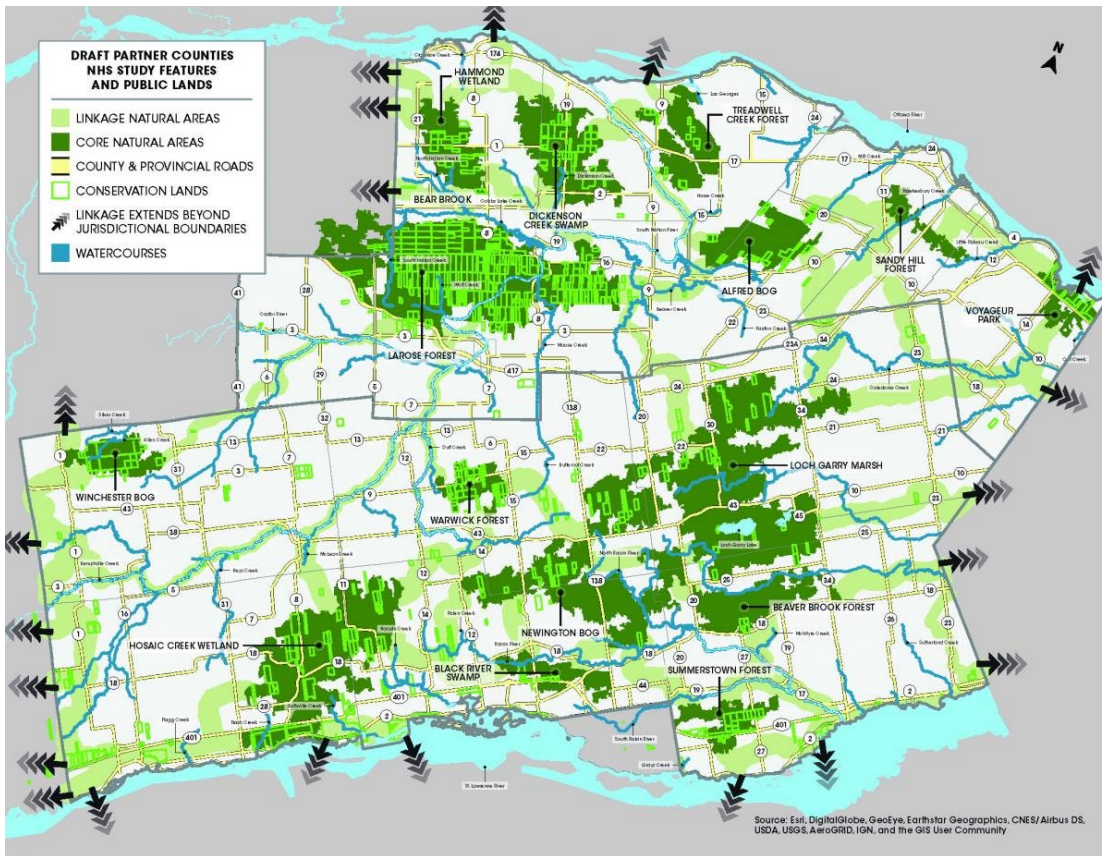
The Province of Ontario requires municipalities to identify natural heritage systems and preserve the diversity and connectivity of these features. This requirement is translated into policies that inform development, stewardship actions, climate change resiliency, environmental studies, and conservation efforts. This strategic approach to maintaining biodiversity preserves green infrastructure that is resilient to climate change and development pressure.

The City of Ottawa and the United Counties of Leeds and Grenville studied and identified their natural heritage systems and linkages in 2012-2013 and the United Counties of Stormont, Dundas, and Glengarry and the United Counties of Prescott-Russell contracted SNC to complete their natural heritage systems study in 2019-2021 (Figure 10).

The Natural Heritage System contributes to the health and wellbeing of residents by making important contributions to surface and ground water quality, forest cover, flood and erosion control, wildlife habitat, air quality, pollination, property values, and quality of life, while reducing risks associated with climate change.

SNC conservation lands play a crucial role in augmenting natural heritage within the region and present valuable opportunities for integration with other public lands.





**Figure 10: United Counties of Prescott and Russell and United Counties of Stormont, Dundas and Glengarry Natural Heritage Systems and Linkages.**

## Forest Cover

Forest cover loss is an ongoing environmental concern; the South Nation River watershed was found to have less than 28% forest cover, 8% interior forests and 22% riparian cover in 2014, with some municipalities containing less than 13% forest cover.

SNC has partnered with the Ontario Woodlot Association to update forest cover for the jurisdiction utilizing LiDAR (Light Detecting and Ranging) data acquired in 2021/2022; the updated forest cover layer is expected in late 2025.

Environment and Climate Change Canada recommends a minimum of 30% forest cover, 10% forest interior, and that 75% of stream length should be naturally vegetated on both sides. These minimum forest cover thresholds are considered a high-risk approach necessary to support half of the potential species richness and marginally healthy aquatic systems in a watershed. Guidelines acknowledge that 40% forest cover is a medium-risk approach and that 50% is a low-risk approach that is likely to support most potential species and healthy aquatic systems (“How Much Habitat is Enough – 3<sup>rd</sup> Edition”, 2013).

Forest and wetland loss have continued to increase, with over 13,000 acres of forest lost between 2008 and 2014, and an approximate 1,000,000 trees being cut per year in the region (SNC’s “Forest Cover and Trends Analysis”, September 2016). This loss not only diminishes habitat and natural heritage connectivity, it also removes natural infrastructure that is essential for mitigating flooding.

In response to studies on forest cover trends, SNC established a Forest Conservation Initiative, which included two years of input from local stakeholders and government representatives, through public working groups, to create a series of recommendations for the SNC Board of Directors and member municipalities. The report *Protecting and Increasing Forest Cover in the South Nation Conservation Jurisdiction* was approved by the Board of Directors in August 2018 (BD-130/18).

## Wetlands

Wetlands provide valuable ecological and hydrological functions at site-specific and watershed scales. Many of southern Ontario’s flora and fauna inhabit wetlands during part or all of their life cycle, including many species at risk. Wetlands are known to be biologically diverse habitats, tending to support a wider range of flora and fauna than other habitat types, particularly on a species per area basis (Environment Canada, 2013).

Wetlands also play a crucial role in mitigating the effects of flooding and drought. They capture and hold water during intense rainfall events, slowly releasing it into receiving watercourses, and allow surface water to infiltrate and recharge groundwater resources.

SNC’s relatively flat terrain supports a variety of wetlands. There are four main wetland types across the SNC jurisdiction: swamps, marshes, fens, and bogs. Each has unique characteristics that define which category it falls into and what ecological role it plays.

**Swamp:** a water body characterized by lowland seasonal flooding and is forested with woody plants such as trees and shrubs.

**Marsh:** typically permanent, treeless water bodies that feature grasses, sedges, cattails, and rushes.

**Bog:** an acidic, low mineral, peat-dominated wetland that often supports growth of sedges, shrubs, and sphagnum moss.

**Fen:** similar to a bog in that this wetland features peat, but instead has an alkaline chemistry and is fed by mineral-rich groundwater/surface water which supports grasses, sedges, rushes, and wildflowers.

### Habitat and Species

The South Nation River Watershed is a diverse and ecologically significant area that encompasses forests, wetlands, rivers, agricultural land, and small communities, making it an important habitat for a variety of species. The watershed supports ecosystems that are vital for both aquatic and terrestrial life. However, human activity, agricultural development, and climate change have impacted many species within this watershed, placing them at risk.

The South Nation River and its tributaries provide an important aquatic environment for species like mussels, fish, and various amphibians. The river itself meanders through wetlands, which are critical breeding grounds for birds and amphibians, as well as riparian zones that support rich biodiversity. These wetlands also act as natural filters for water quality and help to regulate the water table, playing a key role in flood prevention. Forested areas in the watershed are home to mammals like deer, foxes, and raccoons, along with a diverse range of bird species.

Several species within the South Nation River Watershed are considered at risk due to habitat loss, pollution, and changes in water levels caused by both human activities and climate shifts. Fish species such as the American Eel and River Redhorse are listed as species of concern. The American Eel, once abundant in Ontario's waterways, has seen population declines due to barriers like dams that prevent their migration, as well as overfishing and habitat degradation. The Blanding's Turtle and the Spiny Softshell Turtle are also at risk, primarily due to habitat destruction, road mortality, and the loss of nesting sites near wetlands.

Birds such as the Barn Swallow and Eastern Meadowlark, which depend on open grasslands and agricultural areas for nesting, are also vulnerable in the South Nation River Watershed. Changes in farming practices, loss of grassland habitat, and pesticide use have negatively affected these species' populations.

South Nation Conservation is working to protect these species and their habitats through restoration projects, habitat conservation, land acquisition, and community education programs. Efforts include wetland rehabilitation, tree planting, and implementing best practices in agriculture to reduce runoff and improve water quality. These initiatives are crucial for ensuring the health and resilience of the South Nation River Watershed's ecosystems and safeguarding the species that call it home.



## 6.0 Existing Knowledge

SNC staff rely on a variety of different sources of information to complete their work. Existing technical studies, data from monitoring programs, guidelines and procedures, agreements, geospatial data, and legislation directly support program delivery across program areas.

In order to effectively deliver programs and services, SNC staff rely on the following types of information:

- Provincial legislation and guidelines
- Municipal legislation
- Data collected by SNC through monitoring stations
- Data collected for SNC by third parties through contract agreements
- Data collected by other agencies (federal/provincial)
- Geospatial data developed by SNC or provided by 3<sup>rd</sup> parties
- SNC guidelines, policies, and publications
- Legal agreements and agreements with other governmental agencies
- Externally developed/maintained software and databases

For a complete list, refer to Appendix I - Existing Technical Studies, Monitoring Programs, and Other Information Directly Supporting Program Delivery.

SNC relies on data from monitoring stations throughout the watershed for information on climate, precipitation, surface and groundwater levels, and water chemistry.

SNC maintains an internal geoportal through which geospatial data can be accessed. Geospatial information comes from a variety of sources, whether it is data collected from monitoring stations, mapping layers developed by SNC staff, or data that is used through agreements with municipalities or other levels of government. This data includes Light Detection and Radar (LiDAR) topographic information, orthophotos, water control structures, water monitoring stations, floodplain maps, property information, watercourses, land cover, municipal information, etc.

SNC staff use legislation, agreements, guidelines and procedures to guide their work. Key pieces of legislation include the Conservation Authorities Act and O/Reg 41/24, the Planning Act, municipal Official Plans and Zoning by-laws, the Ontario Building Code, the Occupational Health & Safety Act, the Employment Standards Act, and the Income Tax Act. SNC has developed its own plans, strategies, guidelines, and procedures for identifying natural hazards, alterations to watercourses, land securement, forest management, operations, and infrastructure maintenance. SNC also relies on externally-developed guidelines, such as those produced by the Ministry of Natural Resources or the Ministry of Environment, Conservation and Parks with respect to natural hazards, source water protection, and wetlands.

### Indigenous Traditional Knowledge

SNC staff are aware of the limitations of a perspective dominated by western science and colonial traditions. An effort has been made to ensure that staff have opportunities to learn more about Indigenous cultures, traditions, local knowledge, and alternative ways of understanding the natural world.

Two-Eyed Seeing is the Guiding Principle brought into the Integrative Science co-learning journey by Mi'kmaw Elder Albert Marshall in Fall 2004. Two-Eyed Seeing refers to learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing and learning to use both these eyes together.

The Seventh Generation Principle is a concept that urges the current generation of humans to live, work, and plan for the benefit of the seventh generation into the future. This concept is based on laws and practices of the Haudenosaunee peoples, and similar concepts exist in other indigenous cultures across Turtle Island. The principle applies to decisions being made about our energy, water, and natural resources, and ensuring those decisions are sustainable for seven generations in the future.

SNC will continue to work with local Indigenous communities and with members of the Eastern Ontario First Nations Working Group to integrate First Nations knowledge and culture into this Watershed-based Resource Management Strategy as well as the development and delivery of its programs and services.

## 7.0 Programs and Services

### 7.1 Category 1 – Mandatory Programs

#### General Operations and Governance

General operations are the day-to-day Authority operations that support all programs and services, which are not directly related to the delivery of any specific program or service but are the overhead and support costs of the Conservation Authority. These include operating services (e.g., information management, information technology and geographic information systems (GIS), finance, corporate services, and human resources), operating expenses (e.g., utilities, insurance, legal services, and health and safety) and capital assets (e.g., administrative office, workshop, and vehicles).

General operating also includes the Authority's governance structure; the overall framework for managing and decision making of the organization. This includes expenses related to the operation and support of the SNC Board of Directors and any associated Standing Committees.

Communications related to municipal and public engagement on mandatory programs and services and governance are considered general operating. This also includes the hosting, development, and content management for SNC's English and French websites and social media platforms; as well as conventional communication products such as brochures, displays, and reporting (e.g., annual reports, watershed report cards, and SNC State of the Nation).

#### Natural Hazards Management

##### *Flood Forecasting and Warning*

Flood Forecasting and Warning is part of the Ministry of Natural Resources (MNR) Emergency Response Plan, which was developed in accordance with Ontario's *Emergency Management and Civil Protection Act*. The Emergency Response Plan describes the services provided by the MNR and its partners in response to flood conditions and how to respond in the event of flood conditions.

To reduce the risk of loss of life, injury and property damage, SNC provides flood warning messages with enough lead time for municipalities and the public to act. An annual Flood Contingency Plan is prepared following the provincial standards established in the Ontario Flood Forecasting and Warning: Implementation Guidelines for Conservation Authorities and Ministry of Natural Resources and Forestry (2008) prepared by the Provincial Flood Forecasting and Warning Committee.

Under the provincial Flood Forecasting and Warning program, SNC provides services to municipal partners across the jurisdiction including flood forecasting and warning for riverine, small inland lake, and St. Lawrence River and Ottawa River shorelines.

##### *Low Water Response*

The Ontario Low Water Response Program is coordinated by SNC to ensure preparedness and assist in a coordinated, consistent approach of local response in the event of a drought. This program is based on existing legislation and regulations and builds on existing relationships between the CA, province and local government bodies.

The province provides overall direction for the plan and coordinates policies, science, and information systems. In extreme circumstances, support is provided where local declarations of an emergency have been made. At the local jurisdiction, the emphasis of this response plan is directed to collecting information, interpreting policy, and delivering programs to minimize the effects of low water conditions.

SNC has a Water Response Team to provide local stakeholder input in times of low water or drought. The 'Ontario Low Water Response SNC's Water Response Team' plan and terms of reference are reviewed annually, updated as needed, and circulated to member municipalities.

### *Hazard Mapping*

Conservation Authorities have been delegated floodplain management responsibilities by the Ontario Ministry of Natural Resources on a watershed scale. SNC responsibilities include the identification of lands that are subject to flood hazard; supporting regulations made under Section 28 of the *Conservation Authorities Act*; and supporting Official Plan land use designations and zoning by-laws adopted by municipalities in accordance with the *Planning Act* and the associated Provincial Planning Statement.

Accurate, engineered flood mapping is the foundation for effective flood hazard management. In Eastern Ontario, the 1:100-year floodplain is the regulatory standard, calculated as having a 1% Annual Exceedance Probability (AEP).

The methodology for completing floodplain studies and mapping is standardized throughout Canada and the United States. The methodology for the completion of floodplain studies and the production of floodplain maps is described in the following documents:

- MNR (1986). *Floodplain Management in Ontario: Technical Guidelines* Ontario Ministry of Natural Resources, Conservation Authorities and Water Management Branch, Toronto.
- MNR (2002). *River and Stream Systems Technical Guide: Flooding Hazard Limit*. Ontario. Ministry of Natural Resources, Water Resources Section, Peterborough, Ontario, 2002.
- Conservation Ontario (2005). *Guidelines for Developing Schedules of Regulated Areas - Section 3.0*. Conservation Ontario and the Ministry of Natural Resources, October 2005.

While flood hazard mapping serves as a valuable piece of information in understanding the extent of flooding for specific events, flood hazard mapping alone does not provide the information required to fully understand flood risk. Flood risk is a combination of the likelihood and consequence of flooding associated with communities, buildings, and infrastructure.

SNC developed a 10-year Flood Mapping Strategy so that flood mapping resources are directed to critical areas and the largest risk reduction benefits are realized. The Strategy was approved by the Board of Directors in April 2023 (BD-074/23).

The 10-year Flood Mapping Strategy included several steps:

- Identify high risk flood mapping projects;
- Estimate cost of undertaking hazard mapping for each flood mapping project;
- Prioritize flood mapping projects based on highest risk (product of potential hazard and catchment vulnerability);

- Prepare a 10-year capital plan; and
- Present results and adjusted plan based on discussions with municipal partners and available funding.

There will be floods greater than the 1:100 event. SNC delineates more severe flood events (e.g., 1:350 year) for any new or updated natural hazard mapping projects. Smaller flood events are also modelled to calculate flood depth; this provides a screening-level assessment of the extent of flooding over roadways as well as an inventory of communities, buildings, and dwelling units lacking access and egress. The additional flood extents are for scoping analyses only and are not used for defining specific or regulatory limits.

Erosion hazards are defined by the loss of land due to human or natural processes that poses a threat to life and property (Government of Ontario, 2014). Erosion hazard limits are regulated in the Province of Ontario to keep people and property safe.

The erosion hazard limit is determined using 4 factors:

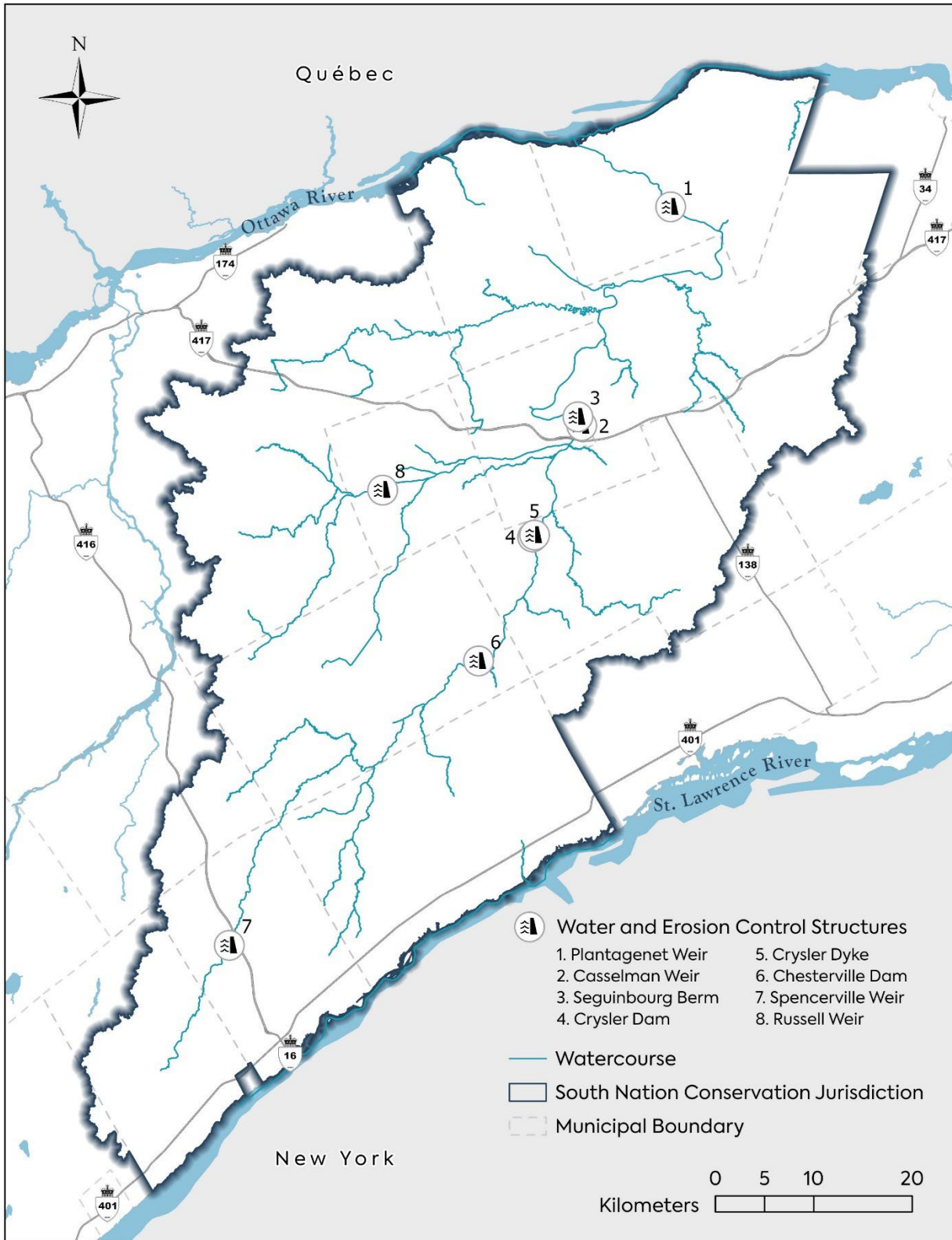
- 100-year erosion rate (average annual rate of recession extended over a hundred-year time span);
- slope stability;
- erosion allowance, and
- meander belt allowance.

The methodology for the completion of erosion studies and the production of erosion maps is described in the following document:

- MNR (2002). River and Stream Systems Technical Guide: Erosion Hazard Limit. Ontario. Ministry of Natural Resources, Water Resources Section, Peterborough, Ontario, 2002.

#### *Water and Erosion Control Infrastructure*

SNC owns, operates, and maintains seven water control structures and has undertaken four flood control channelization projects throughout the watershed (Figure 11). This infrastructure serves purposes such as flood control, erosion control, low flow augmentation, water supply, recreation, and protection of fish and wildlife habitat.



**Figure 11: Water and Erosion Control Structures in the SNC jurisdiction.**



### Chesterville Dam

The 1978 Chesterville Dam controls a drainage area of 1,050 km<sup>2</sup>. It consists of a six-bay, reinforced concrete structure. The dam provided a water supply for the Nestlé Canada Inc. plant prior to its closing. SNC's upgrades to the gate control devices allow it to open if water levels rise. To make reservoir users aware of the changes, the Public Safety Procedure for the Chesterville Dam includes warning signage, public awareness materials and media releases.

### Crysler Dam

The Chrysler Dam controls a drainage area of about 1,300 km<sup>2</sup>. First built circa 1900, it consisted of: an overflow section; a north and south retaining wall; a north abutment; an intake channel; and a mill. Modifications to the dam in 1975 included: plugging the mill's intake channel; strengthening the overflow dam stone and timber crib construction; adding a downstream concrete/stone apron; and constructing a new stop log channel, low-flow augmentation and associated channel on the south riverbank. The dam currently improves water quality through low-flow augmentation and offers recreational opportunities.

### Crysler Dyke

The Chrysler Dyke is situated just northeast of the Chrysler Dam. The dyke was originally built in the 1980s in response to a Flood Damage Reduction Study conducted for the Village of Chrysler. The dyke mitigates flood hazards on the southern bank of the South Nation River for the town of Chrysler and consists of an earth berm that is approximately 420 m long and ranges from 3 m to 5 m in height. The Dyke contains several internal drainage control structures such as storm drains with backflow valves, concrete catch-basins, culvert pipes and a series of manholes.

### Casselman Weir

The 1958 Casselman Weir consists of an overflow section and a one-bay, stop log channel. Construction of a 375 kW hydroelectric plant in 1987 diverted water from upstream of the weir. In 1996, the weir was raised by 0.6 m to increase water storage. Current uses for the weir include recreation, low-flow augmentation, municipal water supply, and hydroelectric generation.

### Russell Weir

Originally an unreinforced dam was built in 1916 to help regulate discharge of the Castor River, 60 m east of the existing road bridge. This dam failed in 1959 under spring freshet loads. A new weir was built in 1967 with reinforced concrete downstream from the original dam site. The weir has a reinforced concrete stilling basin on the north end with measurements 21 m long, 5 m wide and 1.2 m deep. There is a manway with a steel sluice gate approximately 42 m from the northern abutment which is no longer operated by SNC.

### Plantagenet Weir

The structure was built in 1980 by South Nation Conservation to remove a natural limestone "pitch off" or ledge that extended across the South Nation River. The natural dam formed by the ledge would result in the accumulation of logs and driftwood during spring freshet leading to increases in overflow and flooding in the area. The weir spans 117.5 m across the South Nation River, is 0.6 m thick and approximately 1.2 m high. The weir also boasts galvanized wear plates bolted onto an angle-iron plate anchored into the concrete crests. The Plantagenet Weir controls a drainage area of approximately 3,810 km<sup>2</sup> with an impoundment length of 10 km.

## Seguinbourg Berm

The Seguinbourg Development Area consists of a residential area located about two kilometres north of Casselman. The site extends about 1.8 km along the northeast bank of the South Nation River, encompassing more than 50 residential properties in The Nation Municipality.

A 1982 study of the South Nation River by the Ministry of Natural Resources indicated that the Seguinbourg Development Area could be within a retrogressive landslide area. To mitigate risk to people and property, SNC undertook the construction of a rock berm below the development area.

The Seguinbourg Berm was constructed between 1987 and 1990 at a cost of \$750,000 shared between SNC and MNR grants. The Berm stabilized 1,800 m of the riverbank, protecting it from toe erosion.

## Planning and Regulations

The programs and services delivered by South Nation Conservation to address issues related to planning and permitting are related to mandatory regulatory requirements under the *Conservation Authorities Act* (CA Act) and related regulations.

SNC acts under delegated authority by the Province under O. Reg. 686/21 under the CA Act to ensure that decisions under the Planning Act are consistent with the Natural Hazard Policies in the Provincial Planning Statement (2024) and/or Provincial Plans. In this role, SNC works with member municipalities to ensure that the extent of natural hazards is appropriately identified, and that development is either directed away from hazardous lands or adequate mitigation measures are in place to ensure the safety of the development.

### Planning

SNC is a commenting agency for applications to planning authorities under the *Planning Act* and other applicable legislation to manage natural hazards.

SNC processes regulatory permits and reviews municipal planning documents and development applications under the Planning Act. Both Upper-tier (Counties) and Lower-tier (Townships) municipal planning authorities in the SNC jurisdiction rely on SNC's comments regarding natural hazards as part of the planning and development review process. SNC receives and comments on applications for Site Plan Control, Minor Variances, Zoning By-law Amendments, Official Plan Amendments, Consents to sever, and Plans of Subdivision.

Comments provided by SNC to municipalities on planning applications provide information on the following:

- Regulated features or areas under the *Conservation Authorities Act* and Ontario Regulation 41/24
- Natural Hazards (Section 5.2 of the Provincial Planning Statement)
- Source water protection
- Private sewage systems
- Stormwater management impacts to water quantity

In order to facilitate the planning approvals process, SNC is included in pre-application consultations, including pre-consultation meetings.

SNC planning staff also provide input on comprehensive Zoning By-law and Official Plan updates initiated by municipalities. SNC is able to share unique expertise and perspectives regarding watershed management, protection of water resources, and natural hazards.

SNC offers a Property Inquiry Service through which current property owners, prospective purchasers, or their respective representatives may request information on a property. This service provides important information on whether the property is in or adjacent to the following:

- regulated natural hazards under the Conservation Authorities Act (e.g., floodplains, watercourses, ravines, slopes, wetlands, etc.);
- natural heritage features in local official plans; and
- source protection areas regulated under the Clean Water Act, 2006.

SNC will provide a letter outlining all of the natural hazards and regulated features identified, applicable setbacks, and appropriate reports required.

### *Regulations*

SNC administers and enforces Part VI and Part VII of the *Conservation Authorities Act* and Ontario Regulation 41/24: Prohibited Activities, Exemptions and Permits.

SNC also develops guidance and assessment tools such as policies, implementation guidelines, modelling and mapping of natural hazards which are approved by the SNC Board of Directors to guide staff and applicants through the permitting and planning process. These tools ensure that hazard risks are avoided, existing hazards are not aggravated, and new hazards are not created. This is a mandatory program under O. Reg. 686/21.

SNC reviews applications for development activities or other activities in or near the following areas: floodplains; watercourses; unstable slopes; unstable soils and bedrock; hazardous lands; wetlands; and areas within 30 m of wetlands.

SNC Regulations staff provide information regarding regulations and development restrictions to the public. Staff process and review applications and issue permits for development activities within regulated areas or that modify an existing watercourse. Throughout the pre-consultation and permit review process, staff liaise with contractors, engineers, and landowners to ensure work is designed and carried out in a way that protects people and property from flooding and erosion.

Regulations staff are responsible for ensuring compliance with regulations and permit conditions. They undertake inspections and investigations of potential violations in regulated areas as well as inspections as part of the permit review process or for compliance with issued permits. Staff resolve minor infractions in cooperation with property owners and resolve violations through discussions, removal, restoration and/or the permit process where possible. Where cooperation with the landowner does not lead to a successful resolution of the situation, staff may initiate legal proceedings, when necessary, to ensure compliance.

### *Protecting Drinking Water Sources*

Ontario's *Clean Water Act*, 2006, was created to protect existing and future Municipal drinking water sources. The Act requires municipalities and stakeholders to work together to develop watershed-based Source Protection Plans (SPP). These Plans focus on protecting the source water that supplies municipal drinking water systems.

The Raisin-South Nation Source Protection Region encompasses a landmass of approximately 6,900 km<sup>2</sup>. The region includes the jurisdictions of the Raisin Region Conservation Authority, South Nation Conservation, and some additional area which is not formally part of either Conservation Authority. There are 26 municipal drinking water systems within the region: 13 groundwater systems and 13 surface water systems. Of this total, 10 groundwater and 8 surface water systems are within South Nation's source protection area. The South Nation Source Protection Authority (SN-SPA) supports municipalities within the jurisdiction of source protection policies and reports annually on progress towards implementing source protection plans.

The Raisin-South Nation SPP contains policies to protect Municipal drinking water systems. Most serviced municipalities draw their drinking water from the Ottawa River, St. Lawrence River, or local groundwater sources. The Municipality of Casselman is the only remaining municipality to use the South Nation River as their drinking water source; options for connecting to a regional pipeline from the Ottawa River are being explored.

The Raisin-South Nation Assessment Report identifies areas around wells and surface intakes that are vulnerable to contamination or overuse for residential drinking water systems in the Counties of Prescott-Russell; Stormont, Dundas & Glengarry; and Leeds & Grenville. The Assessment Report also summarizes water budget studies that assess water quality risk to current and future municipal drinking water sources. Additional information on the drinking water Source Protection Program is available online at <https://yourdrinkingwater.ca/>

## Watershed Resource Management

SNC delivers several water-related monitoring programs as delegated under the *Conservation Authorities Act*, mandatory programs and services. SNC partners with the province, providing resources for the collection of data while the province provides water quality sampling analysis and online portals for public access to open data from these monitoring programs.

SNC is a partner on a regional (10 conservation authorities) partnership for data management. This regional hub has acquired and maintains Water Information System from Kisters (WISKI) software. Real-time monitoring stations are setup to automatically download data to WISKI, creating an efficient and cost-effective means of data retrieval and storage.

SNC utilizes a HydroGeoSphere model (3-dimensional surface/ground water model) for simulating watershed conditions. The model is class leading 3D hydrological modelling software, allowing for the simulation of the entire terrestrial water cycle (surface and groundwater). The model simulates a 7-to-14-day watershed conditions forecast based on the real-time monitoring data and a compilation of weather forecast ensembles. The assimilation of data, through to the model data output, is completely automated, staff need only initiate the model run. This is an integral tool for the delivery of Flood Forecasting and Warning, Low Water Response, and development of natural hazards mapping and sub-watershed plans. The model pulls monitoring data directly from the WISKI system.

## Monitoring Programs

### Provincial Groundwater Monitoring Network

South Nation Conservation monitors groundwater quantity and quality resources through the Provincial Groundwater Monitoring Network (PGMN). SNC has 17 monitoring wells at 14 different locations throughout the jurisdiction (Figure 12) in partnership with Ministry of Environment, Conservation and Parks. Data is used for the following:

- Flood Forecasting and Warning Program
- Low Water Response Program
- Collection of long-term baseline conditions
- HydroGeoSphere modeling
- Watershed Report Cards
- Resolution of groundwater quantity interference issues
- Advising Health Unit and rural, private well owners on testing/treating private wells
- Assessment of permit-to-take water and pit/quarry applications
- Climate change detection and adaptation

### Provincial Water Quality Monitoring Network

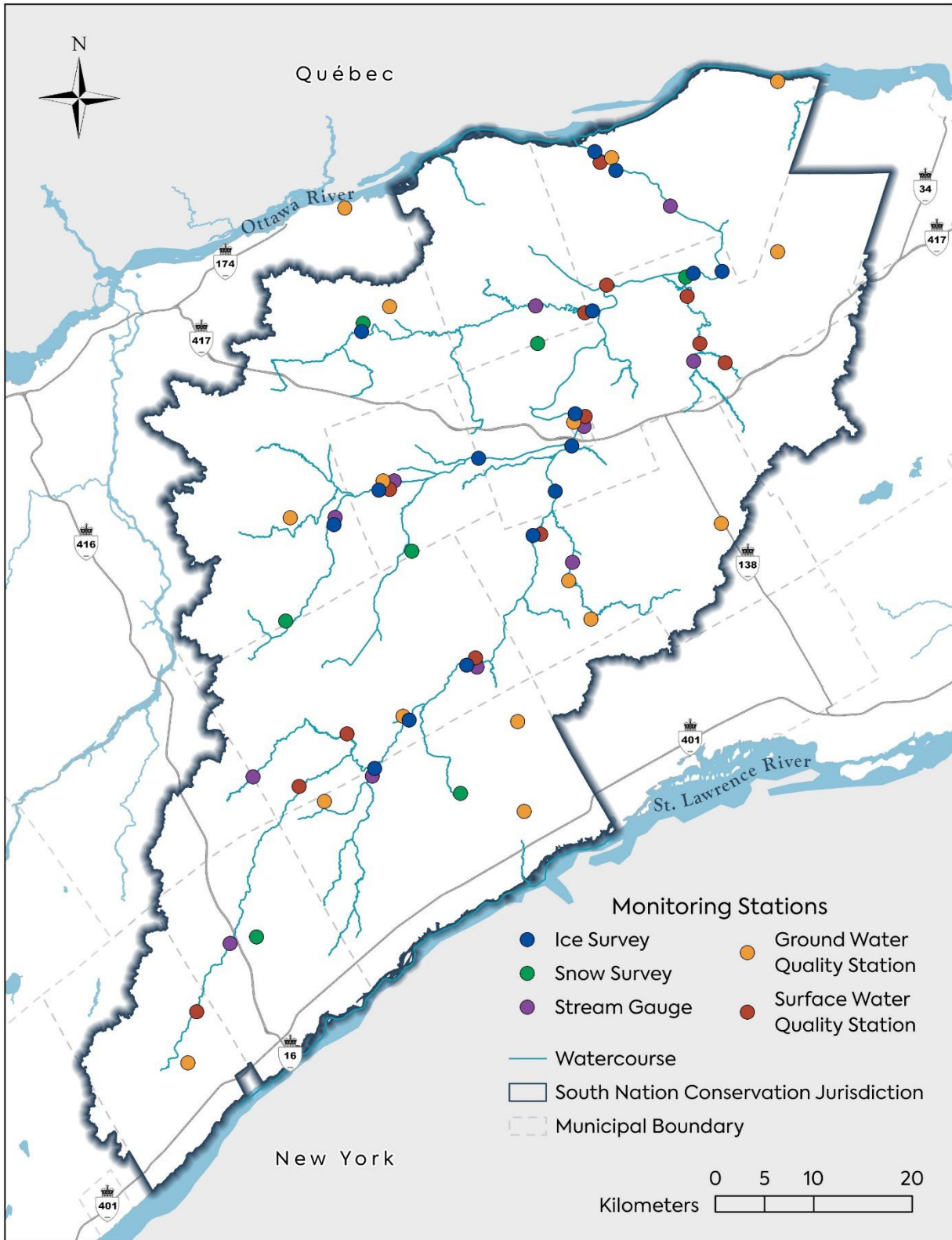
South Nation Conservation monitors surface water quality resources at 13 different river locations during ice-free months (approximately 8 sample events per year) through the Provincial Water Quality Monitoring Network (PWQMN).

Locations of sampling stations can be seen in Figure 12. This is a partnership program with the Ministry of Environment, Conservation and Parks (Environmental Monitoring and Reporting Branch – PWQMN, Eastern Regional Branch – WCN). Data is used for the following:

- Water pollution identification
- State of the Nation reporting
- Sub-watershed Report Cards
- Planning activities (i.e., permits, environmental impact statements or assessments)
- Measurement of program effectiveness
- Watershed characterization for drinking water source protection
- Climate change detection and adaptation
- Development of water quality standards
- Data storage and reporting (WISKI, Ministry of Environment, Conservation and Park's Portal)

### Water Quantity and Stream Gauge Network

Stream gauges are essential for tracking water levels, flow rates, and understanding hydrological dynamics in the area. Water level and flow data is collected from 11 stream gauges throughout the SNC jurisdiction, maintained by Water Survey Canada (Figure 12). In addition, surrounding Environment Canada climate stations are also used for monitoring weather and watershed conditions on a daily basis. Water levels and flow rates data are used by the SNC's Flood Forecasting and Warning Team to assess watershed conditions and identify potential flooding areas. This data is also used to interpret watershed trends and to complete natural hazards maps.



**Figure 12: Monitoring locations within the SNC jurisdiction.**



## Snow and Ice Monitoring Program

SNC staff monitor snow depth and snow water equivalent every two weeks from November to May at 7 stations spread out across the SNC jurisdiction (Figure 12): Spencerville, Williamsburg, Ventnor, Larose (2 stations), St. Isidore, and Bear Brook.

This information is used to calculate the snowpack levels, track the timing of snowmelt, and evaluate the potential impacts on water resources and local ecosystems. Snow sampling data is also submitted to the Ontario Surface Water Monitoring Centre, which collects the snow survey data from all Conservation Authorities in the province.

Snow data is used by the SNC's Flood Forecasting and Warning Team to assess watershed conditions and identify potential flooding areas.

The objective of ice monitoring is to assess ice thickness, extent, and quality, which are critical for understanding safety conditions and ecological impacts during the winter months. Ice surveys are completed once a year by SNC staff when it is believed that ice is thickest. Figure 12 shows the ice survey locations under SNC jurisdiction.

## Conservation Lands

The SNC Forest was established in 1961, in partnership with the Province of Ontario, under the Agreement Forest Act. Managed in partnership with the Ontario Ministry of Natural Resources for 40 years and then through SNC's own 20-year Forest Management Plan, produced in 1998 and updated most recently in 2018. The Forest Management Plan applies primarily to the productive and protected forest area.

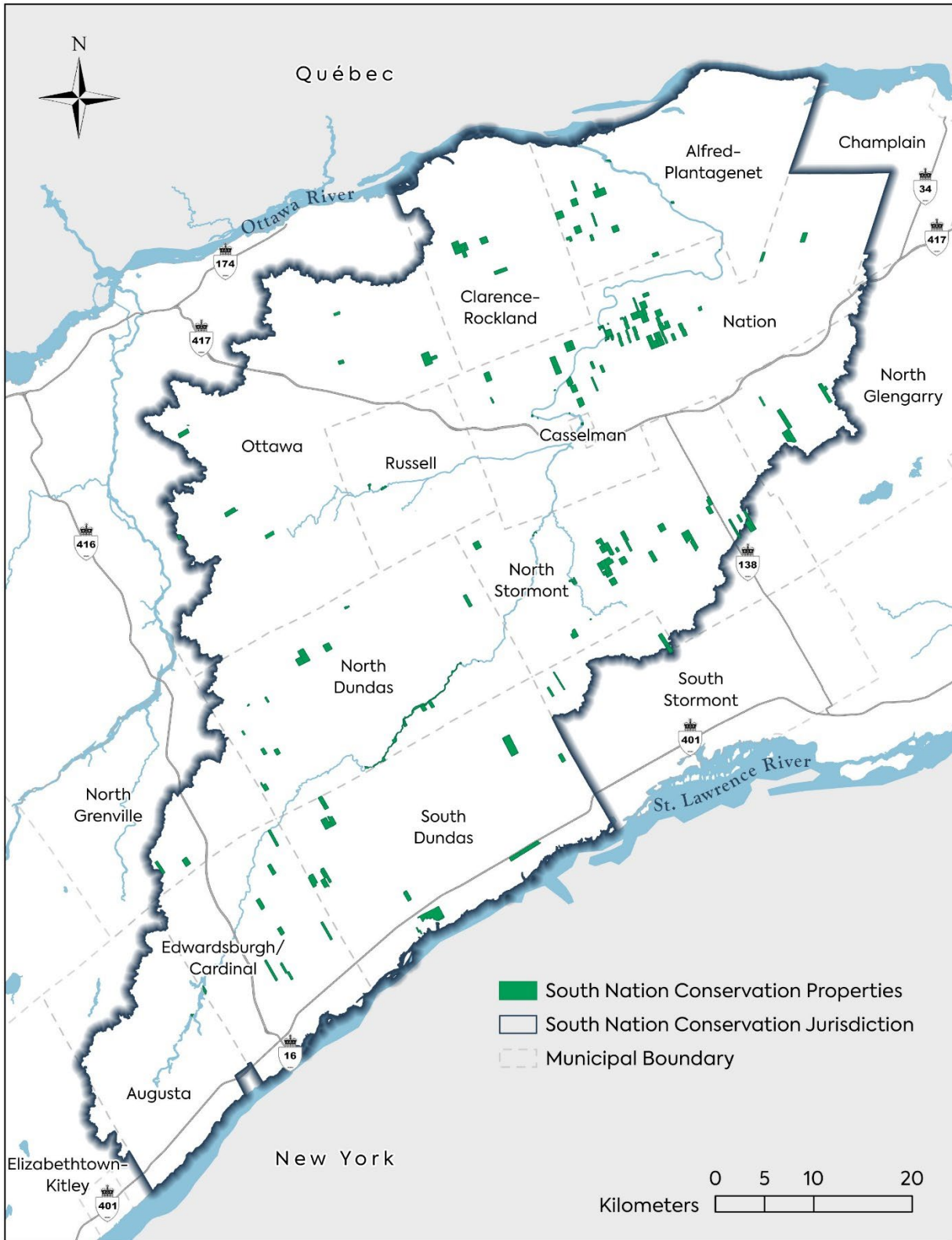
SNC owns and manages 12,879.14 ac of land (Figure 13). Organized by function, the land includes: productive and protected forest (9,694.95 ac); natural heritage (2,235.90 ac); natural hazards (757.89 ac); conservation areas (187.71 ac); and other lands (2.69 ac).

To further ensure forest sustainability good management practices, SNC obtained certification by the Forest Stewardship Council (FSC) under the Eastern Ontario Model Forest's (EOMF) group certificate (RA-COC-000232) in 2005. Yearly audits are performed to retain this certification.

In addition to the [SNC Forest Management Policy](#), the SNC Forest is administered in compliance with several legislative and voluntary protocols, including:

- The Managed Forest Tax Incentive Program
- The Conservation Lands Tax Incentive Program
- Eastern Ontario Model Forest – Forest Certification Policies and Procedures Manual
- Forest Stewardship Council. Group Certificate (Eastern Ontario Forest Group). Certificate No. NC-FM/COC-000232
- Sustainable Forestry Initiative. Group Certificate (Eastern Ontario Forest Group). Certificate No. PBN-SFI/FM-038025
- Heritage Conservation Easement Agreements
- Ducks Unlimited Canada Conservation Agreements
- Utility Easements

There are 43 individual pieces of legislation that may affect forest operations and management.



**Figure 13: SNC properties within the SNC jurisdiction.**

SNC has an active conservation land securement program which is guided by a [Land Securement Strategy \(2022-2027\)](#). Specifically, the Strategy:

- Provides a framework for recommending land for securement to the Board;
- Serves as a point of reference for external funding partners;
- Provides potential sellers and donors with an understanding of SNC's land securement process and options; and
- Ensures the wise use of public funds.

As required by Ontario Regulation 686/21 under the *Conservation Authorities Act*, SNC has drafted a SNC Conservation Lands Strategy, please refer to this document for additional information on SNC's conservation lands.

## 7.2 Category 3 – Other Watershed Programs

South Nation Conservation has entered into a 5-year agreement with its 16 member municipalities to deliver Other Watershed Programs. The agreement allows for up to 12% of the annual general levy to be used towards Category 3 programs. The following summarizes programs included within the agreement.

### Landowner Stewardship and Outreach

#### *Tree Planting*

SNC partners with Forests Canada (formerly Forests Ontario) on the 50 Million Tree Program which offers tree planting subsidies to landowners with at least 1 acre of idle land. This partnership has been in place since the inception of the 50 Million Tree Program in 2008. The 50 Million Tree Program was created, and originally funded, by the Province of Ontario and now receives funding support from the Government of Canada's 2 Billion Tree program. The Board of Directors approves an annual fee schedule for the landowner's contributions towards their planting project.

SNC offers over-the-counter tree planting for smaller orders of trees that do not qualify for funding programs, minimum order of 100, cost is the stock price plus 25% shipping and handling.

To further complement SNC and Forest Canada Programs, the City of Ottawa offers additional subsidies and services through their Green Acres Program, making it easier for property owners to reforest idle land and enhance riparian areas. SNC delivers this program on behalf of the City of Ottawa within its jurisdiction.

SNC also supports the United Counties of Prescott and Russell in their annual Larose Forest underplanting, costs associated with this planting are covered 100% by the Counties.

As part of SNC's Forest Conservation Initiative, SNC began partnering with municipalities in 2019 to deliver "Free Tree Days" each spring; approximately 500 seedlings per municipality are provided to residents to help increase urban tree cover and promote forest conservation efforts. Municipalities are encouraged to match SNC's contribution to increase number of seedlings available for residents.

#### *Clean Water Program*

The Clean Water Program has provided a proactive approach to the protection of water resources since 1993. Many residents rely on the South Nation River for drinking water, livestock watering,

crop production, and recreation. The Clean Water Program offers cost-share grants from \$1,000 to \$8,000 depending on the type of water quality improvement project.

The Clean Water Program focuses on the following aspects:

- Local surface and ground water quality improvement through improved rural, urban, and agricultural land management techniques (best management practices);
- Education and technology transfer;
- Grants to landowners and community groups to complete projects and adopt practices which reduce nutrient, sediment, and bacteria contributions to surface watercourses, and reduce the potential impact to ground water resources, and
- A project's potential to improve water quality and cost effectiveness.

The Clean Water Program has funded more than \$2.8 million in grants to over 954 projects; adding about \$13 million to the local economy in construction projects. Grant applications are reviewed by a multi-stakeholder Grants Sub-Committee. Applications are accepted year-round, though applicants are encouraged to apply early to help secure funding as the program is oversubscribed.

#### Total Phosphorus Management Program

Canada's first Total Phosphorous Management Program (a water quality credit trading program) was established in 2000 in the South Nation River Watershed to address high phosphorous levels in the South Nation River and tributaries. Through this program, regulated point source dischargers, like municipal wastewater treatment plants, have the option to either increase treatment to minimize phosphorus loadings or offset additional loads by funding less costly projects to reduce phosphorus elsewhere in the watershed. Credit trading fees are established through SNC's Fee Schedule and funding is distributed through the Clean Water Program. The Program was most active between 2000-2010; in the last decade, only a few credit trading agreements have been delivered.

#### *Habitat Restoration*

While SNC focuses restoration work on the 12,000 ac of conservation land that it manages, these efforts are not enough to affect change at a watershed scale. SNC support for restoration work on private property helps provide technical support while enabling residents to do their individual part in protecting and enhancing their local environment.

SNC only completes projects on private property when external funding support is obtained. Municipal levy supports staffing resources to secure funding and to support project management and reporting.

Recent projects include partnerships with Ducks Unlimited Canada and ALUS-Ontario East to restore wetland habitat on private property. SNC has also partnered on several grassland habitat restoration projects with property owners, with funding from the Grasslands Stewardship Initiative.

#### *Education and Outreach*

SNC's outreach work promotes environmental programs and services to help protect natural spaces, foster landowner stewardship, and engage the community on their local environment.

Activities help connect interested residents to SNC programs, which aim to provide cost-share funding, educational resources, and support; and education programs provide hands-on learning opportunities for students.

SNC provides a grant, up to \$300 maximum, to organizations for projects that protect and improve the environment in the following categories: Community Environmental Outreach, River, Agri-Environmental, and Heritage. Grant support is generally provided for tree planting, river and park clean ups, fishing derbies, river races, community garden and pollinator initiatives, youth education, and healthy hikes.

Through supporting public events and delivering educational programming, SNC promotes the protection and proper management of natural resources. Education programs are delivered on a cost-recovery basis only and provide opportunities for students to obtain certifications (e.g., Specialist High Skills Major Program) and training by completing work at various project sites and monitoring stations.

Education programs include Stream of Dreams Environmental Education and Community Art Program, the Maple Education Program, a Geocaching Program, Youth Fish Camps, and a Youth Hunt (in partnership with Delta Waterfowl).

### Conservation Land Securement

Land securement by public bodies is an effective way to preserve and enhance natural heritage for public benefit. SNC has a history of land securement going back more than 60 years.

SNC first began acquiring property in 1960, later establishing a Land Donation Program and then a Securement Strategy in 2014 to help guide land purchase decisions and to establish a Forested Land Acquisition Special Levy, supported by 16 municipalities.

The SNC Land Securement Strategy was updated in 2023 to include guidance on natural hazard land securement (e.g., flood-prone areas, floodplain, unstable slopes), references to climate change resiliency, and the importance of land securement within the region's natural heritage system, which was defined in 2021.

SNC is a member of the Ontario Land Trust Alliance and works with willing property owners, partner municipalities, the province, the federal government, and funding partners to acquire the best possible land for conservation.

A case-by-case assessment is completed, based on the framework outlined in the Board-approved Land Securement Strategy, to determine the quality and significance of considered properties.

SNC prioritizes the protection of lands by holding title (fee simple) either through donation or purchase and may consider easements and covenants where they are desirable. Participants in land transactions are willing buyers and willing sellers.

SNC's land securement success is driven by government grants which require matching funds that SNC has contributed through the municipal levy (formerly Forested Land Acquisition Special Levy). In 2022-2023, SNC was able to secure over 1.5 million dollars in federal funding by using the municipal levy contribution as the matching funds.

## 8.0 Programs and Services Assessment

As part of the development of the Watershed-based Resource Management Strategy, SNC identified and evaluated gaps, risks, and opportunities that may have an impact on effective program and service delivery. This assessment process included discussions, workshops and analysis with the SNC Board of Directors; the Watershed Advisory Committee; municipal staff, First Nations and other individuals and organizations that provided valuable insight.

This process led to recommendations and actions that:

- 1) enhance the effectiveness of SNC's existing programs and services in addressing key watershed resource issues and reducing or mitigating identified risks and vulnerabilities; and
- 2) advance the overall goal and guiding principles and objectives that underpin the Watershed-based Resource Management Strategy.

### 8.1 Risks and Opportunities

The table below summarizes the primary risks to the continued efficient and effective delivery of SNC programs and services, as well as opportunities for actions SNC can take to mitigate those risks. The risks and opportunities are grouped into the following key themes:

- Financial
- Strategic
- Compliance
- Operational
- Reputational
- Climate Change

Timelines for implementation are estimated and financial considerations required for implementation are also noted.



## RISKS AND OPPORTUNITIES

<b>FINANCIAL</b>			
<b>Risks</b>	<b>Opportunities</b>	<b>Timeline</b>	<b>Financial Considerations</b>
Increasing capital costs put timely inspection, maintenance, and repair of infrastructure at risk. Infrastructure failure would create a risk to public health and safety and may cause flooding and property damage.	Consider implementing a capital levy to cover costs of infrastructure maintenance and replacement.	2025 and annually thereafter	To be addressed in corporate asset management plan and annual budgets.
Continued provincial freeze on application fees for planning and regulations.	Ensure that, when possible, development pays for development through appropriate user fees for planning and regulations.	Annually	Review and set annual fee schedule to maximize cost recovery of user pay services.
Increasing capital and operational costs for management of conservation lands and conservation areas/trails.	Continue to seek external funding opportunities to support capital and management costs for conservation lands.	Ongoing	Infrastructure capital costs to be addressed in corporate asset management plan.  Matching contributions often required from external funding sources.
Revenue is not keeping pace with inflation and the cost of delivering quality services to meet expectations and requirements is at risk.	<p>Advocate to restore provincial funding to a level consistent with SNC contributions towards provincial programs and objectives.</p> <p>Update donor recognition / sponsorship program and promote opportunities to provide financial assistance.</p> <p>Seek opportunities for collective training and shared services with other conservation authorities and municipalities to reduce operational costs.</p>		

<b>STRATEGIC</b>			
<b>Risks</b>	<b>Opportunities</b>	<b>Timeline</b>	<b>Financial Considerations</b>
Staff turnover and lack of qualified staff create shortfalls and risk of losing institutional knowledge.	<p>Engage in succession planning and increase opportunities for cross-training between departments to enhance operational resiliency.</p> <p>Ensure just, equitable, diverse and inclusive elements are included in Hiring Procedures.</p> <p>Conduct periodic compensation reviews.</p>	<p>Annually – staff training and development plans</p> <p>Ongoing</p> <p>Approx. every 5 years or as market conditions warrant</p>	Training and professional development to be considered in annual budgets.
Natural hazards and watershed management programs rely on outside sources of funding, including grants from the federal and provincial governments, which include additional requirements and strict timelines. This adds to uncertainty and hinders long-term work planning.	Continue to use the 10-year workplan to prioritize new floodplain and erosion control mapping projects as funding becomes available.	2033	<p>Matching contributions often required from external funding sources.</p> <p>Funding applications can span multiple budget cycles.</p>
Need for continued input of traditional and local knowledge into plans and strategies.	<p>Incorporate Indigenous &amp; alternative perspectives, local traditional knowledge and wisdom, and holistic approaches into strategic planning.</p> <p>Leverage the expertise on the Watershed Advisory Committee to guide strategic program direction.</p> <p>Continue to engage municipal staff with Municipal Information Day and maintain good relationships on an ongoing basis.</p>	<p>Ongoing</p> <p>Ongoing – Committee meets quarterly</p> <p>Annually</p>	<p>Honorariums for Indigenous community members and elders for their sharing of knowledge.</p> <p>Annual budget allocation for Committee meetings (including per diem and mileage for volunteer members).</p>

Recommended stewardship activities for watershed health are subject to available annual budgets.	Use data to identify strategic priorities for stewardship activities.	2025/26	Stewardship activities need external funding support for projects completed on private lands. Matching contributions often required from external funding sources.
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**COMPLIANCE**

<b>Risks</b>	<b>Opportunities</b>	<b>Timeline</b>	<b>Financial Considerations</b>
Some of SNC’s mapping of natural hazards is outdated or incomplete. For example, older floodplain studies did not include erosion hazards.  SNC has limited or incomplete mapping for wetlands, karst features, and potential retrogressive landslide risk areas.	Continue to use the 10-year workplan to prioritize new floodplain and erosion control mapping projects as funding becomes available.  Continue collaboration with municipalities, neighbouring conservation authorities and the province to develop a strategy to map and regulate wetlands and unstable soils and bedrock areas.	2033	Consider including natural hazard and regulation maps as assets for inclusion in the corporate asset management plan.  Matching contributions often required from external funding sources.  Funding applications can span multiple budget cycles.
Changes in governing political parties often lead to changes in policies, legislation, and funding priorities.	Continue to engage with all levels of government on opportunities for input on legislation and policies; and advocate for funding to support mandatory and other watershed programs and services.	Ongoing	Matching contributions often required from external funding sources.  Funding applications can span multiple budget cycles.

**OPERATIONAL**

<b>Risks</b>	<b>Opportunities</b>	<b>Timeline</b>	<b>Financial Considerations</b>
Sediment accumulation and erosion along shorelines due to cumulative impacts of loss of riparian vegetation and increased urbanization and/or agricultural production.	Consider revisions to the stewardship programs (e.g., clean water program) to prioritize sediment/erosion projects.  Explore other opportunities for restoration of shorelines and riparian areas.	2028  Ongoing	Landowner stewardship and outreach programs are category 3; under SNC/ municipal cost-apportionment agreement they have an annual levy cap of 3.88%

			Matching contributions often required from external funding sources.
Monitoring data collection relies on external agencies, telecommunications networks, etc.	Acquire, develop, and use new software and hardware tools to improve data collection and analysis.	Ongoing	Upgrading and/or replacement of hardware and software could be considered as part of the corporate asset management plan.
Monitoring data collection is limited to mandated monitoring programs and/or sub-watershed/catchment studies with external funding.	Investigate opportunities for category 3 agreements with municipalities relating to improvements to watershed monitoring.	2028	Include in 5-year review of SNC/municipal cost-apportioning agreements for category 3.
Outdated and/or lack of data required to deliver programs and services (e.g., drape, lidar, land cover, etc.)	Continue to work with partners to acquire current data sets and fill data gaps.	Every three to five years as needed	Could be considered as part of the corporate asset management plan to financially plan for data acquisition and updates.
Need to continue standardization of application forms and submissions to improve consistency and reduce challenges in technical reviews.	Continue to develop technical guidelines and detailed submission requirements for permit applications.	Ongoing	
Invasive species, such as the emerald ash borer, common buckthorn, and phragmites, negatively impact SNC lands.	Develop an invasive species management plan for SNC conservation lands. Seek opportunities for external funding to offset invasive species management expenses.	2026	Matching contributions often required from external funding sources.
<b>REPUTATIONAL</b>			
<b>Risks</b>	<b>Opportunities</b>	<b>Timeline</b>	<b>Financial Considerations</b>
Public understanding of the interconnectedness of development, forest/wetland loss, flooding, and erosion is limited.	Design and implement public education programs to address: water safety, flooding, drought, landslides, shoreline restoration, forest cover loss, and cumulative impacts of development on watershed conditions.		

	Raise awareness of value of natural assets; calculate monetary value of ecosystem services. Improve the public geoportal and consider making more SNC data available to the public.		
Limited availability of resources for public education and outreach programming.	Increase collaboration with partner organizations, including public libraries, school boards, and local citizen groups, for public education and to further engage the public.	Ongoing	

<b>CLIMATE CHANGE</b>			
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<b>Risks</b>	<b>Opportunities</b>	<b>Timeline</b>	<b>Financial Considerations</b>
Climate change affects flooding, erosion, and landslides due to higher temperatures, more rain, increased severe weather events (ice storms, fires, strong winds), changes to ice cover, and water temperature.  Impact to forests from migration of new invasive species and extreme weather events as the climate changes.	Use new technologies to enhance modelling and include more data in modelling.  Analyse large flood/drought events.  Develop a climate change strategy for SNC.	Ongoing  2026/27  2028	External funding opportunities may be available now or in the future - matching contributions often required from external funding sources.

## 9.0 Periodic Review

Ontario Regulation 686/21 mandates a process for the periodic review and updating of the Watershed-based Resource Management Strategy.

This document will be reviewed every five years to allow for consideration of evolving political and socio-economic matters and address emerging environmental issues. It will also give an opportunity for every Board of Directors (4-year appointment term) to review, update and approve the Watershed-based Resource Management Strategy. Ongoing/annual review of the strategy by staff will facilitate the five-year review.

Stakeholders and the public should be consulted during these periodic reviews, in a manner that aligns with the degree of revisions and that meets any regulatory requirements.



## Appendix A - Existing Technical Studies, Monitoring Programs, and Other Information Directly Supporting Program Delivery

Program/Service	Agreements, Legislation, Policies, and Guidelines	Data	Tools	Geospatial Data
<b><i>Natural Hazards</i></b>				
Flood Forecasting and Warning	Provincial Flood Forecasting and Warning Guidelines for Conservation Authorities and the MNR (2023); 3 <sup>rd</sup> Party Operator Assist Agreement for the SNC Hydrometric Network (signed between MNR and SNC); Annual Emergency Contact List; Annual Flood Forecasting and Warning Contingency Plan	Water Survey Canada level/flow gauges (11), SNC water level/flow gauges (3), Climate Stations (9), additional precipitation gauges (7)	Water Information System by Kisters (WISKI), South Nation River HydroGeoSphere flow forecasting model, Flood extents derived from updated Flood Mapping products	Water Monitoring Network
Erosion and Water Control Structures	Operation, Maintenance and Surveillance Manual, Emergency Preparedness Plan, Annual inspections, Geotechnical reports and engineering reports	Elevation data, water control structure drawings and figures		Water Control Structures
Ice Management	Chesterville Dam Operation, Maintenance and Surveillance Manual: Ice Management (Stantec, 2023)	Ice monitoring stations		
Flood Hazard Management	SNC Flood Risk Assessment, SNC 10-year Flood Mapping Strategy, City of Ottawa/SNC Agreement (Agreement 3: 2023:2028); MNR: Technical Guide - River and Stream Systems: Flooding Hazard Limit (2002)	LiDAR, bathymetric data, surveyed structures (culverts, bridges), soil data/CN Values, regulated 100-year flood extent, additional products (2yr, 5yr, 10yr, 20yr, 25yr, 50yr, 350yr) and vulnerable driveways, roads, and bridges	SWMHYMO, OTTHYMO, HEC-HMS, HEC-RAS, GIS	Floodplain maps, Regulated Areas
Erosion Hazard Management	MNR Guidelines: Understanding Natural Hazards: Great Lakes – St. Lawrence river system and large inland lakes, river and stream systems and hazardous site; Technical			

<b>Program/Service</b>	<b>Agreements, Legislation, Policies, and Guidelines</b>	<b>Data</b>	<b>Tools</b>	<b>Geospatial Data</b>
	<p>Guide – River and Stream Systems: Erosion Hazard Limit, Hazardous Sites Technical Guide, Guidelines for Developing Schedules of Regulated Areas.</p> <p>SNC Guides: Specific Site Riverine Erosion Hazard Guidance (Unconfined/Confined Non-Apparent) Meander Belt (2020); Specific Site Riverine Erosion Hazard Guidance (Confined-Apparent) (2020).</p>			
<b><i>Watershed Resource Management</i></b>				
Provincial Water Quality Monitoring Program	Provincial Water Quality Objectives; Canadian Water Quality Guidelines; Watershed Report Cards; Subwatershed Report Cards	13 stations jurisdiction wide; long-term monthly record for a suite of water chemistry parameters	Water Information System by Kisters (WISKI)	PWQMN Network
City of Ottawa Baseline Monitoring Network	Provincial Water Quality Objectives; Canadian Water Quality Guidelines; Watershed Report Cards; Subwatershed Report Cards; City of Ottawa Baseline Reporting	12 stations rural City of Ottawa; long-term monthly record for a suite of water chemistry parameters	Water Information System by Kisters (WISKI)	City of Ottawa Baseline Monitoring Network
Provincial Groundwater Monitoring Program	Provincial Water Quality Objectives; Canadian Water Quality Guidelines; Watershed Report Cards; Subwatershed Report Cards	17 wells jurisdiction wide; long-term hourly water levels; annual water quality parameters	Water Information System by Kisters (WISKI)	PGMN Network
Low Water Response	Ontario Low Water Response Guideline (2003, MNRF); Annual Ontario Low Water Response: SNC's Water Response Team document; Annual Water Response Team Contact List	Water Survey Canada level/flow gauges (11), SNC water level/flow gauges (3), Climate Stations (9), Additional precipitation gauges (7), PGMN monitoring wells	Water Information System by Kisters (WISKI), South Nation River HydroGeoSphere flow forecasting model	Water Monitoring Network, PGMN Network
Snow Monitoring Program	MNRF Methodology for Snow Surveys	Snow data	Water Information System by Listers (WISKI), MNRF's Snow Portal	Snow course

Program/Service	Agreements, Legislation, Policies, and Guidelines	Data	Tools	Geospatial Data
<b>Development Review</b>				
Planning	<i>Conservation Authorities Act; O/Reg 41/24; SNC Regulations Policies; Planning Act; Provincial Policy Statement; Municipal Official Plans and Zoning By-laws; Environmental Assessments Act;</i>		OnBase (File Management)	Orthophotos, LiDAR, property information, land cover, watercourses, regulated areas, Provincially Significant Wetlands, floodplain maps
Regulations	<i>Conservation Authorities Act; O/Reg 41/24; SNC Regulations Policies;</i>		OnBase (File Management)	orthophotos, LiDAR, property information, land cover, watercourses, regulated areas, Provincially Significant Wetlands, floodplain maps
<b>Source Protection Planning</b>				
Source Protection Authority and Source Protection Plans	<i>Clean Water Act; 2021 technical rules under the Clean Water Act; Raisin-South Nation Source Protection Plan &amp; Assessment Reports; Watershed Characterization Report</i>		2021 Source Water Protection Threats Tool Portal (MECP)	Wellhead Protection Areas; Intake Protection Zones
<b>Conservation Lands</b>				
Management - Operating and Capital Maintenance	Ontario Building Code; Engineering Technical Reports	Weekly Property Inspections; Monthly Park Usage		SNC Properties

Program/Service	Agreements, Legislation, Policies, and Guidelines	Data	Tools	Geospatial Data
Forestry Management - Operations	SNC 20-Year Forest Management Plan and 5-Year Operating Plans; SNC Forestry Policy, Provincial Silvicultural Guidelines for Great-Lakes St. Lawrence Forest Region; Provincial Silvicultural Guidelines for Southern Ontario; Ontario Habitat Guidelines for Wildlife, Insect & Disease, Wetlands and Forests; FSC/SFI Group Certificate Standard Operating Procedures	Operational Inventories, Survival and Regeneration Assessments		
Property Agreements	Heritage Conservation Easement Agreements; Ontario Wetland Care Agreements; Encumbrances Registered on Title; <i>Income Tax Act</i>			
Conservation Lands: Natural Heritage Management		Baseline Documentation Report or Ecological Sensitivity Report prepared for each property. Technical Reports prepared through research partnerships. Natural Heritage Information Centre database.		SNC Properties
<b>Landowner Stewardship</b>				
Clean Water Program	SNC/Municipal Cost-Appportioning Agreement (2024-2028)	Clean Water Program Guidelines, Project Rating Criteria, Watershed Report Cards		Subwatershed rating
Tree Planting	SNC/Municipal Cost-Appportioning Agreement (2024-2028); Forests Ontario agreement for 50 Million Tree Program; 2 Billion Tree Program agreement with Environment and Climate Change Canada			
Habitat Restoration	External funding agreements	Baseline Documentation Report or Ecological Sensitivity Reports;		

Program/Service	Agreements, Legislation, Policies, and Guidelines	Data	Tools	Geospatial Data
		Watershed Report Cards; Subwatershed/Catchment Reports		
<b>Communications and Outreach</b>				
Education, Events, and Partnership Development	SNC Brand Guidelines; Public Consultation Plan	Water level monitoring and snow surveys; park visitation		
Corporate Communications, Media and Communications Products	SNC Brand Guidelines; Public Consultation Plan	Water level monitoring and snow surveys; park visitation		
<b>General Operations</b>				
Board and Standing Committees	<i>Conservation Authorities Act</i> and Regulations; SNC Administrative By-laws; HR standards; SNC Purchasing Policy; Purchasing/Contract Agreements		Active Planner Budgeting and Forecasting Tool; Microsoft Dynamics; Excel spreadsheets	
Financial Management	Personnel Policies; Employment Standards Act; Canadian Public Sector Accounting Standards; SNC Purchasing Policy		Active Planner Budgeting and Forecasting Tool; Microsoft Dynamics; Excel spreadsheets; SAGE 300; PayWorks	
Information Technology	Contract agreements			
Buildings/Vehicles	SNC Purchasing Policy; Purchasing/Contract Agreements; <i>Occupational Health and Safety Act</i> ; Insurance Policies			