Bear Brook Watershed Study: Characterization Report Executive Summary

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Prepared for:

Ottawa

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Introduction

Healthy watersheds are essential for thriving ecosystems, communities, and economies. They support biodiversity, reduce natural hazard risks, and provide ecosystem services that benefit both people and the environment. They protect us from floods, droughts, and erosion; provide clean water and air; support recreation, education, and well-being; and help us adapt to a changing climate.

The Bear Brook Watershed has been shaped by both natural processes and human activity. Early European settlement brought extensive land clearing and unsustainable farming practices that degraded soils and water quality, leading to the formation of the Bourget Desert in the early 20th century. In response, major land restoration efforts — including the creation of the Larose Forest, one of the largest plantations in North America — helped stabilize soils and restore ecosystems.

Today, the watershed faces new challenges: rapid urban expansion, agricultural intensification, and climate variability. Recognizing these pressures, the City of Ottawa retained South Nation Conservation (SNC) to complete a comprehensive watershed study to guide sustainable management and protection of this important area.

The Bear Brook Watershed Study is being completed in three phases:

- **Phase 1: Characterization Report** – assessing current conditions (this report).
- **Phase 2: Scenario Planning and Risk Assessment** – evaluating how land use and climate change may affect watershed features.
- **Phase 3: Watershed** Plan – developing recommendations, policies, and management tools to protect the watershed.

The Bear Brook Watershed spans 488 km² across the City of Ottawa and the United Counties of Prescott and Russell. It includes diverse landscapes of urban areas, farmland, wetlands, and forests, flowing west to east into the South Nation River. The watershed lies within the traditional territory of Indigenous Peoples with deep and ongoing connections to the land.

This Executive Summary highlights key findings from the Characterization Report, providing a snapshot of the watershed's environment, natural hazards, water resources, and natural heritage.

Summary of Existing Conditions and Key Findings

Section 1 – Watershed Planning and Policy Framework

Over 78,000 people live in the Bear Brook Watershed today, mostly within settlement areas.

Indigenous Peoples have lived in and used the watershed for over 9,000 years; at least 69 archaeological assessments have been completed, and most of the watershed is considered to have archaeological potential.

The watershed is located on the traditional, unceded territory of the Algonquin Anishinaabe People, and is also part of the traditional hunting and fishing territory of the Haudenosaunee Confederacy, including the Mohawk Nation.

Governance is shared by multiple jurisdictions:

- Upper-tier: City of Ottawa and United Counties of Prescott and Russell
- Lower-tier: Russell Township, City of Clarence-Rockland, and Nation Municipality
- Supporting roles and responsibilities for Conservation Authorities (regulating natural hazards, wetlands and protecting water resources) and the National Capital Commission (managing federal lands)

Watershed planning in Ontario is guided by multiple policy frameworks, which recognize the watershed as the natural scale for managing land and water interactions.

Section 2 – Physical Setting: Geology, Soils, and Landscape

- The watershed's landscape was shaped by glacial retreat, ancient river channels, and sediments left by the former Champlain Sea.
- It contains large areas of clay soils (including Leda clay) that are poorly drained and prone to instability, and sandy soils that are highly erodible with low nutrients.
- The Vars-Winchester Esker, a long, winding ridge of sand and gravel deposited by glacial meltwater, is a major landform affecting groundwater recharge and streamflow.
- The watershed is divided into six major subwatersheds, each with unique physical and ecological characteristics, organized around the main tributaries of Bear Brook.
- Existing land cover in the Bear Brook Watershed is dominated by agricultural lands (35.9%), woodlands (25.3%), wetlands (22.1%), and settlement areas (8.4%).
- Historical unsustainable land use led to severe soil degradation and flooding, culminating in the Bourget Desert; efforts to reverse this included reforestation and restoring wetlands.
- Climate projections for the region indicate a warmer, wetter future, with shorter winters, more intense rainfall, and increased risks of flooding, erosion, and extreme weather events.

Section 3 – Water Resources

- The watershed contains over 1,700 km of mapped watercourses, with 14% designated as municipal drains supporting agricultural drainage and urban development.
- Approximately 17% of the watershed area is tile-drained farmland, affecting natural hydrology and flow patterns.
- Streamflows are highly variable and “flashy,” rising quickly during rainfall and snowmelt events, with spring freshet (seasonal snowmelt runoff) producing annual peak flows.
- Groundwater provides important baseflows during dry periods and is critical for drinking water; municipal wells in Vars and Limoges are protected under the Clean Water Act.
- Municipalities and landowners increasingly use the Drainage Act to facilitate legal drainage outlets in both agricultural and urbanizing areas.
- Recent years have shown above-normal rainfall and several summer flood events, reflecting climate variability impacts on water levels.
- A hydrologic model developed for the study provides a scientific basis for assessing future land use and climate impacts on water quantity and quality.
- The report underscores the need for integrated watershed management to balance water demands with ecosystem sustainability, especially in the context of climate change and development pressures.

Section 4 – Natural Hazards

- Flood hazard mapping identifies a major floodplain between Carlsbad Lane and Dunning Road, with regular overbank flooding during spring freshet and high-intensity storms.
- Vulnerability assessments estimate 121 buildings, including homes, businesses, and outbuildings, are exposed to flooding during a 350-year flood event; many driveways and roads are also vulnerable to flooding during more frequent events, including 2-year and 10-year storms.
- The combination of sandy soils (which allow rapid infiltration) and clay-rich soils (which create high surface runoff) increases vulnerability to both flooding and erosion across the watershed.

Section 5 – Fluvial Geomorphology

- The Bear Brook River’s morphology reflects both natural processes and human modifications, including historical channel straightening, drainage alterations, and ongoing erosion and sedimentation patterns.
- The Vars-Winchester Esker, a long, winding ridge of sand and gravel deposited by glacial meltwater, is a major landform affecting groundwater recharge and streamflow.

- Upstream of the esker, the river flows through wide, shallow floodplains; downstream, it has incised into Champlain Sea sediments, creating deeper channels and valley walls.
- Historical landslides are concentrated along paleochannel escarpments, with evidence of retrogressive slope failures in clay-rich areas.
- Natural meander migration and cut-offs occur slowly under current conditions, but may be accelerated by human activity or extreme rainfall events.

Section 6 – Water Quality and Stream Health

- The watershed's water quality has been shaped by its geological history, particularly the clay plains and former Champlain Sea sediments, which naturally elevate phosphorus levels.
- Naturally elevated phosphorus levels from clay soils are further increased by sediment and nutrient runoff from agriculture.
- Urbanization in the watershed's headwaters has led to elevated levels of chlorides, nutrients, bacteria (E. coli), and metals in some streams, particularly where riparian buffers are lacking.
- Benthic invertebrate sampling (using both DNA-based and traditional methods) detected 27 mayfly species, 13 stonefly species, 24 caddisfly species, and 2 mussel species, with stream health ratings ranging from excellent to poor depending on location and land use impacts.

Section 7 – Natural Heritage Systems

- The watershed contains critical natural features, including:
    - Mer Bleue Bog – a Provincially Significant Wetland that supports biodiversity and provides flood storage.
    - South Bear Brook Wetland – a newly designated Provincially Significant Wetland protecting headwater functions.
    - Larose Forest – one of North America's largest planted forests, offering wildlife habitat, erosion control, and recreational opportunities
    - Cumberland Forest – City-owned properties that form a vital habitat corridor linking Mer Bleue to Larose Forest
- Natural habitats are increasingly fragmented and reduced both inside and outside mapped natural heritage systems, threatening biodiversity and ecosystem services.
- Together, these natural heritage features provide critical ecosystem services such as habitat, flood mitigation, water filtration, and climate resilience.

Moving Forward

The Bear Brook Watershed faces complex challenges from urban growth, agricultural intensification, and climate change. These pressures are altering natural systems, increasing risks to water quality, biodiversity, and public safety.

The next phase of this study will assess how different development and land use scenarios may affect watershed health, water resources, natural heritage, and natural hazards — and will recommend strategies and policies to balance sustainable growth with environmental protection.

The success of the watershed plan depends on collaboration. By engaging residents, Indigenous communities, stakeholders, and municipal partners, we can ensure the Bear Brook Watershed remains healthy, resilient, and valued for generations to come.

Learn more and get involved by visiting www.nation.on.ca.

About South Nation Conservation

South Nation Conservation (SNC) is a non-profit environmental agency with a longstanding history of leadership in watershed management, environmental stewardship, and natural hazard protection across 4,480 km² of Eastern Ontario. Established in 1947 under Ontario's *Conservation Authorities Act,* SNC works collaboratively with 16 municipal partners across the City of Ottawa, United Counties of Prescott and Russell, United Counties of Stormont, Dundas and Glengarry, and United Counties of Leeds and Grenville.

SNC's vision is to improve water quality for a healthy ecosystem, ensuring safe and sustainable water resources for people and nature alike. Its mission includes protecting people and property from natural hazards, conserving forests and wetlands, restoring natural areas, and engaging communities in environmental stewardship.

As one of Ontario's 36 Conservation Authorities, SNC plays a vital role in supporting sustainable development by balancing human needs with ecosystem health. The organization provides technical expertise to municipalities, partners with community groups, and delivers programs to protect biodiversity, mitigate climate change impacts, and enhance natural heritage systems.

SNC acknowledges that the Bear Brook Watershed is located within the unceded traditional territory of the Algonquin Anishinaabe People, and is also part of the traditional hunting and fishing territory of the Haudenosaunee Confederacy, including the Mohawk Nation.

In the spirit of shared stewardship and reconciliation, SNC is committed to working alongside Indigenous partners and local communities to safeguard the land and water for current and future generations.