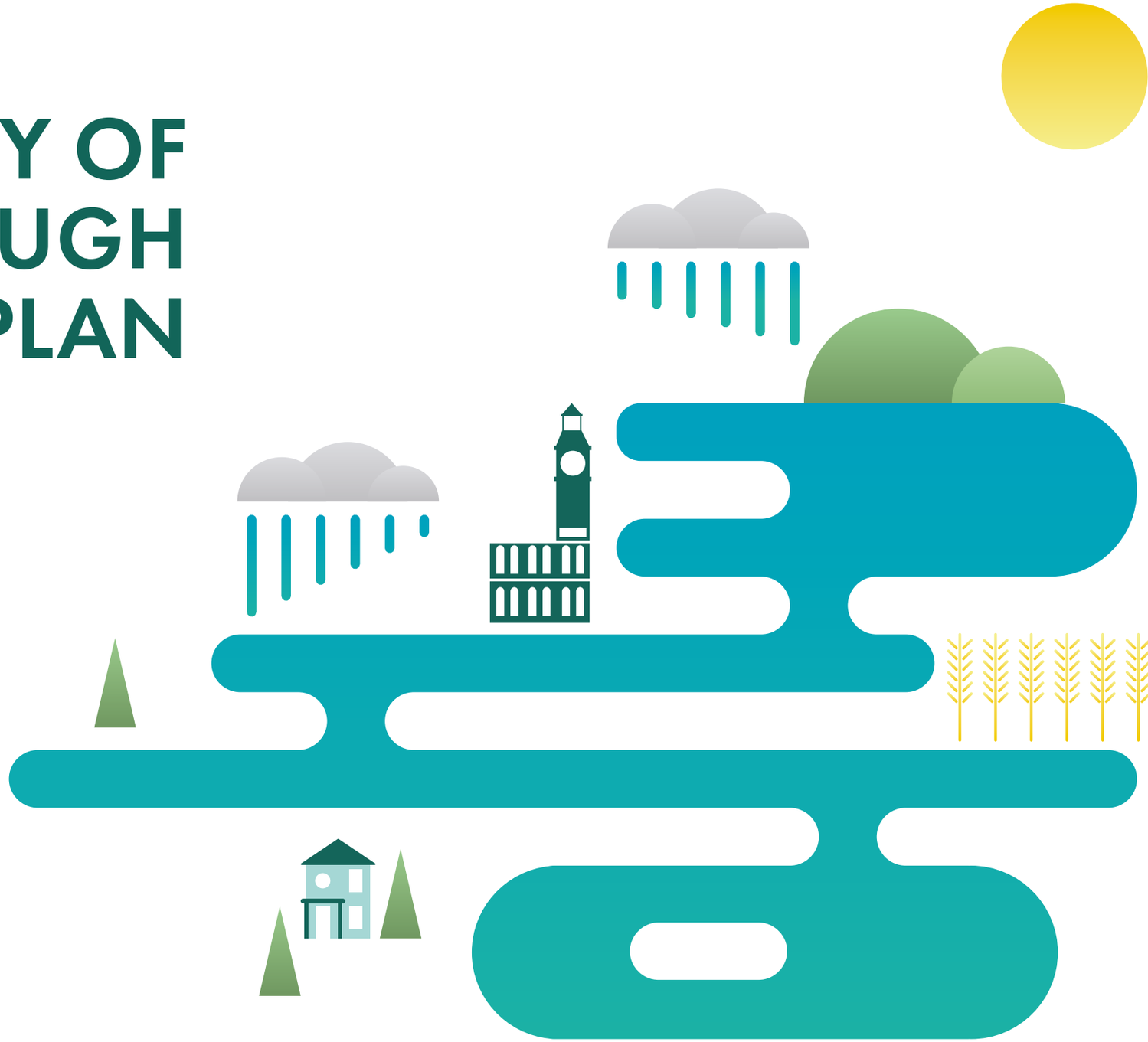
CITY OF PETERBOROUGH WATERSHED PLAN



OUR WATERSHED
OUR BLUEPRINT

Healthy stream

ACKNOWLEDGEMENTS

The City of Peterborough Watershed Plan reflects the culminating efforts of City staff, The Watershed Coordinating Committee, and the Technical Working Group with support from Aquafor Beech and LURA Consulting.

The City would like to take this opportunity to acknowledge the **Watershed Coordinating Committee.**

- Otonabee Conservation
- Curve Lake First Nation
- Hiawatha First Nation
- County of Peterborough
- Cavan-Monaghan Township
- Selwyn Township
- Otonabee-South Monaghan Township
- Douro-Dummer Township
- City of Kawartha Lakes
- Kim Zippel (Former City Councillor)
- City of Peterborough Staff

In addition to the Watershed Coordinating Committee, the Plan integrates insights shared by the Sacred Water Circle.

The City would also like to thank everyone who contributed to the development of the Watershed Plan. Your efforts help ensure the Peterborough Watershed is healthy, resilient and able to protect, sustain and enhance our evolving communities.

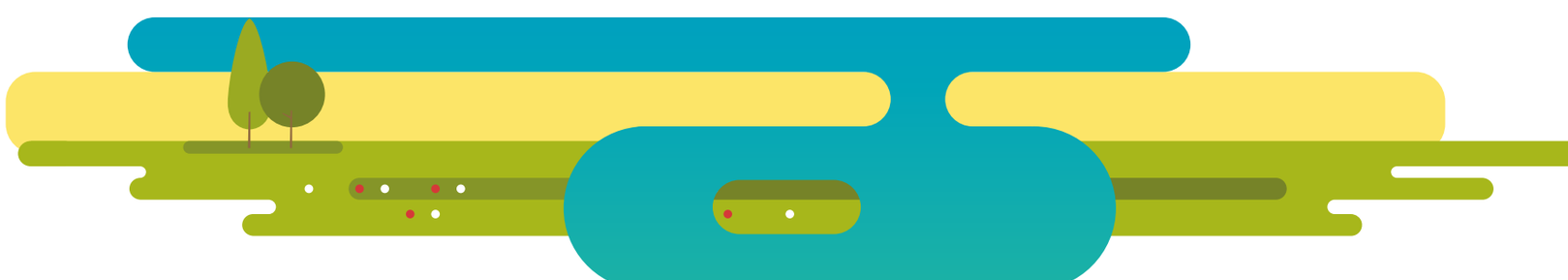
Prepared by Aquafor Beech

55 Regal Road, Unit 3
Guelph, ON
N1K 1B6

Adapted by LURA Consulting

192 Spadina Avenue, Unit 424
Toronto, ON
M5C 2T2

TABLE OF CONTENTS



ACRONYM LIST

AEM – Adaptive Environmental Management

AMA – Adaptive Management Approach

ANSI – Area of Natural and Scientific Interest

CEA – Cumulative effects assessment

NHS – Natural Heritage System

OGS – Oil and Grit Separator

OP – Official Plan

ORM – Oak Ridges Moraine

PPS – Provincial Policy Statement

SAR – Species at Risk

SWH – Significant Wildlife Habitat

SWM – Stormwater Management

GLOSSARY

Area of Natural and Scientific Interest (ANSIs) – The Province of Ontario designates these areas as having natural features or landscapes which are provincially, regionally, or locally significant. These features are designated under criteria and are protected to maintain their natural heritage for appreciation, scientific study or education.

Cumulative effects assessment (CEA) - is completed to ensure the incremental effects of various watershed stressors are assessed in terms of their collective impact on environmental features. When experienced alone, each watershed stressor may be considered insignificant, but when experienced with a variety of other actions, they may be significant.

Land use – How land is used or managed by humans to fulfill needs such as housing, food production, places of work, places of leisure, places of environmental interest, and others. Land uses are outlined in municipal Official Plans and implemented through zoning by-laws.

Land cover – The surface cover of the land. Natural forms of land cover include forests, wetlands, meadows and open water. Land cover introduced on the environment by humans includes cropland, pasture, and urban environments dominated by manicured grasses and impervious surfaces such as concrete and asphalt.

Provincially Significant Wetlands (PSW) – These are wetlands identified with high biological, social, hydrological or special feature components. They are designated as significant by the Ontario Ministry of Natural Resources and Forestry.

Riparian – The area of land surrounding a water feature, extending from upland to the to the edge of the watercourse. The riparian area provides natural services to the watercourse and ecosystem, including shading, bank stability, flood control and passage for wildlife.

Subwatershed – An area within a watershed draining to a common point. Jackson Creek and Cavan Creek are two examples of creek systems that form subwatersheds. These creeks feed into the Otonabee River and form part of the larger Otonabee River watershed.

Species at Risk (SARs) – Species with recognized Federal and/or Provincial status due to loss of habitat.

Tributary – A watercourse such as a stream or creek that feeds into a larger watercourse such as a river.

Watershed – An area comprised of land and water draining to a common point, typically a river outlet. The Otonabee River watershed is defined by the various creeks and streams that feed into the Otonabee River.

Water balance – An accounting of where water goes after rain or snow reaches the ground. From a simplified perspective some water will evaporate, some will be taken up by plants, some will move into the ground, and some will flow off the landscape into streams. The balance will change throughout the year.

LAND ACKNOWLEDGEMENT

We respectfully acknowledge that we are on the treaty and traditional territory of the Mississauga Anishinaabeg. We offer our gratitude to the First Peoples for their care for, and teachings about, our earth and our relations. May we honour those teachings.

1 EXECUTIVE SUMMARY

Healthy watersheds are an integral part of our environment. They provide life-sustaining benefits that support, people, the economy and the environment.

- **Human benefits:** Watersheds supply our drinking water and food and help reduce flooding and erosion.
- **Economic benefits:** Watersheds supply water for our homes, agriculture, and industry. In some cases, watersheds also provide us with energy through hydroelectric dams.
- **Environmental benefits:** Watersheds play an important role in a healthy water cycle and provide habitat for fish, wildlife and plants.

When our watershed and environment are healthy, they help life to flourish.

Our Watershed, Our Blueprint: Peterboroguhs' Watershed Plan (referred to as "The Watershed Plan") aims to understand the health of the subwatersheds within a part of the Otonobee Region watershed and identify how best to protect, enhance and restore its health for the future. The watershed plan looks at terrestrial and aquatic systems, land use, infrastructure planning and development. Ontario's land use planning policies, stretching from Provincial policy to local regulation and implementation, recognize the importance of watershed planning when determining how and where growth occurs and its impacts on the environment more broadly.

Developing the Watershed Plan was a multi-year process involving technical analysis and inputs from First Nations, neighbouring municipalities, stakeholders, and the public across the Otonabee Region.

The Watershed Planning Study generally follows the process outlined in the *Watershed Planning in Ontario (Draft 2018)* guidance document. This process involves three (3) phases. Phase 1 determines watershed features, identifies water resources systems, and characterizes existing conditions. Phase 2 conducts a technical evaluation of watershed planning elements. This includes a cumulative effects assessment which considers climate change and population growth impacts, and an assessment of land use and management scenarios. Phase 3 develops a plan of action outlining watershed-level strategies for improving watershed health through an implementation plan. This document was prepared as a summarized, plain language overview of Watershed Plan.

Readers who are interested in greater technical detail may read the entire plan on the City of Peterborough's website. Where applicable this document references sections of the Watershed Plan where more detail is provided.

OUR WATERSHED
OUR BLUEPRINT

1.1 Our Watershed, Our Blueprint

The Watershed Plan includes 18 subwatersheds that are completely within or drain through the City of Peterborough within the larger Otonabee River watershed. Many of the subwatersheds extend beyond the limits of the City of Peterborough. The region's geological history helps inform how and where water moves across the landscape. More recent interventions by human activity, including the growth of the City of Peterborough and communities in Peterborough County and the development of farmland, have and continue to play a role in the movement of water.

Key stressors facing these subwatersheds include:

- Fragmentation and loss of habitat of the Natural Heritage System (NHS) due to urban development and agricultural land conversion.
- Decline in water quality due to urban runoff, agricultural runoff, and changing sediment loads.
- Changing water balance due to climate change and development resulting in situations where there is too much or too little water at various times throughout the seasons.

1.2 Current and Future Watershed Conditions

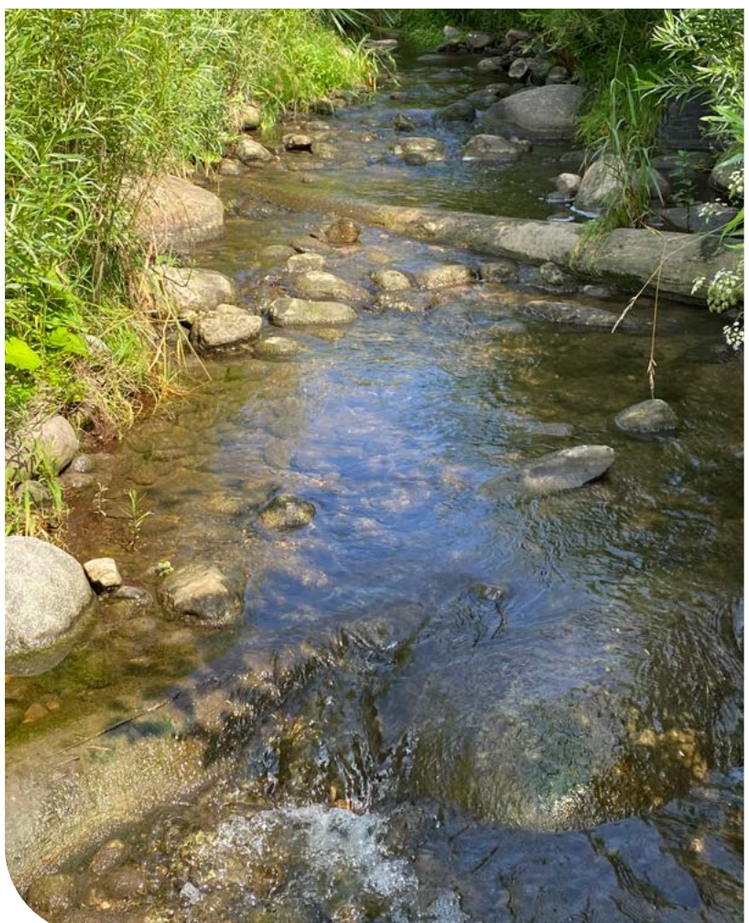
The Watershed Plan recognizes that development and climate change present risks and impacts to the Otonabee Region watershed, but these are not uniform across the study area. All subwatersheds were assessed across metrics related to terrestrial ecology, aquatic ecology, water quality, and stormwater management to create a prioritized list of subwatersheds. Generally, the current conditions of urban watersheds are a higher priority for actions that mitigate and remediate their condition.

The Watershed Plan uses an approach known as a Cumulative effects assessment (CEA) to understand how current and planned land development and future climate change impact on the watershed. The CEA indicates that development and climate change will impact aquatic and terrestrial ecosystems by warming water temperatures, changing the flow and quantity of water, changing water chemistry and quality, and reducing habitat and habitat connectivity. Modelling shows that land use change is significantly more impactful to subwatersheds than climate change; however, climate change worsens the impacts caused by land use changes.

Otonabee is derived from the river's Anishinaabe name Odenibi – "ode" meaning "heart" and "nibi" meaning "river". The name Otonabee references to the river that beats like a heart in reference to the boiling and bubbling water of the rapids. Previous literal interpretations called it the Odoonibi, meaning "of the mouth (of the human).

1.3 Management Framework and Implementation Plan

The management framework provides recommendations on how to protect, improve, and restore subwatersheds. This includes setting goals, objectives, and targets. The management framework focuses on recommendations that improve stormwater management, protect and enhance natural heritage and develop resilience and adaptation plans to respond to climate change. The Implementation Plan includes specific recommendations related to urban and urbanizing watersheds and rural watersheds. This recognizes that while actions may be similar, their application will vary given the conditions of specific subwatersheds.



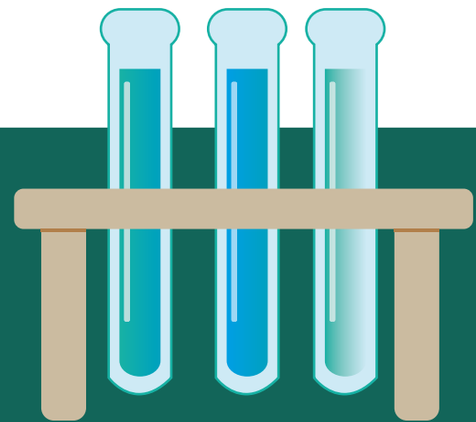
Natural Watercourse

The Watershed Plan Contains:

1.4 Monitoring and Evaluation Program

A monitoring and evaluation program tracks the implementation of the Watershed Plan to ensure the Plan can be adjusted as needed. Targets from the Management Framework help identify whether actions have the desired effect or if changes are needed. Ongoing changes responding to targets is known as an adaptive management approach. These monitoring programs include:

- Groundwater monitoring conducted by the City of Peterborough.
- Otonabee Region watershed health monitoring conducted by the Otonabee Region Conservation Authority.
- Consolidated Linear Infrastructure (CLI) monitoring conducted by the City of Peterborough.



CLI monitoring includes different types of sampling, which happen at different locations and times of the year. Some examples of CLI monitoring include recording water temperature, recording water flow rate, and counting species.

What is a Watershed?

An area drained by a river and its tributaries (smaller rivers, creeks, streams, and other waterways). Wherever you are, you are always in a watershed.

What is stormwater?

Stormwater comes from rain and melting snow. It is intended to naturally absorb into the ground. However in urban settings, hard surfaces such as driveways, sidewalks, parking lots and buildings limit the flow of water into the natural environment and can lead to flooding, erosion and pollution. Modern stormwater management solutions look to minimize these impacts.

How can climate change impact a watershed?

A changing climate creates warmer, wetter and wilder weather. It impacts the frequency and severity of drought, flood, fire, wind, precipitation. These changes can lead to changes in the landscape, negatively impacting water quality and habitats for fish and wildlife.

What is the Natural Heritage System?

A formally recognized land use term for areas consisting of wetlands, watercourses, forests, meadows, and valleylands. They provide important habitat supporting species biodiversity and healthy ecosystems.

How can agriculture affect a watershed?

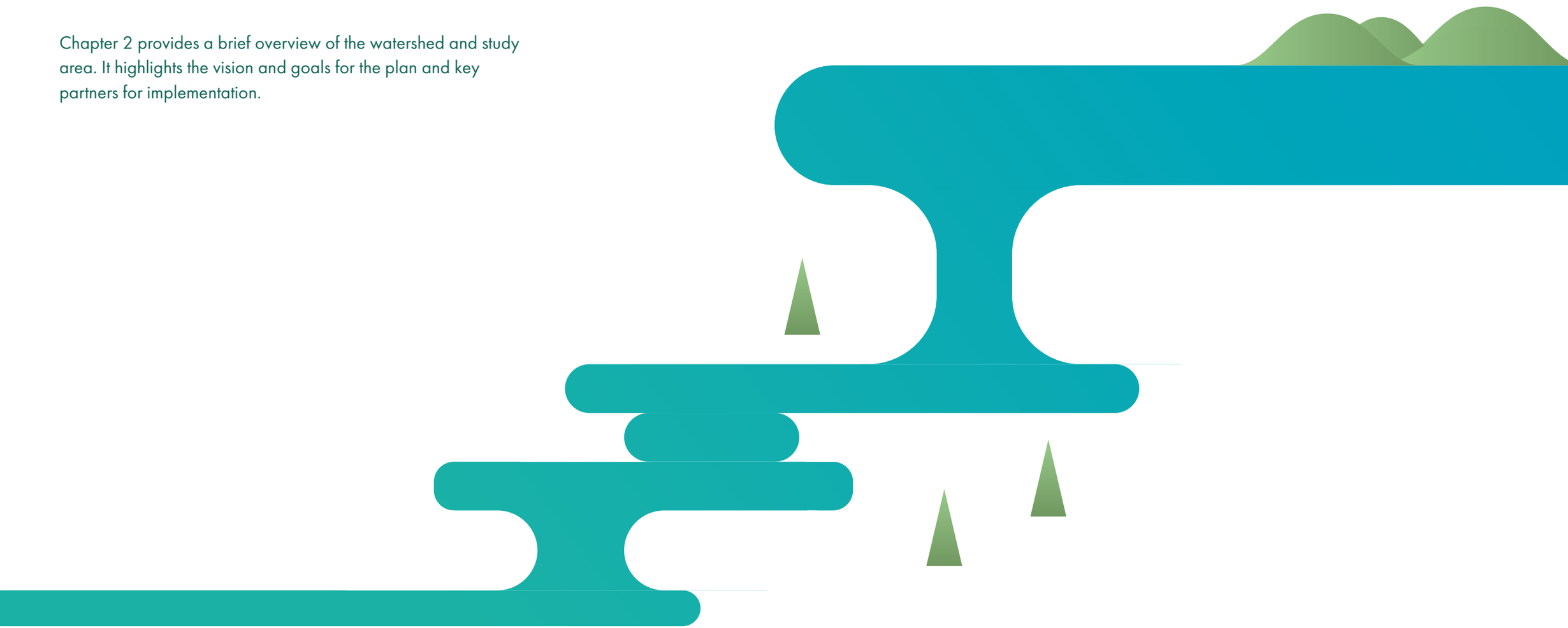
Agricultural Lands allow water to penetrate the soil; however, they can release contaminants into watersheds, such as extra nutrients from fertilizers, animal by-products, and pesticides. Soil erosion from fields can increase the amount of sediment in waterways, harming aquatic habitats.

How can urbanization affect a watershed?

Urbanized Areas covered by large areas of asphalt and concrete do not allow water to absorb into the soil. Water runs off these surfaces into storm drains or creeks, streams, rivers, and other waterways. As runoff, this water can transport contaminants such as road salt, oil, and trash and eroded soil into waterways. Urban areas can produce large amounts of stormwater runoff during large storms, resulting in flooding and erosion. As more areas become urbanized, habitats are lost and natural spaces can become disconnected from one another.

2
INTRODUCTION

Chapter 2 provides a brief overview of the watershed and study area. It highlights the vision and goals for the plan and key partners for implementation.



Natural Watercourse

Our Watershed Our Blueprint: Peterborough's Watershed Plan is a collaborative effort dedicated to protecting and enhancing our water resources. The Watershed Plan provides a collective understanding of the state of the watershed, including how land is used, the state of the natural environment and the infrastructure needed to support watershed health. The Plan provides a framework and guides decisions about watershed planning and management to ensure the watershed's health for the future.

2.1 What is a Watershed?

A watershed is an area of land that drains a river and its tributaries; these include smaller creeks and streams that feed into rivers. Watersheds cross municipal boundaries, and their health depends on the cooperation of many agencies and individuals.

Watersheds include various land forms and use that impact how water moves. Natural heritage systems such as forests, wetlands, meadows, and valleylands; agricultural areas such as farmland; and urbanized areas such as cities, towns, and suburbs all impact how much water is absorbed into the ground or runs off into rivers and streams. Compared to urban landscapes with concrete and asphalt surfaces, natural features absorb more water, reduce stormwater runoff and help clean water.

2.2 Study Area

The watershed planning study area in the Watershed Plan is approximately 474 km^2 across seven (7) municipalities, including the City of Peterborough **(Figure 1a and 1b).** These lands are the traditional territory of the Michi Saagiig Nation and covered by Treaty 20 (Rice Lake Treaty, 1818). The majority of land uses in the watershed are agricultural or natural and open space areas. While smaller in area, residential, commercial, institutional, industrial and other land uses have an important role in protecting watershed health. The signatories to Treaty 20 are Curve Lake First Nation, Hiawatha First Nation, and Scugog Island First Nation, whose People have cared for and continue to act as keepers of the natural lands within this territory[1]. This watershed is named for the Otonabee River, which flows 55 km from Katchiwanooka Lake to Rice Lake.

The Watershed Plan includes 18 subwatersheds, as summarized in **Table 1**. Fourteen (14) subwatersheds are commonly known as Airport Creek, Bears Creek, Byersville Creek, Cavan Creek, Curtis Creek, Fisher Creek, Fleming Creek, Jackson Creek, North Thompson Creek, South Thompson Creek, South Meade Creek, Stewart Hall Creek, Riverview Creek and Whitlaw Creek. Additionally, the Watershed Plan refers to four (4) additional subwatersheds: Harper Creek, Trent Subwatersheds, Otonabee Subwatersheds, and Urban Catchments. The Watershed Plan's Appendix includes a complete description of land use, subwatershed statistics, subwatershed health evaluation, stormwater management, and natural heritage assets for each subwatershed.

1 City of Peterborough Official Plan, April 11 2023. p. 219

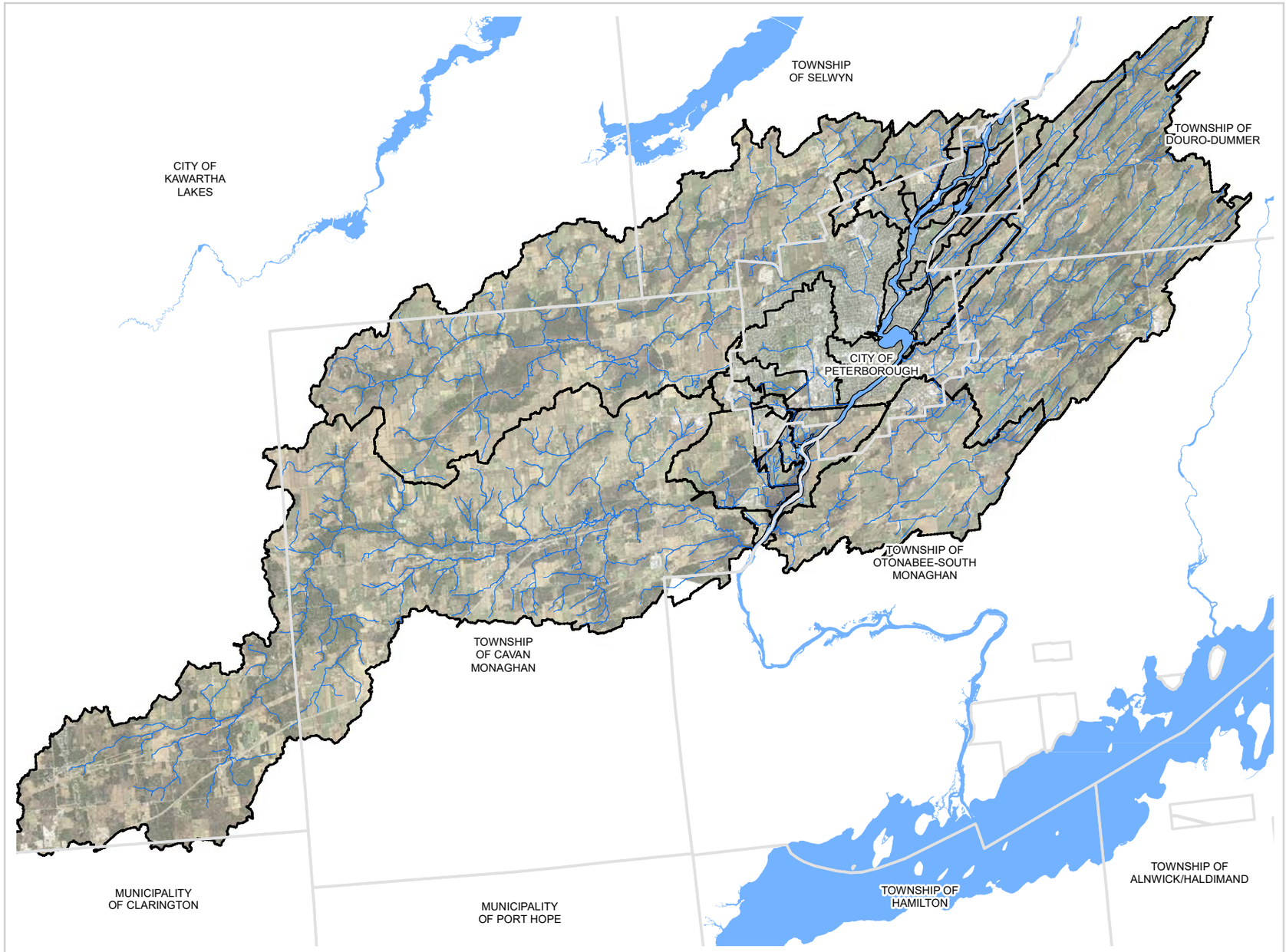


Figure 1a - Study Area & Subwatersheds

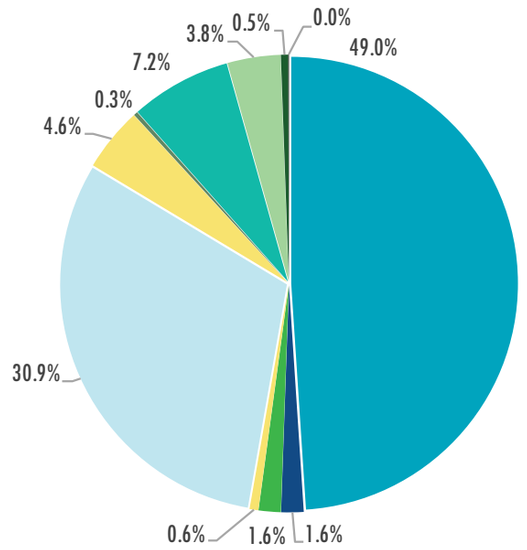


Figure 1b - Existing Land Use Summary

Table 1: Overview of the Eighteen Subwatersheds Within the Peterborough Watershed Plan

Subwatershed	Drainage Area (ha)	Stream Length (km)	Dominant Land Uses
Airport Creek	895	13.9	Agricultural (41%), Natural (40%), Open Space (5%)
Bears Creek	393	6.2	Residential (29%), Open Space (26%), Agricultural (19%)
Byersville Creek	982	8.5	Residential (45%), Road Right Of Way (ROW) (20%), Industrial (11%)
Cavan Creek	16,780	244.6	Natural Area (43%), Agricultural (35%)
Curtis Creek	864	23.3	Agricultural (49%), Open Space (23%), Residential (15%)
Fisher Creek	146	6.0	Natural Area (30%), Agricultural (20%), Residential (15%)
Fleming Creek	459	12.7	Natural Area (26%), Agricultural (23%), Industrial (18%)
Harper Creek	262	3.1	Residential (35%), Open Space (15%), Road ROW (12%)
Jackson Creek	11,919	175.8	Agricultural (50%), Natural Areas (33%), Residential (8%)
North Thompson Creek	352	7.7	Open Space (60%), Natural Area (21%), Agricultural (12%)
Otonabee Subwatersheds	917	14.2	Agricultural (55%), Natural Area (23%), Open Space (7%)
Stewart Hall Creek	3301	56.5	Agricultural (67%), Natural Area (15%), Residential (9%)
Riverview Creek	620	14.1	Agricultural (67%), Residential (16%), Open Space (8%)
South Meade Creek	7,647	180.3	Agricultural (69%), Natural Area (17%), Road ROW (4%)
South Thompson Creek	102	1.9	Residential (62%), Open Space (23%), Road ROW (12%)
Trent Subwatersheds	125	1.8	Natural Area (45%), Institutional (41%), Open Space (8%)
Urban Catchments	1,140	1.5	Residential (43%), Open Space (22%), Road ROW (19%)
Whitlaw Creek	470	13.4	Open Space (30%), Residential (26%), Agricultural (23%)

Did You Know?

Peterborough is the native territory of the Anishinaabeg, a group of Indigenous people comprised of the Ojibwa, Odawa, Potawatami, Chippewa, Mississauga, Algonquin, and Delaware communities who controlled the Great Lakes Basin since the late 1600s.

Before it became known as Peterborough, the area was called Nogojiwanong, Ojibwa for "place at the end of rapids."

The shores of the Otonabee River were a gathering place for Indigenous people. Odenibi, or Otonabee, means "river that beats like a heart."[1]

1 https://www.trentu.ca/indigenous/experience/cultural/nogojiwanong-traditional-area

2.3 Why Does Watershed Planning Matter?

The Watershed Plan helps ensure the City of Peterborough continues to grow and prosper while managing the impacts of development and climate change impacts. The City of Peterborough is the only city in the Otonabee Region watershed with over 80,000 residents including urban Indigenous communities who depend upon the watershed to thrive. By 2051, Peterborough is expected to have a population of over 125,000 residents.

Conversations with Curve Lake and Hiawatha First Nations through the planning process emphasized that "water is the bloodline for all of Mother Earth, and all plants and animals in the world." They noted "it is our obligation to ensure water is protected". First Nations participants highlighted the decline in water quality and quantity, expressing concerns about access to clean drinking water, safe consumption of fish, other wildlife, and plants from wetlands and other aquatic habitat.

The watershed provides important ecosystem services that benefit all living creatures all living creatures. Ecosystem services relate to people, the economy, and the environment.

- **Human benefits:** Watersheds supply our drinking water, food, and help reduce flooding and erosion.
- **Economic benefits:** Watersheds supply water for our homes, agriculture, and industry. In some cases, watersheds also provide us with energy through hydroelectric dams.
- **Environmental benefits:** Watersheds play an important role in a healthy water cycle and provide habitat for fish, wildlife and plants.

With increasing populations and increasing development within the city and surrounding areas, the Watershed Plan provides a comprehensive watershed protection and planning framework to guide actions that protect ecosystem services.

2.4 Vision and Goals for Our Watershed, Our Blueprint

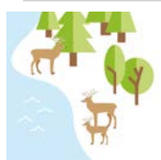
A healthy and resilient watershed that protects, sustains and enhances our evolving communities.

The Plan aims to:

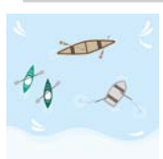
Protect and enhance the natural hydrological function

Enhance or maintain water quality in creeks, wetlands, and rivers

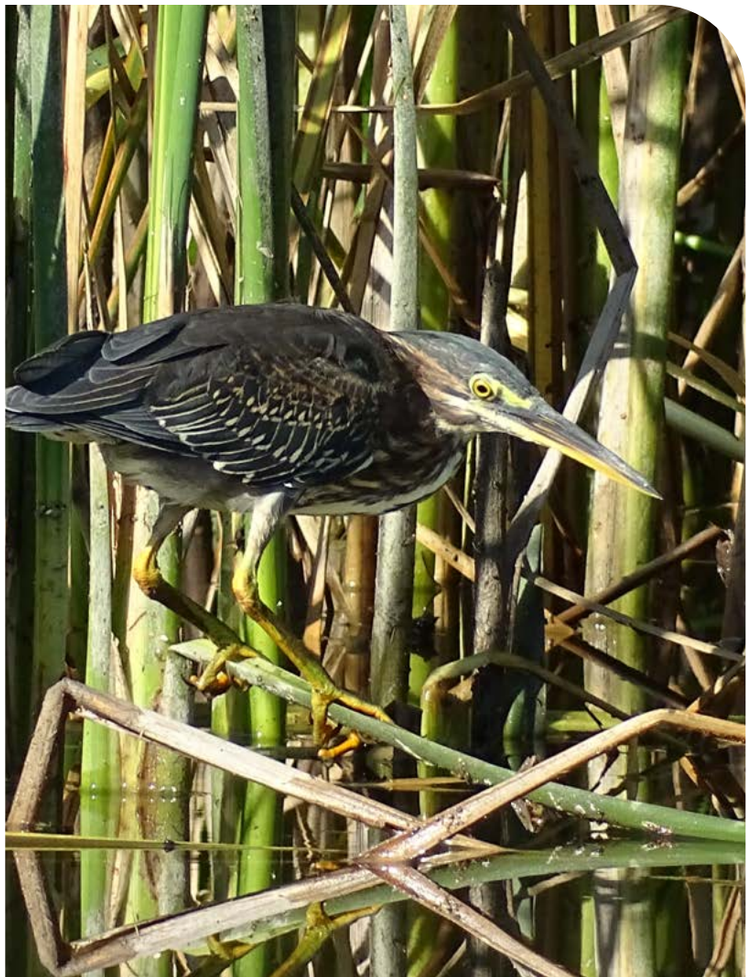
Conserve, protect and restore a healthy aquatic ecosystem



Conserve, protect and restore a healthy terrestrial ecosystem



Support social, economic, and cultural activities that rely on a healthy watershed



Green Heron

A healthy and resilient watershed that protects, sustains and enhances our evolving communities.

2.5 Why Does Policy Matter?

Federal, Provincial, and Municipal policy play an important role in developing the Watershed Plan. Each order of government has jurisdiction over different policy areas that collectively contribute to shaping the Watershed Plan.

- **Federal policies** generally address the protection and conservation of various species. These federal policies apply because species do not abide by borders set by humans.
- **Provincial policies** focus on how land use planning can protect and restore habitat areas that support the healthy function of ecosystems.
- **Municipal policies** implement policies from Federal and Provincial governments. In watershed planning, this is achieved through land use planning. The City's Official Plan guides the growth and development of the city over a planning horizon of 2051. The Planning Act requires an update to the Official Plan within 10 years of coming into effect and every five years thereafter until the plan is replaced. The Official Plan informs tools such as a municipality's zoning by-law, which applies rules to how different land uses can be used.

The Watershed Plan supports the implementation of Peterborough's Official Plan which identified a watershed plan as a priority action for the City to make wise use of water, enhance water quality and quantity and ensure that future generations can use Peteborough's watersheds to drink, fish and swim.

Additional plans work to contribute to the Watershed Plan including the Stormwater Quality Management Master Plan, Urban Forest Strategic Plan, Climate Change Action Plan, and others.

Together, these policies, strategies, and plans provide direction for the City and its partners to prepare for and implement changes that enable the City to grow responsibly.

Federal Policy

Fisheries Act / Migratory Birds Act / Species at Risk Act
These acts protect fish and wildlife habitat, identifying specific species and their habitat for protection.

Provincial Policy

Fish and Wildlife Conservation Act / Endangered Species Act
These acts work in tandem to identify and protect species at risk and their habitat, including regulation on hunting, trapping, and fishing.

Provincial Planning Statement
Provides direction for natural features and long-term ecosystem functionality. Requires the development of a defined NHS in municipal planning processes.

Places to Grow Act and A Place to Grow: Growth Plan for the Greater Golden Horseshoe
Provides direction on residential and employment growth targets. These targets are implemented through Municipal Official Plans.

Environmental Assessment Act
Provides direction for planning and decision-making processes to consider and mitigate environmental effects created by development such as infrastructure projects.

Conservation Authorities Act
Regulates wetlands, watercourses and natural hazards through regulations specific to each watershed jurisdiction.

Oak Ridges Moraine Act and Oak Ridges' Conservation Plan
Provides direction specifically for the Oak Ridges Moraine Area located in a small portion of the Cavan Creek subwatershed.

Clean Water Act
Provides direction to Conservation Authorities to protect drinking water sources.

Environmental Protection Act
Provides direction related to the overall protection and conservation of the natural environment.

Municipal Policy

City of Peterborough Official Plan
Defines and outlines goals, objectives, and targets for land uses including the Natural Heritage System, Agricultural Lands, Designated Greenfield Areas, and the Existing Built-Up Area in the City of Peterborough.

The Official Plan is supported by Secondary Plans and Special Policy Areas and is implemented through the Zoning By-law.

County of Peterborough Official Plan
Like the City of Peterborough's Official Plan but for most Townships in the County.

Lower Tier Municipality Official Plans
Where applicable these plans reference Natural Heritage Features or default to the features listed by the County Official Plan.

2.5.1 Important Components of the Policy Context

The *Provincial Planning Statement* defines a province-wide land use planning policy framework. The Provincial Planning Statement includes direction to protect Natural Heritage Systems. This includes defining Provincially Significant Wetlands (PSWs), significant woodlands, significant valleylands, Significant Wildlife Habitat (SWH), Areas of Natural and Scientific Interest (ANSIs), coastal wetlands, fish habitat, and habitat if endangered or threatened species may be impacted. Other Provincial policies, such as the *Places to Grow Act* and the *Oak Ridges Moraine Act* direct municipalities to protect their watersheds through growth planning. Municipalities implement these policies through Official Plans.

The guiding principles of the City's Official Plan includes identifying, protecting, restoring, and enhancing natural heritage systems, functions and resources using a watershed approach, and further protecting water quality, water quantity and sensitive surface water features. The City of Peterborough's Official Plan includes land use policies related to watershed planning and protection of the NHS. There are four broad areas within the Official Plan urban structure, including.

- **Natural Areas** include wetlands, watercourses valleylands, forests, and meadows – these lands form the NHS. These lands help support healthy ecosystems and can include Provincially Significant Wetlands (PSW), Areas of Natural and Scientific Interest (ANSIs) or known habitats for Species at Risk (SARs).
- **Rural Transitional Areas** that include lands which are anticipated to accommodate urban land uses at some point in the future beyond the 2051 planning horizon.
- **Designated Greenfield Areas** are areas that will accommodate part of future growth. These often correspond with lands converted from Natural Areas but not in use as Agricultural Lands The City's Designated Greenfield Areas will be planned to achieve an overall minimum density of 50 residents and jobs per hectare by 2051 and will accommodate no more than half of the City's growth in residential units.
- **Existing Built-Up Area** are established areas, including places to live (residential or mixed-use areas), work (commercial, industrial or mixed-use areas), or seek services (institutional areas such as hospitals and schools). Half of the City's growth will occur in this Built-Up area to strategically intensify various nodes and corridors throughout the City.

Land use and land use designations are important in planning for the health of subwatersheds and the broader watershed. Land use policy directs areas to protect (such as the NHS), areas where growth is limited (such as agricultural lands), and areas where growth is focused (such as the Existing Built-Up Area and Designated Greenfield Areas). Decisions about the future of land use affect the subwatersheds' health.

2.6 Watershed Partners

Peterborough is located on the traditional territory of many First Nations and is covered by the Williams Treaties and Treaty 20. Water is regarded with the utmost care among First Nations and is regarded as the giver of life. It occupies an important cultural touchpoint for First Nations through its connection to creating and sustaining life, transportation, and cultural practices. Stewardship of water is traditionally the exclusive responsibility of women through water keepers and their teachings. Throughout the Watershed Plan, the project team met with Curve Lake First Nation and Hiawatha First Nation, and extended invitations to the Mississaugas of Scugog Island First Nation and Alderville First Nation.

The City of Peterborough developed the Watershed Plan in three phases in collaboration with watershed partners between June 2019 and March 2023. During each phase, input was gathered from interest groups, planning authorities, First Nations, City staff, and the public to help shape the Plan. Through a series of open houses, pop-up events, stakeholder workshops, and meetings with First Nations, a Watershed Advisory Committee, and a Technical Advisory Committee, the project team discussed emerging directions, goals, objectives, and targets for the Plan. The City, alongside its watershed partners, will continue to work together to implement the actions of the Watershed Plan.

Who is involved in implementing this Plan?

City of Peterborough: The City will implement this Plan through ongoing development review, conservation work, and infrastructure improvements. Working with watershed partners including ORCA and others, the City will lead the implementation of the Plan.

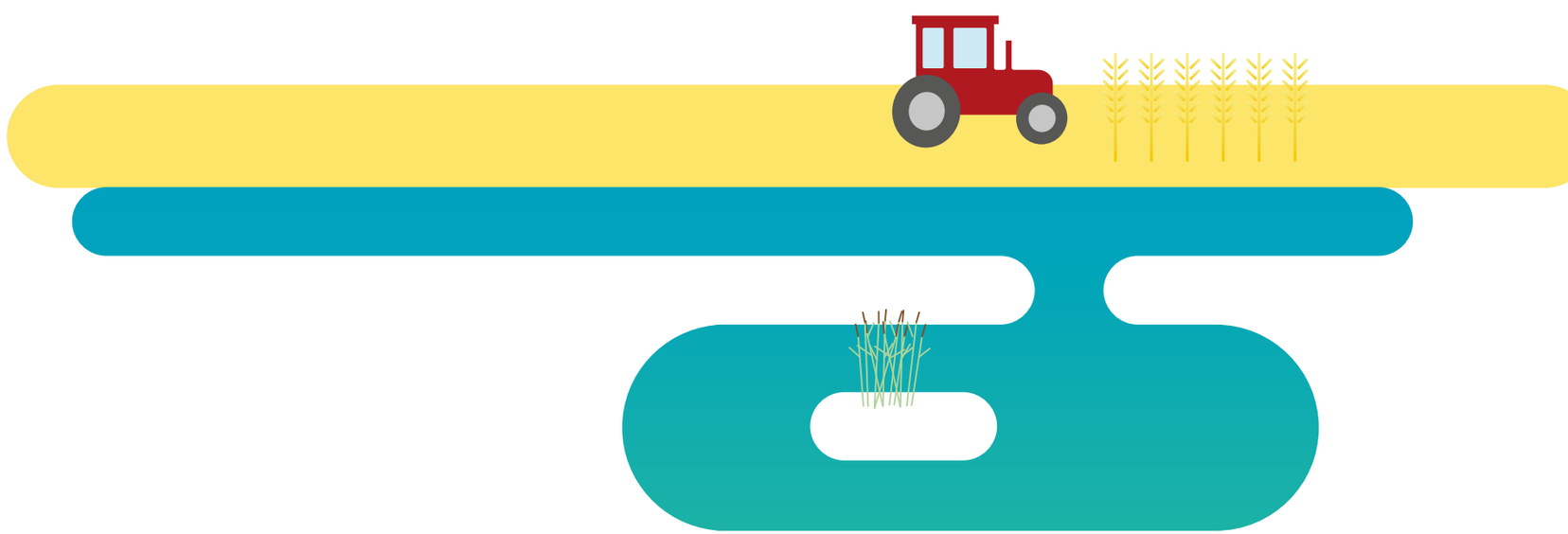
Otonabee Region Conservation Authority (ORCA): ORCA will be an important ongoing partner with the City of Peterborough. ORCA has a legislated requirement to regulate wetlands and natural hazards playing an important role in development review, conservation work, and infrastructure improvements.

Watershed Partners: The City will continue to work with partners in each subwatershed when it undertakes work to implement the Plan.

3

EXISTING WATERSHED CONDITIONS AND LAND USES

Chapter 3 addresses the current conditions and land uses within the watershed at the time of publication. This includes the environmental elements that impact watershed health and the stressors faced by the watershed.



3.1 Current and Planned Land Uses

Human-initiated changes to the land studied in the Watershed Plan are part of an ongoing process spanning centuries. Generally, land in the study area has transformed Natural Areas to Agricultural Land to Urbanized Areas. Major changes to the land surrounding the City of Peterborough coincide with increased settlement in the area and the expansion of industry in the city. Agricultural practices including converting natural areas into farmland and harvesting natural resources such as timber have shaped the city's surrounding areas. Although the City of Peterborough continues to grow at a slower pace than other Southern Ontario cities, it remains the largest urban centre in the Otonabee Region watershed[2]. Located on the Otonabee River, water from all subwatersheds passes through the city at some point on its journey downstream.

Land use differs in each of the subwatersheds in the Watershed Plan. As a result, the study area contains a mix of land use categories, including agricultural land, natural areas, residential areas and open spaces. Agriculture Lands are the largest land use by area, accounting for 49% of the study area. Agricultural Lands are mostly outside of the City of Peterborough in neighbouring communities. Natural areas, including wetlands, woodlands, and valleys that follow the path of creeks and rivers, account for 31% of the study area. Residential areas concentrated in the City of Peterborough are designated for homes, accounting for 7% of the study area. Lastly, Open Space which includes non-Agricultural Lands open to new development accounts for 5% of the study area. Other land uses can be found throughout the study area, however, no other land use category accounts for more than 5% of the study area. For this study, the Plan differentiates Urban Subwatersheds and Rural Subwatersheds due to different stressors posed by development and climate change. These differences require unique responses to each subwatershed. Examples of urban subwatersheds include South Thompson, Byersville and Harper Creeks. Predominately rural subwatersheds include Curtis Creek, Airport Creek, Stewart Hall Creek, and South Meade Creek. Many of the creeks have rural headwaters and urbanized downstream areas. This is true of the two largest subwatersheds; Cavan Creek and Jackson Creek.

The provincial government sets targets for intensification and development. Within the City of Peterborough, much of the growth should occur within the existing built boundary of the city. This will include a focus on redevelopment of existing urban land to support more people and jobs (intensification) and directing development to fill in gaps in the built-up area (infill development). This planned growth creates development pressure on the city. Directing development to occur this way helps reduce land use and land cover changes. Changes to land use and land cover change how water travels from where it hits the ground to where it enters a larger body of water, such as a lake, pond, river, or stream.

Urbanized land is covered in asphalt and concrete, which does not allow water to be absorbed into the ground, resulting in excess stormwater runoff. Some impacts of increased runoff include.

- **Flooding** – Urban areas produce a larger volume of runoff and transport water quickly to water bodies through storm sewers and channels. The risk of flooding is common during short, intense rainfalls and quick snowmelts.
- **Erosion** – High-volume, fast runoff can change the path water takes, removing and transporting soils down waterways, leaving soils downstream and changing the shape and location of a waterway.
- **Water Quality Impacts** – Eroded soil can negatively affect water quality by making it cloudy. Urban water quality is also affected by contaminants such as road salt, oil and grease, heavy metals, fertilizers, bacteria, and waste.
- **Habitat Impacts** – Changes to water systems can reduce species diversity, damage wetlands and vegetation surrounding water, and lead to a general decline in habitat quality.
- **Aesthetic and Recreation Impacts** – People are more likely to participate in activities such as fishing, paddling, and swimming when water is clean and healthy.
- **Groundwater Impacts** – As development increases, hard surfaces such as concrete, asphalt and compressed soils create a barrier preventing water from recharging shallow and deep groundwater reserves.

Rural areas display some of these impacts to a lesser extent than urbanized areas because these rural areas allow for more water to enter the soil. Rural areas exhibit stormwater runoff impacts associated with water quality (due to soil erosion from fields) and habitat impacts (due to the loss of natural habitat replaced by farm fields).

Impacts related to urban and rural development are detailed further in Section 5 Future Watershed Conditions.

2 The Growth Plan for the Greater Golden Horseshoe identifies that Peterborough is anticipated to grow from its current population of approximately 80,000 people to over 115,000 people by 2041.

3.2 Environmental Elements

The Otonabee Region has a rich story of how the landscape has formed over millions of years to create what we see today. Environmental elements help us to better understand characteristics of the landscape that influence the journey water takes when it falls upon the landscape.

- **Topography and Physiography** impact how water moves across a landscape due to the physical shape of the landscape, including areas of high and low elevation such as hills, valleys, and flat lands. Much of the study area has steep-sided hills, which cause water to flow into low-lying areas. These low-lying areas are often poorly drained or swampy due to the soil beneath them.
- **Geology** helps us to understand how the Otonabee Region landscape formed over time. By analyzing the composition of soils and bedrock we can trace a history of processes that have led to the creation of the landscape and soil composition of the region. Notably, glaciers played a key role in shaping the landscape, leaving behind patches of sediments.
- **Hydrology** is the science dealing with the movement and distribution of water across and through the earth. Topography, geology, land use and land cover of an area influence how water moves across and through it. Forest clearing, farm field drainage, and urbanization impact hydrology by increasing runoff that would normally absorb into the ground. The hydrology of a watershed helps us understand how changes to the landscape influence the flow and availability of water.

- **Hydrogeology** deals with the movement and distribution of water across and through the earth. Topography, geology, land use and land cover of an area influence how water moves across and through the land. Forest clearing, farm field drainage, and urbanization impact hydrology by increasing runoff that would normally absorb into the ground. Watershed hydrology helps us understand how changes to the landscape influence the flow and availability of water.

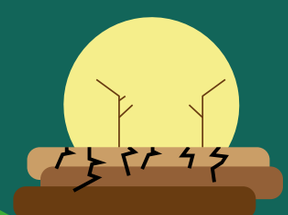
- **Terrestrial (land) and Aquatic (water) Ecology** studies ecosystems, biodiversity, and habitat. Changes in land use impact the ecological health of the region's watersheds. Watershed ecology helps us to understand changes in species composition, which can indicate the health of a watershed.

- **Natural Heritage** refers to areas of minimal human disturbance that provide important ecosystem functions such as habitat for species to exist. These are generally woodlands, wetlands, and valleylands with additional special designation for areas assessed to have significant wildlife habitats, ANSIs, and the presence of species at risk. Ensuring that natural heritage stays connected is key to long-term sustainability. It is important to monitor the watershed's NHS to identify changes in land cover that impact habitat and ecosystem system functions.

- **Climate Change** is the significant long-term change in the earth's temperature and weather patterns due to natural and human activities. Human activities that burn fossil fuels and the loss of forests can increase the amount of greenhouse gas emissions in the atmosphere. Climate change impacts the Otonabee Region watershed and subwatersheds in the following ways.

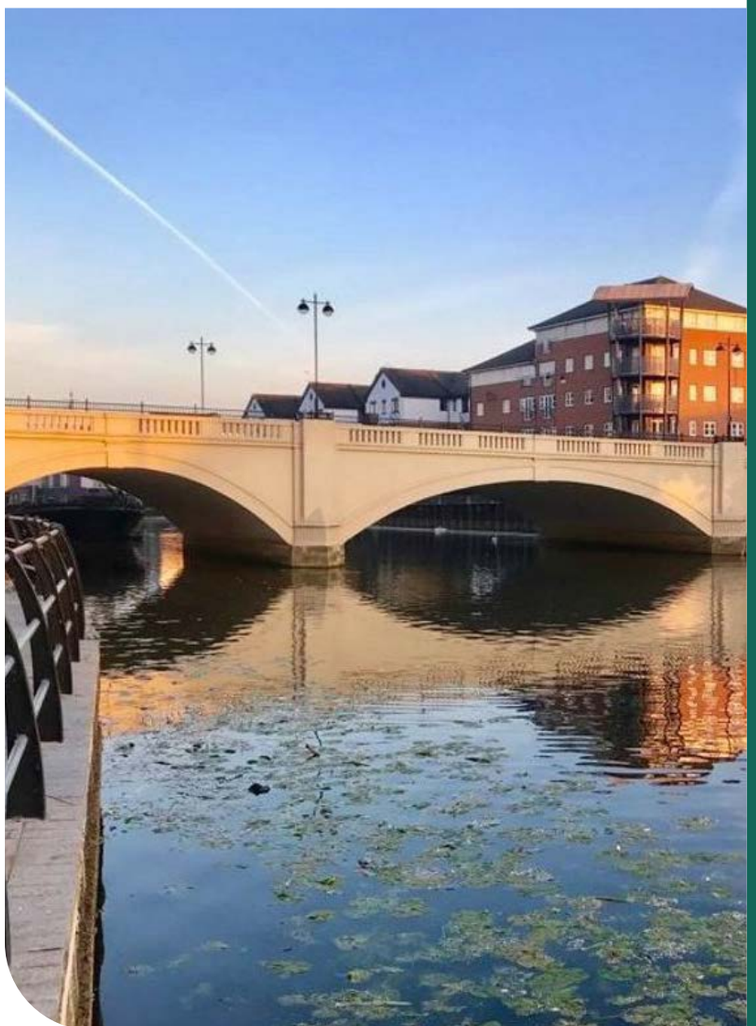
Warmer winters result in less ice cover, less sustained snowpack, more frequent melt events and a less pronounced spring freshet (high water event due to snowmelt).

More frequent large storms with precipitation can result in flooding.



More frequent and longer drought conditions disturb habitat.

Understanding the overall condition and health of a watershed today helps us identify areas where long-term improvement and resiliency are needed. The existing conditions help to inform the Plan's goals, objectives, and targets. A watershed health analysis uses four categories of metrics related to terrestrial ecology, aquatic ecology, stormwater management, and water quality to assess the current health of a subwatershed and assign subwatershed scores.



Downtown Peterborough

A series of metrics help to establish subwatershed scores, including.

Terrestrial Ecology Metrics

- **Wetland Cover** – percent of wetland area in each subwatershed.
- **Forest Cover** – percent of land covered by tree and shrub canopy.
- **Natural Cover** – percent of total covered by wetlands, forests, grasslands, and watercourse edge area.
- **Connectivity** –percent of forest, wetland, or meadowland patches in each subwatershed directly connected physically to at least one other habitat patch by a land or water linkage.

Stormwater Management Metrics

- **Stormwater Quality Control** – total area draining to stormwater quality control facilities such as wet stormwater management facilities (wet ponds) and Oil and Grit Separator units.
- **Stormwater Quantity Control** – total area draining to stormwater quantity control facilities including wet and dry stormwater management facilities.
- **Impervious Percentage** –total area within a subwatershed covered by impervious surfaces such as buildings, parking areas, roadways and sidewalks. These are the main sources of excess stormwater runoff and pollution.

Water Quality Metric

- Water sampling results from multiple sources record pollutants such as chloride from road salt, dissolved materials from vehicle wear and tear, nutrients from yard waste and agriculture (such as nitrogen and phosphorous), pathogens from animal waste, and sediment from erosion and road sand. The water quality metric calculates instances in which levels of these pollutants are greater than acceptable levels.

Aquatic Ecology Metrics

- **Species Richness** – identifies the number of fish species present in the subwatershed. More species indicate higher water quality and habitat.
- **Species Intolerant Disturbance** – identifies the number of species sensitive to change such as temperature or contaminants in the water.
- **Benthic Community (Water Quality)** – identifies the number of macroinvertebrate species in the subwatershed, such as mollusks and crustaceans. More species indicate higher water quality and habitat.
- **Habitat Sensitivity** – identifies the conditions of aquatic habitat with coldwater habitat being more sensitive to disturbance than coolwater and warmwater habitats.

The Watershed Plan assigns each subwatershed a priority level based on their combined score in the watershed health analysis, as shown in **Table 3**. This priority rating helps identify subwatersheds that benefit from early and more intensive restoration actions. Six subwatersheds are Priority 1, four are Priority 2, eight subwatersheds are Priority 3, and six subwatersheds are Priority 4. Priority 1 and 2 subwatersheds generally tend to be in urbanized areas (**Figure 2**). Priority 1 subwatersheds have the poorest conditions based on the metrics assessed, whereas Priority 4 subwatersheds have better conditions. Management practices are still important for lower priority watersheds to prevent them from degrading.

By understanding that urban subwatersheds are experiencing greater impacts due to stressors compared to their rural counterparts, this provides important focus for future actions in priority subwatersheds. In general, this means improving habitat in urban areas, upgrading stormwater infrastructure in older neighbourhoods, and improved monitoring plans to test water quality and track aquatic ecology.

3.3 Data Limitations and Gaps

Several subwatersheds assessed through the watershed health analysis presented insufficient data for water quality (12 subwatersheds) and aquatic health (12 subwatersheds). The average subwatershed metric score was used where there is no water quality data. Correlation between subwatershed urbanization and water quality through available data and academic literature review provides the confidence to record these assumed average values.

The Watershed Plan recommends that the City undertake a comprehensive City-wide water quality and aquatic resources monitoring program. Once the City has collected data to fill gaps the subwatershed health analysis should be repeated to recategorize the subwatershed health of various watersheds.

The Watershed Plan's Appendix includes a complete list of information for each subwatershed.

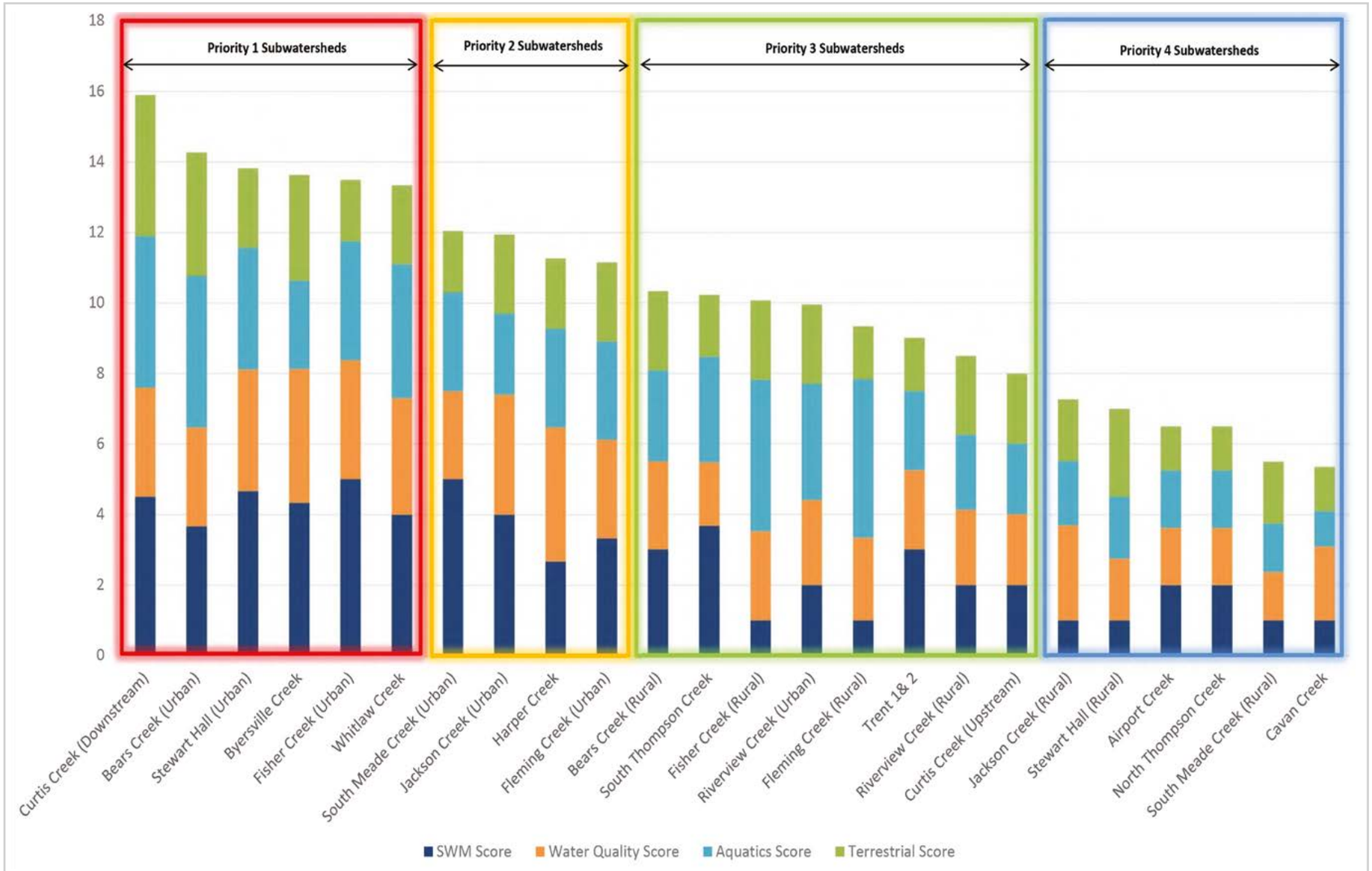


Figure 2 - Evaluation of Existing Conditions and Priority Rating

3.4 Stressors Facing the Watershed

Fragmentation of the Natural Heritage System, water quality degradation, and climate change are key stressors in the Otonabee Region watershed, as shown by the watershed health assessment. Each are explored further below.

3.4.1 Fragmentation of the Natural Heritage System (NHS)

Although Peterborough continues to experience less development pressure than other parts of Southern Ontario, ongoing risks to the NHS persist. Existing development in the City of Peterborough and the conversion of land cover from forests, grasslands, and wetlands to Agricultural Land and Built-Up Areas have and continue to fragment the NHS and reduce habitat for species living in these ecosystems. Fragmentation also reduces areas with a greater capacity to absorb water. Larger rural subwatersheds such as the Upper Jackson, Cavan, and Upper South Meade, with higher natural coverage, are highly connected along streams and creeks connecting forests and wetlands, providing more habitat diversity.

Ensuring habitat patches in new and existing urban and agricultural areas is important to species and habitat diversity. Opportunities to enhance the connectivity of the NHS include constructing wildlife crossing structures (such as enlarged road culverts), reducing road speeds and increasing traffic calming efforts to reduce wildlife road-related deaths.

Fragmentation is particularly prevalent in subwatersheds with Designated Greenfield Areas that will accommodate future development and, to a lesser extent, areas outside of the City of Peterborough. The Watershed Plan's Natural Heritage Report identifies that at a regional level, protecting landscape connectivity, protecting and enhancing urban tree cover, and protecting and enhancing wetland communities are the three highest priorities for the NHS.

3.4.2 Degradation of Water Quality

Urban and agricultural land use presents unique risks to water quality. These lands can introduce contaminants such as chloride (road salt), sediment (from erosion and road sanding), dissolved materials and chemicals, and nutrient runoff (such as nitrogen and phosphorous). These contaminants enter the water system through runoff from pavement, compacted soils, and drainage systems. Reducing stormwater runoff through actions that improve the ability of soil to absorb stormwater and slow the flow of water into rivers and creeks can contribute to preserving and restoring water quality.

3.4.3 Climate Change

Climate change refers to a significant change in long-term weather patterns. This can include variations in temperature, wind patterns, and precipitation. Climate change modelling shows us that the frequency and severity of large precipitation events are expected to increase. Short and intense precipitation events have the potential to lead to localized flooding, erosion, and destruction of habitat. Other impacts due to severe weather, such as heatwaves and ice storms, present added risks to the NHS, particularly sensitive vegetation. Responding to climate change locally involves a toolkit of actions that increase the resilience of the NHS and Peterborough's infrastructure. These potential recommendations are detailed further in Section 7 Implementation and Monitoring.

Urban watercourse with a dense, healthy riparian area with further opportunities to restore upland areas for improved terrestrial ecology.

4

TECHNICAL STUDIES AND REPORTS

Chapter 4 highlights the technical reports that support our understanding of the watershed health and form the foundation for recommendations.

To better understand existing watershed conditions, and the impacts of watershed stressors on watershed function and features, several technical assessments were undertaken during Phase 2 of this project, as shown in **Table 2** below.

Table 2: Technical Assessments Completed to Support the Development of the Watershed Report

Report/Memo	Description
Future Flood Recommendations Report	This report provides a review of the existing floodplain management framework within the study area. This provides recommendations for updates to existing floodplain studies. Updating floodplain studies is an important modelling exercise to better understand changing flood risk. The top three subwatersheds recommended for modeling updates include Byersville Creek, Bears Creek and Riverview Creek. These subwatersheds are highest priority for modelling updates due to recent infrastructure upgrades and completed new developments since the last time floodplain mapping was completed. All three also contain Designated Greenfield Areas where new developments are planned to occur. These changes to the built environment along with climate change result in changes to hydrologic response and potential flood risk. This report also identifies opportunities for the integration of watershed health initiatives such as water quality improvements or watercourse naturalization within proposed flood reduction projects.
Groundwater Resources Report	This report describes the groundwater resources in the study area. It models the flow of groundwater across the study area within and across subwatersheds. Considerable work, related to Municipal Groundwater Studies and Source Water Protection (SWP) program studies, happened in the Otonabee watershed over the last 10 years. This project updates and expands on findings of this and other previous studies. The model quantifies water budget elements (e.g., infiltration, overland runoff, evapotranspiration, groundwater recharge, and groundwater discharge to streams) under current and future conditions. The report also identifies Ecologically Significant Groundwater Recharge Areas (ESGRA), these are important areas that connect surface water to groundwater systems feeding streams and wetlands.
Water Quality Modelling Report	This report summarizes the results of a subwatershed-level hydrologic model which includes pollutant loading estimates. This modelling exercise was expanded to analyze both development impacts and climate change as part of the cumulative effects assessment.
Natural Heritage Report	This report defines a comprehensive NHS consistent with municipal, provincial, and federal legislation. It identifies existing and potential connections across the landscape, both within and between watersheds. This report identifies any relevant NHS data gaps and the strategies for obtaining the necessary information to address those gaps. From a climate change perspective, this report analyses the potential effects of climate change and development/infrastructure on the NHS. The report discusses potential adaptation strategies and design criteria that may aid in alleviating the risks associated with climate change and development.
Climate Change Memo	This memo summarizes and provides updates to the findings of other technical reports undertaken for the Watershed Planning Study, specifically findings related to climate change. The memo also contains direction for incorporating climate change adaptation and mitigation strategies into the Watershed Plan. The memo covers impacts of climate change on watershed processes and municipal infrastructure, provides future climate projections, and analyses climate change impacts on seasonal watershed hydrology, ecosystems, and habitat. An analysis of rainfall intensification is undertaken via rainfall Intensity-Duration-Frequency analysis showing significant changes for 6-hour through 24-hour storms.

5

FUTURE WATERSHED CONDITIONS

Chapter 5 provides an understanding of the cumulative impacts to the watershed's health if no action is taken at the local level.

Agricultural land

The Provincial Policy Statement directs watershed and subwatershed planning to ensure that planning authorities protect, improve, and restore natural features and processes that contribute to the healthy functioning of the watershed.

Through a process called Cumulative Effects Assessment (CEA), the combined impacts of climate change and development are analyzed. Where quantitative models were used during the characterization phase to determine existing subwatershed functions including hydrology, water balance and pollutant loading, these models were updated to reflect changing climate and urban intensity. Extra focus is given to the eight (8) Designated Greenfield Areas and thirty-three (33) natural heritage features during the CEA to understand projected future conditions.

Modelling compares land use and climate change independently to the baseline. It also compares both land use and climate change to the baseline. Modelling shows that land use changes resulting from development are significantly more impactful to subwatersheds containing Designated Greenfield Areas than climate change; however, climate change exacerbates the impacts caused by land use changes. Climate change is projected to have geographically wider impacts on the watershed including areas characterized by rural catchments and large complexes of natural heritage features.

Modelling shows that land use changes resulting from development are significantly more impactful to subwatersheds containing Designated Greenfield Areas than climate change; however, climate change exacerbates the impacts caused by land use changes.

5.1 Cumulative effects assessment

5.1.1 Development

Urban development practices alter the landscape by removing vegetation, regrading land, compacting soils, and introducing surfaces such as asphalt and concrete, which collectively reduce the effectiveness of these processes. Some of the consequences of urbanization include.

- Alteration to waterways through more extreme erosion.
- Increased frequency and severity of flooding.
- Reduced water quality.
- Fragmentation and degradation of habitat.
- Decline in aesthetic value and recreational potential.
- Changes in groundwater replenishment, flow, and direction.

Urban development is most prevalent in the City of Peterborough, where Provincial Policy directs most of the region's growth over the coming decades. The City of Peterborough's Official Plan identifies Designated Greenfield Areas, represented in **Figure 3**, which will accommodate a part of the City's future growth. It is not expected that all these lands will be developed over the term of the Watershed Plan; however, these lands play an important role in the future of subwatersheds in the City. From an environmental perspective, land intensification presents fewer negative impacts than urban sprawl into greenfield areas. For the impact assessment phase of the study, designated greenfield areas were analyzed for impacts to watershed systems and function.

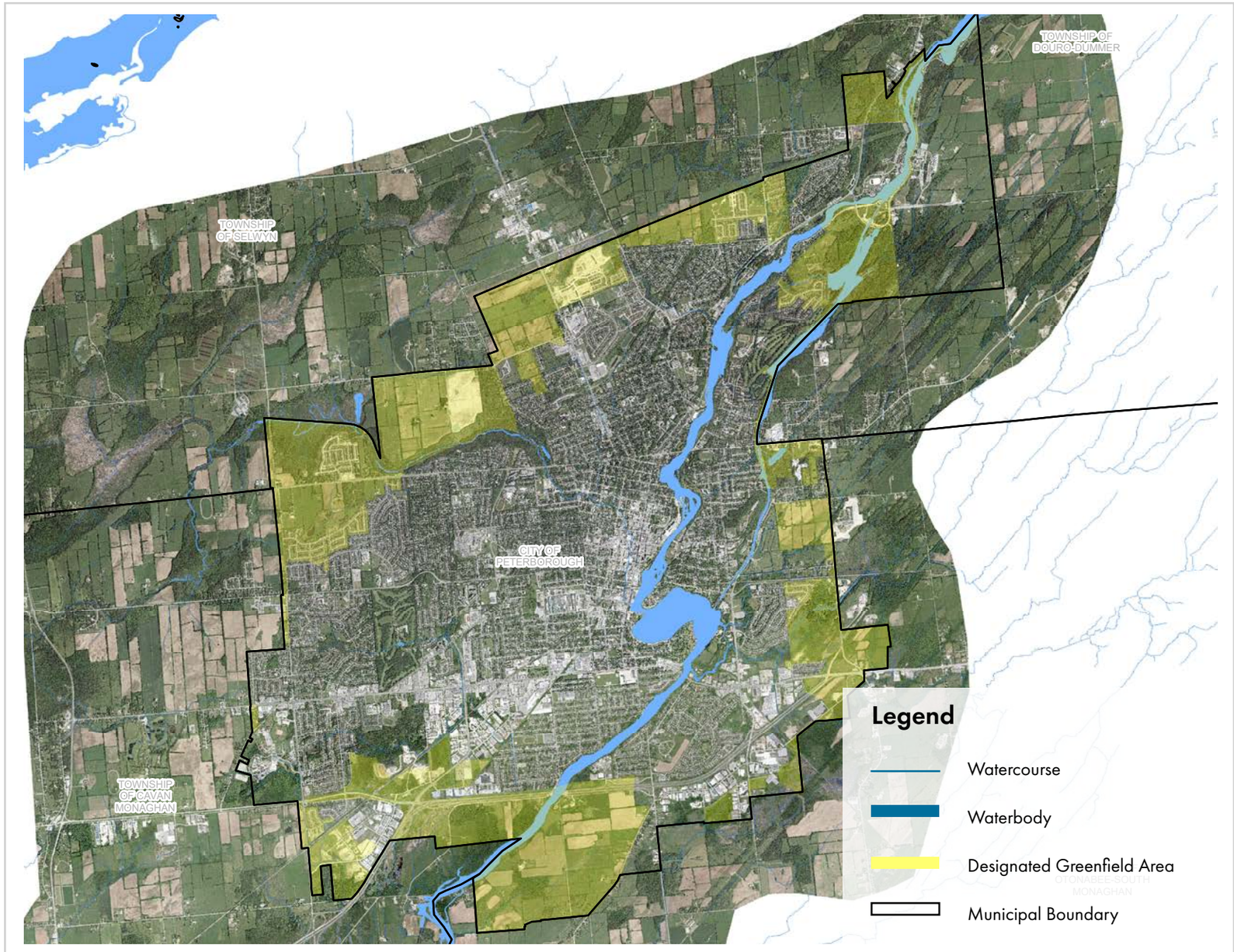


Figure 3 - Designated Greenfield

5.1.2 Climate Change

Anticipated impacts of climate change caused by greenhouse gases are wide-ranging and will impact all subwatersheds. The ability of ecological systems to naturally adapt to hotter, drier summers, extreme precipitation events, and shorter periods of snowpack and frost will largely be determined by local biodiversity and resilience of habitat features such as wetlands vegetation and riparian cover. **Table 4** lists potential climate change impacts on watershed processes. Within urban areas, extreme rainfall events are projected to overwhelm municipal drainage systems including storm sewers and ditches more frequently causing nuisance flooding on roads and private property.

Two methods were used to quantify impacts associated with climate change on subwatersheds. For long-term seasonal trends, the Climate Atlas of Canada's monthly average precipitation and temperature changes associated with Representative Concentration Pathway scenario 6.0 for 2044 through 2049 were used to modify historical data from the Peterborough Airport Climate Station. For single-event extreme rainfall analysis, Intensity-Duration-Frequency relationships for several storm events were analyzed using the IDF_CC Tool 5.0 developed by the University of Western Ontario and the Institute for Catastrophic Loss Reduction. These events were projected forward to the year 2100 for future climate scenarios corresponding to future global greenhouse gas emissions pathways.

Road flooding from heavy rainfalls

Table 4: Potential Watershed Impacts Resulting From Climate Change Events

Climate Parameters	Potential Watershed Processes Impacts	
Changes to Precipitation Patterns	• Increase runoff to surface receivers, affecting flows, nutrient delivery, and sediment transportation • Increase stream erosion • Increase spread of invasive species through changes in flooding patterns • Declines in climate-sensitive vegetation	• Drying out of shallow aquifers • Stress on native plants and animals, who become more susceptible to disease and invasive species. Displacement or extirpation may result. • Changes in seasonality of extreme events, with more frequent extreme events in spring and fall
Winter Temperature Increases	• Changes to timing and intensity of spring freshet • Reduction of snow cover and its insulation benefits for plants and animals • Extended window for aquifer recharge • Increased winter runoff	• Ice accumulation damage to plant species and habitats • Increases in algal bloom frequency and intensity resulting from smaller "flush" • Increases in salt runoff from roads into receiving waterbodies
Prolonged Dry Conditions	• Degradation of aquatic habitat from extended Low flow conditions • Stress on native plants and animals, who become more susceptible to disease and invasive species. Displacement or extirpation may result. • Species migration for more suitable environments • Changes to wetland hydroperiod and ultimately dry out • Declines in climate-sensitive vegetation	• Degraded water quality • Increases in algal bloom frequency and intensity • Less precipitation reduces infiltration to groundwater • Dry out in summer • More frequent low baseflow
Changing Lake Levels	• Stresses on native plants and animals, who become more susceptible to disease and invasive species.	
Freeze Thaw Events	• Changes to timing and intensity of spring freshet • Reduced snow cover and its insulation benefits for plants and animals	• Increased winter runoff • Increases in salt runoff from roads into receiving waterbodies
Higher Temperatures	• Impacts to aquatic species distribution, threatening survival of sensitive species • Impacts to native plants and animals, who become more susceptible to disease and invasive species. Displacement or extirpation may result. • Species migration for more suitable environments • Disruption to synchrony in biological systems • Increased algal bloom frequency and intensity • Changes to wetland hydroperiod and ultimately to dry out	• Declines in temperature-sensitive vegetation • Thermally degraded water quality • Reduce infiltration to groundwater from higher evaporation • Summer dry out of shallow aquifers • Greater winter survival of various invasive species • Seasonal evapotranspiration increases • Increased frequency of low baseflow • Reduced ice cover on watercourses and waterbodies allows for additional winter evaporation
Extreme Cold Events	• Stress impacts on plants and animals if minimal snow present	• Enable greater winter survival of various invasive species

Brown Trout

5.2 Impacts of Development and Climate Change

5.2.1 Impacts on Aquatic Ecology

Otonabee River subwatersheds provide habitat for a variety of fish species. Several subwatersheds provide important coldwater habitat for species such as Brook Trout, Brown Trout, Slimy Sculpin and Burbot. Subwatersheds that support coldwater fish species that are intolerant of disturbance include Byersville, Cavan, Harper, Riverview, Jackson, and Fleming. Long-term hydrologic modelling for climate change scenarios indicates less sustained snowpack due to milder winters, resulting in more winter rain and melt events. A smaller spring freshet[3] combined with warmer air temperatures results in warmer water in Creeks during the spring. Warming of creeks is projected to extend into the summer as more days of extreme heat are expected throughout June, July, August, and September. In urban areas, these changes are exacerbated by runoff from paved urban surfaces heated to extreme temperatures by the sun and outflows from stormwater detention ponds lacking protective shading. A summary of wide-ranging cumulative impacts due to development and climate change is provided below.

Warming Water Temperatures – Warmer air temperatures, shorter ice cover season and thinner lake ice, loss of wetlands, larger and more frequent storm events, and warmer, shorter winters all contribute to the warming of lakes and streams. These ecological changes can alter species' migration, spawning times, and lifecycle processes. Within the study area, five (5) coldwater fish species are impacted by changes to the thermal regime.

Changes to Water Quality and Flow – Several subwatersheds are at risk of impacts posed by changes to the quantity of snow and ice accumulation during the winter and melt during the spring. Many subwatersheds depend on snow and ice melt to recharge groundwater. Rapid melting can lead to flooding, erosion, and habitat damage. More spring and less summer precipitation are expected to worsen drought conditions, impacting aquatic environments.

Changes to Water Chemistry and Quality – Warmer water temperatures produce less dissolved oxygen for fish and other organisms. Greater surface runoff is expected to contribute to more pollutants, nutrients, and contaminants entering watercourses.

Loss of Habitat and Habitat Connectivity – Habitat loss or change resulting from development and climate change presents risks to species. The speed at which habitat changes is faster than species' ability to acclimate themselves to that change.

These impacts can be controlled to varying degrees. Urban development impacts are more controllable through enforcing development policy and implementing low-impact development. In contrast, climate change impacts are addressed by building climate resiliency into new development and existing systems. In general, subwatersheds that are more resilient to development and climate change impacts are those with more abundant natural areas.

Table 5: Evaluation Score

Evaluation Score					
	1 (Excellent)	2 (Good)	3 (Fair)	4 (Marginal)	5 (Poor)
Species Richness	20-24	15-19	10-14	5-9	0-4
Species Intolerant of Disturbance	4+	3	2	1	0
Benthic Community (Water Quality)	Good, Very Good, Excellent	Fair	Fairly Poor	Poor	Very Poor
Habitat Sensitivity	Coldwater	Cold-coolwater	Coolwater	Cool-warmwater	Warm

3 A spring freshet refers to the annual high-water event in the spring associated with the melting of snow and ice.

5.2.2 Impacts on Terrestrial Ecology

Development and climate change can impact the future terrestrial ecology of the region in the following ways:

- **Woodlands** – Woodland communities are impacted by urban and rural land use changes such as fragmentation of large woodlands or a reduction in good quality habitat. Climate change is also expected to result in a greater prevalence of insects, diseases, invasive species, fluctuations in water balance, increased runoff during storm events, and more frequent drought conditions. The cumulative effects model suggests that woodlands mostly contained within the city limit, including Otonabee Catchments Woodlots, Fisher Woodlots, and Fleming Woodlots will have the greatest changes to annual water balance due to adjacent land use changes. Woodlands away from urban areas with deep, healthy soil systems will be less impacted.
- **Wetlands** – Peterborough has several Provincially Significant Wetlands. Development and climate change present risks related to changes in the annual water balance. Changes in the amount and timing of water in and out of the wetland can significantly impact soils, vegetation, and wildlife. Climate projections indicate more rain falling during significant storm events with longer dry periods in between, resulting in more frequent periods of drought. These variations of too much or little water can stress specialist species (species that depend upon a specific set of conditions to thrive), leading to declining populations compared to generalist species (species that are more adaptable to change).
- **Greenfield Areas** – For the purposes of the Watershed Plan, the Designated Greenfield Area has been split into eight areas. Each Designated Greenfield Area presents varying degrees of impact on subwatersheds. When built, these urban areas are expected to have less interception of water by vegetation and less groundwater recharge. These changes result from reduced forest canopy and excess runoff from hard surfaces.

Table 6 identifies six fish species, three plant species, ten bird species, and one turtle species most likely to be impacted by climate change.

Table 6: Species Most Impacted by Climate Change

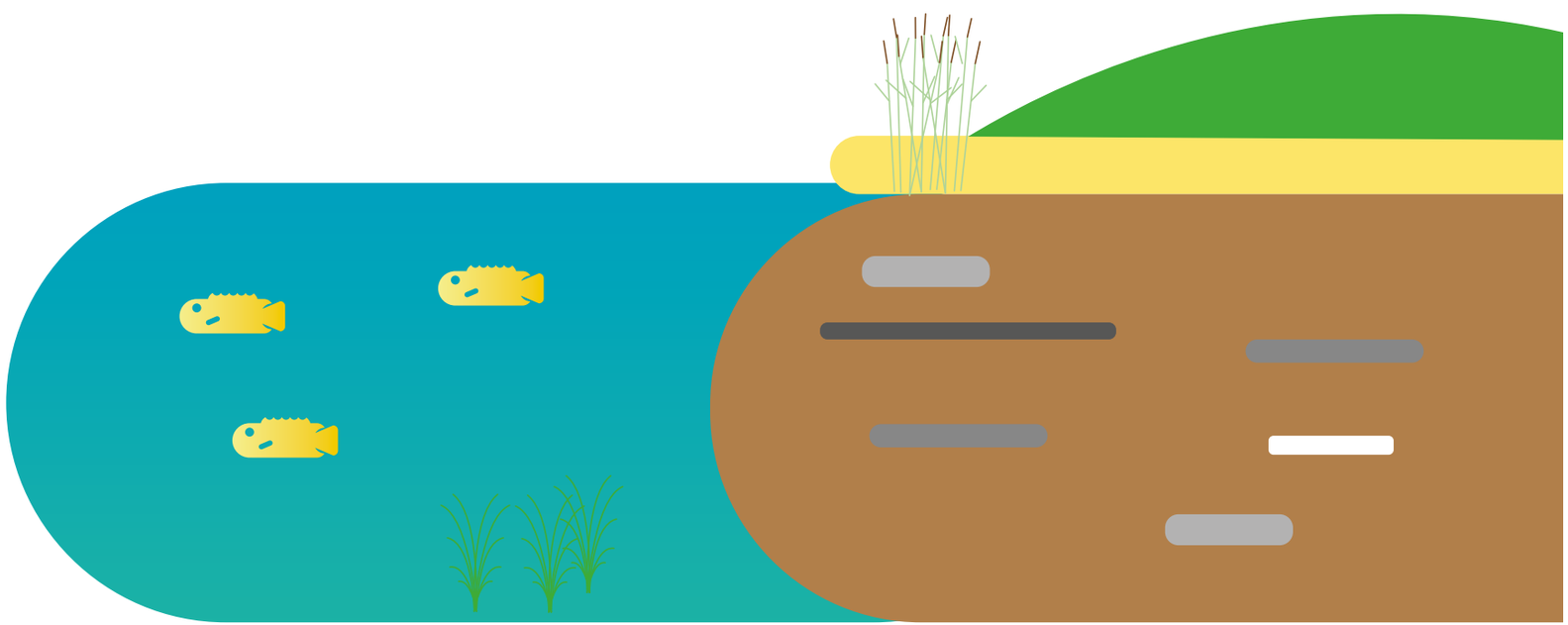
Species Most Impacted by Climate Change	
Fish Species	Blackchin Shiner (*Notropis heterodon*) Blacknose Shiner (*Notropis heterolepis*) Brook Trout (*Salvelinus fontinalis*) Brown Trout (*Salmo trutta*) Slimy Sculpin (*Cottus cognatus*) Burbot (*Lota*)
Plant Species	Honey-locust (*Gleditsia triacanthos*) Ram's head Lady's slipper (*Cypripedium arietinum*) Stiff Gentian (*Gentianella quinquefolia*)
Bird Species	Bald Eagle (*Haliaeetus leucopephalus*) Short-eared owl (*Asio flammeaus*) Acadian Flycatcher (*Empidonax virescens*) Least Bittern (*Ixobrychus exilis*) Black Tern (*Chilidonias niger*) Cerulean Warbler (*Setophaga cerulea*) Canada Warbler (*Cardellina canadensis*) Grasshopper Sparrow (*Ammondramus savannarum*) Loggerhead Shrike (*Lanius ludovicianus*)
Turtle Species	Norther Map Turtle (*Graptemys geographica*)

Bald Eagle

6

GOALS, OBJECTIVES AND TARGETS

Chapter 6 provides an overview of the goals, objectives and targets within the watershed management framework.



The Watershed Plan uses a series of goals, objectives, and targets associated with watershed health. The goals, objectives, and targets provide a management framework that helps inform how actions will be implemented to protect and improve subwatersheds, shown in **Table 7**.

Goals

Goals provide broad aims for conserving or restoring natural features or processes within the study area. These often reflect municipal priorities and visions or requirements set by Provincial or Federal governments.

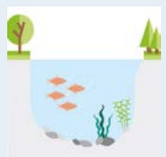
Objectives

Objectives are more specific ways in which to achieve the goals. These often relate to technical principles and help guide the implementation of the watershed Plan. Objectives are associated with one or more indicators. Indicators measure the state of the ecosystem or one of its components. Indicators may include measurements related to temperature, E. Coli, forest and wetland cover, and more.

Targets

Targets are specific aims that will be achieved and maintained in the short, medium, or long-term. Targets are established through baseline data gathering and then guided by goals and objectives to maintain or improve conditions.

Table 7: Goals and Objectives for the Watershed Plan

Goals		Objectives
	**Protect and enhance the natural hydrological function**	1. Minimize flood risk; 2. Support natural channel morphology and protect against erosion and sedimentation; 3. Protect and support aquatic communities; 4. Support wetland ecosystem function; 5. Maintain recharge of groundwater systems; 6. Manage surface water withdrawals and, 7. Protect and support terrestrial communities.
	**Enhance or maintain water quality in creeks, wetlands and rivers**	1. Support aquatic communities and habitat; 2. Prevent eutrophication and algal growth; 3. Protect drinking water supply; and, 4. Support terrestrial communities.
	**Conserve, protect and restore a healthy aquatic ecosystem**	1. Maintain fish habitat and ensure healthy and sustainable fisheries; 2. Maintain or restore natural thermal regime within watercourses; 3. Protect native aquatic and riparian vegetation; 4. Promote native aquatic species biodiversity including benthic invertebrates, reptiles, aquatic mammals and waterfowl.
	**Conserve, protect and restore a healthy terrestrial ecosystem**	1. Protect, restore, and enhance native terrestrial plant and animal species, community diversity and productivity; and, 2. Protect, restore and enhance the integrity of the watershed ecosystem through an integrated approach of natural areas, habitats and connected links.
	**Support social, economic, and cultural activities that rely on a healthy watershed**	1. Support recreational water activities including swimming and boating; 2. Protect and support terrestrial communities; 3. Support the local recreational and environmental tourism industry; 4. Support local agricultural water users; and 5. Support cultural and/or traditional learnings about water and acknowledge the interconnectedness of all life in the watershed.

6.1 Watershed Level Targets

Watershed and subwatershed level objectives and targets provide the backbone of Watershed's Plan to protect and improve its terrestrial and aquatic ecosystems. Some examples of objectives and targets are provided below.

Objectives

- Maintain fish habitat and ensure healthy and sustainable fisheries.
- Maintain or restore natural thermal regime within watercourses.
- Protect native aquatic and riparian vegetation.
- Promote native aquatic species biodiversity, including benthic invertebrates, reptiles, aquatic mammals, and waterfowl.

The following terrestrial and aquatic target categories provide a general summary of targets. Each subwatershed has specific targets that establish a more local articulation of these targets. The Watershed Plan includes a complete list of subwatershed-specific targets.

Terrestrial Targets

- No net loss of natural heritage features and functions.
- The greater for either: each subwatershed should include a minimum 6% land cover by wetlands, averaging 10% across the watershed or 40% of historic wetland coverage.
- Minimum 30% woodlands land cover within the City of Peterborough and 40% woodlands land cover outside the city.
- Natural corridors and linkages should be between 50 to 100 meters wide.
- 75% of natural and semi-natural areas in each subwatershed should be directly connected to other natural and semi-natural areas.

Aquatic Targets

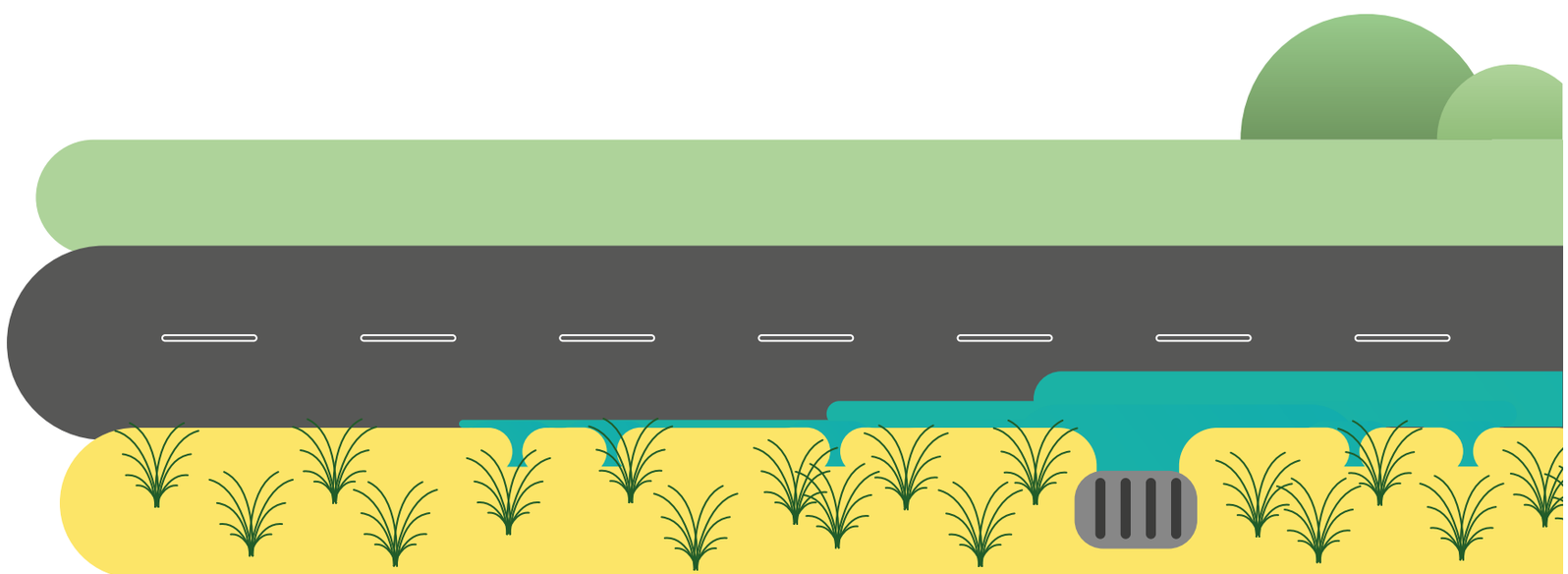
- Limit impervious land cover.
- Develop subwatershed-scale fisheries management plans.
- Maintain thermal regime in existing cool and cold water creek systems or restore to the historical thermal regime.
- Inventory and remove non-essential dams and/or ponds or consider retrofits.
- Develop riparian restoration plans.

Healthy, natural river channel

7

IMPLEMENTATION AND MONITORING

Chapter 7 provides an overview of the policy, monitoring and reporting recommendations.



7.1 Watershed Planning Policy Recommendations

An implementation plan has been developed that builds on the insights from the watershed characterization and an understanding of the impacts of development and climate change on the watershed. Implementing the Watershed Plan requires refining existing and developing new policies, undertaking detailed studies, and implementing programs and projects that help improve watershed health. Highlights of the implementation plan strategies are presented in the sections below. While the City of Peterborough is responsible for implementing the plan, many strategies benefit from collaboration between the City of Peterborough and partners such as the Otonabee Region Conservation Authority, community members and landowners interested in environmental stewardship.

Analysis conducted during the Watershed Plan informed policy recommendations for stormwater management, natural heritage, and climate change adaptation within the plan. All three policy areas touch upon the land use planning process implemented through Official Plans, Secondary Plans, and development application review.

7.1.1 Natural Heritage Policy

Natural Heritage policies exist in Federal and Provincial legislation and municipal planning policies of the City of Peterborough. These policies emphasize preserving areas of natural heritage. This includes promoting connections between natural heritage lands through features such as valleys and waterways. The Watershed Plan recommends preserving and expanding this network of connections and linkages.

7.1.2 Climate Change Policy

The Watershed Plan identifies opportunities for further action the City can take to contribute to addressing climate change. This strategy recommends detailed action to protect built-up areas and the NHS from climate change impacts. The Watershed Plan recommends ensuring that planning anticipates how climate change will impact the ability of infrastructure to handle future change in alignment with the new Provincial Planning Statement.

7.1.3 Ecology Restoration and Enhancement

The Watershed Plan suggests several ecological restoration measures to ensure the overall natural heritage system within and surrounding the City of Peterborough is enhanced with a focus on the connectivity of rural headwater areas to the Otonabee River through City of Peterborough valleylands and woodland corridors. Restoration measures and ecological enhancement strategies are below.

Watercourse Restoration Measures primarily address erosion. These actions help address issues with the flow of water and the stability of a watercourse's edges. These actions are specific to each circumstance. Actions can include reintroducing vegetation, protecting waterway edges, and other landscaping interventions. The results of this work can improve water quality, reduce erosion, slow runoff, cool water temperatures, and improve habitat.

This can be achieved through highlighting problem areas where there is severe erosion, watercourses that are confined, where vegetation cover along streams is sparse, and where there are barriers to fish passage. Locations can then be prioritized and restoration plans can be developed and implemented.

Shoreline Restoration Measures address the erosion and loss of habitat observed along larger waterbodies resulting from the removal of shoreline vegetation and introduction of engineered hard structures. These actions typically involve planting and habitat enhancement along larger rivers and lakes.

Shoreline along the lake will be reviewed for priority locations where erosion is severe and where restoration works could create greater habitat. Then restoration plans can be developed and implemented.

Natural Heritage Restoration Alternatives focus on valley lands and wetland areas that link nearby areas of natural significance. Ecological restoration efforts can help improve ecosystem health, resiliency to climate change, water quality, and improve/expand habitat.

Policy 4.6 Natural Heritage System from the City's Official Plan (which defines Regional Connections and Proximity Linkages) must be considered when completing secondary plans and subwatershed studies, and provide potential restoration and enhancement areas. Subsequent development plans then must consider these locations including the ecological functions provided by the preexisting natural heritage features.

Land Acquisition is a strategy that can help preserve areas of natural significance. Acquiring land strategically that enhances the NHS can improve linkages to areas of natural significance and improve ecosystem health.

- Further to Policy 7.11 Land Acquisition from the City's Official Plan which requires the conveyance of hazard, open space and designated natural areas the City shall identify a strategy to:
- Acquire additional natural heritage lands including linkages and corridors that connect undeveloped lands outside of the City of Peterborough to the Otonabee River. This includes those located in Designated Greenfield Areas.
- Negotiate the acquisition of lands that were historically degraded or natural areas that have been removed with the intent to restore these features, where restoration is in the best interest of the public (i.e. removing hazards, creating key habitats)

Natural Heritage System Policies can be updated to further protect natural heritage features. This can include attributing requirements to land use such as separation distances between natural features and new developments.

- Further to Policy 4.6 NHS from the City's Official Plan which defines the components of the natural heritage system and the minimum vegetation protection zones required around them, the City shall:
  - Evaluate all wetlands in the City; and
  - Incorporate watercourse, woodlands, and wetland as Natural Assets in the Asset Management Plan.

Stormwater management alternatives play an important role in mitigating the impacts of land use changes that contribute to increased runoff, flooding, erosion, poor water quality, habitat destruction and changes to water balance. Historically, stormwater management infrastructure is added to urban areas as they are developed through land use and environmental planning processes. Unfortunately, there are many areas of the City that were developed before the introduction of modern stormwater management objectives. To design objectives like water quality treatment and water balance maintenance to older neighbourhoods retrofits are necessary.

End-of-Pipe Stormwater Management Facilities such as stormwater ponds, underground storage tanks, and large infiltration facilities can improve stormwater quality, reduce erosion, and control the release of runoff from urban areas into local streams and rivers. Ponds hold runoff before entering a watercourse, allowing sediment and other pollutants to settle. These facilities help prevent flooding by storing large volumes of water before it is slowly released into the environment. The Watershed Plan identified potential sites for end-of-pipe stormwater management facilities on large vacant or publicly-owned lands in the City where stormwater controls are lacking. Four urban parks were identified as potential retrofit locations. Two parks are within the Urban Catchments, one in the Byersville Creek Subwatershed and one in the Jackson Creek Subwatershed. Along with this analysis, large stormwater catchments discharging directly to the Otonabee River and lacking stormwater controls were identified as potential locations for oil-grit separators (underground devices attached to sewers that catch and store pollutants for disposal).

Residential Source Controls are activities a property owner can do to capture or divert runoff before it enters storm sewers. This includes rain gardens, rain barrels, downspout disconnections, and special pavement that allows water to pass through. Incentives, demonstration sites, changes to municipal bylaws and neighbourhood-based marketing may be required to facilitate the uptake of these activities. These activities should be prioritized in stormwater catchments where water quality and/or water quantity controls are lacking. These activities are key to restoring urban streams to historically cool or cold-water temperature profiles.

Non-Residential Source Controls can be implemented on a larger scale on commercial, institutional, and industrial properties. These properties can produce significant runoff volumes as many have large areas of hard surfaces, such as parking lots and rooftops. Runoff can be captured and treated or retained by implementing green roofs, bioretention and stormwater management systems that encourage infiltration by local soils.

Road Right-of-Way Conveyance Controls can play a key role in managing contaminated runoff. Roads produce large volumes of stormwater runoff, which often includes urban pollutants. Perforated pipe systems and roadside bioretention features help retain and slowly release water into the environment. These tools can be added to new roads and those planned for reconstruction. These activities should be prioritized in areas lacking stormwater controls and integrated into capital works planning.

Pollution Prevention Measures minimize the transfer of pollutants into the water system. This includes management plans for road salt application, handling and storing hazardous materials, and substituting materials.

Operational Measures include changes to municipal operations such as street sweeping, catch basin cleaning, removing sediment from stormwater ponds, and maintaining oil and grit separators.

Low Impact Development (LID) is a key strategy to reduce pollutant loading, flooding and erosion impact in existing urban areas and new development. The Watershed Plan re-enforces the importance of the LID approach identified in the City's Official Plan, adopted by Council in 2021 and suggests strategies for implementing these on a wide-range of land uses to meet water quality and water balance targets.

What is Low-Impact Development?

Low-Impact Development is landscape design that makes it easier for water to absorb into soils in urbanized areas, reducing runoff. This can include design features such as rain gardens, green roofs, permeable pavement, and perforated pipes (pipes that allow some water to seep out into surrounding soils).

Example LID Practices from Top Left to Right: Soil Amendment (Mississauga, ON), Exfiltration System (Etobicoke ON); Exfiltration System (Guelph, ON); Perforated Pipe (Toronto, ON)

Example LID Practices from Top Left to Right: Bioretention (Toronto, ON); Bioretention (Bostwick Community Centre, London, ON); Raingarden (Waterloo Street, SOHO, London, ON); Grass Swale (Mississauga, ON)

Lily pads

Along with the LID approach to stormwater, Watershed Plan discusses the role of stormwater detention facilities in protecting local watercourses from flooding, erosion and excess pollutant loading. Recommendations related to stormwater detention facilities include.

- Designing new stormwater detention facilities with consideration for climate change;
- Evaluating the impact of climate change on existing stormwater detention facilities.
- Evaluating the opportunities associated with constructing new stormwater management facilities in public green spaces to treat areas of the city lacking stormwater control; and
- Providing enhanced thermal mitigation in subwatersheds that are sensitive to changes in water temperature (i.e. Byersville, Cavan, Harper, Riverview, Jackson, and Fleming)

7.2 Recommendations for Rural Subwatersheds

The Watershed Plan proposes recommendations specific to rural subwatersheds based on existing and future conditions and the goals, objectives, and targets. These recommendations fall within the realm of Ecological Restoration and Enhancement.

7.2.1 Ecological Restoration and Enhancement

Natural Heritage Protection and Restoration Measures

Although less likely to be affected by land use changes, natural heritage protection and restoration play a key role in the health of rural subwatersheds. Opportunities to protect and restore the NHS focus primarily on protecting and restoring the connectivity of natural features. These allow wildlife to move between patches of habitat. This includes restoring wetlands and waterways, constructing wildlife crossings, and reducing runoff from roads.

Natural Heritage System Policies

Like urban and urbanizing watersheds, various terrestrial and aquatic ecology and climate change adaptation policies can be applied to rural subwatersheds. The overall NHS should be mapped through the completion of the County's Watershed Management Plan, and landscape-level linkages should be highlighted. Strategies to restore, enhance or increase the overall coverage of wetland and woodlands while improving watercourses and connectivity should be considered in secondary plans and development applications. Future climate change implications should also be considered when evaluating potential impacts from development.

Watercourse Restoration Measures

Similar to restoration measures in urban and urbanizing subwatersheds, watercourse restoration in rural subwatersheds targets historical degradation generated by agricultural practices such as straightening waterways. Restoration measures may include renaturalizing the edges of waterways, which can help reduce erosion, improve runoff filtration, and support a variety of species with new habitat.

Rural Best Management Practices

Implementation of best practices will rely on stakeholders for planning and implementation. Approaches will focus on managing runoff from agricultural lands. Uptake of the practices will require building support for these practices, recognition of community benefits, increasing incentives, and offering other forms of innovative support.

7.3 Existing Monitoring Programs

To ensure the goals and objectives of the Watershed Plan are achieved, a multidisciplinary watershed-wide monitoring program has also been recommended as part of this Implementation Plan. The monitoring strategy builds upon existing monitoring programs in the area by filling geographical gaps and gaps associated with specific watershed health metrics. Existing monitoring programs that will continue to provide subwatershed-level information include the City of Peterborough's **Groundwater Monitoring Program , Rainfall Monitoring and ORCA's Watershed Health Monitoring.** The recommended monitoring plan includes.

- Flow proportionate water quality sampling;
- Expanded flow and low flow monitoring;
- Water temperature monitoring;
- Invertebrate Community Sampling;
- Fish community sampling; and
- Expanded climate monitoring.

To adapt to changing watershed conditions, climate change uncertainties, and evolving environmental policy throughout the Watershed Plan implementation phase, an adaptive management approach to monitoring is recommended. Peterborough uses an adaptive management approach as part of its monitoring studies to understand whether a strategy effectively meets short, medium, and long-range targets. Results inform whether goals, objectives, and targets are being met. If the targets are not being met, it may prompt updates to municipal or subwatershed implementation or planning strategies. Monitoring results are documented in annual reports, trend and status reports, and watershed report cards.

The City of Peterborough is in the process of developing a stormwater management monitoring program for the **MECP's Consolidated Linear Infrastructure (CLI)** Environmental Compliance Approvals program. Through this program, new development is required to satisfy stormwater management criteria during the application review and approval process. Criteria vary slightly but cover key subwatershed issues to help manage development activity's impact on the subwatershed. CLI requirements include a monitoring plan that tracks the health of the subwatershed and the effectiveness of stormwater management infrastructure.

Figure 4 shows example sites of the following four levels of CLI monitoring.

- Level 1 – Monitoring major tributaries such as Jackson Creek where it enters and exits the municipal boundaries.
- Level 2 – Monitoring isolated individual watercourses upstream and downstream of major tributaries.
- Level 3 – Monitoring major areas of concern such as new development areas or when triggered by degrading water quality trends in specific stormwater management catchments. Designated Greenfield Areas are shown on **Figure 4** to highlight future development pressures on watershed health.
- Level 4 – Monitoring isolated problems in the stormwater management system. These may include water quality issues at a neighbourhood or infrastructure level (e.g. SWM facility with performance issues). Municipal SWM facilities are shown on **Figure 4** to highlight water quality infrastructure that may require performance monitoring.

Table 8 shows the recommended monitoring locations consistent with a CLI approach. Because subwatershed-level monitoring should extend beyond the City limits, collaboration with ORCA and external municipal partners is key.

Water monitoring

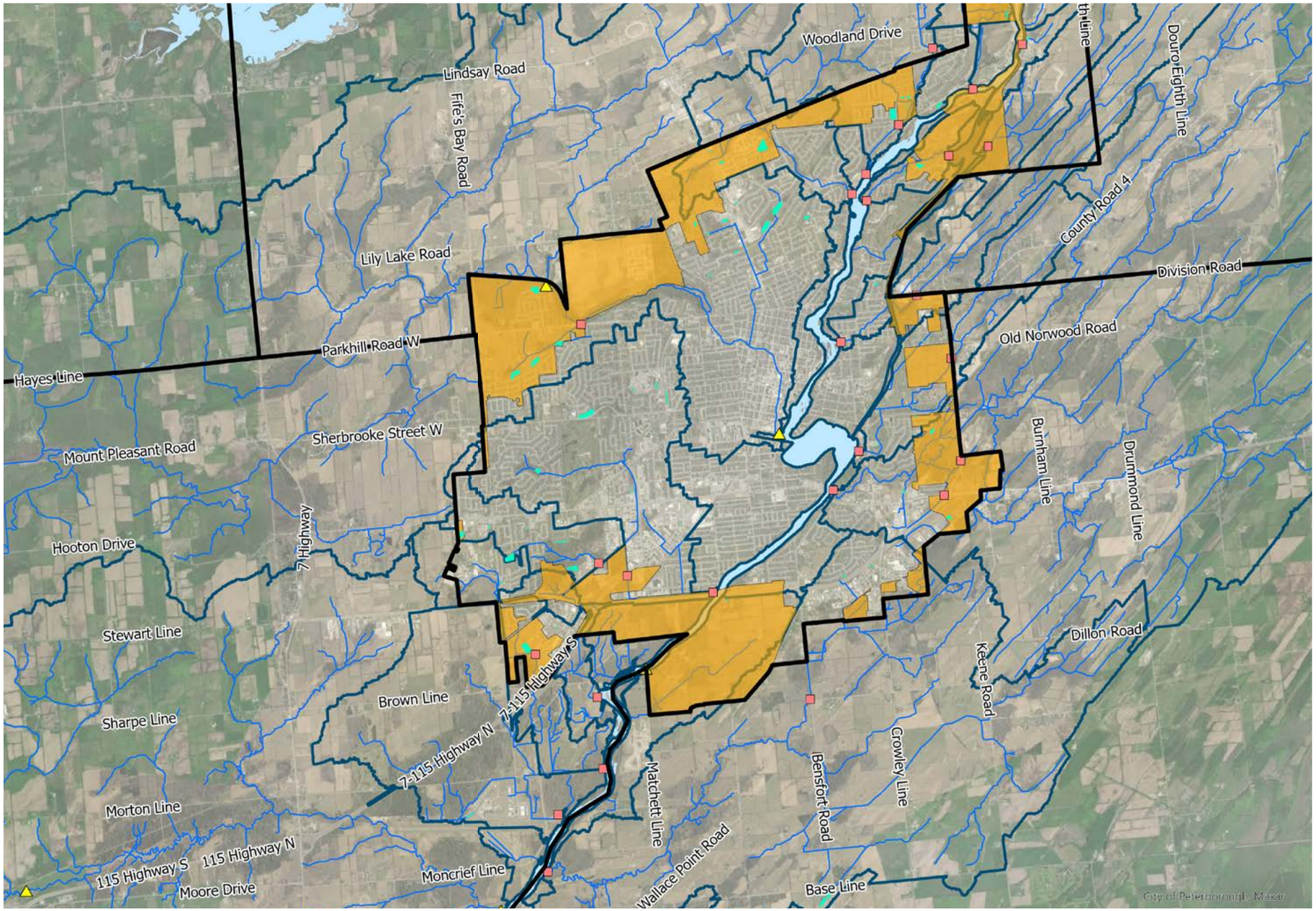
Table 8: Recommended monitoring locations and metrics

Recommendation	Sites	Metric(s)
Flow Proportionate Water Quality Sampling	Level 2 (rotational based on annual priorities) and Level 3 sites as they are identified	Event mean concentrations and seasonal / annual loadings of key stormwater constituents
Continuous Flow Monitoring at Long-Term Flow Stations	All Level 2 sites plus areas of concern for summer low flow *Note: rating curves must be set up at initiation of monitoring*	Flow
Temperature Monitoring	Level 2 sites	Water temperature
Invertebrate Community Sampling	Level 2 and 3 sites as they are identified	Species counts
Fish Community Sampling	Level 2 and 3 sites as they are identified	Species counts

Analysis undertaken through this study has shown that new development will impact subwatershed processes including erosion, sediment transport, water temperature, runoff response and water balance. To ensure mitigation measures counteract these impacts, environmental monitoring prior to development, during development and after development is recommended. This is consistent with "Level 3" CLI monitoring and true to the City's OP which supports a comprehensive program to "monitor the effects of development on the form and function, including wildlife, of the Jackson Creek East Provincially Significant Wetland, the Jackson Creek Valley, Jackson Creek and its tributaries, and unevaluated wetlands within the Planning Area" as a part of the Lily Lake Secondary Plan.

7.4 Reporting

It is recommended that on a 5-year basis the City of Peterborough review and refine the overall stormwater monitoring program. Monitoring program refinements should be in keeping with the goals and objectives of the Watershed Plan.



Legend

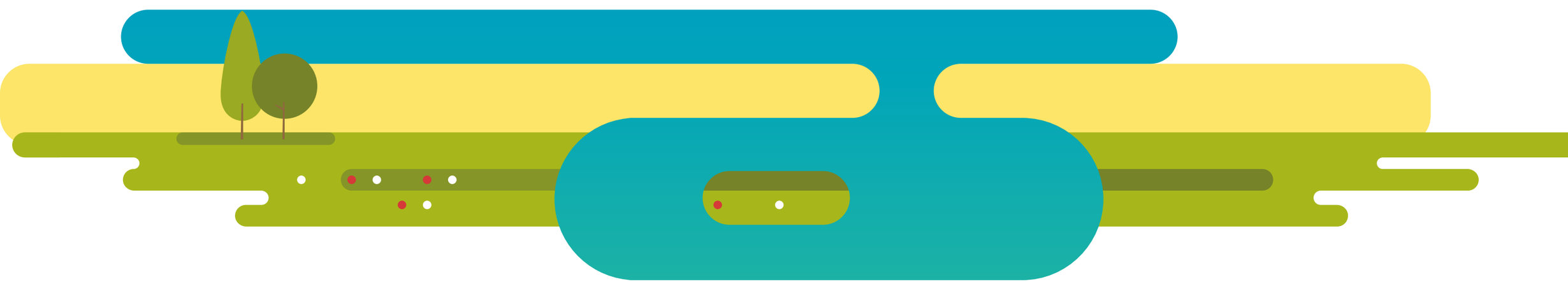
- Watercourse
- Waterbody
- Road Boundary
- Municipal Boundary

Monitoring Location Priority

- Level 1 – Monitoring major tributaries such as Jackson Creek where it enters and exits the municipal boundaries.
- Level 2 – Monitoring isolated individual watercourses upstream and downstream of major tributaries.
- Level 3 – Monitoring major areas of concern such as new development areas or when triggered by degrading water quality trends in specific stormwater management catchments.
- Level 4 – Monitoring isolated problems in the stormwater management system. These may include water quality issues at a neighbourhood or infrastructure level (e.g. SWM facility with performance issues).

Figure 4 - Monitoring Location Priority

8
CONCLUSION



Painted turtles

8.1 Costs

The Watershed Plan includes a wide variety of components that should be implemented to improve watershed health. These include recommended programs, projects, policies and future studies. Where feasible, a range of costs have been provided in the Watershed Plan. Funding for Watershed Plan components will need to be spread across multiple sources including Capital Works funding through tax levies, a recommended Green Streets Fund, a general Stormwater Utility Fee. There are also several provincial, federal and private funding partnership opportunities that are worth exploring to make a positive impact on local streams, lakes, rivers and wetlands.

8.2 Monitoring

To ensure the goals and objectives of the Watershed Plan are accomplished over time, a refocused watershed-wide monitoring program has also been recommended as part of this Implementation Plan. The monitoring program will ultimately follow an Adaptive Environmental Management (AEM) process whereby management policies, programs and practices are evaluated over the long-term and adjusted where necessary to meet changing watershed conditions and evolving objectives. The monitoring program will rely on established monitoring such as existing municipal groundwater monitoring, ORCA watershed health monitoring and refocused stormwater monitoring associated with Consolidated Linear Infrastructure (CLI) Environmental Compliance as required by MECP.

Watershed, subwatershed and catchment-level water quality monitoring are specifically required as part of CLI monitoring within the City of Peterborough. Additional resources will be required to expend this monitoring program to cover areas of the watershed external to the City of Peterborough.

Monitoring associated with development impacts will also need to be undertaken. This will include parameters related to the form and function of natural heritage system features (e.g. wetlands and woodlands) as well as the health of terrestrial ecology. Efforts should be made to quantify the species and sensitivity present within NHS patches, ecological communities and their functions, local connectivity pathways, presence and abundance of invasive species. Annual monitoring should be tailored to the existing NHS resources to monitor changes over time and provide adaptive mitigation measures that can reduce/mitigate the severity of potential impacts caused by urban intensification and climate change over time.

In order to ensure the aquatic goals of the Watershed Plan are achieved, a comprehensive aquatic monitoring program is recommended. This program is to utilize water quality, flow, and temperature monitoring along with invertebrate community, fish community and habitat sampling to determine a holistic perspective of aquatic health at key locations within the watershed.

8.3 Conclusion

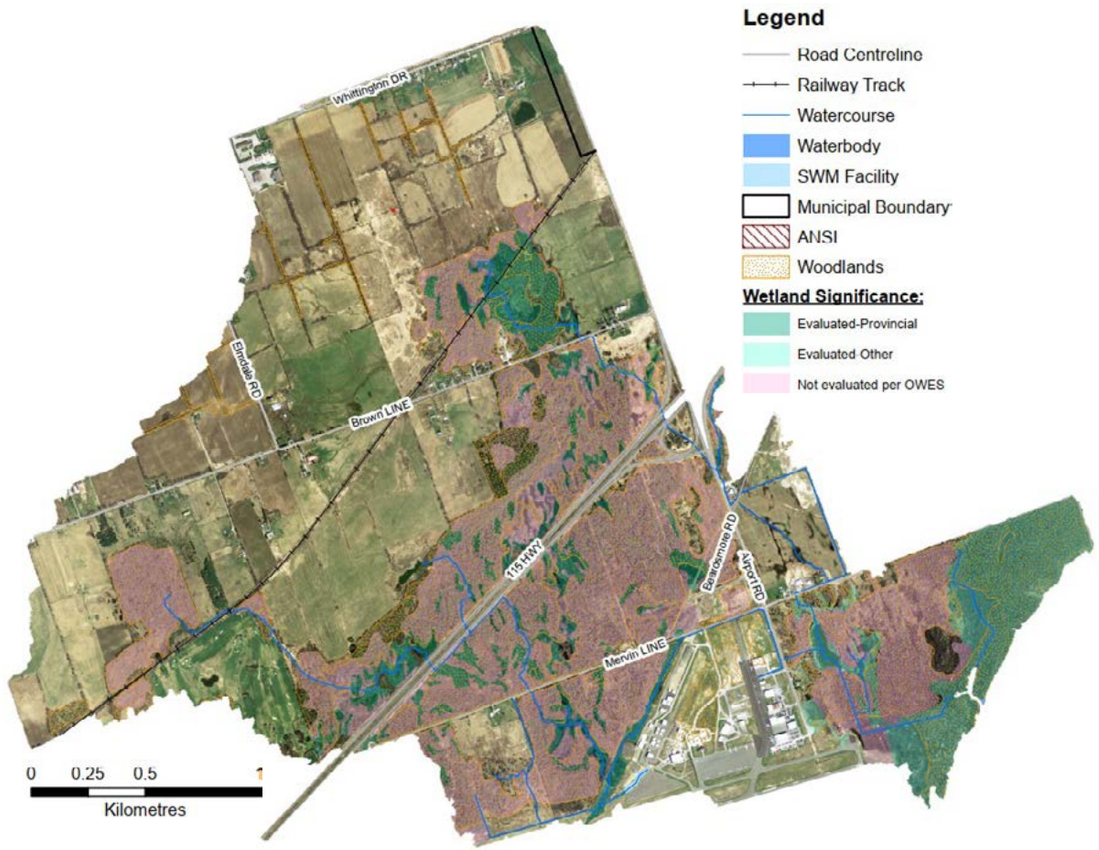
The Watershed Plan provides a path to a healthy and resilient watershed that protects, sustains and enhances our evolving communities. The Plan ensures the long-term health of the natural environment and human populations by addressing water quality, habitat conservation, flood management, and sustainable land use. The programs, projects, policies and future studies require ongoing collaboration across jurisdictions between the City, ORCA, adjacent lower-tier municipalities, Indigenous communities, and local interest groups. It proactively assesses the potential for stressors such as urban growth and climate change to impact the health of the region's subwatersheds. It proposes actions that mitigate the impacts of these stressors and will track their implementation to ensure they strive to meet the goals, objectives, and targets.

APPENDIX

Airport Creek Subwatershed

Airport Creek Overview

Airport Creek is a tributary of the Otonabee River, south of the City of Peterborough, in the Township of Cavan Monaghan. Peterborough Municipal Airport is located within the subwatershed, with current and future development scheduled to occur in the vicinity. The watershed is characterized by a rural landscape with large swamp patches that are connected by watercourses and transected by major roads. There are no specific policy areas present.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
895.0	9.6	16.5	36.0

Subwatershed Health Evaluation

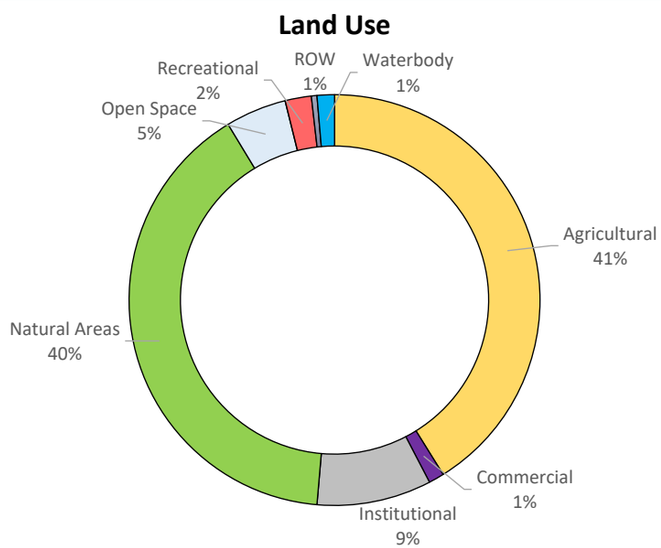
Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Excellent	Ins. Data	Ins. Data	Priority 4

Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	1	0.0	0.0	0.0	1

Natural Heritage

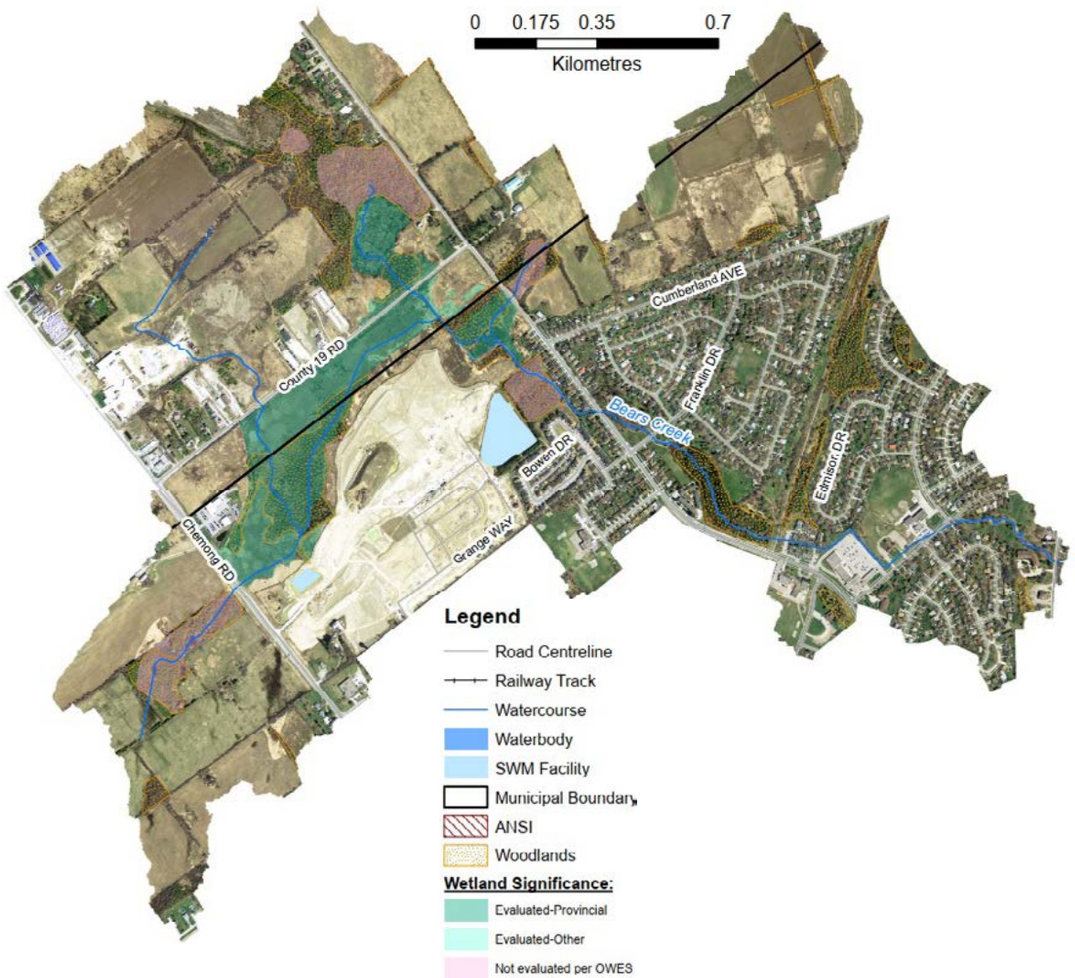
Woodlands	Upland Forest: 12 ha Lowland/Swamp Forest: 258.36 ha
Provincially Significant Wetland (PSW)	Total Area: 321.90 ha Provincially Significant Wetland (PSW): Peterborough Airport Wetland Complex Evaluated Wetland: Otonabee River Floodplain Swamp Complex
Areas of Natural and Scientific Interest (ANSI)	None present



Bears Creek Subwatershed

Bears Creek Overview

Bears Creek is a tributary of the Otonabee River, located in the City of Peterborough but with its headwaters in the Township of Selwyn. The subwatershed transitions from rural landscape into a residential area. Outside of the urban area Bears Creek is buffered by significant wetland and woodland habitat but becomes much narrower and disconnected.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
392.9	24.6	8.2	9.0

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Fair	Fair	Marginal	Poor	Priority 1

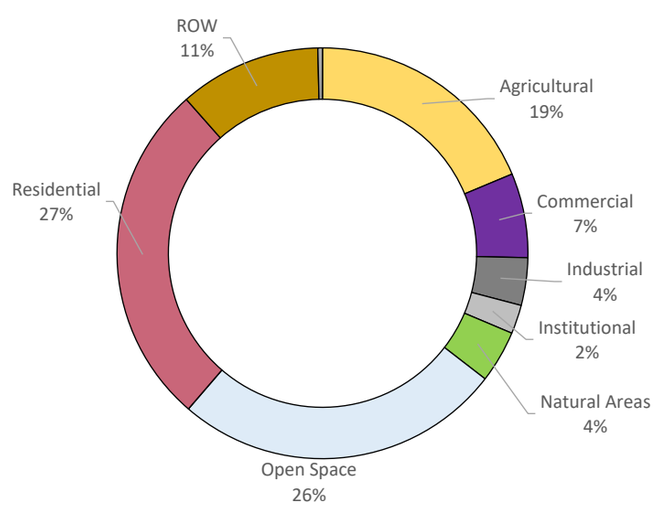
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
1	2	1.1	43.8	2.1	17

Natural Heritage

Woodlands	Upland Forest: 18.68 ha Lowland/Swamp Forest: 40.35 ha
Provincially Significant Wetland (PSW)	Total Area: 35.41 ha Provincially Significant Wetland (PSW): Jackson Creek Evaluated Wetland: None Present
Areas of Natural and Scientific Interest (ANSI)	None present

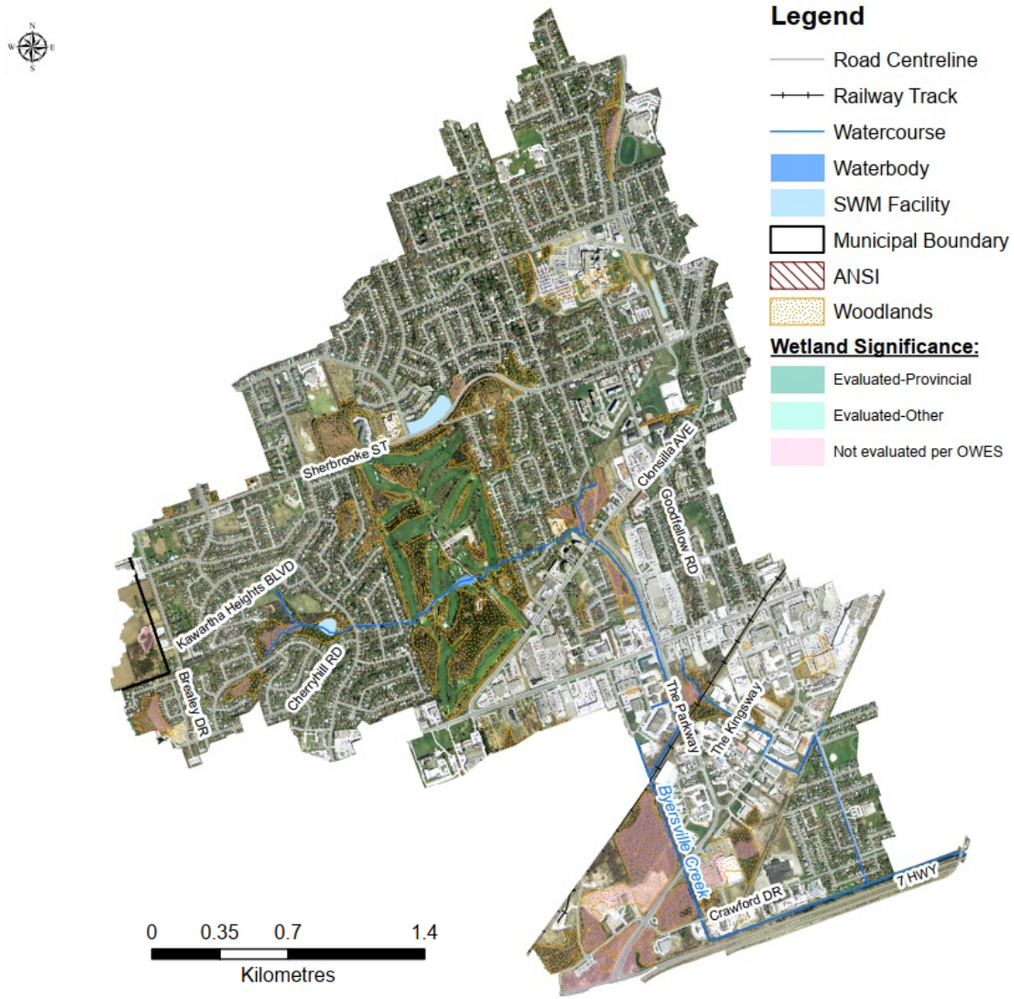
Land Use



Byersville Creek Subwatershed

Byersville Creek Overview

Byersville Creek is a tributary of the Otonabee River. The majority of the catchment is located in the City of Peterborough. The headwaters include groundwater upwellings in the western branch of the creek, and the presence of wetlands and woodlands play an important hydrologic and ecological role. Several sections of Byersville Creek have been piped underground. Much of the area subwatershed can be characterized as an urban landscape with little natural cover, of which most is contained within the golf course and municipal parks.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
982.0	42.2	21.5	3.8

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Fair	Poor	Poor	Fair	Priority 1

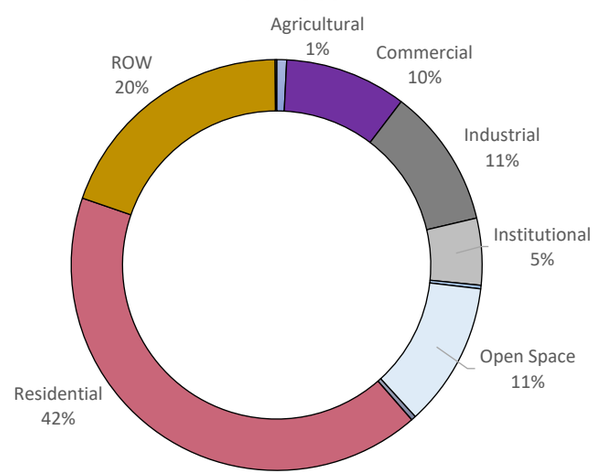
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	5	196.2	72.2	0.0	51

Natural Heritage

Woodlands	Upland Forest: 70.54 ha Lowland/Swamp Forest: 113.01 ha
Provincially Significant Wetland (PSW)	Total Area: 36.89 ha Provincially Significant Wetland (PSW): Harper Creek Wetland Evaluated Wetland: None Present
Areas of Natural and Scientific Interest (ANSI)	None present

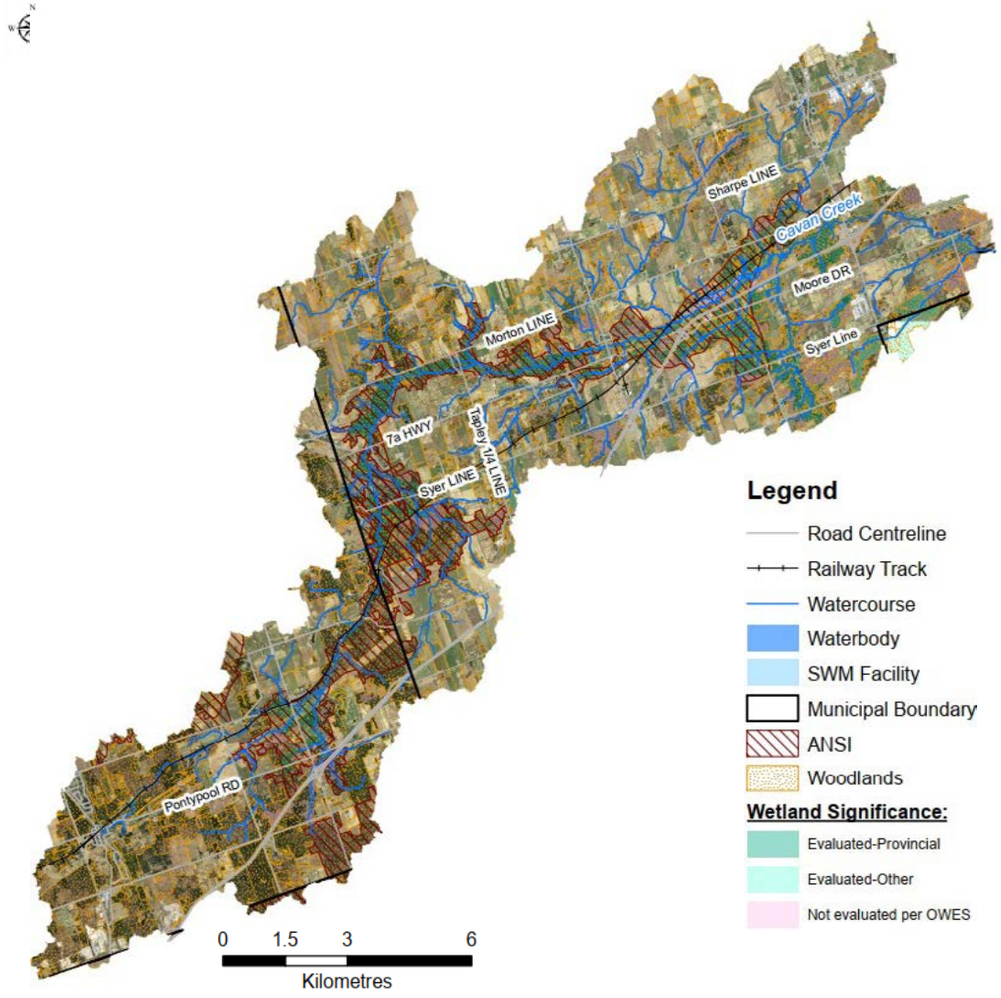
Land Use



Cavan Creek Subwatershed

Cavan Creek Overview

Cavan Creek is a large subwatershed south of the City of Peterborough which drains into the Otonabee River. Its headwaters are in the City of Kawartha Lakes, but much of the creek is in the Township of Cavan Monaghan. Although the City of Peterborough does not currently occupy any land in this subwatershed, urban expansion may occur in this area within the planning horizon. The subwatershed can be characterized as rural landscape with several large wetland and forest patches interconnected by watercourses contain many unique features and functions. The south portion of the subwatershed is contained within the Oak Ridges Moraine and Greenbelt policy area



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
16779.9	5.9	1.7	15.0

Subwatershed Health Evaluation

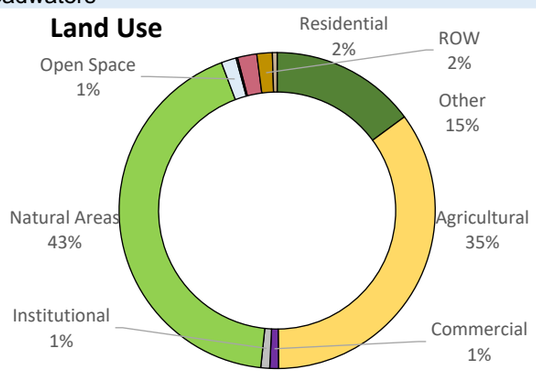
Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Excellent	Fair	Excellent	Priority 4

Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	0	0.0	0.0	0.0	1

Natural Heritage

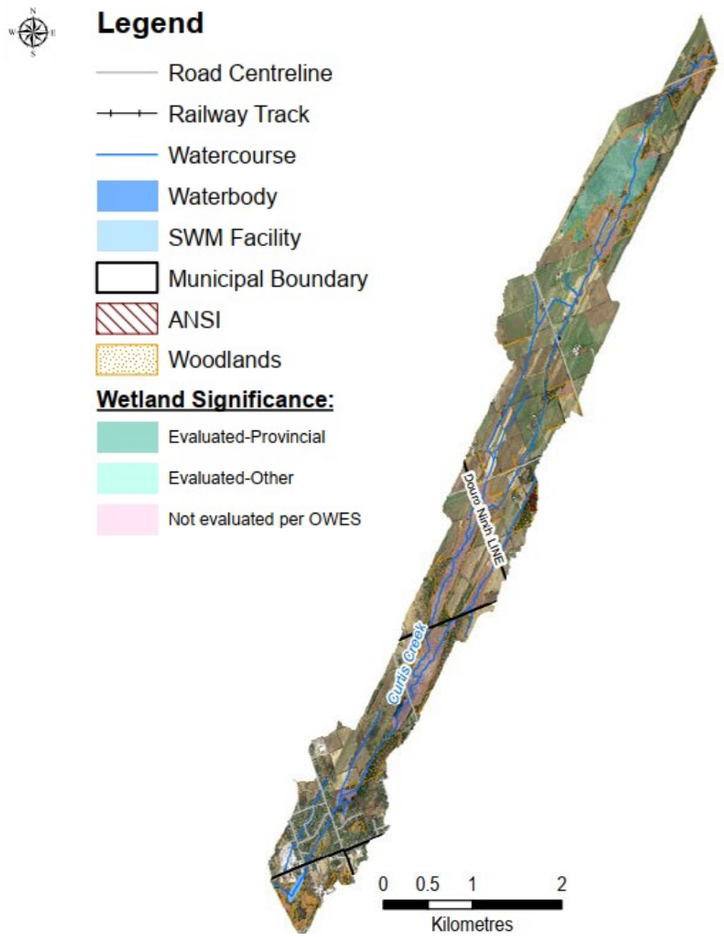
Woodlands	Upland Forest: 3554.12 ha Lowland/Swamp Forest: 2216.58 ha
Provincially Significant Wetland (PSW)	Total Area: 2513.77 ha Provincially Significant Wetland (PSW): Cavan Creek Wetland, Peterborough Airport Wetland Complex Evaluated Wetland: Cavan Creek Outlet Swamp, Fraserville, Tapley South
Areas of Natural and Scientific Interest (ANSI)	Provincial Earth Science ANSI: Bethany Crevasse Fillings, Fleetwood Kames Regional Life Science ANSI: Cavan Creek Wetlands Candidate Regional Earth Science ANSI: Kendal Lookout Candidate Regional Life Science ANSI: Cavan Creek Headwaters



Curtis Creek Subwatershed

Curtis Creek Overview

Curtis Creek is a tributary of the Otonabee River located in the drumlin field east of the City. The headwaters are located in the Township of Douro-Dummer before it enters the City of Peterborough. Curtis Creek is bisected by the Trent Canal which is maintained by the Curtis Creek Earth dams. Curtis Creek flows beneath the Canal through a 1500 mm diameter depressed culvert. The subwatershed is long and narrow with forest patches connected to natural features in South Meade and North Thompson subwatershed to the south and north respectively. The Curtis Creek has long stretches of watercourse with little or no riparian buffer.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
863.9	13.7	3.7	15.0

Subwatershed Health Evaluation

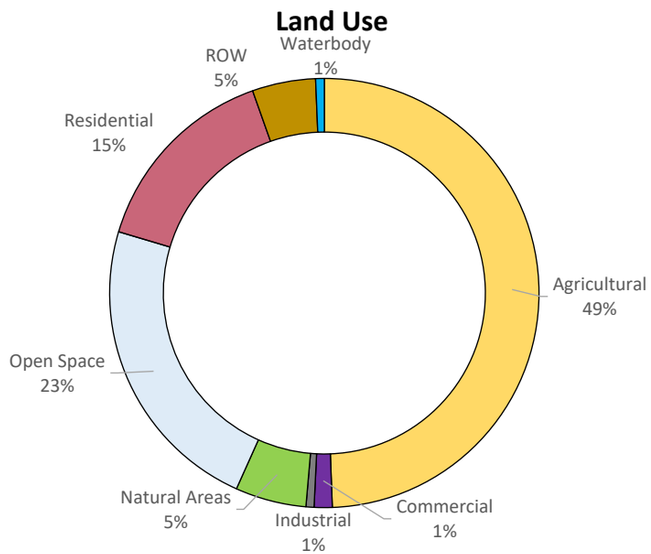
Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Marginal	Marginal	Poor	Priority 1

Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	1	6.2	0.0	0.0	11

Natural Heritage

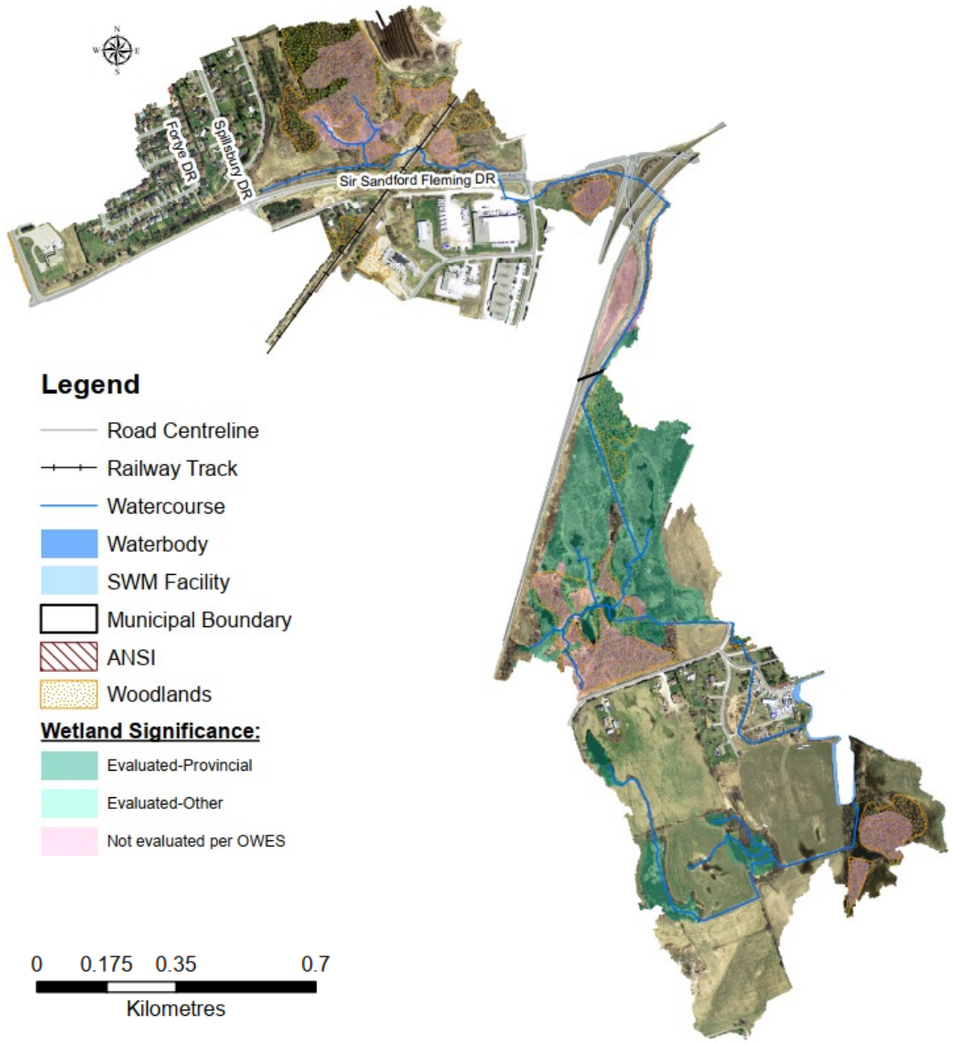
Woodlands	Upland Forest: 60.47 ha Lowland/Swamp Forest: 104.17 ha
Provincially Significant Wetland (PSW)	Total Area: 129.88 ha Provincially Significant Wetland (PSW): None present Evaluated Wetland: Sawers Creek South
Areas of Natural and Scientific Interest (ANSI)	Regional Earth Science ANSI: Peterborough Drumlin Field No. 1



Fisher Creek Subwatershed

Fisher Creek Overview

Fisher Creek flows into the Otonabee River south of the City of Peterborough, and is located in the Township of Cavan Monaghan. The subwatershed is characterized by a mixture of urban and rural landscape with several low lying wetland complexes but little woodland cover.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
146.0	17.3	25.0	23.0

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Marginal	Ins. Data	Poor	Priority 1

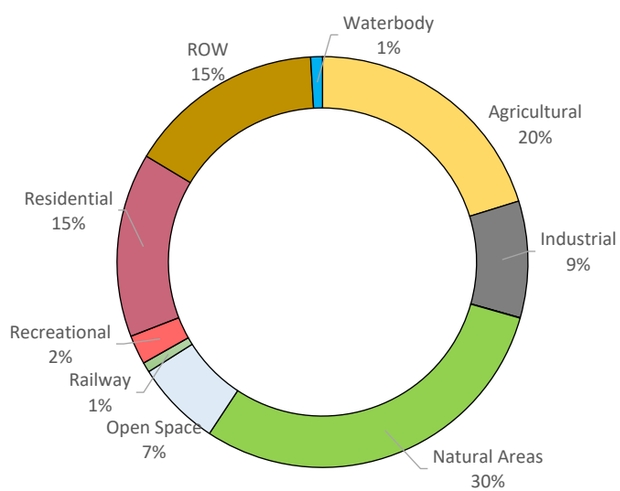
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	0	0.0	1.5	0.0	5

Natural Heritage

Woodlands	Upland Forest: 5.15 ha Lowland/Swamp Forest: 19.64 ha
Provincially Significant Wetland (PSW)	Total Area: 33.58 ha Provincially Significant Wetland (PSW): Peterborough Airport Wetland Complex Evaluated Wetland: None present
Areas of Natural and Scientific Interest (ANSI)	None present

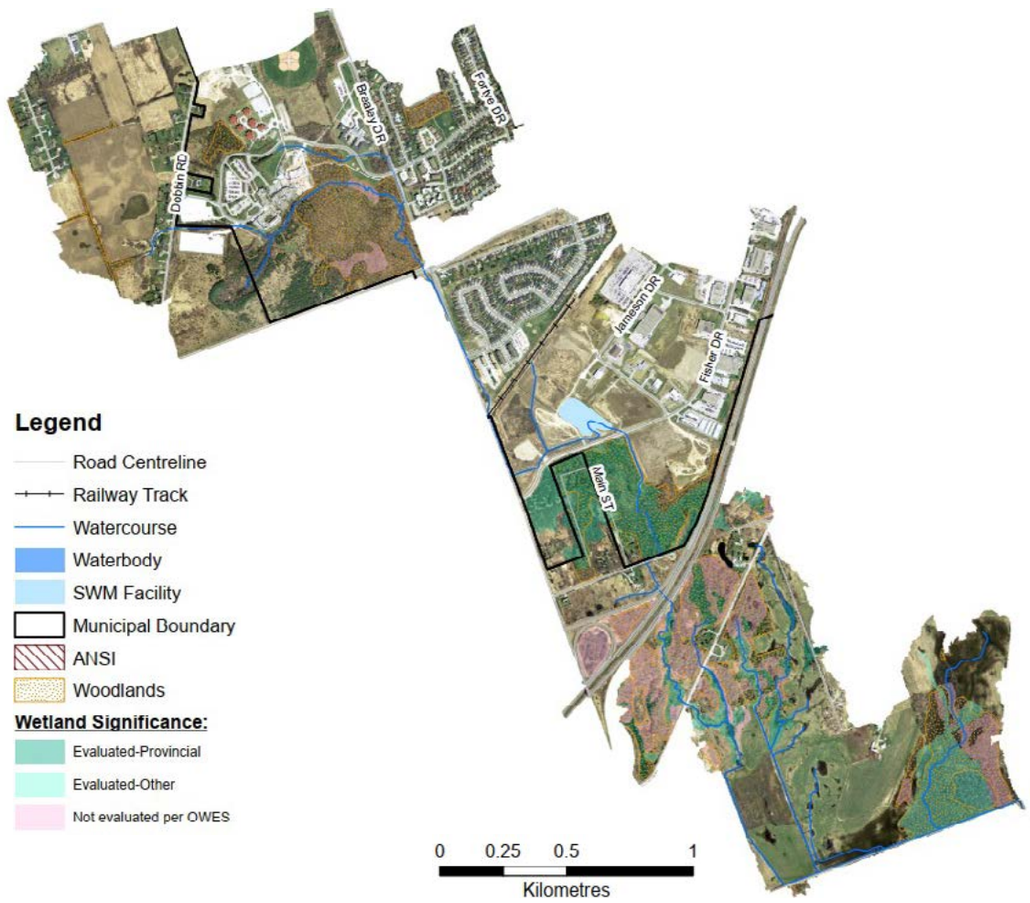
Land Use



Fleming Creek Subwatershed

Fleming Creek Overview

Fleming Creek flows into the Otonabee River south of the City of Peterborough, and is located in the Township of Cavan Monaghan. The watershed is characterized by a mixture of urban and rural landscape with some isolated woodlands and connected swamps.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
459.2	20.4	17.5	15.5

Subwatershed Health Evaluation

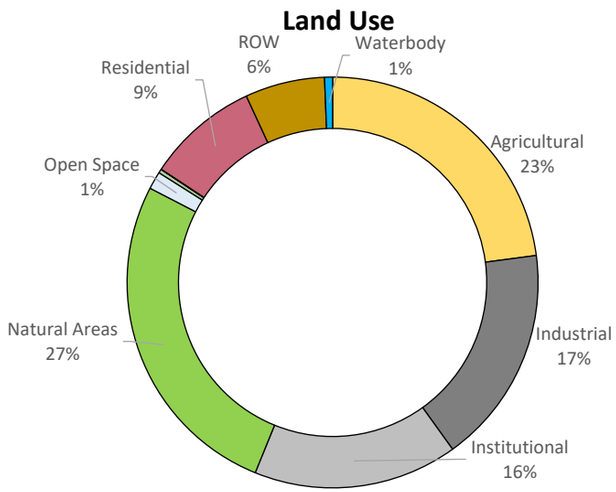
Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Fair	Insufficient Data	Poor	Priority 1

Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
4	2	0.0	78.8	30.1	16

Natural Heritage

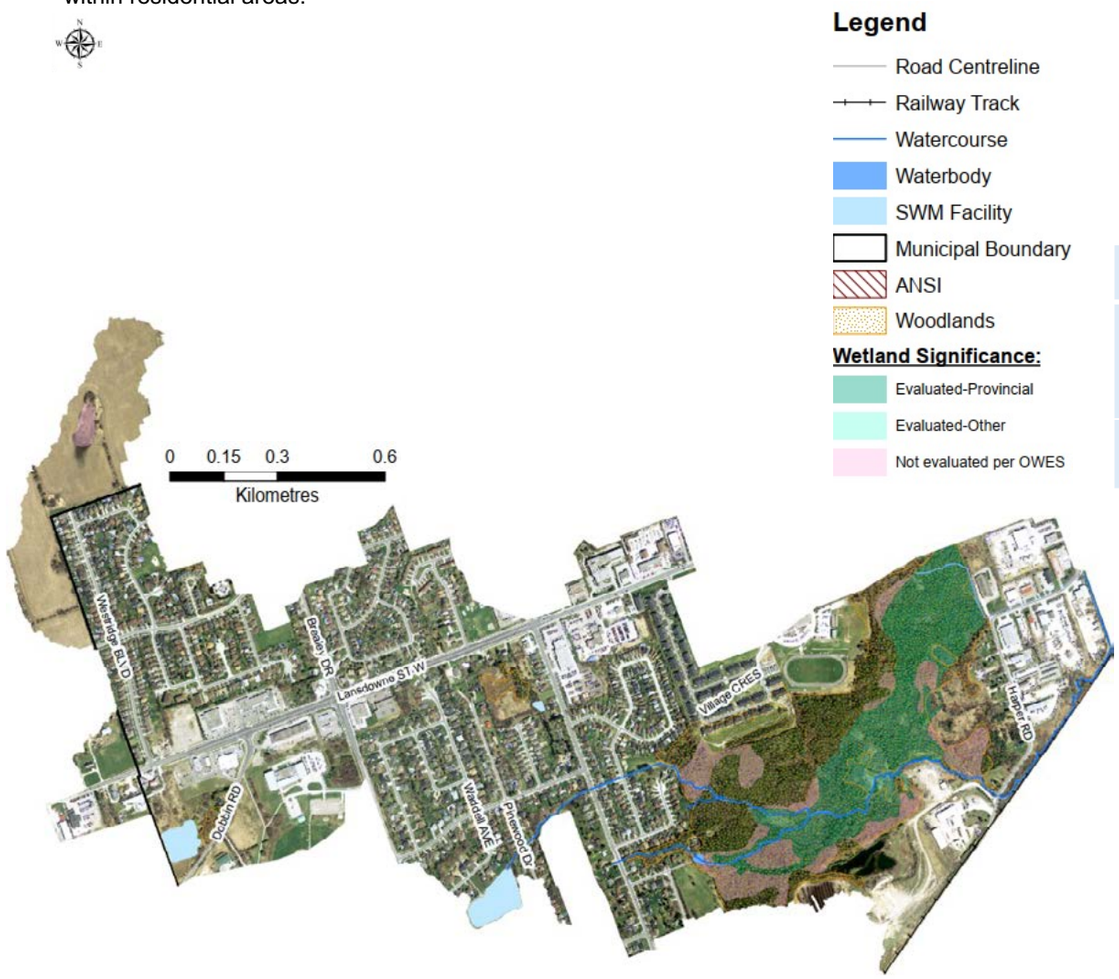
Woodlands	Upland Forest: 23.98 ha Lowland/Swamp Forest: 70.91 ha
Provincially Significant Wetland (PSW)	Total Area: 70.97 ha Provincially Significant Wetland (PSW): Peterborough Airport Wetland Complex Evaluated Wetland: Otonabee River Floodplain Swamp Complex
Areas of Natural and Scientific Interest (ANSI)	None present



Harper Creek Subwatershed

Harper Creek Overview

Harper Creek is a significant tributary of Byersville Creek, located in the southern part of the subwatershed. This subwatershed contains one of Peterborough's only large, naturally vegetated and heavily treed areas in Harper Creek Wetland and Harper Park. The subwatershed is characterized by urban landscape with a large forest and swamp feature and isolated woodlots within residential areas.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
261.7	33.7	1.9	10.9

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Good	Poor	Fair	Priority 2

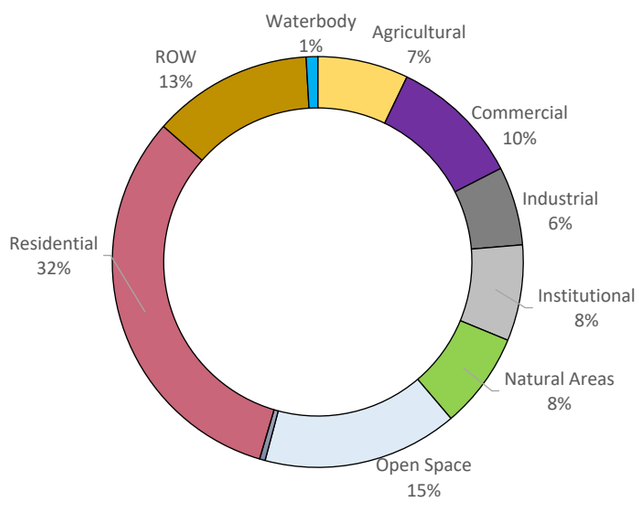
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
2	3	11.2	134.6	6.4	12

Natural Heritage

Woodlands	Upland Forest: 19.36 ha Lowland/Swamp Forest: 39.33 ha
Provincially Significant Wetland (PSW)	Total Area: 28.44 ha Provincially Significant Wetland (PSW): Harper Creek Wetland Evaluated Wetland: None present
Areas of Natural and Scientific Interest (ANSI)	None present

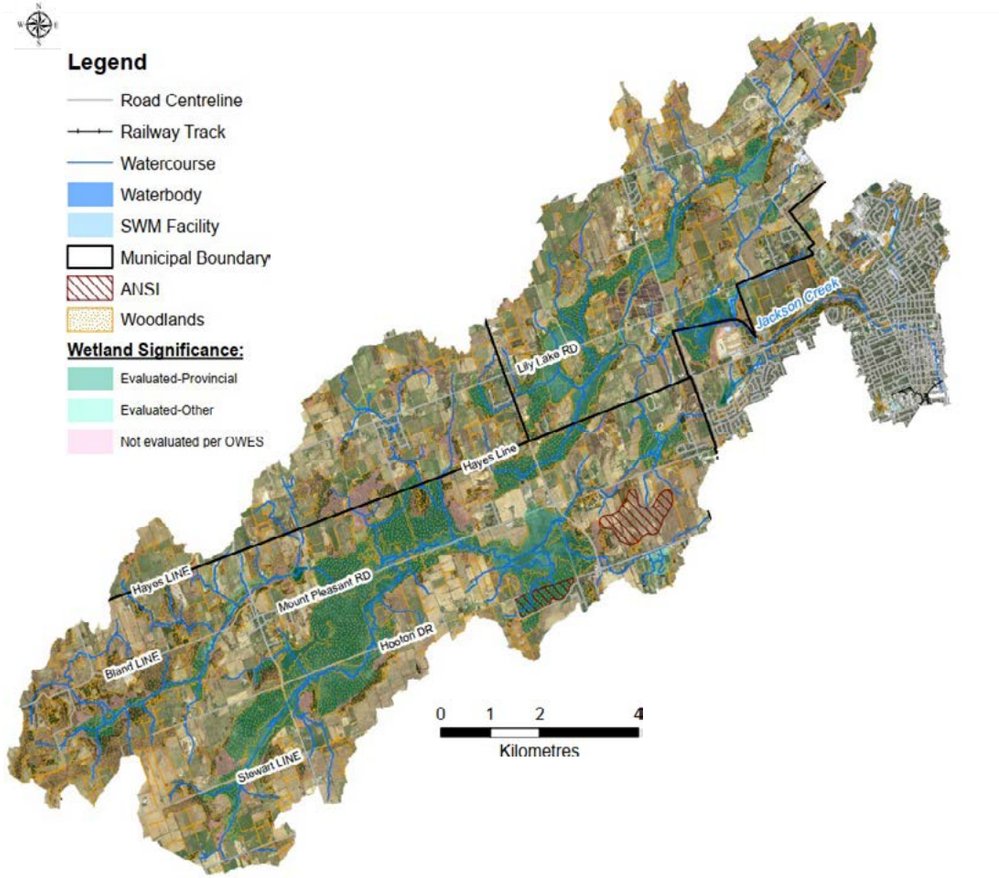
Land Use



Jackson Creek Subwatershed

Jackson Creek Overview

Jackson Creek is a tributary of the Otonabee River, with large catchment areas in the City of Peterborough, the City of Kawartha Lakes, and Townships of Selwyn and Cavan Monaghan. The subwatershed is largely rural north of the Cavan Creek subwatershed with a large connected complex of woodlands and wetlands with very little isolated natural patches. The Jackson Creek stream network includes many tributaries which flow into the main creek from the north and south. The Cavan Bog is a significant feature in the watershed. The Jackson Weir restricts flow in Jackson Creek to reduce downstream flooding by creating additional storage in Lily Lake and the nearby wetlands.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
11918.7	9.5	2.6	23.1

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Fair	Poor	Good	Priority 3

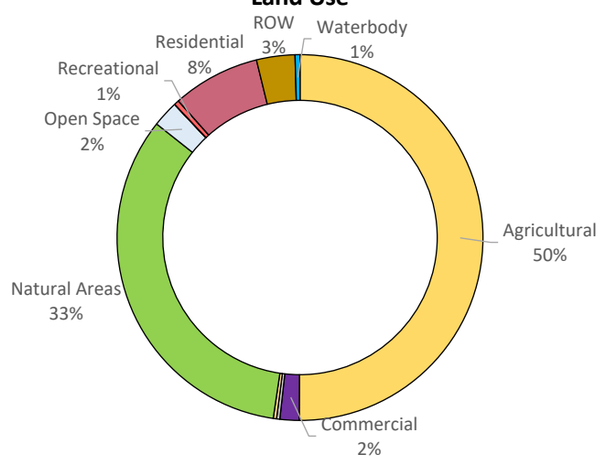
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
4	11	60.2	191.6	19.2	97

Natural Heritage

Woodlands	Upland Forest: 1025.20 ha Lowland/Swamp Forest: 2180.74 ha
Provincially Significant Wetland (PSW)	Total Area: 2751.49 ha Provincially Significant Wetland (PSW): Jackson Creek East, Jackson Creek Headwaters, Jackson Creek Lowlands, Loggerhead Marsh Evaluated Wetland: Conservation Area East, Victoria County Areas 1,2,3
Areas of Natural and Scientific Interest (ANSI)	Provincial Earth Science ANSI: Jackson Creek Drumlins Provincial Life Science ANSI: Cavan Bog

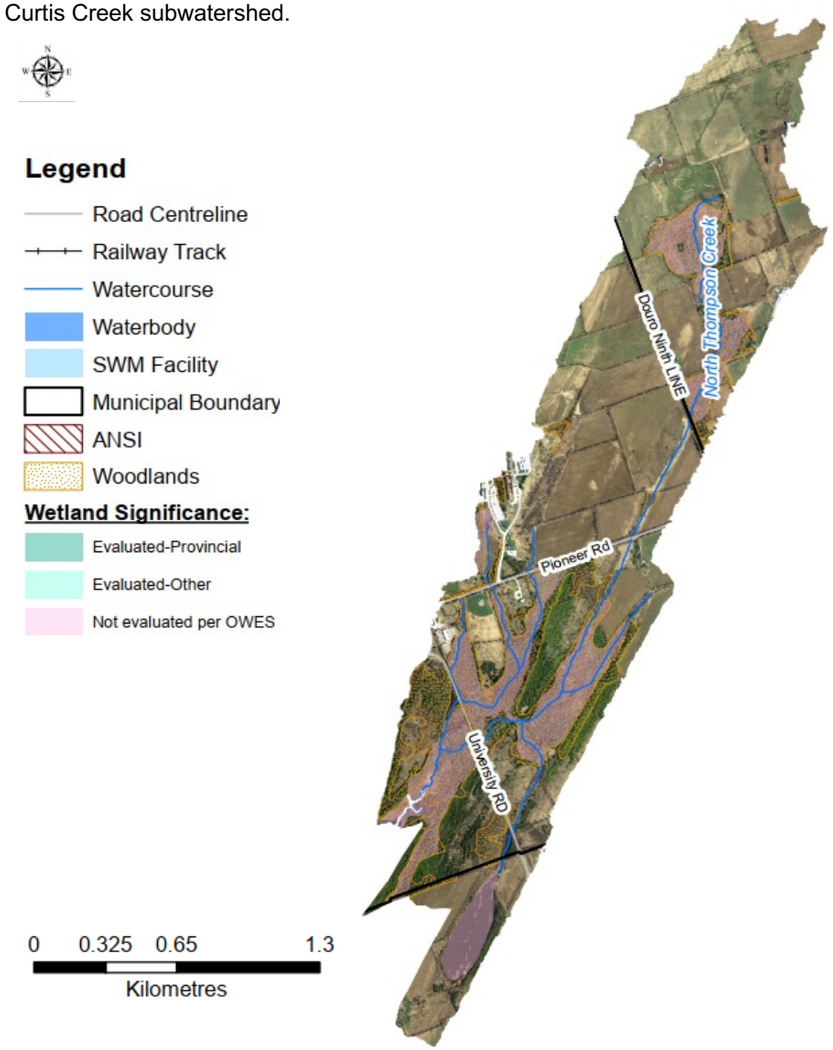
Land Use



North Thompson Creek Subwatershed

North Thompson Creek Overview

Thompson Creek is a tributary of the Otonabee River located in the City of Peterborough with headwaters in the Township of Douro-Dummer. Thompson Creek was bisected by the construction of the Trent Canal. North Thompson Creek flows into the Trent Canal. The subwatershed is narrow consisting of mostly agricultural fields with swamp/forest that is connected to natural features in Curtis Creek subwatershed.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
352.3	6.7	-	17.1

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Marginal	Good	Insufficient Data	Priority 3

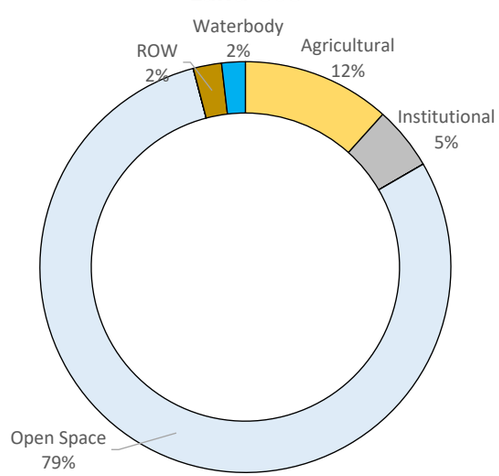
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	0	0.0	0.0	0.0	0

Natural Heritage

Woodlands	Upland Forest: 25.97 ha Lowland/Swamp Forest: 108.10 ha
Provincially Significant Wetland (PSW)	Total Area: 60.25 ha Provincially Significant Wetland (PSW): None present Evaluated Wetland: None present
Areas of Natural and Scientific Interest (ANSI)	None present

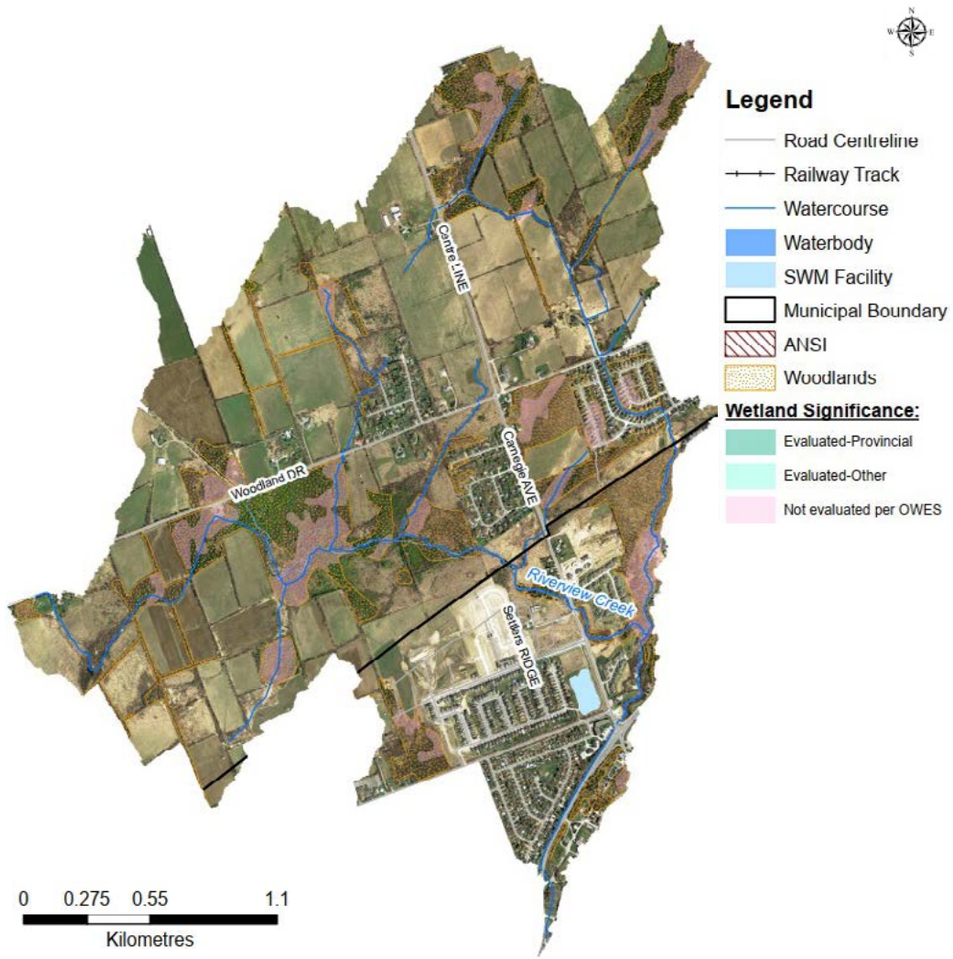
Land Use



Riverview Creek Subwatershed

Riverview Creek Overview

Riverview Creek is a tributary of the Otonabee River. The southern reaches of the creek are within the City of Peterborough, and the northern headwaters are within the Township of Selwyn. There are two significant branches of Riverview Creek which converge within the City. The subwatershed is mostly rural with some residential towards the south. Woodland patches with wet pockets are generally connected along the Riverview Creek. Hedgerows provide additional linkages between natural features.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
619.7	25.2	5.2	6.6

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Fair	Good	Marginal	Marginal	Priority 2

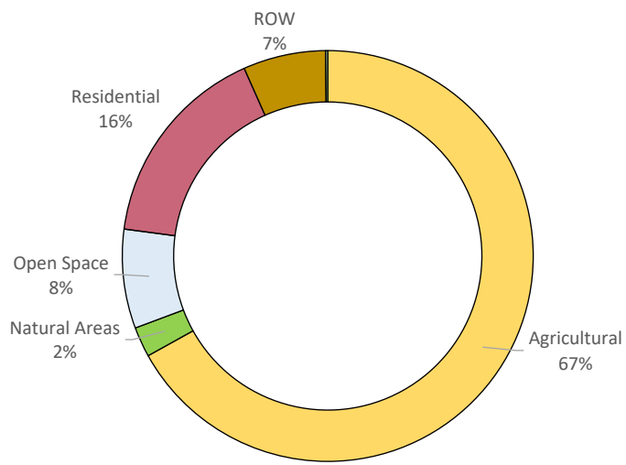
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	1	0.0	55.6	0.0	16

Natural Heritage

Woodlands	Upland Forest: 73.63 ha Lowland/Swamp Forest: 55.43 ha
Provincially Significant Wetland (PSW)	Total Area: 40.95 ha Provincially Significant Wetland (PSW): None present Evaluated Wetland: None present
Areas of Natural and Scientific Interest (ANSI)	None present

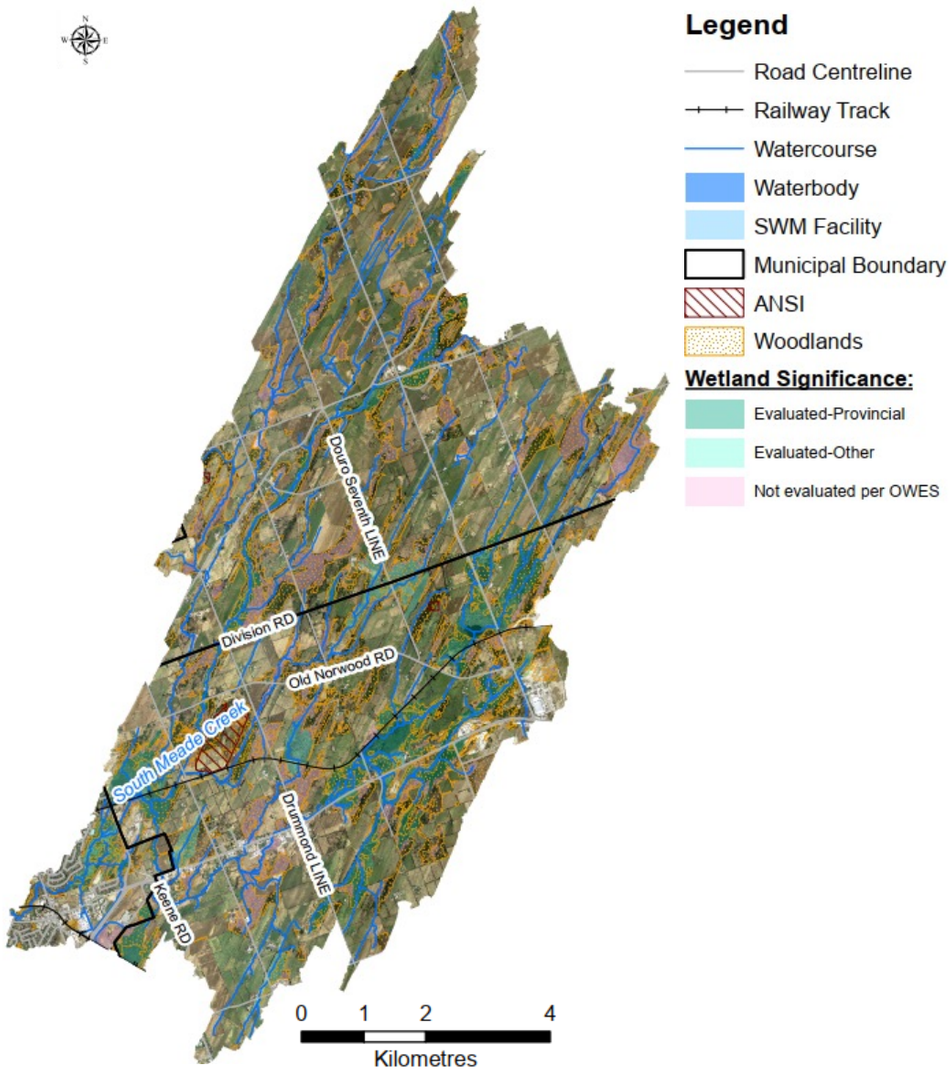
Land Use



South Meade Creek Subwatershed

South Meade Creek Overview

South Meade Creek is a tributary of the Otonabee River located in the drumlin field in the City of Peterborough and the Townships of Douro-Dummer and Otonabee-South Monaghan. Downer's Corners Wetland is a Provincially Significant wetland located within the subwatershed.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
7646.8	10.3	2.8	22.4

Subwatershed Health Evaluation

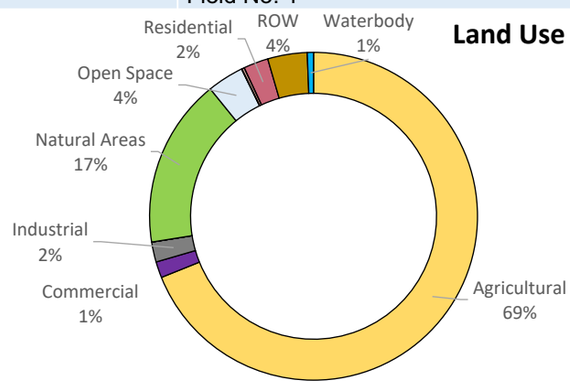
Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Marginal	Marginal	Fair	Priority 2

Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
5	1	0.1	3.9	36.8	20

Natural Heritage

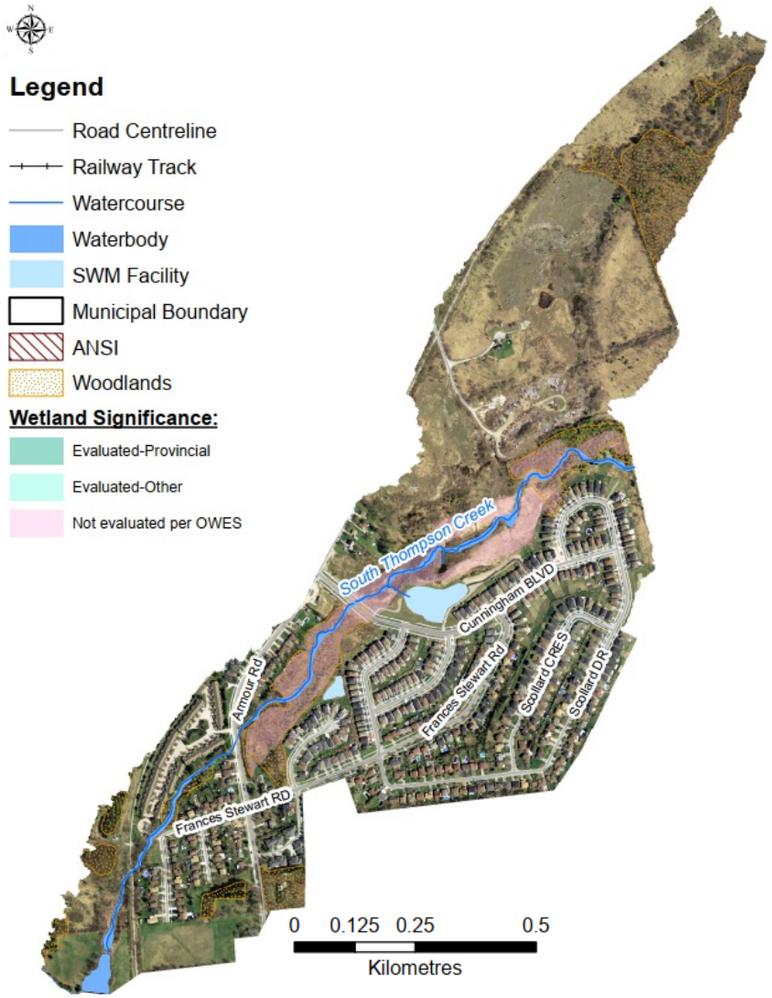
Woodlands	Upland Forest: 583.29 ha Lowland/Swamp Forest: 1113.32 ha
Provincially Significant Wetland (PSW)	Total Area: 1709.49 ha Provincially Significant Wetland (PSW): Cold Springs & Yankee Bonnet Wetland, Douro North Complex, Downer's Corners, Indian River (Warsaw South) Wetland, Meade Creek Complex, Woodview Swamp Evaluated Wetland: Burnham East Complex, Burnham Woods, Junkyard Wetland, Peterborough Fish and Game Club Wetland, Woodview Northeast Complex
Areas of Natural and Scientific Interest (ANSI)	Provincial Earth Science ANSI: Meade Creek Drumlin, Peterborough Drumlin Field No. 2 Regional Earth Science ANSI: Peterborough Drumlin Field No. 1



South Thompson Creek Subwatershed

South Thompson Creek Overview

South Thompson Creek is a tributary of the Otonabee River located in the City of Peterborough. Thompson Creek was bisected by the construction of the Trent Canal. Flows into South Thompson Creek are therefore controlled by the Thompson Creek Dam on the Trent Canal, which was designed to maintain a baseflow to South Thompson Creek. The creek is contained within a narrow wooded riparian corridor with residential development adjacent.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
102.1	23.5	9.2	6.9

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Fair	Good	Fair	Priority 3

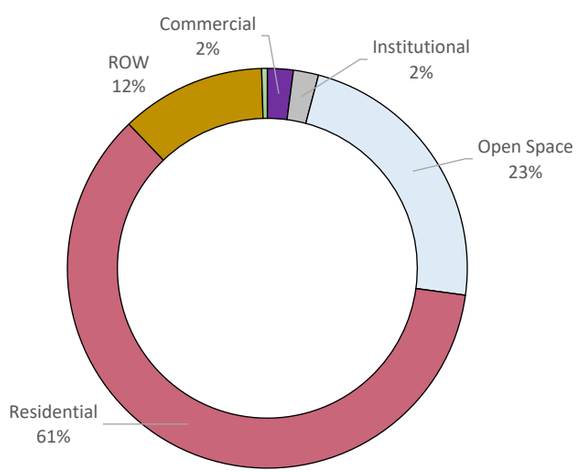
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	2	2.9	27.4	0.0	8

Natural Heritage

Woodlands	Upland Forest: 6.76 ha Lowland/Swamp Forest: 16.60 ha
Provincially Significant Wetland (PSW)	Total Area: 7.04 ha Provincially Significant Wetland (PSW): None present Evaluated Wetland: None present
Areas of Natural and Scientific Interest (ANSI)	None present

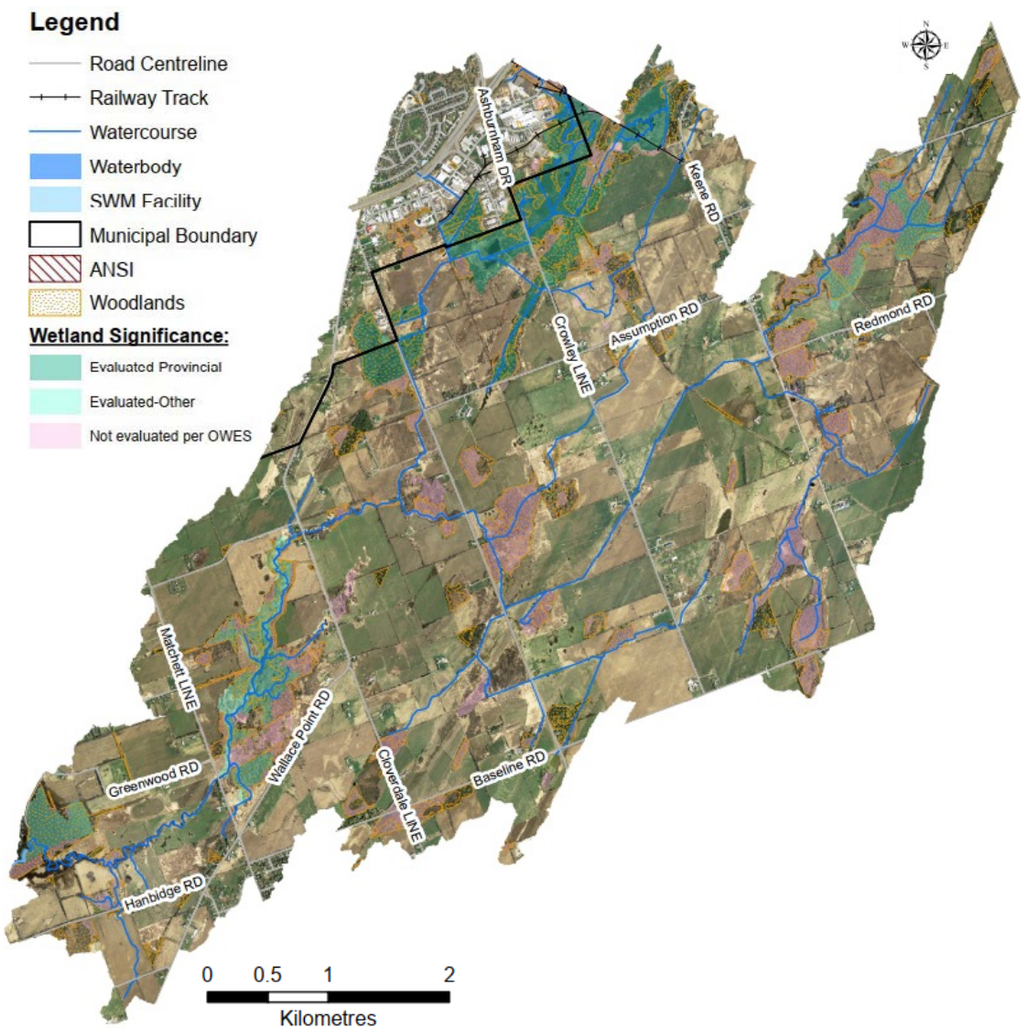
Land Use



Stewart Hall Creek Subwatershed

Stewart Hall Creek Overview

The Stewart Hall Creek Subwatershed is located to the southeast of the City of Peterborough. A portion of this subwatershed is located within the City's south-east industrial land area, but most is in the Township of Otonabee-South Monaghan. The subwatershed is characterized by Rural landscape with many small isolated woodlands and watercourse with little or no riparian buffer.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
3300.6	10.9	5.9	14.2

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Fair	Marginal	Ins. Data	Ins. Data	Priority 1

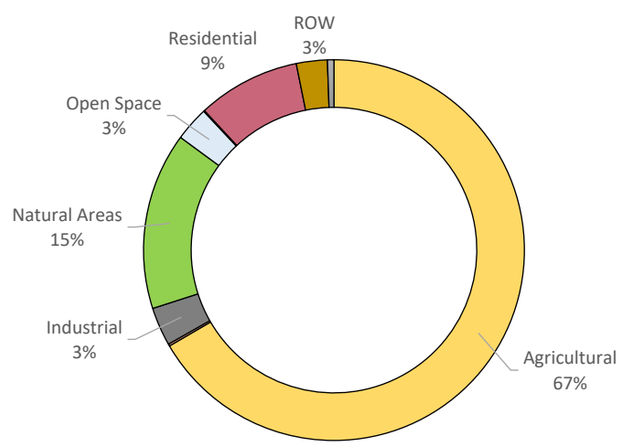
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	1	31.3	0.0	0.0	2

Natural Heritage

Woodlands	Upland Forest: 69.54 ha Lowland/Swamp Forest: 320.40 ha
Provincially Significant Wetland (PSW)	Total Area: 469.51 ha Provincially Significant Wetland (PSW): Cold Springs & Yankee Bonnet Wetland Evaluated Wetland: Junkyard Wetland, Otonabee River Floodplain Swamp Complex, Stewart Hall
Areas of Natural and Scientific Interest (ANSI)	None present

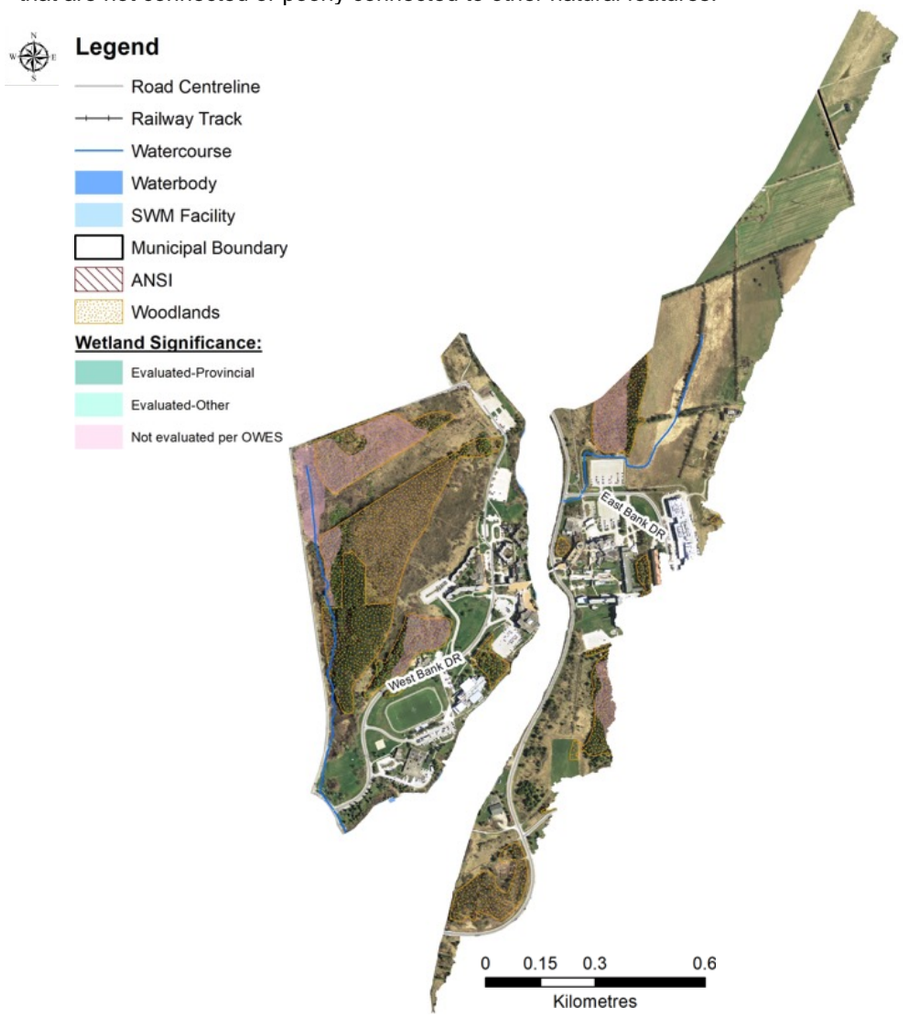
Land Use



Trent Subwatersheds

Trent Subwatersheds Overview

The two Trent subwatersheds are located on the east and west banks of the Otonabee River, but they share similar physiographic characteristics. The subwatersheds are predominantly located in the City of Peterborough. These subwatersheds are transected by the Ontabee River and contain a large woodland that is connected to adjacent natural features and smaller woodlands and wetland that are not connected or poorly connected to other natural features.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
124.7	18.0	5.4	7.1

Subwatershed Health Evaluation

Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Good	Marginal	Insufficient Data	Insufficient Data	Priority 2

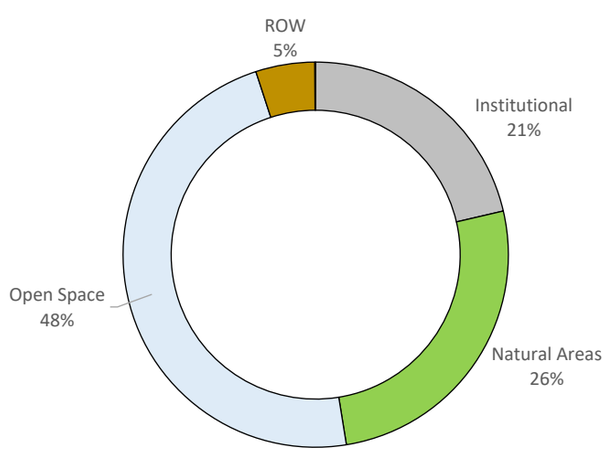
Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
0	0	0.0	0.0	0.0	2

Natural Heritage

Woodlands	Upland Forest: 18.08 ha Lowland/Swamp Forest: 24.97 ha
Provincially Significant Wetland (PSW)	Total Area: 8.87 ha Provincially Significant Wetland (PSW): None present Evaluated Wetland: None present
Areas of Natural and Scientific Interest (ANSI)	None present

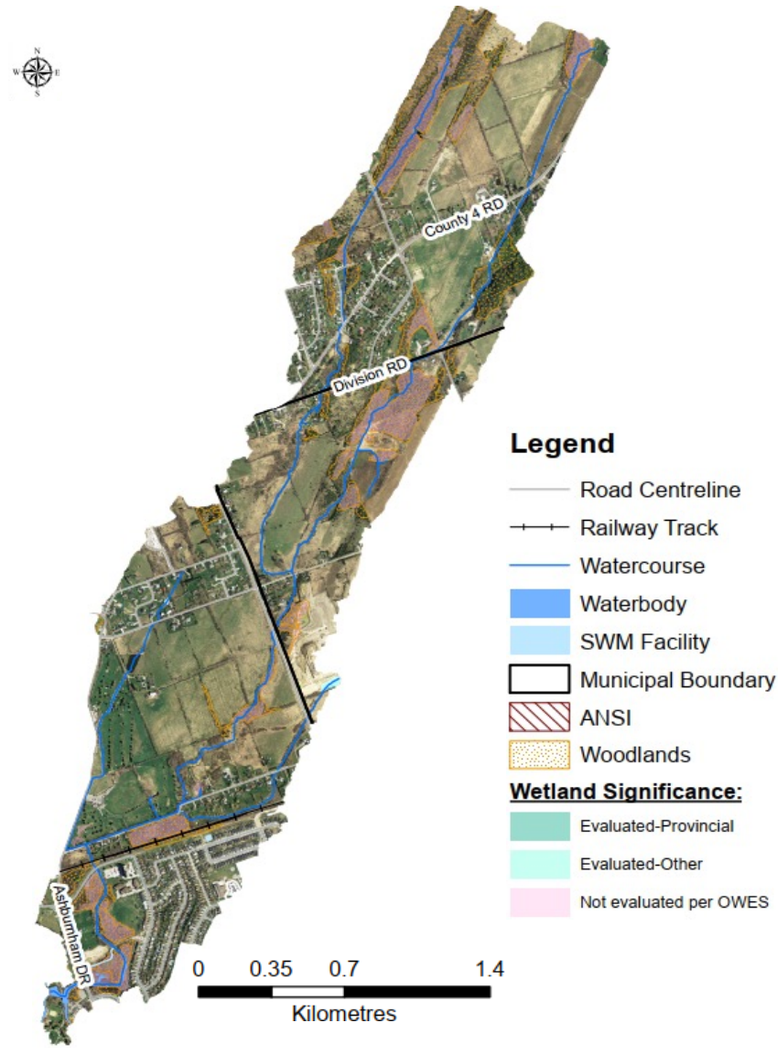
Land Use



Whitlaw Creek (North Meade) Subwatersheds

Whitlaw Creek (North Meade) Overview

Whitlaw Creek, also known as North Meade Creek, is a tributary of the Otonabee River but also connects to South Meade Creek. It is located in the Townships of Douro-Dummer and Otonabee-South Monaghan and the City of Peterborough. The subwatershed includes wetland pockets along Whitlaw creek with large stretches of watercourse with little to no riparian buffer.



General Subwatershed Stats

Drainage Area (ha)	% Impervious	% Delineated Floodplain	% Wetlands
469.7	21.3	8.9	7.1

Subwatershed Health Evaluation

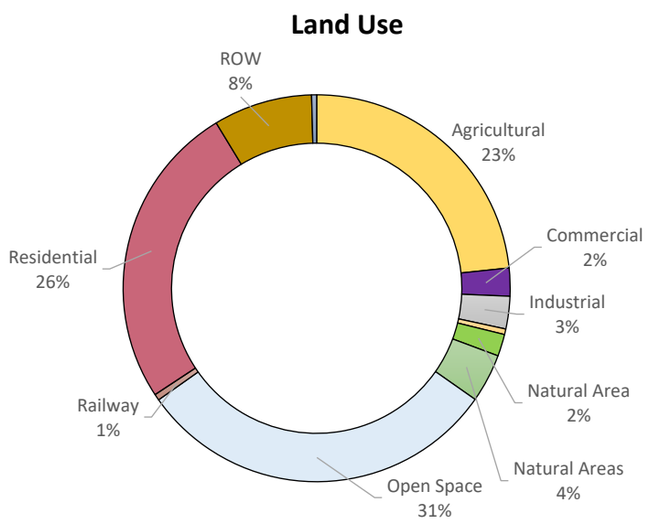
Terrestrial	Stormwater	Water Quality	Aquatic Health	Overall Priority
Fair	Marginal	Marginal	Marginal	Priority 1

Urban Stormwater Management

City OGS Units	City SWMF	Drainage Area to Quantity SWMF (ha)	Drainage Area to Quantity & Quality SWMF (ha)	Drainage Area to OGS Units (ha)	Number of SWM Outfalls
2	3	0.0	8.3	28.3	13

Natural Heritage

Woodlands	**Upland Forest: 18.08 ha** **Lowland/Swamp Forest: 51.04 ha**
Provincially Significant Wetland (PSW)	Total Area: 29.54 ha Provincially Significant Wetland (PSW): None present Evaluated Wetland: None present
Areas of Natural and Scientific Interest (ANSI)	None present



OUR WATERSHED
OUR BLUEPRINT

www.peterborough.ca/watershedplan