



Central
Lake Ontario
Conservation

2020 Bowmanville/Soper Creek Watershed Plan

DRAFT

Acknowledgements and Special Thanks



Many members of CLOCA's staff have played a role in the review and update of the Bowmanville/Soper Creek Watershed Plan. This Watershed Plan is reflective of the significant effort undertaken during the last five years by CLOCA's Natural Heritage, Engineering and Groundwater teams who collected field data, analyzed the findings, prepared reports and reviewed this Plan and its components. Also, significant effort has been undertaken by the Planning team to work with the development community to protect the identified Natural Heritage System, and by the Community Engagement team to ensure our watershed community continues to be engaged in CLOCA's work. A special thank you goes to the work of CLOCA's GIS staff who have generated the maps, managed the data, produced display materials, provided statistics and contributed many hours to the creation, evaluation and analysis of updated scenario modelling. Other members of CLOCA staff have provided their support, which has been invaluable during consultation.

I wish to thank those individuals external to CLOCA, who have participated in the Bowmanville/Soper Creek Watershed Plan consultation process. Your insightful comments and suggestions have positively contributed to the updated actions and recommendations found in this Plan.

Without the expertise, advice, support and knowledge provided by the many contributors, the updated Watershed Plan would not be what it is today.

Thank you to everyone for your support!

A handwritten signature in black ink, appearing to read 'Jamie Davidson'.

Jamie Davidson,
Acting Director, Watershed Planning & Natural Heritage
Central Lake Ontario Conservation (CLOCA)

Healthy Watersheds for Today and Tomorrow



DRAFT

Executive Summary

A watershed plan examines the environment and human activities within a watershed area and assesses the relationships between these activities to determine how the ecosystems of the watershed should be managed to ensure they retain their ecological integrity and health in a sustainable manner.

Since the development of the 2013 Bowmanville/Soper Creek Watershed Plan (WSP) much has changed. This WSP recognizes the updated urban, rural and natural environment conditions present in the watershed (up to 2017), considers potential future growth, planning policy requirements, climate change and presents specific recommendations to protect CLOCA's natural resources.

This updated WSP is to be used by CLOCA, municipalities, planning authorities, agencies and other stakeholders as the definitive tool to guide decisions concerning the effective management of watershed resources in response to a changing environment.

As part of the WSP update process, CLOCA has implemented a refined, science-based framework for watershed planning. This framework provides a systematic, comprehensive, and consistent process that links actions to results and ultimate outcomes.

CLOCA's new watershed plan **Vision** is *a healthy, resilient watershed that sustains ecological integrity for the plant, animal and human communities within it*. The framework identifies goals, strategies, objectives and actions to achieve the watershed plan vision. The 6 **Targets** that have been identified will be used to evaluate watershed health: *Natural Cover, Forests, Streams, Coastal Wetlands, Human Health and Community Engagement*. **Goals** for each target have been set, 29 in total, and are stated in terms of measurable indicators; as of 2017, 5 of the 29 goals have been met.

To achieve the goals of the watershed plan, three overarching **strategies** have been identified:

- *conserve, enhance and restore ecosystems of the Bowmanville/Soper creek watershed;*
- *promote responsible land use practices to protect ecological and human health;* and
- *encourage, acquire, and expand stakeholder support for the watershed plan.*

The desired outcomes from the implementation of each strategy have been stated as short-term objectives. The timeframe for achieving these 19 **objectives** has been set within the next 5 years, and progress will be reported on in the next WSP update.

Achieving a healthy, resilient watershed requires the cooperation and dedicated action of all impacted stakeholders. Every person has a role to play in the environmental, social and economic health of the Bowmanville/Soper creek watershed through their everyday lives. To help achieve the vision of the WSP, CLOCA has identified a suite of **actions** to be completed by CLOCA, Municipalities and community members. Together, we ensure healthy watersheds for today and tomorrow.

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Acronyms

AFN	Alderville First Nation	MCR	Municipal Comprehensive Review
ANSI	Area of Natural and Scientific Interest	MNO	Métis Nation of Ontario
CLOCA	Central Lake Ontario Conservation	MNRF	Ministry of Natural Resources
DRCWMP	Durham Region Coastal Wetland Monitoring Project	NGO	Non-Government Organization
ELC	Ecological Land Classification	NHS	Natural Heritage System
FDC	Flood Damage Centre	OP	Official Plan
GGH	Greater Golden Horseshoe	ORM	Oak Ridges Moraine
HVA	High Volume Aquifer	ORMCP	Oak Ridges Moraine Conservation Plan
HVRA	High Volume Recharge Area	PSW	Provincially Significant Wetland
IBI	Index of Biotic Integrity	SAR	Species at Risk
KHA	Key Hydrologic Area	SGRA	Significant Groundwater Recharge Area
LIB	Lake Iroquois Beach	WSP	Watershed Plan
LIDAR	Light Detection and Ranging		



Section 1 – Planning for watershed health

Introduction

In 2012/2013, Central Lake Ontario Conservation (CLOCA) prepared Watershed Plans (WSP) for each of the major watersheds within its jurisdiction. During the following 5 years (2012 to 2017), land use and legislative changes occurred, new challenges emerged, and knowledge gaps were filled that affected watershed planning. This update to the Bowmanville/Soper creek WSP addresses these changes by updating the maps and land use models in the original WSP, identifying significant socio-political changes, introducing a refined, science-based approach to achieving and maintaining watershed health, and highlights progress that has been made over the past 5 years.

Implementation of the actions proposed in this WSP will ensure that the natural heritage and water resources in the watershed will continue to sustain healthy plant, animal, and human communities, provide essential services to maintain a high quality of life, and be resilient enough to endure the stressors that climate change will impose. These actions, however, can only be achieved with the continued support and active engagement of municipal partners, residents and private landowners, Indigenous partners, Non-Government Organizations, businesses and agencies. CLOCA will look to these stakeholders to help implement the actions of this WSP.

Legislation

Watershed plans are recognized as a legislated land use and policy planning tool that considers human impacts on the environment to protect the health of local watersheds. Since 2013, amendments to Federal and Provincial legislation, land use plans, and municipal policy have occurred. This WSP includes a review of relevant legislation and guidance documents and identifies their relationship to watershed planning (Appendix B). Many of these documents have placed a greater emphasis on the need for watershed planning and, increasingly, there is recognition of, and support for, the importance of maintaining, restoring, and improving natural heritage systems as a means to mitigate and adapt to climate change. This reinforces the importance of incorporating the recommended WSP policies into Official Plans (OP) and other municipal policy tools.

The new watershed vision, goals, and strategies are consistent with recent amendments to Provincial land use plans as a result of the 2015-17 comprehensive review. It is recognized that legislation at all levels of government is amended from time to time to reflect current issues and that these changes may impact how the actions, best management practices and policy recommendations detailed in this WSP are implemented.

Consultation

As part of this update, CLOCA consulted with numerous partners to receive feedback about the 2012 WSP and identify changes that should be incorporated into this WSP. Consultation was comprised of meetings with municipal partners, stakeholder discussions, public information centres, and online surveys. Some of the feedback included making the updated WSP more user-friendly, re-designating some of the recommended OP policies to operating guidelines, and focusing on the protection and enhancement of natural areas in the watershed.

The consultation process also provided the opportunity to gain traditional knowledge and align the vision and guiding principles for the updated WSP with some of the priorities of the Métis Nation of Ontario (MNO) and the Williams Treaties First Nations¹.

Through the WSP engagement process the MNO shared with CLOCA their 2010 Traditional Plant Use Study, which states that *‘the relationship between Métis communities and their traditional territories is a symbolic one. One cannot be healthy without the other one being healthy. As such, what happens to these traditional territories in relation to use, development, ecosystems and sustainability are of fundamental importance to the survival of the Métis communities. If these territories are indelibly changed or damaged, the Métis people and communities will be too.’* Also, that *‘Métis are stewards of their traditional territories and have the responsibility to work with First Nations, governments and others to protect them.’*

The Williams Treaty First Nation identifies protection, conservation and sustainable collaborative managements as priorities, which are exemplified by the Alderville First Nation (AFN) community consultation protocol, which requires that the AFN *‘preserve and enhance a mutually respectful relationship with the Environment ...co-exist with Mother Earth and protect this relationship. AFN under its laws has the responsibility to care for its Traditional Territory and/or Treaty Territory for future generations, to preserve and protect wildlife, lands, waters, air and resources.’*

The feedback from this consultation process – that the relationship between watershed health and human health is important, that it is our responsibility to act as good stewards of our watershed resources, and that we must work collectively to protect and restore watershed health – are principles that are encompassed in this updated WSP.



¹ The Williams Treaty represents the seven nations of the Chippewas of Beausoleil, Georgina Island and Rama, and the Mississaugas of Alderville, Curve Lake, Hiawatha and Scugog Island.

Population growth and climate change

Between 2007 and 2017, the population of the Region of Durham increased by 15%, which is significantly higher than the rest of Ontario (11%). In the next 13 years, the population is expected to grow by another 28%, and by 2041 there will be 1.19 million people living in the Region. With this growth comes the need for more residential, commercial, and institutional land, more roads, and more spaces for recreation. At the same time, climate change is expected to bring more severe weather events to Southern Ontario. These pressures will have a negative impact on watershed health if mitigation and adaptation strategies are not put in place to protect the natural heritage and water resources in the watershed. CLOCA has developed a natural heritage system that, if protected and restored, will help the watershed withstand the environmental stress of climate change and continue to deliver the environmental services that sustain its communities.

POPULATION GROWTH IN DURHAM REGION



In response to the forecasted growth, the Region of Durham is updating its official plan through a municipal comprehensive review (MCR) process known as *Envision Durham*, the goal of which is to develop a “progressive and forward-looking land use planning vision for the region to 2041”. In response to climate change, the Region of Durham has been working with various stakeholders to develop an updated climate change regional ensemble model that uses key indicators, such as temperature and precipitation, to predict regional changes under different climate scenarios. The results from this updated model will help inform the Region’s climate change adaptation and mitigation strategies and will be used by CLOCA to develop a *Natural Heritage System Climate Change Vulnerability Assessment* to further identify and prioritize vulnerable areas within the jurisdiction. This model may also be used to develop additional adaptive measures not currently addressed through the existing watershed health targets.

Everyone has an important role to play in maintaining healthy watersheds and resilient communities, and action is needed at all levels to manage the risks associated with climate change. Preserving and enhancing our existing natural resources while our communities are growing is a critical and cost-effective way of adapting to climate change impacts while providing additional social, economic, and health benefits for the community.

Watershed planning framework

CLOCA has implemented a refined, science-based framework for watershed planning and the components of this framework have been incorporated into this WSP update. The framework provides a systematic, comprehensive, and consistent process that links actions to results and ultimate outcomes.

Vision

The first component of the framework is a clear vision statement that describes the ultimate desired state of the watershed. CLOCA's new WSP vision is *a healthy, resilient watershed that sustains ecological integrity for the plant, animal and human communities within it.*

Targets, attributes and indicators

To achieve the watershed vision it is necessary to identify the components of the watershed (referred to as targets) that represent the ecological and human focus of the WSP. CLOCA has identified six targets for this WSP: *Natural Cover, Forests, Streams, Coastal Wetlands, Human Health and Community Engagement.* For each target, attributes have been identified that best represent whether a target is in good condition or functioning. Attributes are then measured with indicators – specific measurable characteristics or collections of characteristics combined into indices. Targets, attributes and indicators are the basis for setting goals, carrying out actions and measuring WSP success.

Goals

CLOCA has identified specific goals outlining what this WSP aims to accomplish over the next 20 years. Goals have been identified for each target, stated in terms of the desired future status of each indicator.

Strategies

To ensure success, three strategies have been selected to focus the actions of CLOCA, municipal partners and the watershed community towards achieving the watershed goals:

1. Conserve, enhance and restore ecosystems of the Bowmanville/Soper creek watershed.
2. Promote responsible land use practices to protect ecological and human health.
3. Encourage, acquire and expand stakeholder support for the watershed plan.

Objectives

The intended outcomes from the implementation of each of the three strategies have been stated as short-term objectives.



Actions

CLOCA actions

In the 2013 Bowmanville/Soper creek WSP there were 23 priority CLOCA Action Plans identified to help achieve specific watershed targets. Many of these documents have been completed and contributed to the updated mapping, knowledge, and recommendations incorporated in this updated WSP. See Appendix C for more information on CLOCA Action Plans.

Additional action items for CLOCA to undertake, which are intended to complement, support, and inform Regional and municipal programs, projects, and corporate priorities, and provide a greater level of detail to achieve the watershed goals and objectives, have also been identified in this WSP.

Municipal actions

This update continues to follow the previous WSP format of classifying recommended Municipal Official Plan policies as fundamental, key, or voluntary. A complete list of Official Plan policy recommendations, both existing and new, is included in Appendix D. Where a recommendation revokes and replaces a previous one a note has been made with the previous policy reference number.

This update recognizes that some recommendations may be more appropriate to adopt as operating guidelines than as OP policies and identifies those in Appendix D. This WSP also recommends that municipalities recognize components of their NHS as natural assets within asset management plans to help achieve the WSP goals.

As in the previous WSP, it is understood that municipalities may alter some wording within the recommended policies and guidelines to better conform to their existing requirements; however, it is important that these revisions do not alter the meaning or intent of the provided policies and guidelines.

Community actions

This WSP includes specific action items for the watershed community to undertake, many of which may be done in partnership with CLOCA, to help achieve the WSP goals. These are discussed in Section 3 and listed in Appendix A (Table 2).





Watershed plan guiding principles

Communicate, educate and inspire

Encourage and provide technical advice for the implementation of best management practices, new technologies and low-impact development techniques that protect human safety, property and promote ecological health.

Leaders in integrated watershed management

Promote current and ecologically-sustainable watershed management practices by providing guidance that is derived from sound science and technical expertise.

Operate responsibly and sustainably

Use sound science, technical expertise, and leadership to effectively administer applicable legislation and regulations to protect human safety, property and ecological integrity.

Collaborate and partner

Support projects and partnerships that improve habitat in the watershed and promote a diversity of flora and fauna, including Species at Risk (SAR).

Advance watershed science and knowledge

Effectively monitor key watershed health indicators and communicate trends to municipalities and other partners to support conservation, restoration, and mitigation efforts to ensure continued human and ecological health.

Watershed existing conditions

The Bowmanville/Soper creek and its tributaries drain an area of approximately 169 km², and the Bowmanville/Soper watershed is one of 4 major watersheds in the CLOCA jurisdiction. It is located in the Region of Durham as Figure 1 illustrates. Watersheds are comprised of a mix of natural and non-natural (anthropogenic) components, both of which are influenced, to varying degrees, by the physical geography of the watershed. How a watershed changes over time, i.e., how the proportion of natural to non-natural components changes, is influenced by the policies that protect or promote given components or areas within the watershed. Watershed planning is at the intersection of these and it aims to deliver a blueprint for growth that maintains the ecological integrity of the watershed.

Changes to the components, or the policies that influence them, have the potential to alter the WSP as well, so it is important to update the existing conditions of the watershed periodically to maintain a current WSP. The components that factored into the development of the 2020 Bowmanville/Soper creek WSP (Figure 1) are described below and any changes that have occurred since 2012 are discussed.

Natural heritage resources

The 2017 vegetation communities in the watershed are represented by CLOCA's Ecological Land Classification (ELC) dataset. It is updated by CLOCA as new orthophotography is acquired. No significant changes have occurred to this map since 2012.

No new Provincially Significant Wetlands (PSW) or Areas of Natural and Scientific Interest (ANSI) have been identified in the 5 years following the original WSP; however, the Ministry of Natural Resources (MNRF) occasionally updates the boundaries of these features so an updated natural heritage resources map has been included in this update (Figure 2). All wetlands in the watershed have also been included in Figure 2 as they are considered *Key Natural Heritage Features* in Provincial land use planning and policy documents.

A **Watershed** is an area of land drained by a river or creek and its tributaries into a body of water.



Water resources

In 2017, Key Hydrologic Areas (KHA) were introduced as important components to consider in the water resource system in both the Greenbelt Plan and the Growth Plan for the Greater Golden Horseshoe (GGH). The 2017 Greenbelt Plan defines KHAs as including *significant groundwater recharge areas* (SGRA), *highly vulnerable aquifers* (HVA) and *significant water contribution areas*. At the time of this update, the definition of *significant water contribution areas* was still being determined and, consequently, the KHAs shown in Figure 3 include only SGRAs (as defined by Source Water Protection) and HVAs.

Ecologically Significant Groundwater Recharge Areas (ESGRA) have been developed by CLOCA to identify important groundwater recharge areas for hydrologically-sensitive natural heritage features, such as wetlands. Although not included in the definition of KHAs, these areas are important to protect if the hydrologically-sensitive features in the landscape are to be protected and maintained. For this reason, ESGRAs have also been included as part of the water resource system in Figure 3 and CLOCA encourages policies that protect these areas.

Regional policy, regulated areas & Flood Damage Centres

The headwaters of the Bowmanville/Soper creek watershed originate in the Oak Ridges Moraine (ORM) and its watercourses flow south through the Lake Iroquois Beach (LIB) and outlet into Lake Ontario. The Greenbelt area encompasses all of the ORM and much of the LIB in the watershed, and all of the major Bowmanville/Soper creek valley lands. In 2017 the Greenbelt Plan expanded its boundary to include the urban valley lands in the watershed and this change is reflected in Figure 4.

The urban boundary for the Municipality of Clarington has not changed since 2012 and Figure 4 shows the most current urban boundary, as presented in Regional and municipal OPs.

The 2017 regulated areas, which were updated to incorporate CLOCA's most current ELC, PSW and hazard land layers, are shown in Figure 5. The map also displays the Flood Damage Centres (FDC) in the watershed, which were updated in response to the completion of the 2017 CLOCA FDC Upgrading report (available online at <https://www.cloca.com/action-plans>).

The FDC Upgrading report identifies areas in the watersheds that are vulnerable to flooding and evaluates the level of risk to life and property. In the Bowmanville/Soper creek watershed there are 21 flood damage centres: 1 is considered moderate risk and the remaining 20 are considered low risk. One of these has been identified as an *Area of Interest*.

FLOOD DAMAGE CENTRES

Areas consisting of residential, commercial and institutional development that are adjacent to a creek and prone to flooding that threatens the safety, welfare of people, and damage to public or private property.

FLOODWAY

The inner portion of the flood plain representing the area required for the safe passage of flood flow and/or the area where flood depths and/or velocities are considered to be such that they pose a potential threat to life and/or property.

FLOOD FRINGE

The outer portion of the flood plain where flood depths and velocities are less severe and where development may be permitted subject to certain established standards and procedures.

Figure 1: Bowmanville/Soper creek watershed

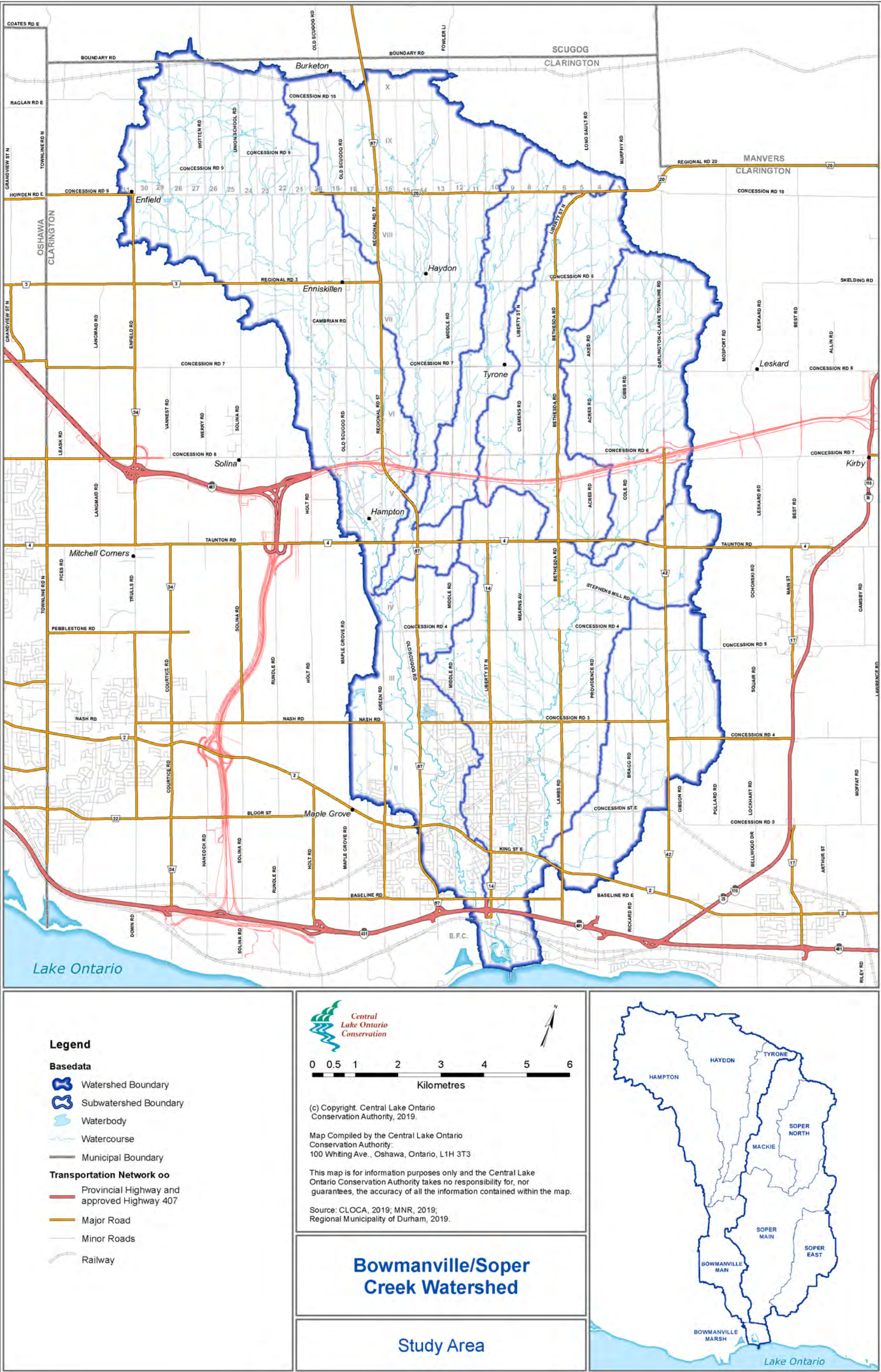
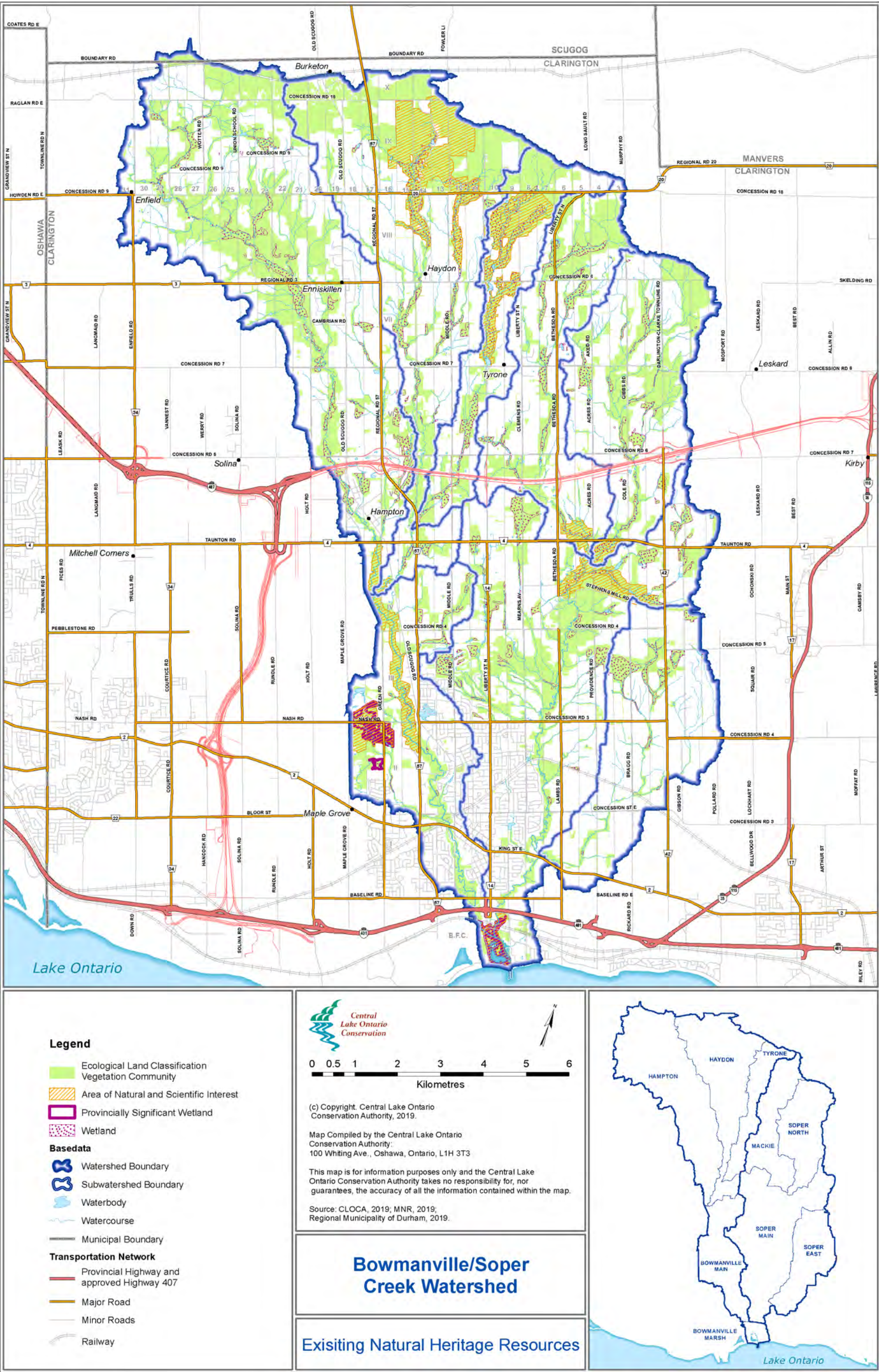


Figure 2: Natural heritage resources



Key Hydrologic Area

- Significant Groundwater Recharge Areas
- High Vulnerability Aquifer
- Significant Surface Water Contribution Areas *

Key Hydrologic Features

- Waterbody
- Wetland
- Spring and Seep **
- Watercourse

ESGRA

- Watershed Boundary
- Subwatershed Boundary
- Municipal Boundary

Transportation Network

- Provincial Highway and approved Highway 407
- Major Road
- Minor Roads
- Railway

* Note: Not currently available
** Note: Data available only within ORM extent

Bowmanville/Soper Creek Watershed

Water Resource Systems

Central Lake Ontario Conservation Authority, 2019.

Map Compiled by the Central Lake Ontario Conservation Authority:
100 Whiting Ave., Oshawa, Ontario, L1H 3T3

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Source: CLOCA, 2019; MNR, 2019; Regional Municipality of Durham, 2019.

Map Details:

- Scale:** 0 to 6 Kilometres
- North Arrow:** Indicated by a stylized arrow pointing North.
- Inset Map:** Shows the location of the Bowmanville/Soper Creek Watershed within the larger context of the Central Lake Ontario Conservation Authority's jurisdiction, including areas like HAMPTON, HAYDON, TYRONE, SOPER NORTH, MACKIE, SOPER MAIN, SOPER EAST, BOWMANVILLE MAN, and BOWMANVILLE MARSH.
- Geographic Labels:** The main map includes labels for various roads (e.g., CONCESSION RD 1, CONCESSION RD 2, CONCESSION RD 3, CONCESSION RD 4, CONCESSION RD 5, CONCESSION RD 6, CONCESSION RD 7, CONCESSION RD 8, CONCESSION RD 9, CONCESSION RD 10, CONCESSION RD 11, CONCESSION RD 12, CONCESSION RD 13, CONCESSION RD 14, CONCESSION RD 15, CONCESSION RD 16, CONCESSION RD 17, CONCESSION RD 18, CONCESSION RD 19, CONCESSION RD 20, CONCESSION RD 21, CONCESSION RD 22, CONCESSION RD 23, CONCESSION RD 24, CONCESSION RD 25, CONCESSION RD 26, CONCESSION RD 27, CONCESSION RD 28, CONCESSION RD 29, CONCESSION RD 30, CONCESSION RD 31, CONCESSION RD 32, CONCESSION RD 33, CONCESSION RD 34, CONCESSION RD 35, CONCESSION RD 36, CONCESSION RD 37, CONCESSION RD 38, CONCESSION RD 39, CONCESSION RD 40, CONCESSION RD 41, CONCESSION RD 42, CONCESSION RD 43, CONCESSION RD 44, CONCESSION RD 45, CONCESSION RD 46, CONCESSION RD 47, CONCESSION RD 48, CONCESSION RD 49, CONCESSION RD 50, CONCESSION RD 51, CONCESSION RD 52, CONCESSION RD 53, CONCESSION RD 54, CONCESSION RD 55, CONCESSION RD 56, CONCESSION RD 57, CONCESSION RD 58, CONCESSION RD 59, CONCESSION RD 60, CONCESSION RD 61, CONCESSION RD 62, CONCESSION RD 63, CONCESSION RD 64, CONCESSION RD 65, CONCESSION RD 66, CONCESSION RD 67, CONCESSION RD 68, CONCESSION RD 69, CONCESSION RD 70, CONCESSION RD 71, CONCESSION RD 72, CONCESSION RD 73, CONCESSION RD 74, CONCESSION RD 75, CONCESSION RD 76, CONCESSION RD 77, CONCESSION RD 78, CONCESSION RD 79, CONCESSION RD 80, CONCESSION RD 81, CONCESSION RD 82, CONCESSION RD 83, CONCESSION RD 84, CONCESSION RD 85, CONCESSION RD 86, CONCESSION RD 87, CONCESSION RD 88, CONCESSION RD 89, CONCESSION RD 90, CONCESSION RD 91, CONCESSION RD 92, CONCESSION RD 93, CONCESSION RD 94, CONCESSION RD 95, CONCESSION RD 96, CONCESSION RD 97, CONCESSION RD 98, CONCESSION RD 99, CONCESSION RD 100), towns (e.g., BURKETO, ENFIELD, HAYDON, TYRONE, HAMPTON, SOLINA, MITCHELL CORNERS, MAPLE GROVE, KIRBY, LESKARD), and geographical features (e.g., Lake Ontario, B.F.C.).

Legend

- Oak Ridges Moraine
- Lake Iroquois Beach
- Greenbelt
- Urban Boundary (2015 Official Plan)

Basedata

- Watershed Boundary
- Subwatershed Boundary
- Waterbody
- Watercourse
- Municipal Boundary

Transportation Network

- Provincial Highway and approved Highway 407
- Major Road
- Minor Roads
- Railway

Bowmanville/Soper Creek Watershed

Regional Landscape and Policy Areas

Central Lake Ontario Conservation Authority

0 0.5 1 2 3 4 5 6 Kilometres

(c) Copyright. Central Lake Ontario Conservation Authority, 2019.

Map Compiled by the Central Lake Ontario Conservation Authority:
100 Whiting Ave., Oshawa, Ontario, L1H 3T3

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Source: CLOCA, 2019; MNR, 2019; Regional Municipality of Durham, 2019.

Map showing the Bowmanville/Soper Creek Watershed and its regional landscape and policy areas. The map includes a legend, scale bar, north arrow, and an inset map of the region.

Legend

- Damage Centre
- Generic Regulation Limit 42/06

Basedata

- Watershed Boundary
- Subwatershed Boundary
- Waterbody
- Watercourse
- Municipal Boundary

Transportation Network

- Provincial Highway and approved Highway 407
- Major Road
- Minor Roads
- Railway

0 0.5 1 2 3 4 5 6
Kilometres

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Source: CLOCA, 2019; MNR, 2019; Regional Municipality of Durham, 2019.

Bowmanville/Soper Creek Watershed

Regulated Areas and Flood Damage Centres

The map shows the Bowmanville/Soper Creek Watershed, which is a subwatershed of the Central Lake Ontario Conservation Authority. The watershed boundary is shown in blue, and the subwatershed boundary is shown in orange. The map includes a legend, a scale bar, a north arrow, and an inset map of the watershed's location within the Central Lake Ontario Conservation Authority. The inset map shows the watershed's location relative to the surrounding watersheds: HAMPTON, HAYDON, TYRONE, SOPER NORTH, MACKIE, SOPER MAIN, SOPER EAST, BOWMANVILLE MAN, and BOWMANVILLE MARSH. The map also shows the watershed's location relative to the surrounding municipalities: Oshawa, Clarington, and Durham. The map includes a legend, a scale bar, a north arrow, and an inset map of the watershed's location within the Central Lake Ontario Conservation Authority.

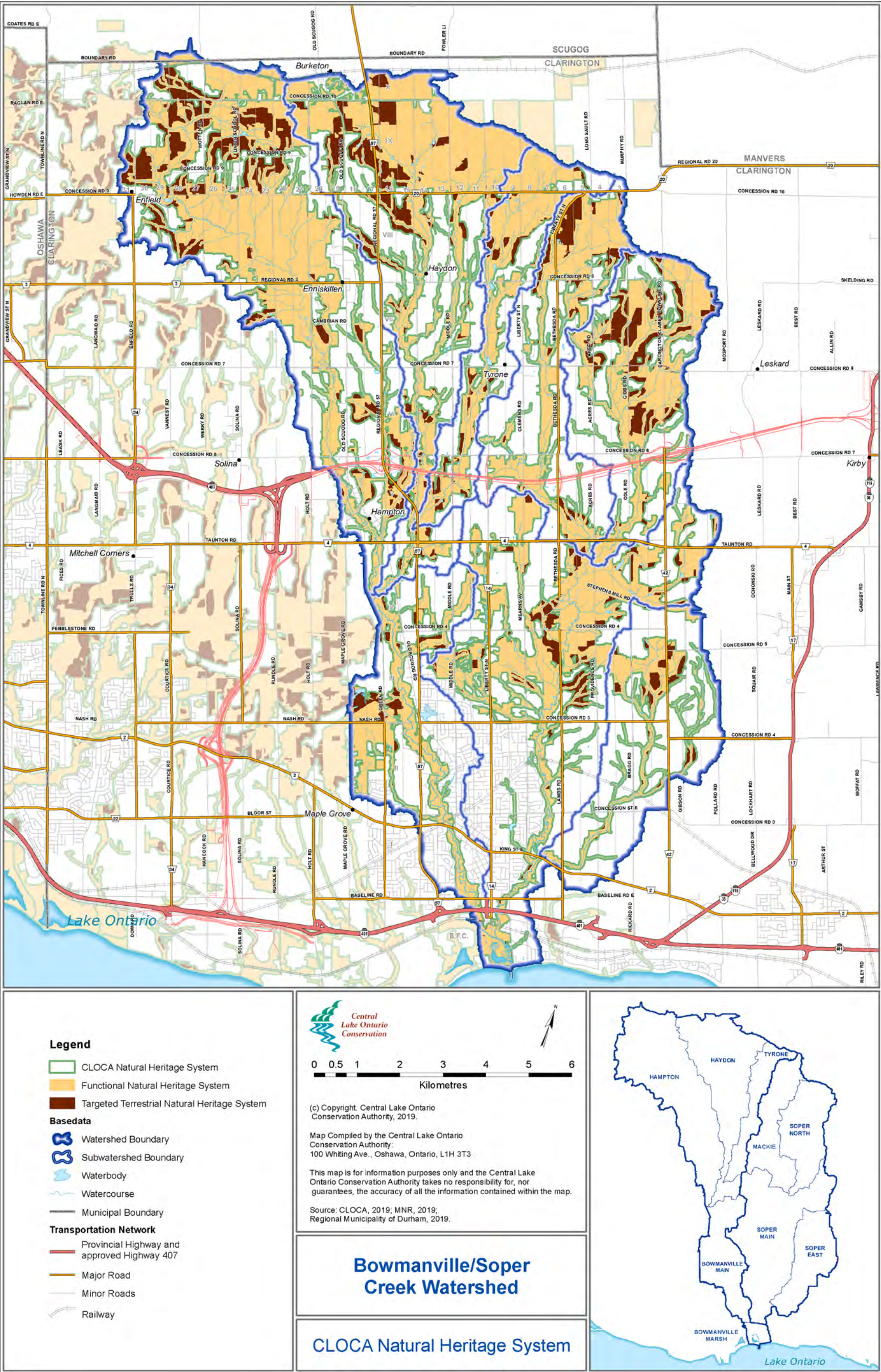
CLOCA Natural Heritage System (NHS)

In 2012, CLOCA developed a NHS for each of its watersheds. It is made up of two components: the *functional NHS*, which contains existing natural heritage features, riparian buffers and wildlife corridors; and the *targeted NHS*, which identifies future restoration areas in the watershed. Ultimately, the purpose of the functional NHS is to maintain current watershed health by protecting the existing features and functions that support plant, animal, and human communities in the watershed. It promotes watershed resiliency by connecting the habitats within each watershed, as well as across watershed boundaries, which is an important function for adapting to the effects of climate change. The targeted NHS has been developed to help achieve many of the goals outlined in this WSP, and habitat restoration in these areas will specifically ensure that the natural cover goals are achieved.

The CLOCA NHS was reviewed as part of this WSP update and revised to incorporate land use changes and updated natural heritage resources information. The updated NHS map is shown in Figure 8.



Figure 6: CLOCA Natural Heritage System



Section 2 – Evaluating watershed health

CLOCA has identified six targets that are the focus of this WSP and that have been used to evaluate overall watershed health: *Natural Cover, Forests, Streams, Coastal Wetlands, Human Health and Community Engagement*. The six targets are described in this section. A series of attributes that represent whether a target is in good condition or functioning properly are also discussed along with the indicators that have been used to measure these attributes. More detailed descriptions of indicators can be found in Appendix A (Table 1). Targets, attributes and indicators are the basis for setting goals. Goals for each Target have been identified, and stated in terms of measureable indicators.

The status of each goal is also presented and discussed. Where data is available the status graphics depict the status of the goal in 2012 when the WSP was first created and the status in 2017, the most up to date data available when this WSP update was initiated.

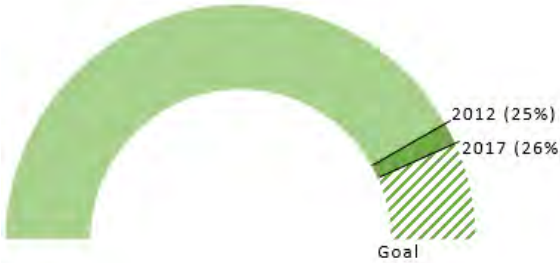
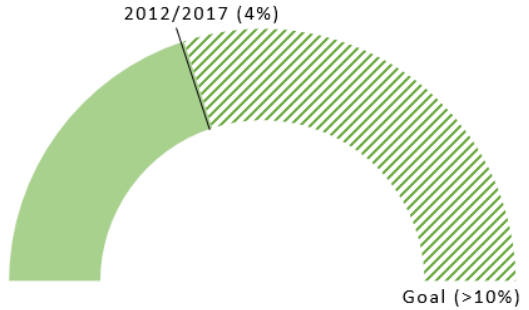
INDEX OF BIOTIC INTEGRITY (IBI)

A scoring system used to measure the health or condition of a biological community (ex. fish community). Several metrics are combined into each IBI. Metrics are characteristics of a community that are sensitive to changes caused by human disturbance (ex. native species richness). Each metric is scored and the scores are combined into a total overall IBI score (out of 100) for a particular community. The higher the overall score, the healthier the biological community.

Target 1: Natural cover

Natural cover refers to the percentage of the watershed area that is covered by natural vegetation. The percent natural cover of natural heritage features (forests, wetlands, riparian habitats and wildlife corridors) is used to assess watershed health for this target and is calculated using CLOCA's ELC dataset. These natural heritage features, combined with additional areas of natural cover make up CLOCA's Natural Heritage System (NHS). The percent cover of the NHS in the watershed is also used to evaluate watershed health. Natural cover contributes to watershed health by providing essential habitat for wildlife as well as providing valuable ecological, hydrological and social functions such as flood control, water quality improvements, erosion control and habitat connectivity. The goals for forest, wetland and riparian cover were adopted from the guidelines set out in *How Much Habitat is Enough?* (Environment Canada, 2013).

Table 1: Natural cover summary, goals and status.

Attribute	Indicator	Goal	Status
Natural cover	% NHS cover	By 2040, achieve and maintain 100% natural cover of the CLOCA NHS in the Bowmanville/Soper creek watershed.	 <p>2017 (68%) 2012 (71%) Goal (100%)</p>
Forest cover	% forest cover	By 2040, achieve and maintain a minimum of 30% forest cover in the Bowmanville/Soper creek watershed.	 <p>2012 (25%) 2017 (26%) Goal</p>
	% forest interior cover	By 2040, achieve and maintain a minimum of 10% forest interior cover in the Bowmanville/Soper creek watershed.	 <p>2012/2017 (4%) Goal (>10%)</p>



Attribute	Indicator	Goal	Status
	% deep forest interior cover	By 2040, achieve and maintain a minimum of 5% deep forest interior cover in the Bowmanville/Soper creek watershed.	<p>2017 (1%) 2012 (<1%) Goal (>5%)</p>
Wetland cover	% wetland cover	By 2040, achieve and maintain a minimum of 10% wetland cover in the Bowmanville/Soper creek watershed.	<p>2012 (8%) 2017 (10%) Goal (>10%) Historical cover (unknown)</p>
Riparian cover	% riparian cover	By 2040, achieve and maintain a minimum of 75% riparian cover in the Bowmanville/Soper creek watershed.	<p>2017 (49%) Goal (>75%)</p>



Attribute	Indicator	Goal	Status
Wildlife corridor cover	% wildlife corridor cover	By 2040, achieve and maintain a minimum of 58% naturally-vegetated wildlife corridor within 1 km of the Lake Ontario shoreline in the Bowmanville/Soper creek watershed.	
		By 2040, achieve and maintain 75% natural cover in the landscape and local corridor systems in the Bowmanville/Soper creek watershed.	Not currently available

As of 2017, only one of the eight goals for natural cover had been met, which indicates that significant restoration of natural vegetation will need to take place in the Bowmanville/Soper watershed in the coming years. The current natural cover in the Bowmanville/Soper NHS is 68%, which is 3% less cover than in 2012. This is well below the goal of achieving 100% cover in the NHS.

The amount of forest cover, forest interior and deep forest interior in the watershed has changed very little since 2012. Forest cover is estimated to be 26% in the Bowmanville/Soper creek watershed, based on an ELC analysis, which is close to the minimum goal of 30% forest cover for a healthy watershed. Forest interior is estimated at 4% and deep forest interior at 1%, which is well below the minimum goals of 10% and 5% respectively. Wetland cover in the Bowmanville/Soper creek watershed has also not changed significantly in the past 5 years. It is estimated to be 10%, which is the minimum cover goal set for the watershed. Riparian cover in the Bowmanville/Soper creek watershed in 2017 was 49%, which is well below the minimum goal of 75%. The Lake Ontario regional wildlife corridor has 47% natural cover, which is an increase from 2012 (44%). This remains below the goal of achieving 58% cover in the watershed.



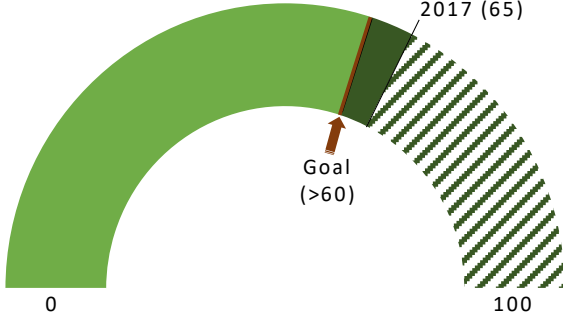
Target 2: Forests

Forest communities are integral ecosystems within the watershed and contribute to watershed health by providing essential habitat and connectivity for local flora and fauna communities; they also play a role in maintaining and improving surface water quality and quantity by providing flood control, nutrient filtration, and reducing soil erosion. Forest communities provide many irreplaceable societal services such as sequestration of carbon, production of oxygen, and the moderation of climate. Forests are facing many stressors such as surrounding land-use pressures, climate change, invasive pests and pathogens and fragmentation; as such, forest community health is reflective of overall terrestrial watershed health.

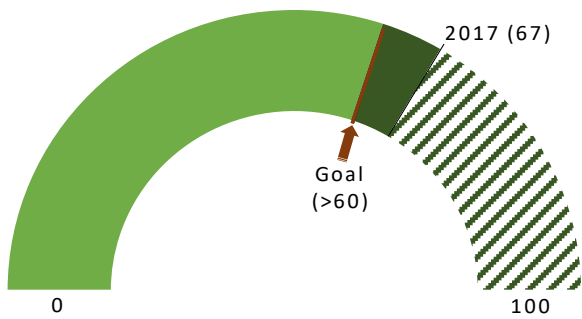
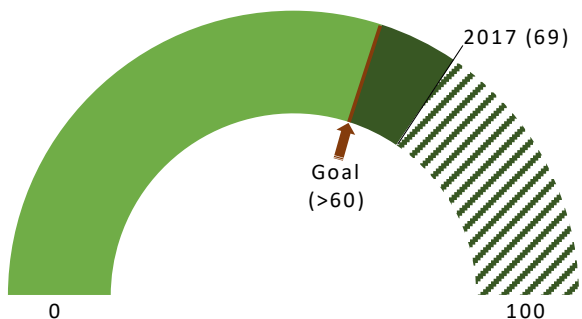
The Integrated Watershed Monitoring Program is a long-term program that assesses the health of forests within CLOCA's jurisdiction over time. This program uses three attributes of forest ecosystems that best reflect forest health and changing conditions. The attributes include breeding birds, tree health and dead wood, and plant community. Each of these attributes are measured using indicators that are reflective of the health of the forest ecosystems. Together, the indicators are used to assess the overall condition of a forest, and ongoing monitoring of these indicators enables CLOCA to evaluate changes in forest health over time.

Due to resource limitations, forest health is monitored on a watershed zone scale, rather than by individual watersheds. The Eastern Zone best represents conditions in the Bowmanville/Soper watershed and was used in this WSP to set goals for the forest target.

Table 2: Forests summary, goals and status.

Attribute	Indicator	Goal	Status
Breeding birds	Breeding Bird IBI	By 2040, achieve and maintain a minimum Breeding Bird IBI score of 60 in the Eastern Zone.	



Attribute	Indicator	Goal	Status
Tree health & dead wood	Tree Health & Dead Wood IBI	By 2040, achieve and maintain a minimum Tree Health and Dead Wood IBI score of 60 in the Eastern Zone.	
Plant community	Plant Community IBI	By 2040, achieve and maintain a minimum Plant Community IBI score of 60 in the Eastern Zone.	

As of 2017, all of the Forest health goals of achieving and maintaining scores of above 60 have been met. Overall forest health within the eastern zone of the jurisdiction scored 67 out of 100. According to the Index of Biotic Integrity (IBI), scores in the range of 61-80 are considered “Good” in terms of forest health. Breeding birds scored 65 out of 100, tree health and dead wood scored 67 out of 100 and plant community scored 69 out of 100.

Target 3: Streams

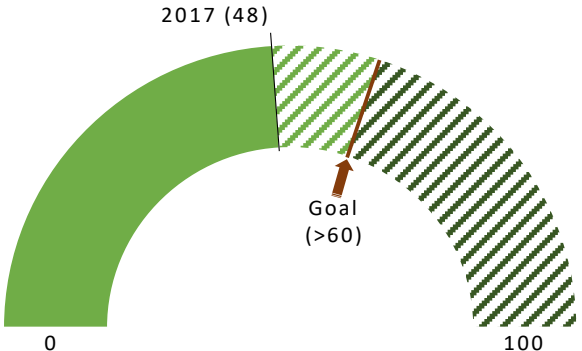
Streams are integral components of watersheds as they provide water to wildlife and people, habitat to aquatic species, drainage from the land, as well as social and cultural values. They are an excellent way to understand the health of the watershed given they reflect the conditions around them. When the landscape around the stream is altered, the conditions within the stream will reflect that change.



The Integrated Watershed Monitoring Program is a long-term program that assesses the health of streams within CLOCA's jurisdiction over time. This program uses five attributes of stream ecosystems that best reflect stream health and changing conditions. The attributes include Water Quality, Biological Connectivity, Fish and Macroinvertebrate Community, and Stream Stability. Each of these attributes are measured using indicators that are reflective of the health of the stream system. Three indicators are used for Water Quality due to the range of stresses on this attribute. Together, the indicators are used to assess the overall condition of a stream, and ongoing monitoring of these indicators enables CLOCA to evaluate changes in stream health over time.

Due to resource limitations, stream health is monitored on a watershed zone scale, rather than in individual watersheds. The Eastern Zone best represents conditions in the Bowmanville/Soper watershed and was used in this WSP to set goals for the stream target.

Table 3: Streams summary, goals and status.

Attribute	Indicator	Goal	Status
Water quality	Water Temperature	By 2040, achieve and maintain a water temperature score of 60 in the Eastern Zone.	Not currently available
	Water Quality Index	By 2040, achieve and maintain a minimum Water Quality Index of 60 in the Bowmanville/Soper creek watershed.	 <p>2017 (48)</p> <p>Goal (>60)</p> <p>0 100</p>



Attribute	Indicator	Goal	Status
	Chloride	By 2040, achieve and maintain 0% of samples exceeding Canadian Water Quality Guidelines for Chloride (120mg/L) in the Bowmanville/Soper creek watershed.	<p>A gauge chart for Chloride. The scale goes from 0 to 100. A green arc represents the current status at 3% in 2017. A hatched green arc at the very beginning represents the goal at 0%.</p>
Biological connectivity	# of instream barriers	By 2040, improve biological connectivity through the removal of 12 barriers from the Bowmanville/Soper creek watershed, as identified in the Instream Barrier Action Plan.	<p>A gauge chart for Biological connectivity. The scale goes from 0 to 100. A hatched green arc represents the current status at 1 in 2017. A solid green arc represents the goal at 12.</p>
Fish community	Golden Horseshoe Fish Index	By 2040, achieve and maintain a minimum Golden Horseshoe Fish Index of 60 in the Eastern Zone.	<p>A gauge chart for Fish community. The scale goes from 0 to 100. A solid green arc represents the current status at 48 in 2017. A hatched green arc represents the goal at >60, indicated by a red arrow.</p>



Attribute	Indicator	Goal	Status
Macroinvertebrate community	Hilsenhoff Biotic Index	By 2040, achieve and maintain a minimum Hilsenhoff Biotic Index of 60 in the Eastern Zone.	
Stream stability	Stream Stability Index	By 2040, achieve and maintain an average stability index score of <0.2 in the Bowmanville/Soper creek watershed.	

As of 2017, none of the stream health goals of achieving and maintaining scores above 60 have been met. Water Quality and fish community scored 48 out of 100 and macroinvertebrate community scored 49 out of 100. Scores in the range of 41-60 are considered “Fair” in terms of stream health. Chloride samples exceeded the Canadian Water Quality Guidelines (120mg/L) 3% of the time, which is slightly above the target of 0%. Stream stability scored 0.34, which is above the target of 0.2. Within the Bowmanville/Soper Creek watershed, 12 instream barriers were identified as barriers to biological connectivity. One of the 12 barriers were removed and creek connectivity was restored at that location. This has allowed resident and migratory fish access to an additional 18 km of stream habitat. The indicator for water temperature has been recently reviewed and updates were required. Once the new indicator is completed, stored 2017 data will be evaluated and this indicator can be updated.



Target 4: Coastal wetlands (Bowmanville Marsh)

Great Lakes coastal wetlands are formed at the mouths of watercourses and in bays along the shoreline. They are biologically rich and productive ecosystems that when healthy, contribute to watershed health by providing essential ecological and societal services such as flood control, sediment and nutrient filtration, shoreline protection, and wildlife habitat. Conditions in coastal wetlands reflect the cumulative effects of land-use activities in the watershed. The loss of natural cover and the release of pollutants into waterways affects the health and functionality of coastal wetlands downstream.

The Durham Region Coastal Wetland Monitoring Project (DRCWMP) is a long-term program that assesses the health of wetlands along the north shore of Lake Ontario. Coastal wetland health is evaluated using five indicators related to breeding birds, fish, aquatic macroinvertebrates, submerged aquatic vegetation and water quality. Together, these indicators are used to assess the overall condition of a wetland, and ongoing monitoring of these indicators enables CLOCA to evaluate changes in health over time.

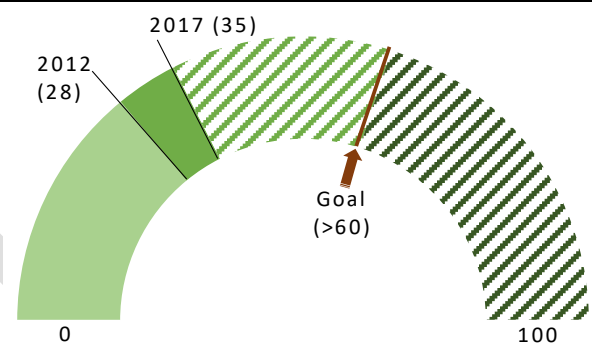
Table 4: Coastal wetlands (Bowmanville Marsh) summary, goals and status.

Attribute	Indicator	Goal	Status
Breeding bird community	Wetland Breeding Bird IBI	By 2040, achieve and maintain a minimum Wetland Breeding Bird IBI score of 60 at Bowmanville Marsh.	<p>2012 (36)</p> <p>2017 (45)</p> <p>Goal (>60)</p> <p>0 100</p>



Attribute	Indicator	Goal	Status
Fish community	Fish IBI	By 2040, achieve and maintain a minimum Fish IBI score of 60 at Bowmanville Marsh.	<p>A gauge chart for Fish IBI. The scale ranges from 0 to 100. A green segment covers the range from 0 to 40. A yellow segment covers the range from 40 to 41. A brown arrow points to the goal mark at 60. The current score is 40 in 2017, and the target score is 41 in 2012.</p>
Submerged aquatic vegetation (SAV) community	Submerged Aquatic Vegetation IBI	By 2040, achieve and maintain a minimum SAV IBI score of 60 at Bowmanville Marsh.	<p>A gauge chart for SAV IBI. The scale ranges from 0 to 100. A green segment covers the range from 0 to 16. A yellow segment covers the range from 16 to 17. A brown arrow points to the goal mark at 60. The current score is 16 in 2017, and the target score is 17 in 2012.</p>
Aquatic macroinvertebrate Community	Aquatic Macroinvertebrate IBI	By 2040, achieve and maintain a minimum Aquatic Macroinvertebrate IBI score of 60 at Bowmanville Marsh.	<p>A gauge chart for Aquatic Macroinvertebrate IBI. The scale ranges from 0 to 100. A green segment covers the range from 0 to 28. A yellow segment covers the range from 28 to 35. A brown arrow points to the goal mark at 60. The current score is 28 in 2017, and the target score is 35 in 2012.</p>



Attribute	Indicator	Goal	Status
Water quality	Water Quality Index	By 2040, achieve and maintain a minimum Water Quality Index of 60 at Bowmanville Marsh.	 <p>2012 (28)</p> <p>2017 (35)</p> <p>Goal (>60)</p> <p>0 100</p>

As of 2017, none of the five indicators for Bowmanville Marsh have met the goal of achieving and maintaining scores above 60. All five indicators showed no significant change between the 2012 status and the 2017 status. The Submerged Aquatic Vegetation IBI scored in Very Poor condition (<20) and the other indicators (Water Quality Index, Fish IBI, Aquatic Macroinvertebrate IBI and Wetland Breeding Bird IBI) all scored in Poor to Fair condition (20-60).

Target 5: Human Health

Healthy watersheds provide valuable goods and services that protect human health. These goods and services include such things as safe drinking water, flood control, clean air and the moderation of climate. Human health has been evaluated for this watershed plan using two indicators: Flood Damage Centres and Ontario Drinking Water Standards for groundwater. Flooding is a significant natural hazard that causes risk to public safety. Flood damage centres (FDCs) are areas where buildings are located within the regulatory floodplain of a stream system or Lake Ontario shoreline. Rural communities rely on groundwater wells as their primary source of drinking water, and depend on groundwater supplies to maintain domestic, commercial, industrial, agricultural and institutional operations. Chloride is a chemical that does not naturally exist in deep aquifers but is abundant in surface water due to its use as a de-icer in winter. This makes it a useful chemical to gauge how much potential anthropogenic impacts there are on deep aquifers and how much risk there may be to well water quality and the human health that depends on them. The Ontario Drinking Water Quality Standards sets guidelines for safe limits of chemicals in drinking water sources. The guideline for chloride is 250 mg/L.



Table 5: Human Health summary, goals and status.

Attribute	Indicator	Goal	Status
Deep groundwater quality	Ontario Drinking Water Quality Standards (Chloride)	By 2040, maintain 0% of samples from deep wells exceeding the Ontario Drinking Water Quality Standards prescribed limits for Chloride Bowmanville/Soper creek Watershed.	
Shallow groundwater quality	Ontario Drinking Water Quality Standards (Chloride)	By 2040, achieve and maintain fewer than 10% of samples from shallow wells exceeding Ontario Drinking Water Quality Standards prescribed limits for Chloride in the Bowmanville/Soper creek watershed.	
Flooding	Flood Damage Centres	By 2040, 50% of recommendations for all high and moderate risk damage centre assessments are adopted and implemented.	Not currently available



As of 2017, data is not available for Flood Damage Centre indicator. The goal for deep groundwater quality has not been met with 18% of samples from deep wells exceeding the chloride concentration limit identified in the Ontario Drinking Water Quality Standards. The goal for shallow groundwater quality has been met with 0% of samples from shallow wells exceeding the chloride concentration limit.



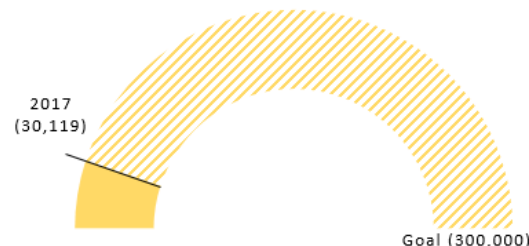
Target 6: Community Engagement

The success of a watershed plan in achieving watershed health is directly related to awareness and action from the watershed community. Three indicators have been used to measure community engagement: the # of volunteers, # of students and # of public participants. Volunteers help deliver programs promoting watershed health, students engage in programs to increase their understanding of watershed health, and the public participates in programs to improve watershed health through hands-on education and restoration activities.

Table 6: Community Engagement summary, goals and status.

Attribute	Indicator	Goal	Status
Volunteer engagement	# of volunteers	By 2040, engage 20,000 volunteers across the jurisdiction in CLOCA volunteer initiatives related to watershed health.	 <p>2017 (1,855)</p> <p>Goal (20,000)</p>
Student engagement	# of students (elementary, high school and post-secondary)	By 2040, engage 240,000 students across the jurisdiction in CLOCA curriculum-based education programs related to watershed health.	 <p>2017 (25,719)</p> <p>Goal (240,000)</p>



Attribute	Indicator	Goal	Status
Public engagement	# of public participants	By 2040, engage 300,000 community members across the jurisdiction in projects and activities related to watershed health.	 <p>2017 (30,119)</p> <p>Goal (300,000)</p>

Although CLOCA has been operating many of its volunteer, educational, and public programs for a long time, the system for tracking the participation rates for each program has evolved and improved since 2012; consequently, the most accurate counts available for these indicators are from 2016 and 2017. Over 1,800 volunteers, 25,000 students, and 30,000 community members were engaged in watershed-based programs for those two years. CLOCA aims to, at a minimum, maintain annual participation rates to meet its 2040 Goals.



Section 3 – Achieving watershed health

Three strategies have been identified to achieve the Goals of the watershed plan: *conserve, enhance and restore ecosystems of the Bowmanville/Soper creek watershed; promote responsible land use practices to protect ecological and human health; and encourage, acquire, and expand stakeholder support for the watershed plan.* For each Strategy, the intended outcomes from their implementation have been stated as short-term Objectives. Objectives are described below along with information about progress made to date. For all of the strategies, specific actions for CLOCA, municipal partners, and the watershed community to take have also been recommended. A summary of these actions, by group, occurs later in this section.

For a complete table of the strategies, objectives, actions completed and actions required, as well as any progress towards completing an objective since 2012, see Appendix A (Table 2).

Strategy 1: Conserve, enhance and restore ecosystems of the Bowmanville/Soper creek watershed

This strategy and objectives relate to protecting and restoring natural cover, and consequently improving the health of ecosystems in the watershed. The achievement of natural cover and ecosystem goals can only occur with dedicated action towards protecting these natural heritage features from loss to development and the implementation of enhancement and restoration projects.

Objective 1: By 2025, restore 169 hectares of forest cover in the Bowmanville/Soper creek watershed through reforestation and natural succession.

This objective is directed at achieving the goal of 30% forest cover in the watershed, as well as increasing the amount of forest interior and deep forest interior on the landscape, but this objective has farther-reaching benefits. Expanding forest cover in the NHS will help achieve the goal of 100% natural cover within that system. It will also positively contribute to overall forest health by increasing the amount of breeding habitat for forest birds and will improve wildlife connectivity and riparian cover. Increased forest cover also benefits adjacent and downstream communities (ex. coastal wetlands, streams) as these communities feel the cumulative effects of land-use activities in the watershed. Increased forest cover in the watershed also benefits human health through improved water quality, reduced flooding and cleaner air.

To achieve the goal of 30% forest cover in the Bowmanville/Soper creek watershed by 2040, 667 ha of forest will need to be restored, or 169 ha every 5 years. As this is a new objective, there is no progress to report.

Objective 2: By 2025, maintain existing wetlands in the Bowmanville/Soper creek watershed.

As was stated in the previous section, the current wetland cover in the Bowmanville/Soper creek watershed is 10%, which is the goal that has been set for watershed health in this WSP. This objective will have been achieved if no net loss of wetland cover is observed in the watershed during the next 5-year interval. As this is a new objective, there is no change in status to report.

Objective 3: By 2025, restore 180 hectares of natural riparian cover in the Bowmanville/Soper creek watershed

This objective focuses on achieving the riparian cover goal of 75%, and plays an integral role in improving stream health. Achieving this objective will positively impact the stream indicators through moderating stream temperature, intercepting sediment and contaminant run-off, reducing erosion and, as a result, improving habitat quality for fish and other aquatic wildlife.

The improvements to stream health that are gained by increasing riparian cover in the watershed will also be captured by many of the coastal wetland indicators and will help achieve the coastal wetland goals. Because all of the creeks in the watershed outlet through coastal wetlands, poor stream health can degrade the overall health of the wetland by degrading water quality, making the habitat less suitable for aquatic vegetation and reducing habitat quality for breeding birds, fish, and macroinvertebrates. Increased riparian cover in the watershed also benefits human health through improved water quality, reduced flooding and cleaner air.

Currently, riparian cover for the watershed is 49%. To achieve 75% cover by 2040, 721 ha of riparian habitat will need to be restored. If 180 ha of riparian cover is restored in the watershed every 5 years, then the goal of 75% cover can be achieved. As this is a new objective, there is nothing to report regarding progress towards this objective.

Objective 4: By 2025, remove 3 barriers as identified in the Instream Barrier Action Plan.

This objective is directly related to the accessible fish habitat indicator in the streams target. The Instream Barriers Action Plan has identified 12 barriers that should be removed from the Bowmanville/Soper creek system in order to expand available fish habitat in the watershed. If 3 barriers are removed every 5 years then this goal can be achieved by 2040.

Objective 5: By 2025, restore 4.25 ha of shoreline habitat in the Bowmanville/Soper creek watershed

Restoring 4.25 ha of shoreline habitat will directly assist migratory birds and help achieve the WSP goal of 58% naturally-vegetated wildlife corridor within 1 km of the Lake Ontario shoreline. This objective also contributes to meeting the Coastal Wetland goals, as these features are located along the Lake Ontario shoreline. Improving habitat cover within this area will contribute to maintaining or improving breeding bird habitat and habitat for aquatic plant and wildlife species.

As this is a new objective, there is no progress to report at this time.

Objective 6: By 2025, develop objective to restore natural cover in the landscape and local wildlife corridor systems.

Percent natural cover in the wildlife corridor system was introduced in this WSP as a measure of habitat connectivity; however, at the time of this update a methodology had not yet been developed for conducting this analysis. As the data is currently unavailable, an objective for achieving the 75% cover goal has not been set. Instead, the objective for this WSP is to develop an appropriate objective for the next WSP update.

Strategy 2: Promote responsible land use practices to protect ecological and human health

This strategy and objectives relate to promoting responsible land use practices in the watershed to protect natural ecosystems and watershed health as well protect human and health and safety from hazards.

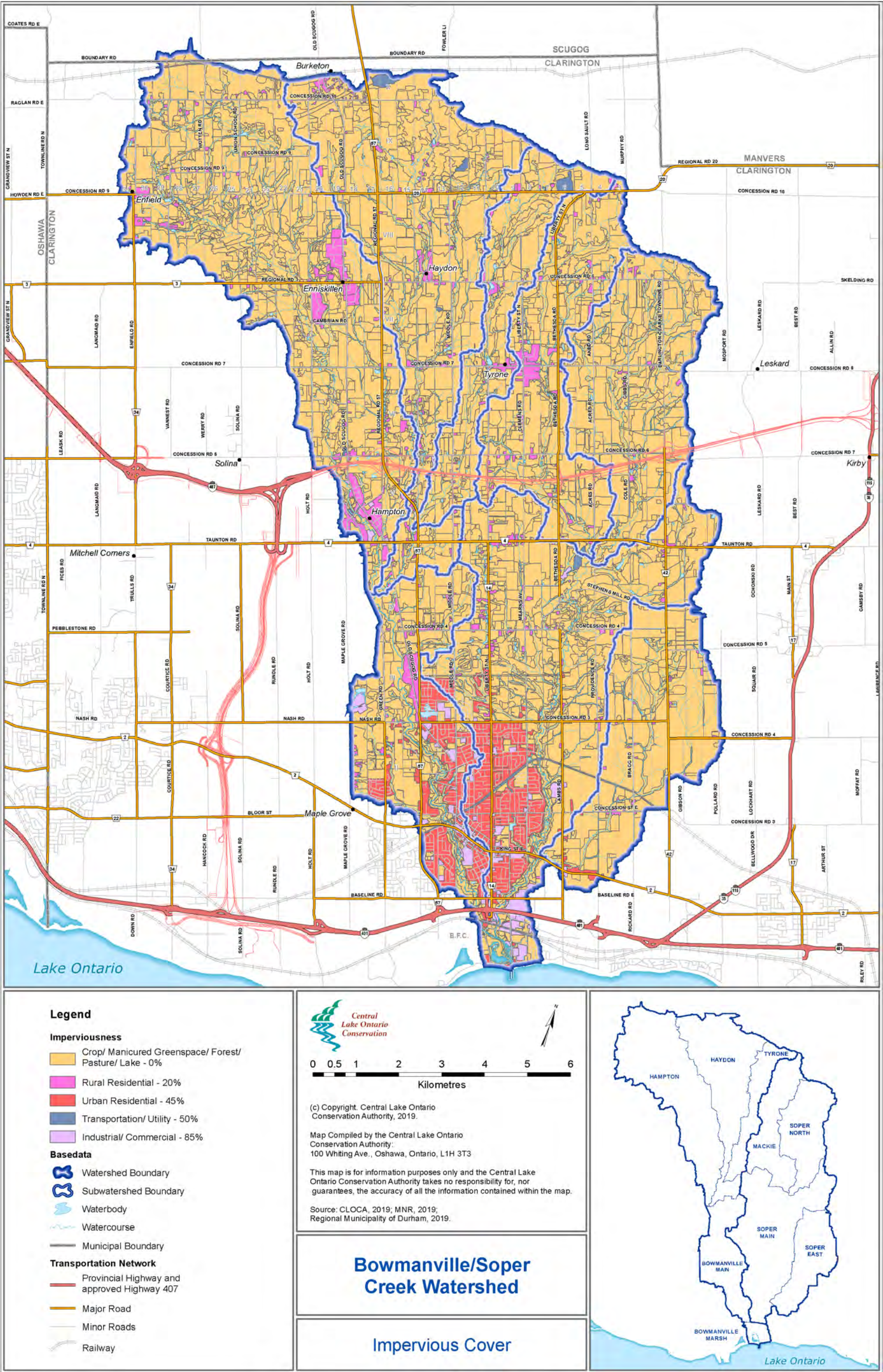
Objective 1: By 2040, achieve and maintain <10% imperviousness in the watershed.

Stream health is directly related to impervious cover. Guidance documents (Environment Canada, 2013) have shown the benefits of maintaining imperviousness in the watershed at less than 10%. For example, water quality and stream temperature are negatively impacted when this threshold is exceeded. These impacts cumulatively effect aquatic habitat in the creeks and coastal wetland health downstream. Flooding is also related to impervious cover, water runs off more quickly from impervious surfaces and flooding becomes more common and more intense downstream.

In 2018, CLOCA recalculated impervious cover for the watershed. Imperviousness has remained at 6% in the Bowmanville/Soper creek watershed since 2012, which meets the maximum 10% impervious cover objective. Figure 7 shows updated land uses and their contributions to imperviousness for the Bowmanville/Soper creek watershed.



Figure 7: Impervious Cover



Objectives 2 & 3: By 2040, achieve and maintain wildlife potential permeability (WPP) scores of ‘very good’ or better in the landscape corridor system, and achieve and maintain WPP scores of ‘moderate’ or better in the local corridor system.

Transportation infrastructure is a barrier to wildlife movement, and roads/railways that intersect with the wildlife habitat network, as defined in the 2015 Wildlife Corridor Protection & Enhancement Plan, reduce habitat connectivity overall. These barriers are potentially mitigated, for the majority of wildlife, by the presence of culverts; however, some culverts are more suitable for wildlife use than others.

The action plan categorizes wildlife movement corridors by scale – regional, landscape, and local – and conducts an evaluation of the passage potential for each of the transit crossings (known as wildlife potential permeability) within these corridors, scoring them from Excellent to Very Poor. The objectives for this WSP were adopted from the Wildlife Corridor Protection & Enhancement Plan which recommends working towards removing barriers to wildlife movement at the two lower-tier scales such that the landscape corridor system is accessible to all mammals and reptiles (permeability scores of very good or better) and the local corridor system is accessible to most mammals and/or reptiles (permeability scores of moderate or better). The proportion of scores in the system will be used to assess the overall connectivity of the wildlife habitat network in the watershed. Currently, the Bowmanville/Soper creek watershed has 67 movement barriers in its landscape corridor system and of these, 16 have permeability scores of very good or better (24%). The report identified 14 movement barriers in the local corridor system and of these, 2 have permeability scores of moderate or better (14%).

The Wildlife Corridor Protection and Enhancement Plan is scheduled to be updated in 2020, and that update will capture new barriers within the system as a result of the new 400-series highways in the CLOCA jurisdiction, as well as any improvements associated with recent road improvement projects. These changes will be reflected in the 2025 WSP update.

Strategy 3: Encourage, acquire, and expand stakeholder support for the watershed plan

This strategy and its objectives focus on measuring and gaining support for the updated WSP. The achievement of the watershed plan goals, as discussed in Section 2 can only occur with appropriate support for protecting existing natural heritage and water resources, promoting stewardship and restoration on the landscape, and committing to responsible land use and management practices.

Objectives 1, 2 & 3: By 2025 or the next MCR, 100% adoption of fundamental OP policies, 75% adoption of key OP policies, and 50% adoption of voluntary OP policies by the Region and the municipalities in the watershed.

This WSP identifies three policy levels: fundamental policies directly support the achievement of the watershed vision and goals; key policies provide more detail and support the fundamental policies; and, voluntary policies provide specific guidance for dealing with detailed planning and operation situations. A complete list of all recommended official plan, asset management planning, and operating guideline policies can be found

in Appendix D – Recommended OP policies and operating guidelines. The adoption rate assigned to each policy level is reflective of its importance in achieving the goals outlined in this WSP.

Since the implementation of the 2012/2013 watershed plans, municipalities have included a significant number of the original fundamental, key and voluntary policies into official plans. Currently, the Region of Durham and the Municipality of Clarington, which are the municipalities whose OPs govern land use in the Bowmanville/Soper creek watershed, have collectively adopted 90% of fundamental policies, 50% of key policies, and 36% of voluntary policies in some form. CLOCA acknowledges this effort and will continue to track the number of policies that are adopted within the next 5 years (or MCR) to help assess the level of Regional and municipal support for the watershed plan and evaluate the potential for its watershed goals to be achieved.

Objective 4: By 2025 or the next MCR, 50% adoption of operating guidelines by the Region and the municipalities in the watershed.

Operating guidelines have been recommended in this watershed plan for municipalities to adopt to further contribute to the achievement of the WSP goals. Most of these guidelines were previously categorized as OP policies; however, feedback during the consultation process was that many of them were not appropriate OP policies and would be more likely to be adopted as operating guidelines. This WSP has incorporated that change.

The inclusion of the recommended operating guidelines into relevant procedural documents is a measure of municipal support for the WSP and its goals, and will be tracked and reported on in future updates.

Objective 5: By 2025, municipalities adopt a connected natural heritage system that protects the features identified in the functional CLOCA NHS.

The 2014 Provincial Policy Statement (PPS) defines a NHS as a “system made up of natural heritage features and areas, and linkages intended to provide connectivity (at the regional or site level) and support natural processes which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species, and ecosystems.”

CLOCA has developed a NHS that is comprised of a functional system that includes these features and areas and connects them via corridors. This WSP encourages Regional and municipal partners to adopt CLOCA’s functional NHS, as it has been developed in a manner that is consistent with Provincial direction and is specific to the watershed; however, this WSP also recognizes that municipal partners may choose to develop a NHS of their own, an action that is supported by both CLOCA and the Province. For municipal partners that have developed a NHS of their own, this objective will assess how successful their NHS is at protecting and connecting existing features in the watershed, and evaluate the potential for the NHS to meet the goals of this WSP.

Currently all of CLOCA’s municipal partners have met this objective.

Objective 6: By 2025, municipalities adopt a connected NHS that includes CLOCA's targeted NHS or includes areas identified for future restoration that will achieve the WSP natural cover goals.

The 2014 PPS NHS definition further provides that “these systems can include natural heritage features and areas, federal and provincial parks and conservation reserves, other natural heritage features, lands that have been restored or have the potential to be restored to a natural state, areas that support hydrologic functions, and working landscapes that enable ecological functions to continue.”

CLOCA's NHS also contains a targeted system that identifies land in the watershed that, if protected and restored, would enable many of the goals of the natural cover target to be achieved, and would positively contribute toward achieving the goals of other targets identified in Section 2. This WSP encourages Regional and municipal partners to adopt CLOCA's targeted NHS as part of their NHS, as the target areas have been selected with the WSP goals in mind and in consideration of watershed characteristics; however, the objective recognizes that municipal partners may choose to identify future restoration areas for their NHS independently. CLOCA supports the adoption of its targeted system as well as an alternative target system, provided the targeted land base is adequate enough to meet the goals of this WSP. For partner municipalities that have developed a NHS of their own, this objective will determine if the system includes target restoration areas and whether these areas, if restored, will be sufficient for the goals of the WSP to be realized.

Objective 7: By 2025 or the next MCR, municipalities develop asset management plans that recognize, as natural assets, a connected NHS that protects the features identified in CLOCA's functional NHS.

Asset management planning is a legislated municipal requirement. The 2012 Municipal Infrastructure Strategy “requires municipalities to demonstrate how projects fit within a comprehensive asset management plan and encourages municipalities to improve integration of planning for land use and infrastructure”. Green infrastructure is one way that municipalities can achieve cost-savings to infrastructure and CLOCA's NHS contains numerous features that could be considered natural assets and valued to quantify the services they provide. The inclusion of functional NHS components in municipal asset management plans will help protect these features and demonstrate support for the goals in this WSP. For more information about asset management planning, see the Municipal Actions description below.

Objective 8: By 2025 engage 5,000 volunteers across the jurisdiction in CLOCA volunteer initiatives related to watershed health.

Volunteers are an important component to CLOCA's outreach and education strategy, as they help staff facilitate programs to larger audiences and become ambassadors for watershed health. In 2016 and 2017, CLOCA's volunteer program attracted 1,855 volunteers in total. If this rate of engagement continues, CLOCA will be on track to achieve the 2025 WSP objective of engaging 5,000 volunteers.

Objective 9: By 2025, engage 60,000 students across the jurisdiction in CLOCA curriculum-based education programs related to watershed health.

Students are the watershed stewards of the future, and instilling in them the importance of maintaining and enhancing watershed health, for themselves and for the next generation, is essential to achieving a healthy watershed. The education programs introduce students to elements of the natural heritage and water resource systems, help them understand how they work and why they are important to protect, and inspire them to take actions in their own backyards or neighbourhoods.

In 2016 and 2017, CLOCA education programs reached 25,719 students in total. If this rate of engagement continues, CLOCA will exceed its objective of engaging 60,000 students by 2025.

Objective 10: By 2025, engage 75,000 community members across the jurisdiction in projects and activities related to watershed health.

The watershed community includes everyone who resides, works, owns property or business, or visits its natural spaces, and these are the people that must take responsibility for maintaining and enhancing the watershed resources that plants and animals depend on for survival, and that sustain them as well. CLOCA public programs aim to raise awareness about watershed health and empower the community to take positive action to protect and improve the habitats in the watershed. In 2016 and 2017, CLOCA engaged 30,119 community members in total. If these levels of engagement are maintained then CLOCA should meet, if not exceed, its objective of engaging 75,000 people by 2025.

Actions: achieving the objectives

A complete list of recommended actions for CLOCA, municipalities and the community can be found in Appendix A (Table 2). The following describes the actions in greater detail and gives context for implementation.

CLOCA actions

As experts in the science of watershed health, CLOCA is committed to monitoring and reporting on the indicators identified in this WSP. CLOCA will continue to execute the *Integrated Watershed Monitoring Programs* annually as a means of evaluating watershed health over time, and maintain its datasets to track landscape-level changes. Currently the Integrated Watershed Monitoring Program is configured to assess forest and stream health indicators at a zone-scale as opposed to a watershed scale; however, CLOCA will pursue opportunities to expand the program to collect data at the watershed scale if there is support for this level of detail. The results of these monitoring programs will be shared with municipal partners and stakeholders annually via CLOCA's website and through watershed plan updates.

CLOCA is also committed to providing its partners with up-to-date resources that will assist them in making informed land use decisions and taking strategic action towards maintaining and improving watershed health for the benefit of its residents and visitors. The action plans and planning tools and reports that have been completed to date are available online at <https://www.cloca.com/action-plans>. CLOCA is currently developing a *Restoration Prioritization Tool* that will help CLOCA determine where restoration activities should occur across the jurisdiction. This tool will be the basis for the *CLOCA Restoration Guidelines*, which will guide CLOCA staff and partners to undertake strategic restoration activities. These guidelines will also speak to the development of a *stewardship and restoration program* that help with the implementation of restoration projects across the jurisdiction on both private and public lands. The *CLOCA Land Acquisition Strategy* will consider this tool, as well as other goals, to assist in the strategic acquisition of lands for protection and/or recreation. The *CLOCA Conservation Lands Master Plan* will consider the tools and strategies identified above, as well as others, to develop a series of management guidelines and recommendations that will help to ensure the 2,700 plus hectares that CLOCA owns and manages throughout the jurisdiction continue to meet our original intention to conserve natural features and functions, while providing for compatible high quality visitor experiences that meet the needs of our community. Implementing these above plans will help achieve many of the natural cover targets identified in this WSP and will positively impact forest communities, streams, and coastal wetlands across the watershed. In the Bowmanville/Soper creek watershed, a *Bowmanville Marsh Restoration and Management Plan* will be developed to make specific recommendations as to how to improve the health of this coastal wetland.

Stream health is closely related to land use and CLOCA is developing additional resources to help protect water. The *Urban LID Retrofits, Salt Vulnerability Mapping Tool, and Connected Imperviousness Action Plans* will provide specific recommendations for reducing imperviousness in the watershed and improving water quality as it relates to salt levels and other common contaminants. It is expected that by implementing the recommendations in these plans that the goals of improved water quality and, by extension, stream health and coastal wetland health, can be achieved. CLOCA will also undertake a Light Detection and Ranging (LIDAR)-based mapping project to identify the *headwater protection areas* in

INVASIVE SPECIES

are an ongoing threat to the health and biodiversity of CLOCA's natural heritage features. The *Invasive Species Management Strategy* (CLOCA, 2017) outlines actions municipalities and non-profit organizations can take in partnership with CLOCA to prevent, detect, manage and respond to invasive species, including:

- Work with partners to communicate the threats of invasive species
- Implement best practices to prevent, detect and manage invasive species
- Work with all levels of government to address new and existing invasive species
- Strengthen existing partnerships and build new alliances and create connections
- Use and enhance existing monitoring programs to detect new invaders and track the spread of existing invasive species

its watersheds for future consideration in land use management. Despite best efforts to manage stormwater with lot-level conveyance and end-of-pipe treatments, urban development can still trigger stream instability. Both *Rapid Geomorphic and Rapid Stream Assessments* will be undertaken to determine stream stability and stress due to urban pressures.

In order to stay current in the management of its regulated areas, protect people and property from harm, and be prepared for the potential impacts of climate change, CLOCA regularly updates a number of documents to ensure changes in the watershed are reflected in a timely manner. The *Policy and Procedural Document for Regulations & Plan Review* formalizes existing regulation plan review policies and procedures, as well as commonly accepted standards applied during the plan review process within CLOCA's jurisdiction in order to improve transparency, and increase public understanding of plan review approval process. Updates reflect changes to policy & legislation, new standards and updated technical documents to continue to safeguard public safety and protect the local environment. Revised documents are circulated to municipalities when updates are proposed.

As part of CLOCA's core mandate, the effective monitoring and reporting of flood conditions and 'flood damage centres' is achieved through regular updates to floodplain mapping and risk assessments. When these updates are carried out, they consider the following:

- improved topographic mapping and modelling techniques and reflect climate change
- improvements in web-based access for agencies and partners
- assessment and evaluation of risk / threats, and the development mitigation plans for high and moderate risk FDCs
- addition of new vulnerable population centres to improve understanding of risk
- Improve business and economic risk assessment by collecting additional business information and data

The CLOCA 2017 *Flood Damage Centres Upgrading report* identifies the most recent update of flood damage centres as a result of recent changes in land use. This information

THE FUTURE OF STORMWATER MANAGEMENT

Integrating green infrastructure and low impact development into traditional stormwater management will be one of the most significant ways to improve water quality and mitigate impacts of climate change. Future flows will likely increase due to climate change. The aim of green infrastructure and low impact development projects is to decrease imperviousness, increase infiltration and retain rainfall event volumes onsite.

GREEN INFRASTRUCTURE

Natural and human-made elements that provide ecological and hydrological functions and processes (ex. street trees, urban forests, natural channels, permeable surfaces and green roofs).

LOW IMPACT DEVELOPMENT

Small-scale structures that minimize runoff volumes by mimicking natural hydrology, infiltration, evapotranspiration, harvesting, filtration and detention of stormwater.

assists with the management of flood risk and emergencies in these areas in order to improve public safety. Flood forecasting is required to reduce the risk of loss of life and property damage due to flooding through forecasting of flood events, issuing flood warnings, alerts and advisories. The development of the *Stream Flow and Water Level Forecasting Model* will provide the ability to effectively analyze and predict the potential impacts of runoff on stream flow rates at the local level.

Climate change has become an increasingly important factor to consider in watershed management. It is a consideration that will be included in any restoration planning that CLOCA undertakes; furthermore, CLOCA will develop a *Natural Heritage System Climate Change Vulnerability Assessment Report* to identify vulnerable areas and restoration opportunities within CLOCA's NHS based on identified risks and priorities with respect to climate change impacts. This report will leverage the new regional climate change ensemble model work that is currently being developed for Durham Region.

In order to address potential losses in ecological features or functions within CLOCA's NHS as a result of changes in land use, CLOCA is developing an *Ecological Compensation Action Plan* for use in planning applications to provide a transparent and consistent means of replacing losses to the natural heritage system that are determined to be unavoidable, after the protection hierarchy has been applied (avoid, minimize, mitigate). If natural cover within the NHS cannot be maintained within a new land use then it is important for the features and functions to be replaced in an appropriate location if the watersheds cover targets are to be met. CLOCA will need to develop an effective system to track the results of restoration projects as well as natural and anthropogenic changes in cover. This *natural heritage tracking tool* will be an important component in CLOCA's ability to accurately report gains or losses to the natural cover in the watershed over time.

Finally, CLOCA works hard to communicate, educate, and inspire the broader community in the work that it does around watershed management. To inspire our community to be watershed champions and to take action for real change, CLOCA has developed a number of programs to engage the students, volunteers and the general public, and tools to guide and track participation. The CLOCA *Education Program Delivery Assessment (2018)*, *Community Needs and Opportunities for Environmental Education (2018)*, and the *Conservation Area Trail Stewardship Program*, have all been updated or developed recently to engage different segments of our watershed community. The *online Volunteer Program promotion, registration and training* platform provides a convenient format to manage and track volunteer activities, and will be used to help monitor CLOCA's success in reaching the engagement objectives laid out in this watershed plan.

Municipal actions

The current status of many of the watershed health indicators are below, and in some cases significantly below, the goals identified in this watershed plan. While municipalities have made significant efforts to incorporate the 2012/2103 watershed plan recommendations into policy documents, there is still much work to be done. If the goals and objectives of this WSP are to be achieved, Regional and area municipalities must first continue to ensure that land use policies are in place that protect the natural heritage features and functions that currently exist in the watershed. However, simply protecting what currently exists will not achieve the recommended goals in this WSP. As a result, Regional and area municipalities must strengthen support, both politically and financially, for significant restoration efforts within the watershed if the collective “we” are hoping to achieve healthy resilient watersheds by 2040. In particular, support for private land stewardship programs and restoration activities on public lands will result in significant gains in the natural cover target in particular.

Adopting CLOCA’s natural heritage system, or a connected system with similar attributes to the CLOCA functional natural heritage system, into Regional and municipal OPs is one way of protecting the land base needed to achieve many of the WSP goals. Adopting and implementing the recommended policies and operating guidelines identified in Appendix D, which were developed with the WSP goals in mind, will ensure that protecting and improving the natural heritage and water resource systems in the watershed is a priority at every level of land management.

Since the original WSP was published, CLOCA has developed numerous action plans and tools that will help achieve the goals and objectives of this WSP. These plans are available online at <https://www.cloca.com/action-plans>. For example, the *Wildlife Corridor Protection and Enhancement Plan* (2015), the *Riparian Corridors Restoration Plan* (2017), the *Instream Barriers Action Plan* (2017), and the *Invasive Species Management Strategy* (2017) all include best management practices that various departments within the Region or area municipalities can refer to when developing programs or devising work plans. Consideration of these practices, particularly in the management of natural municipal spaces, will

URBAN FORESTS

play an integral role in the community and the health of CLOCA’s watersheds. Urban forests are increasingly under pressure from invasive pests and pathogens, soil compaction, disturbance to the understory, and the effects of climate change. Municipalities are encouraged to develop best practices to preserve and enhance urban forests to protect their many benefits for future generations. Trees Canada has produced a Compendium of Best Urban Forest Management Practices (Bardekjian, A., 2018) that identifies many of these important topics and how to address them.

ensure that existing habitats are protected and/or improved, thereby contributing to the achievement of many of the WSP goals. In particular, the management of urban forests should be addressed by Regional and municipal landowners to prevent the decline of these important natural heritage features. CLOCA is committed to working with interested municipal partners to develop *best management practices for urban forests* to ensure their long-term health, which would contribute to achieving the forest cover and health goals.

The *Wildlife Corridor Protection and Enhancement Plan* (2015) and the *Instream Barriers Action Plan* (2017) contain maps that prioritize instream and terrestrial wildlife barriers, which municipalities can refer to when developing work plans related to culvert replacements and improvements to the transportation network. By considering the recommendations in these plans, and including culvert upgrades in initial designs, these goals can be achieved over time, resulting in a healthier and more resilient watershed. Improving culverts for wildlife may also reduce the risk to municipal infrastructure and human safety from flooding, which is also a target discussed in this WSP.

The application, handling and storage of road salt, as well as snow storage, are listed as a prescribed drinking water threat under the Clean Water Act, 2006 and within the Source Protection Plan, 2015. It is well-documented that the use of salt to maintain winter safety has adverse impacts on the health of our water. Often, salt is over-applied and makes its way into creeks, groundwater and drinking water, negatively affecting human health, fish, wildlife, soils, vegetation and even infrastructure.

A further reduction in road salt usage by continuously improving winter maintenance operations through the implementation of best management practices is needed to ensure healthy water throughout CLOCA's jurisdiction. CLOCA will work to develop an *Identification of Salt Vulnerable Areas in the CLOCA Watershed* assessment that will provide a list of recommended practices and maps that identify the vulnerable areas in the watershed where modified salting activities should be considered by the municipalities and the province to protect water quality.

SOURCE PROTECTION PLANS (SPP)¹

provide guidance to ensure clean, safe, secure, and sustainable sources of drinking water within CLOCA's jurisdiction by identifying key threats (Figure 8) on the land that would have the greatest potential impact to water quality and quantity. CLOCA, through the CTC Source Water Protection Committee provides technical advice to Durham Region that supports implementation of the SSP.

EVENT BASED AREAS

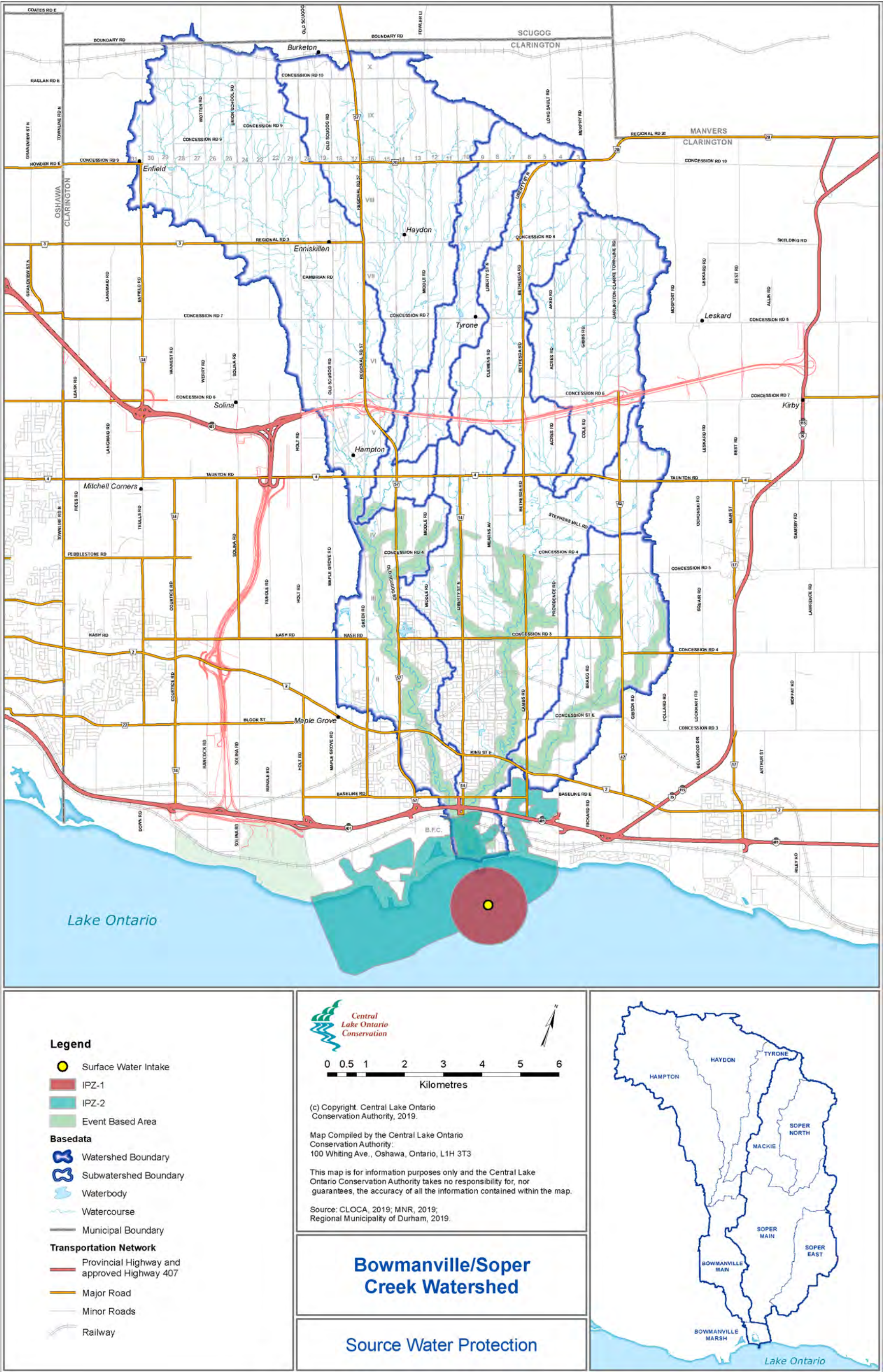
identify pathways where a potential spill from a specific activity would cause a significant threat to drinking water sources.

INTAKE PROTECTION ZONES

are the area of land and water immediately surrounding a municipal surface water intake and considers 1) distance from the intake, 2) minimum travel time of water associated with the intake 3) minimum response time for system operators to respond to adverse conditions or an emergency and 4) the remaining watershed area upstream.

¹ Source Protection Plan: CTC Source Protection Region, 2015

Figure 8: Source Water Protection



Municipal OP policies

The goals in the updated WSP cannot be achieved without Regional and municipal support for the watershed plan. Adopting recommended OP policies and operating guidelines, developing asset management plans that include NHS features as natural assets, and recognizing a NHS in OPs that achieves the goals of this WSP are the actions that municipal partners can continue to take to demonstrate their commitment to achieving the watershed vision and meeting the objectives. Support will be measured by tracking actions made towards meeting these related objectives for the next WSP update in 2025.

Asset Management Plans

The Infrastructure for Jobs and Prosperity Act, 2015, sets the framework for which the Province and municipalities work together to ensure long-term asset management planning to prioritize investment in public infrastructure. Ontario Regulation 588/17 further outlines asset management planning for municipal infrastructure, providing prescriptive timelines and the context to consider core municipal infrastructure assets and green infrastructure assets.

As municipalities develop asset management plans, there is a greater need to consider the value and benefits provided by natural assets. It is increasingly being demonstrated that natural assets provide equivalent or better services than many engineered assets. Inclusion of natural assets in asset management planning will help to protect and manage these assets and has the potential to save significant costs on engineered structures while supporting a community that is resilient and adaptable to climate change.

In CLOCA's jurisdiction, the identified NHS offers a suite of ecological services such as flood attenuation, water purification, mitigation of extreme weather events, and support for healthy lifestyles among many other services; therefore, components of the NHS would be ideal to consider as natural assets and included in municipal asset management plans.

As municipalities move forward in the development of asset management plans, there is an opportunity to work in partnership with Conservation Authorities in the valuation of natural assets and their services to inform decision-making processes. CLOCA's 2017 report *Ecological Services: Valuing Natural Areas in the CLOCA Jurisdiction* is one tool that municipal partners can use to inform their own natural asset valuations for asset management plans. Identifying, measuring and managing natural assets as part of an overall asset management strategy can save costs, ensure better management of natural resources and support community resiliency. The complete report (as well as other completed action plans and tools) is available online at <https://www.cloca.com/action-plans>.

Operating Guidelines

Because many of the daily operations carried out by Regional and municipal staff are related to the indicators identified in this WSP, one action that municipalities can take to help achieve the WSP goals is to adopt the recommended operating guidelines. Many of these, if adopted and followed, will help improve water quality and quantity, forest communities and coastal wetland health. A complete list of recommended guidelines is included in Appendix D.

Community actions

Private landholdings comprise the majority of the watershed; therefore, the conservation targets identified in this WSP require action from everyone if the goals and objectives are to be achieved.

The Action Plans that CLOCA has produced to date contain a number of best management practices that private landowners and businesses can apply to their own properties to protect and improve natural cover, forest communities, streams and coastal wetlands. The *Riparian Corridors Restoration Plan*, the *Instream Barriers Action Plan*, and the *Wildlife Corridor Protection and Enhancement Plan* contain maps that stakeholders can use to identify these features on the landscape and offer strategies for landowners with creeks or corridors on their properties to protect them. These plans are available online at <https://www.cloca.com/action-plans>.

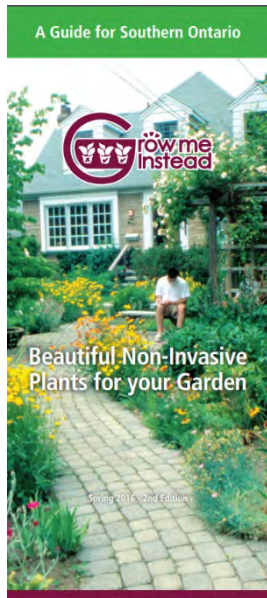
For landowners interested in taking a more active restoration role on their properties, CLOCA staff and local municipalities can assist with identifying natural features and interpreting regulatory constraints, such as regulated areas and tree by-laws. CLOCA may also be able to provide advice

on where to focus restoration efforts. For landowners with existing natural heritage features, Provincial tax-incentive programs may be available to offset property taxes and encourage the preservation of important habitats.

Residents and businesses in urban and suburban parts of the watershed can help improve stream health by practicing water conservation and reducing imperviousness. Invasive species can also be addressed in these locations by choosing native plants for gardens and ponds and removing known invasive species. Some excellent resources include the *Grow Me Instead* guide and species specific best management guides, available online, and websites such as <http://www.invadingspecies.com/plants/>.

Finally, responsible, low-impact recreation is a key component to achieving watershed health. Simple actions, such as refraining from dumping yard waste in ravines and brushing off shoes between visits to natural areas can have a big impact on reducing the spread of non-native and invasive species to natural areas, which promotes forest, stream, and

wetland health. See the sidebar for more actions.



10 THINGS YOU CAN DO!

1. Be a responsible pet-owner: keep dogs on a leash in natural areas and pick up pet waste.
2. Buy native plants whenever possible and remove invasive species from your property.
3. Install rain barrels and make your yard less impervious by putting in gardens and permeable driveway/patios.
4. Understand what you can and can't do by learning about regulated areas, tree by-laws, and fill regulations.
5. Dispose of waste - including yard waste and compost – properly.
6. Only storm water should go down the storm sewer grate!
7. Practice the “take only pictures, leave only footprints” philosophy when visiting natural areas.
8. Stay on established trails to avoid trampling plants and compacting soil.
9. Keep wildlife wild by securing food waste and by not hand-feeding.
10. Use sand instead of salt for winter traction.

Next steps

Working Together In Partnership

Achieving *a healthy, resilient watershed that sustains ecological integrity for the plant, animal and human communities within it* requires the cooperation and dedicated action of all impacted stakeholders. Every person has a role to play in the environmental, social and economic health of the Bowmanville/Soper creek watershed through their everyday lives. Our environmental choices today matter for the future and how we ‘make space for nature’ through our decisions and actions will ultimately determine the success in achieving the WSP vision, goals, and objectives.

How to Get Involved

Stakeholder comments, ideas and suggestions on how to achieve the Watershed Plan vision, goals, and objectives will be considered and supported if possible. All stakeholders interesting in becoming involved to help implement the various aspects of the Watershed Plan should visit CLOCA’s website, www.cloca.com. We look forward to working with existing partners and new stakeholders who would like to contribute to improving watershed health.

Evaluating Watershed Plan Success

A critical component of achieving the WSP vision, goals and objectives is understanding current conditions and how those are changing over time. Sir William Thomson summarized this same sentiment more concisely, “if you cannot measure it, you cannot improve it”. The backbone of this WSP is the background data that is collected through the Integrated Watershed Monitoring Program, the Durham Region Coastal Wetland Monitoring Program, through ELC inventory programs and others. This long-term data allows us to understand how healthy and resilient the watersheds are and how they are changing so tracking success of the goals and objectives is possible. These monitoring and inventory programs have gone through extensive scientific review and planning to ensure that the results and recommendations from them are reliable, accurate, and guide us towards a healthier future. Future updates and success tracking to the WSP will be dependent on the continuation of the CLOCA monitoring and inventory programs. Recommendations have been suggested where gaps in monitoring or data quality exist in order to improve CLOCA’s ability to understand conditions and trends and maintain our goal of advancing watershed science and knowledge.

Further to this, additional support and advancement in technology will be important for creating tracking tools, such as restoration and communication tracking systems, managing large datasets, and updating Geographic Information System (GIS) modelling for climate change and

land use change impacts for scenario modelling. These tools help convert large amounts of scientific data into resources that can be efficiently interpreted for WSP recommendations that maintain a healthy and safe watershed.

Implementation

Watershed Plans will continue to be updated every five years from the date they are finalized to reflect changing conditions, pressures and trends in the watershed. The next five-year review following the 2020 WSPs, will include a complete update of all existing condition reports, re-evaluated targets and updated mapping and modelling. This review will be scheduled for 2025. Decisions and actions to develop collaborative implementation begins the next steps of the 2020 Watershed Plan's progress.

The actions identified in this WSP represent an effort dedicated to continuing to achieve a healthy and resilient watershed. As stated in the previous WSP, the fundamental barrier to executing these actions is commitment. Provincial, Regional and Area Municipal endorsement of the updated WSP, as well as resource support for implementation, will need to continue.

CLOCA is well-positioned to undertake the majority of the work with our current level of in-house expertise, but it is anticipated that additional resources will be necessary to develop and execute all of the actions within the next five-year period. This updated WSP continues to support the achievement of strategic corporate goals, satisfy Regional and Area Municipal natural heritage responsibilities and integrates well with existing environmental programs offered by our municipal partners. Outside funding sources will continue to be sought to supplement the required resources where available and appropriate.



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Appendix A – Watershed health evaluation tables

TABLE 1- BOWMANVILLE/SOPER CREEK WATERSHED TARGETS, ATTRIBUTES & INDICATORS

Target 1: Natural Cover		
Attribute	Indicator	Description
Natural cover	% NHS cover	This indicator measures the difference between the existing cover within the CLOCA NHS and the total area of the NHS to determine how much restoration is required to achieve 100% cover. Tracking change in the NHS cover over time will help CLOCA assess our collective success at protecting and improving the system.
Forest cover	% forest, interior forest & deep interior forest cover	These indicators were adopted from <i>How much habitat is enough?</i> (3 rd ed.) (Environment Canada, 2013) for the 2012 WSP. The amount of forest cover, forest interior, and deep forest interior in a watershed are indicators of healthy wildlife communities and provide insight into the size and shape of the forest patches on the landscape.
Wetland cover	% wetland cover	Wetland cover is an indicator of a watershed's ability to manage water. Increased wetland cover is related to reduced flooding, higher base flows in creeks, and reduced occurrence of high flows, which are important factors for stream health, municipal infrastructure, and human safety.
Riparian cover	% riparian cover	Riparian cover plays an important role in stream health by reducing sedimentation, moderating stream temperatures, stabilizing banks, and generating substrate habitat that is capable of supporting sensitive benthic communities.



Wildlife corridor cover	% wildlife corridor cover	<p>Habitat connectivity is an important function within the NHS because it allows plants and animals to move between habitat areas on the landscape, and will be even more important if climate change makes some habitats unsuitable and wildlife is required to migrate. Many species move slowly and need natural cover to protect them from harm. The amount of natural cover within the landscape and local corridors in the watershed is an indicator of how well-connected the habitats in the watershed are.</p> <p>Along the shoreline, particularly within 1 km of Lake Ontario, natural cover is key for migrating birds that have crossed the lake and are in need of habitats to stop, rest, and re-fuel. Natural cover within this corridor is an indicator of how high-functioning the shoreline habitats are for migratory species.</p>
Target 2: Forests		
Attribute	Indicator	Description
Breeding birds	Forest Bird Index of Biotic Integrity (IBI)	Many birds have specific habitat needs while others can successfully nest in a variety of habitats and conditions. In this indicator, the presence or absence of sensitive forest birds is used as a measure of how high-functioning a forest ecosystem is.
Tree health & dead wood	Tree Index of Biotic Integrity (IBI)	Trees provide the structural and biophysical components of a forest and yield important functions like regulating light and moisture, and supply habitat for forest flora and fauna. Downed woody debris, or the accumulation of dead wood on the forest floor, promotes nutrient cycling within the community. This indicator uses crown health, the presence of diseases, pests and pathogens, and the volume of downed woody debris as a measure of forest ecosystem function.
Plant community	Floristic Quality Index	Increased diversity of native plants can lead to improved resistance to stressors and increased diversity in higher trophic levels, as plants provide the basis for the food web. Plant community looks at the diversity and sensitivity of floral species, the presence and abundance of invasive species, and the regeneration of trees and shrubs which, in turn, provides insight into the structure of the future forest.
Target 3: Streams		
Attribute	Indicator	Description
Water quality	Water temperature	Long-term stability in water temperature is important for maintaining a healthy aquatic habitat. Just as air temperature is important for people, water temperature impacts the type of habitat available for fish species. Local changes in land use and larger-scale impacts like climate change can have negative impacts on water temperature, putting stress on aquatic life. By



		understanding the temperature and rate of change in different seasons, we can understand how much stress there is in aquatic ecosystems.
	Water quality	As water becomes contaminated, it is more difficult for aquatic species to survive, less desirable for recreation, and more expensive to purify for drinking water. For aquatic species, high levels of nutrients from fertilizers cause decreases in dissolved oxygen; erosion and sediment run-off cause gravel beds to be filled in destroying spawning habitat; and, road salt increases chloride concentrations putting stress on aquatic species chemical exchanges. Understanding whether certain water quality parameters are under safe thresholds is critical for understanding the health of aquatic ecosystems.
	Chloride	One of the most common chemicals present in streams systems in northern climates is Chloride. Due to its affordability and properties that make it ideal for de-icing roads in the winter, huge quantities of Chloride (in the form of road salt) are applied across the watershed. After being applied to roads, Chloride dissolves and flows towards the nearest water body. As a result, concentrations within streams have been increasing consistently. Chloride has been identified by the Canadian Water Quality Guidelines as dangerous to aquatic health when its concentrations exceed 120 mg/L.
Biological connectivity	Accessible fish habitat	Aquatic species can use many types of habitats during their life cycle. For some species, spawning may happen in small, headwater tributaries while overwintering occurs in Lake Ontario. In order for fish to be able to access different habitat types streams must be free of barriers, which can include old mill ponds or poorly-installed culverts. In the CLOCA Instream Barrier Action Plan, barriers have been documented and prioritized for removal to restore access to stream habitat. This indicator measures habitat availability by tracking the number of instream barriers in the watershed over time.
Fish community	Golden Horseshoe Fish Index	Fish species have individual preferences and ranges of conditions in which they can survive; therefore, the relative abundance of different fish species at a site can be used to indicate stream health. If a fish community is dominated by coldwater species that are sensitive to changes in water quality, such as Brook Trout, it is representative of a healthy stream system, and if a community is dominated by non-native tolerant species, such as Common Carp, it is representative of poor health. By taking all species into consideration, a comprehensive stream health score can be determined.



Macroinvertebrate community	Hilsenhoff Biotic Index	Aquatic bugs, otherwise known as macroinvertebrates, all have their own habitat preferences and range of conditions they can survive in. Similar to the Golden Horseshoe Fish Index, using this knowledge of their relative abundance and sensitivity to watershed stressors makes this a valuable measure for understanding stream health. With increasing impacts on stream ecosystems, sensitive species will become less abundant and result in a lower score. If that system is restored, sensitive species will increase and the stream score will also increase.
Stream stability	Stream Stability Index	Streams naturally move and change shape over time because flowing water moves stream habitat material. When changes occur naturally, they tend to be relatively slow and that allows aquatic life to adjust to the habitat that is present. If changes to flow rates and timing occur due to changes in land use practices or stormwater management, this can cause accelerated and extreme changes to stream channel shape and stability. These changes tend to decrease stream habitat quality by reducing the diversity and type of habitat available to aquatic species. As a result, stream shape and stability can be a very useful indicator for stream health as deviation from a natural state will result in poorer stream habitat, functions, and services.
Target 4: Coastal Wetlands		
Attribute	Indicator	Description
Breeding bird Community	Wetland Breeding Bird Index of Biotic Integrity (IBI)	Coastal wetlands provide important habitat for wetland-dependent birds, and some are more sensitive than others. This indicator uses the suite of bird species breeding within a marsh to evaluate how high-functioning the wetland is.
Fish community	Fish Index of Biotic Integrity (IBI)	Coastal wetlands provide spawning and nursery habitat for many native fish species, which is influenced by changes in water quality, physical habitat conditions, and invasive fish species. Fish community monitoring documents the species present and their biomass to assess habitat quality.
Submerged aquatic vegetation (SAV) community	SAV Index of Biotic Integrity (IBI)	Submerged aquatic vegetation provides essential food and habitat for a variety of coastal wetland wildlife species throughout their life stages. This indicator documents species present and their coverage within a wetland to evaluate wetland habitat quality.
Aquatic macroinvertebrate community	Aquatic Macroinvertebrate Index of Biotic Integrity (IBI)	Aquatic macroinvertebrates provide food resources for amphibians, fish and waterfowl. As aquatic organisms, they are sensitive to both changes in water quality and physical habitat conditions, and their abundance in a wetland is an indicator of habitat quality.
Water quality	Water Quality Index	Wetland plants and animals are heavily influenced by the water quality in a wetland. Water quality is assessed using water temperature, pH, conductivity and turbidity, as these parameters



		reflect the cumulative effects of land use activities in the watershed, e.g., nutrient and chemical inputs, road salt runoff, erosion, as well as conditions in the wetland itself, e.g., invasive species.
Target 5: Human Health		
Attribute	Indicator	Description
Deep groundwater quality Shallow groundwater quality	Ontario Drinking Water Quality Standards (Chloride)	Chloride is a common source of contamination in groundwater. Chloride is a chemical that does not naturally exist in deep aquifers but is abundant in surface water due to its use as a de-icer in winter. This makes it a useful chemical to gauge how much potential anthropogenic impacts there are on deep aquifers and how much risk there may be to well water quality and the human health that depends on them. The Ontario Drinking Water Quality Standards sets guidelines for safe limits of chemicals in drinking water sources. The guideline for chloride is 250 mg/L.
Flooding	Flood Damage Centres	Flood damage centres (FDCs) are areas where buildings are located within the regulatory floodplain of a stream system or Lake Ontario shoreline. The Central Lake Ontario Conservation Watershed Flood-Risk Assessment (CLOCA 2017) identified 92 FDCs throughout our watershed, and assessed each FDC by looking at the vulnerability to flooding (property, structures, and public safety), likelihood of flooding; and social, economic, and environmental impact from a flood event. Based on this analysis, the FDCs were risk-assessed and ranked. Seven FDC's were assessed as high to medium risk, and are the focus of CLOCA's efforts.
Target 6: Community Engagement		
Attribute	Indicator	Description
Volunteers engaged	# of volunteers	Volunteers are engaged to help deliver numerous CLOCA educational and natural/cultural heritage programs across the jurisdiction and this indicator uses volunteer participation rates to evaluate the watershed community's commitment to promoting watershed health.
Students engaged	# of students	CLOCA delivers curriculum-based and watershed-based education programs to elementary, high school, and post-secondary students throughout its jurisdiction. This indicator uses the number of students reached via these programs to assess the watershed community's commitment to understanding watershed health.
Public engaged	# of public participants	CLOCA provides opportunities for members of the public to participate in hands-on educational and/or restoration activities to increase awareness about the watershed and improve habitats. This indicator uses the number of people that attend these events to assess the watershed community's commitment to action for maintaining and improving watershed health.



TABLE 2- STRATEGIES, OBJECTIVES AND ACTIONS FOR ACHIEVING THE BOWMANVILLE/SOPER CREEK WATERSHED GOALS

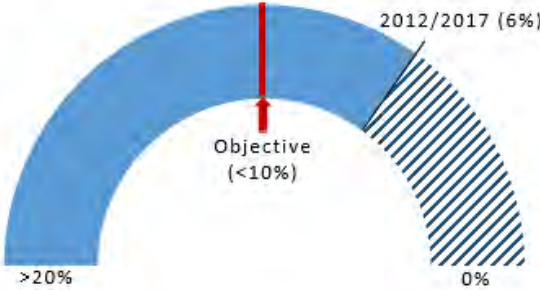
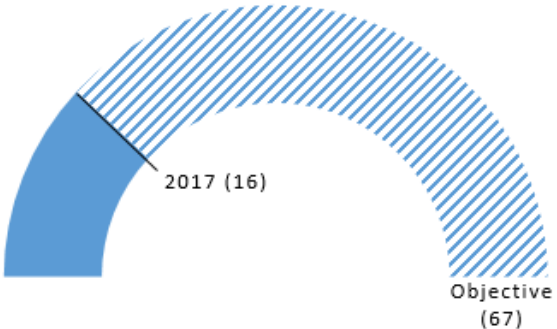
Strategy	Objectives	Status	Actions Completed	Actions Identified
Conserve, enhance and restore ecosystems of the Bowmanville/Soper creek watershed	1. By 2025, restore 169 hectares of forest cover in the Bowmanville/Soper creek watershed through reforestation and natural succession.	New objective	1. Riparian Corridors Restoration Plan	CLOCA Actions: 1. Complete Ecological Compensation Action Plan. 2. Complete Restoration Guidelines and Prioritization Tool. 3. Complete Conservation Lands Master Plan. 4. Complete Urban LID Retrofits Action Plan. 5. Complete Identification of Salt Vulnerable Areas in the Bowmanville/Soper creek watershed. 6. Complete Natural Heritage System Climate Change Vulnerability Assessment. 7. Complete Assessing Imperviousness – A Guidance Document 8. Complete Connected Imperviousness Action Plan. 9. Complete headwater protection mapping using LIDAR for future indicator development. 10. Develop a Bowmanville Marsh Restoration and Management Plan. 11. Develop and implement a stewardship and restoration program, and integrate these into relevant outreach programs. 12. Implement the Invasive Species Management Strategy in partnership with Municipal and Community partners 13. Update Wildlife Corridor Protection & Enhancement Plan in 2020 to include corridor analysis methodology. 14. Complete Rapid Geomorphic and Stream Assessments 15. Complete Stream and Water Level Forecasting Model 16. Expand volunteer community by pursuing program funding/sponsorship, facilitating co-op placements and corporate partnerships, and accommodating volunteer requests. 17. Work with municipal partners to develop and deliver collaborative environmental learning experiences.
	2. By 2025, maintain existing wetlands in the Bowmanville/Soper creek watershed.	New objective	2. Wildlife Corridor Protection and Enhancement Plan	
	3. By 2025, restore 180 hectares of riparian cover in the Bowmanville/Soper creek watershed.	New objective	3. CLOCA Land Acquisition Strategy	
	4. By 2025, remove 3 barriers as identified in the Instream Barrier Action Plan.	New objective	4. Restoration and planting projects have occurred within the watershed however formal tracking of gains by all stakeholders has not occurred.	
	5. By 2025, restore 4.25 ha of shoreline habitat in the Bowmanville/Soper creek watershed	New objective	5. Instream Barrier Action Plan	
	6. By 2025, develop objective to restore natural cover in the landscape and local wildlife corridor systems.	New objective	6. CLOCA and member municipalities have worked together to ensure policies have been adopted into official plans.	
Promote responsible land use practices to protect ecological and human health.	1. By 2040, achieve and maintain <10% imperviousness in the watershed.		7. Ecological Services: Valuing natural areas within CLOCA	
	2. By 2040, achieve and maintain wildlife potential permeability (WPP) scores of 'very good' or better in the landscape corridor system.		8. Invasive Species Management Strategy (2017)	
			9. Education Program Delivery Assessment (2018) with brochure and website	
			10. Community Needs and Opportunities for Environmental Education (2018)	
			11. Online volunteer program promotion, registration and training.	
			12. Conservation Area trail stewardship program.	



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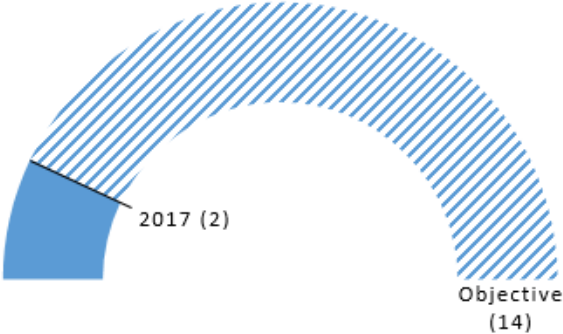
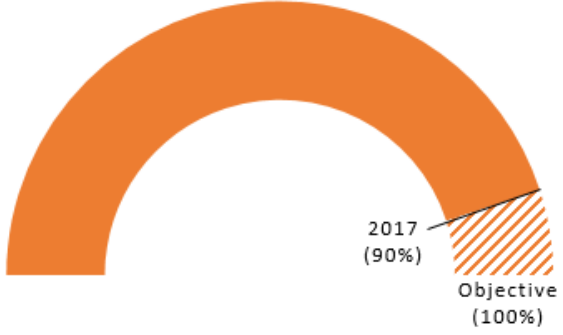
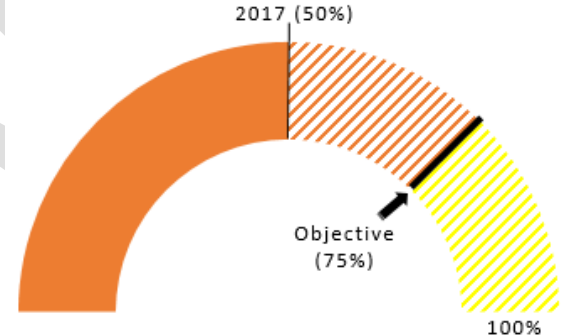
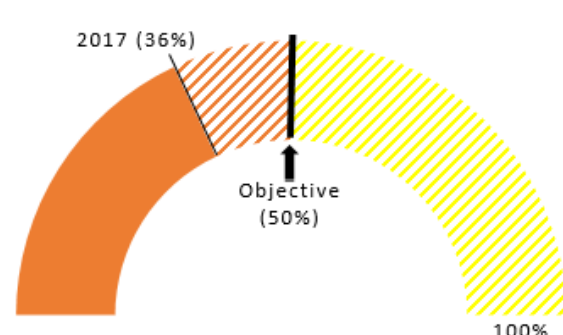
Strategy	Objectives	Status	Actions Completed	Actions Identified
	3. By 2040, achieve and maintain WPP scores of ‘moderate’ or better in the local corridor system.		13. Well best management practices education program 14. Port Darlington Flood Study (CLOCA 2018) 15. Flood Damage Centres Upgrading Report (2017)	18. Develop a corporate strategy to ensure that all departments participate in showcasing the depth of our business and expertise. Municipal Actions: 1. Implement the adopted official plan policies. 2. Adopt additional fundamental, key and voluntary official plan policies to protect natural heritage features and functions (Appendix D). 3. Adopt and implement operating guidelines (Appendix D). 4. Implement best management practices identified in the Wildlife Corridor Protection and Enhancement Plan, Riparian Corridors Restoration Plan, Instream Barriers Action Plan, and Identification of Salt Vulnerable Areas in the Bowmanville/Soper creek watershed. 5. Work with CLOCA to develop a BMP for the enhancement and protection of Urban Forests.
Encourage, acquire, and expand stakeholder support for the watershed plan.	1. By 2025 or the next municipal comprehensive review (MCR), 100% adoption of fundamental official plan policies by the Region and the municipalities in the watershed.			Community Actions: 1. Implement best management practices identified in the Riparian Corridors Restoration Plan, Wildlife Corridor Protection and Enhancement Plan and Instream Barriers Action Plan. 2. Work with CLOCA and member municipality to protect and restore natural heritage features on your property. 3. Partner with provincial agencies in tax-incentive programs to protect and restore natural heritage features on your property. 4. Work with regional and local municipalities to ensure you are following tree by-laws. 5. Follow best management practices on your property to prevent the introduction and spread of invasive species. 6. Practice responsible recreation to reduce your impacts on natural heritage features in the Bowmanville/Soper creek watershed.
	2. By 2025 or the next MCR, 75% adoption of key official plan policies by the Region and the municipalities in the watershed.			
	3. By 2025 or the next MCR, 50% adoption of voluntary official plan policies by the Region and the municipalities in the watershed.			



TABLE 2- STRATEGIES, OBJECTIVES AND ACTIONS FOR ACHIEVING THE BOWMANVILLE/SOPER CREEK WATERSHED GOALS


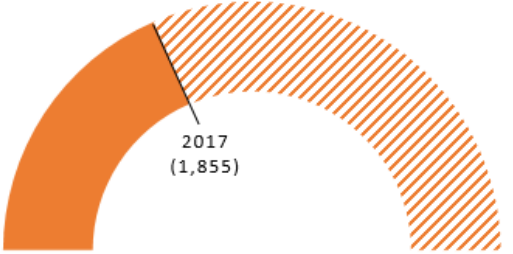
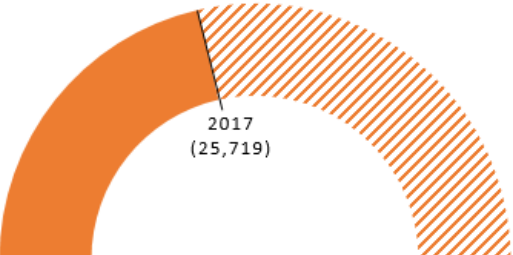
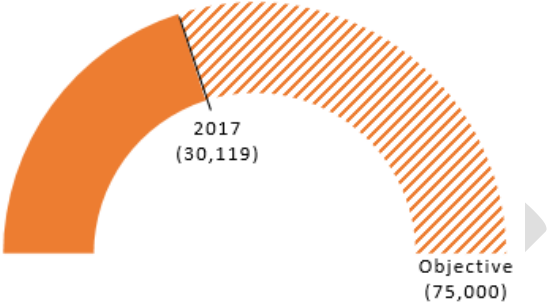
Strategy	Objectives	Status	Actions Completed	Actions Identified
	4. By 2025 or the next MCR, 50% adoption of operating guidelines by the Region and the municipalities in the watershed.	New objective		7. Utilize existing programs to reduce your property's stormwater impacts on streams.
	5. By 2025, municipalities adopt a connected natural heritage system that protects the features identified in the functional CLOCA NHS.	 Objective (100%)		
	6. By 2025, municipalities adopt a connected NHS that includes CLOCA's targeted NHS, or includes areas identified for future restoration that will achieve the WSP natural cover goals.	Not currently available		
	7. By 2025 or the next MCR, municipalities develop asset management plans that recognize as natural assets a connected natural heritage system that protects the features identified in CLOCA's functional NHS.	New objective		
	8. By 2025 engage 5,000 volunteers across the jurisdiction in CLOCA volunteer initiatives related to watershed health.	 2017 (1,855) Objective (5,000)		
	9. By 2025, engage 60,000 students across the jurisdiction in CLOCA curriculum-based education programs related to watershed health.	 2017 (25,719) Objective (60,000)		



TABLE 2- STRATEGIES, OBJECTIVES AND ACTIONS FOR ACHIEVING THE BOWMANVILLE/SOPER CREEK WATERSHED GOALS

Strategy	Objectives	Status	Actions Completed	Actions Identified
	10. By 2025, engage 75,000 community members across the jurisdiction each year in projects and activities relating to watershed health.	 <p>2017 (30,119)</p> <p>Objective (75,000)</p>		



Appendix B – Legislative summary

Legislation/ Policy Title	Year	Requirement	Conforms? (Y/N)
Federal			
Federal Fisheries Act	2018	Direction on the conservation and protection of habitat essential to sustaining freshwater and marine fish species. The Act includes a self-assessment process to review future activities in and around water. It also includes increased recognition of Indigenous rights and knowledge.	Y
'How Much Habitat Is Enough?', 3 rd Edition	2013	Provides information in the Great Lakes Areas of Concern, to be used in setting and listing criteria concerning fish and wildlife habitat. This guide is used to set restoration targets and identify restoration project locations.	Y
Provincial			
Environment Plan	2018	Ontario's commitment to conservation and climate action, the protection of natural resources and waste diversion, in an effort to maintain a healthy and economically prosperous province.	Y
Conservation Authorities Act	2019	Increase clarity and consistency in the roles and responsibilities of Conservation Authorities with regards to the delivery of core programs and services that help advance conservation, development, management and restoration of natural resources in Ontario's watersheds.	Y
Endangered Species Act	2019	Legal protection to species classified as endangered or threatened and their habitat. It sets timelines for strategies and plans to recover at-risk species and provides tools to encourage protection and recovery activities and reduce impact of human activity.	Y
Fishing in Your Backyard	2015	Encourages responsible and sustainable use of Ontario's natural resources and promotes angling, healthy aquatic habitats and accessible fishing sites throughout the Greater Toronto Area.	Y
Great Lakes Protection Act	2015	Provides support to combat climate change through the protection and restoration of the Great Lakes- St. Lawrence River Basin, more specifically <ul style="list-style-type: none"> • The Great Lakes Protection Initiative that ensures all land use decisions conform • In circumstances associated with provincial legislation the Great Lakes Initiative prevails • Great Lakes Guardian Council established to include Conservation Authorities whose purpose is to provide a forum to identify priority actions, foster collaboration, share information and provide input on issues pertaining to the Great Lakes 	Y
Great Lakes Strategy	2012	Outlines goals to protect and restore the ecological health of the Great Lakes-St. Lawrence River Basin through: <ul style="list-style-type: none"> • Water quality management • Protection and restoration of coastal shorelines, beaches, & wetlands • Improving habitat and supporting biodiversity • Dealing with invasive species 	Y



Legislation/ Policy Title	Year	Requirement	Conforms? (Y/N)
		<ul style="list-style-type: none"> Utilizing advance climate change science Managing salt contamination 	
Greenbelt Plan	2017	Facilitates long-term strategic growth in the Greater Golden Horseshoe that incorporates environmental protection to mitigate development impacts and climate change and identify special areas of concern within the Greenbelt.	Y
Growth Plan for the Greater Golden Horseshoe	2019	To plan for growth and development in a way that supports economic prosperity, protects the environment and helps communities achieve a high quality of life in the Greater Golden Horseshoe Area.	Y
Infrastructure for Jobs & Prosperity Act (O. Reg 588/17)	2015	Regulation includes Green Infrastructure Assets which consist of natural or human-made elements that provide ecological and hydrological functions and processes. Requires every municipality to prepare a strategic asset management policy and plan.	Y
New Horizons: Ontario's Agricultural Soil Health & Conservation Strategy	2018	This document is a long-term framework to guide collaborative soil health research, investments and activities until 2030.	Y
Oak Ridges Moraine Conservation Plan	2017	Ecologically based plan and provides land use and resource management direction for the Oak Ridges Moraine.	Y
Ontario's Biodiversity Strategy	2011	Safeguards Ontario's species variety and ecosystems through coordinated conservation strategies.	Y
Ontario's Five-Year Climate Change Action Plan	2016-2020	Framework to create competitive conditions for the adoption of low-carbon technology using a variety of actionable target areas.	Y
Planning Act	2019	A land use planning framework in which municipalities shall have regard to the protection of ecological systems including natural areas, features and functions.	Y
Provincial Policy Statement (DRAFT)	2019	Policy regarding land use planning and development to protect/ enhance quality of life for all Ontario residents. Includes considerations to prepare for the impacts of climate change, enhance stormwater management policies, address excess soil, maintain policies related to natural & human made hazards, identify natural heritage systems and protection for the Greenbelt.	Y
Runoff Volume Control Targets for Ontario	2016	Provides a minimum runoff volume control target (RCV _T) for Ontario for the implementation of low impact development to maintain pre-development water balance to ensure ecosystem function and natural water quality. Applies to new development, redevelopment, re-urbanization, residential intensification and stormwater retrofits.	Y
Source Water Protection Plan	2015	A strategy and set of policies outlining how the quality of source watersheds for municipal drinking water systems will be protected.	Y



Legislation/ Policy Title	Year	Requirement	Conforms? (Y/N)
Watershed Planning in Ontario (DRAFT)	2018	A framework for watershed and sub-watershed planning to be used by municipalities and other planning authorities in fulfilling legislative requirements.	Y
Wetland Conservation Strategy for Ontario	2017-2030	<p>Framework to guide Ontario through the conservation of wetlands with a focus on protection. The Province has committed to two targets:</p> <ol style="list-style-type: none"> 1) By 2025, the net loss of wetland area and function is halted where wetland loss has been the greatest 2) 2030, a net gain in wetland area and function is achieved where wetland loss has been the greatest 	Y
Regional/ Municipal			
Towards Resilience: Durham Community Climate Adaption Plan	2016	Endorsed for climate adaptation for Durham Region. Includes 18 programs for social infrastructure for emergency, standards for new buildings and retrofits, protection against flooding, improve electrical reliability, redefine flood hazards, improve flood forecasting & warnings, advanced warning of extreme weather, property standards, manage urban heat, resilient asphalt & roads, enhance natural capital and climate adaptation.	Y
Durham Region Official Plan (conformity amendment in 2019- Envision Durham)	2017	Considerable efforts have been made by the Region and all municipal governments in CLOCA's jurisdiction to incorporate fundamental and many of the key/ voluntary policies from 2012/2013 Watershed Plans into current Official Plans. The 2020 CLOCA watershed plans will directly inform and support the Envision Durham process, as well as subsequent official plan updates by area municipalities.	Y
Town of Whitby Official Plan	2018		
City of Oshawa Official Plan	2018		
Municipality of Clarington Official Plan	2017		
Township of Scugog	2017		
Township of Uxbridge Official Plan	2014		



Appendix C – CLOCA Action Plan status

#	Title	Status	Product	Available Online	Description
1	NHS Restoration Guidelines	In Progress	Mapping tool, methodology document, project planning framework, and program development guidelines	No	Mapping tool prioritizes restoration sites based on a number of ecological and socio-political factors. Project planning framework, and restoration program development guidelines still to be developed.
2	Riparian Corridors Restoration Plan	Complete	Report with maps & recommendations	Yes	Evaluation of riparian cover for each watershed with recommendations for improving cover.
3	Community Needs and Opportunities for Environmental Education	Complete	Report	No	Assessment of current and future demographics in CLOCA jurisdiction with recommendations on how to reach target audiences.
4	Policy and procedural document for regulation and plan review	Complete	Report	Yes	Summary of legislation that CLOCA must adhere to when reviewing and approving permits in its jurisdiction. Sets out rules that CLOCA will follow when reviewing and approving permits in regulated areas.
5	Wildlife Corridor Protection & Enhancement Plan	Complete	Report with maps & recommendations	Yes	Evaluation of corridor connectivity and road barriers within the wildlife habitat network. Priority restoration areas identified.
6	High Volume Recharge Area Study	Complete	Report with maps	Yes	Identifies broad, jurisdiction-wide tools and resources that support protection of HVRAs: specifically, the “Ecologically Significant Groundwater Recharge Area Delineation in the Central Lake Ontario Conservation Authority Area” and “Hydrogeological Assessment Submissions, Conservation Authority Guidelines to Support Development Applications”.
7	CLOCA Data/Analytical Needs & Coordination Assessment	Removed			
8	CLOCA Integrated Aquatic Monitoring Program	Complete	Integrated monitoring program (storymap)	Yes	Water quality measurements at 36 sites across 3 zones in the jurisdiction.
9	CLOCA Urban LID Retrofits Plan	Not started			Plan will identify potential opportunities across the jurisdiction to incorporate Low Impact Development (LID) retrofits into existing stormwater management systems, and where LID could be integrated into new development. Guidelines and BMP’s will be proposed through this document.
10	Stewardship & Education Priorities Plan	Removed			
11	CLOCA Land Acquisition Strategy	Complete	Report with maps	Yes	Identifies areas for future land acquisition with rationale for locations identified.



#	Title	Status	Product	Available Online	Description
12	Assessing imperviousness - a guidance document	In progress	Mapping tool and methodology document	No	2012 imperviousness assessments re-done for each watershed with updated watershed boundaries, land uses, policy areas and physiographic regions. Interactive map layer under development.
13	Connected Imperviousness BMP	In Progress			Establish a connected impervious (impervious area connected to a common outlet to a stream) to methodology for documenting existing conditions and identifying priority restoration and mitigation areas.
14	Ecological Services: Valuing Natural Areas within CLOCA	Complete	Report	Yes	Valuation of services that forests, wetlands, successional habitats, and streams provide to watershed community.
15	Identification of Salt Vulnerable Areas in the CLOCA Watershed	In Progress			Provide a list of recommended practices and provide maps that identify the vulnerable areas in the watershed where modified salting activities should be considered by the municipalities and the province to protect water quality.
16	Invasive Species Management Strategy and Update (2017)	Complete	Report	Yes	Recommendations on how to educate and engage partners in management of invasive species.
17	In-stream Barriers Action Plan	Complete	Report with maps & recommendations	Yes	Identifies barriers in each watershed and prioritizes removal of each.
18	CLOCA Ecological Compensation protocol	In Progress			To help replace losses to the natural system that are determined to be unavoidable, after the protection hierarchy has been applied (avoid, minimize, mitigate), CLOCA, municipalities and landowners have used ecosystem compensation. Formal guidance on how, when and where compensation may be considered will be developed.
19	Lichen Pilot Project	Complete	Report	Yes	Report recommends not developing a lichen monitoring program
20	CLOCA Climate Change Monitoring/Adaptive Management Strategy	Removed			
21	CLOCA SWM Performance Monitoring & Maintenance Plan	Removed			
22	HWY 407 Post-construction monitoring plan	Removed			
23	Flood Damage Centres Upgrading	Complete	Report with maps & recommendations	Yes	Report identifies flood risk areas in each watershed and evaluates risk of flooding for each.
24	Montgomery Creek Restoration Plan	Complete	Report with maps & recommendations	Yes	Report examines existing NH conditions in the subwatershed and makes specific recommendations to improve health.



#	Title	Status	Product	Available Online	Description
NEW	NHS Climate Change Vulnerability Assessment				A vulnerability assessment will identify vulnerable areas and restoration opportunities within the natural heritage system based on identified risks and priorities with respect to climate change impacts. This assessment is based on the recently completed climate change ensemble approach modelling completed by the Region of Durham. It is also recommended that a focus be placed on potential impacts to CLOCA's land holdings to determine vulnerable areas and restoration options to reduce the likelihood of risks and hazards from occurring.
NEW	Rapid Geomorphic & Stream Assessments				Despite best efforts to manage stormwater with lot-level conveyance and end-of-pipe treatments, urban development can still trigger stream instability. Both rapid geomorphic and rapid stream assessments can be undertaken to determine stream stability and stress due to urban pressures. Development of a regular monitoring schedule to undertake these assessments will provide critical information on stream health. Areas identified as stressed will be considered for future land restoration and/ or private land stewardship engagement.
NEW	Stream Flow & water level forecasting model				Flood forecasting is required to reduce the risk of loss of life and property damage due to flooding through forecasting of flood events, issuing flood warnings, alerts and advisories. The development of a model will provide the ability to effectively analyze and predict the potential impacts of runoff on stream flow rates. Project considerations will include: <ul style="list-style-type: none"> • Desired forecasting lead time (i.e. 5- 10 days) and appropriate level of flood response and preparedness time • Scale of weather data to utilize (i.e. local, regional, etc.) • Integration of existing real-time rainfall monitoring • Continue to improve web-based presence for agencies and partners
NEW	Conservation Lands Master Plan				Central Lake Ontario Conservation (CLOCA) owns and manages over 2,700 hectares of environmentally sensitive land across our watershed. These lands are referred to as conservation areas, and with population growth in the community, the demand for our greenspace, trails and nature appreciation has increased significantly. CLOCA Conservation Lands Master Plan will ensure these public lands continue to meet our original intention to conserve natural features and functions, while providing for compatible high quality visitor experiences that meet the needs of our community. This Master Plan involves a conservation area lands assessment and consultation with the public and stakeholders to ensure we meet the needs of our visitors and our municipal partners now and into the future.
NEW	Natural Heritage Tracking Tool				CLOCA will need to develop an effective system to track the results of restoration projects as well as natural and anthropogenic changes in cover. This <i>natural heritage tracking tool</i> will be an important component in CLOCA's ability to accurately report gains or losses to the natural cover in the watershed over time.



Appendix D – Recommended OP policies and operating guidelines

Policy Number	Fundamental Municipal Official Plan Policies	Policy Status
F1	The Lynde creek watershed management plan provides the foundation upon which to make environmentally sound decisions to maintain, improve, and enhance the watershed's future health. The watershed vision, goals and objectives, as well as the recommendations for implementation and monitoring contained within this watershed plan shall be supported.	Current
F2	To achieve a healthy watershed, the municipality supports the following minimum watershed targets: 30% forest cover; 10% wetland cover; 10% interior forest; 5% deep interior forest; and 75% riparian cover along stream lengths. On lands within the Oak Ridges Moraine and Greenbelt, the percentage of impervious surfaces shall not exceed 10%.	Current
F3	Water is recognized as a vital component of a healthy watershed and the protection of this valuable resource is necessary to ensure a sustainable, functioning hydrological and hydrogeological system consisting of sufficient water resources (quality, quantity and temperatures) to support and protect: healthy aquatic and terrestrial ecosystems and ecological functions; clean drinking water for watershed residents; sustainable human use of groundwater resources for non-drinking water purposes; Lake Ontario as a drinking water source; human life, property and infrastructure from flooding, and erosion hazards.	Current
F4	Ground and surface water features include: groundwater recharge areas including High Volume Recharge Areas (HVRAs); groundwater discharge areas including seeps, springs, and baseflow contribution zones (baseflow to streams); highly vulnerable aquifers; and all watercourses including headwater drainage features, lakes, and wetlands. Watercourses, headwater drainage features, lakes and wetlands and some groundwater discharge areas are mapped as part of the Natural Heritage System. HVRAs are an important component of the Natural Heritage System, but for policy implementation, have not been incorporated into the mapped Natural Heritage System, but are identified on Schedule XX to this plan.	Revoked and Replaced by F20
F5	New development within watercourses, wetlands, and lakes is prohibited except flood and erosion control work and development permitted in accordance with applicable Provincial and/or Federal legislation.	Current



Policy Number	Fundamental Municipal Official Plan Policies	Policy Status
F6	<p>Development shall maintain a 30 m buffer from each side of the watercourse. The limit of the watercourse is described as:</p> <ul style="list-style-type: none"> • for a meandering stream with defined bed and banks, the line that connects the outside curve of the bank at bankfull stage; • for a non-meandering stream with defined bed and banks, the normal high-water mark; • for lakes, the normal high-water mark; • for an intermittent stream with no defined bed and bank, including headwater drainage feature, the centre line of a channel or depression that concentrates flow <p>Where possible, headwater drainage features shall generally be protected. Notwithstanding, development may be considered provided the necessary technical studies are completed to the satisfaction of the Municipality and the Conservation Authority that assesses the aquatic, hydrologic and geomorphic attributes of the feature and function including management options, and shall be consistent with the Evaluation, Classification and Management of Headwater Drainage Features Guideline (TRCA/CVC, 2014).</p>	Current
F7	<p>Removal or disruption to HVRAs will impact groundwater and surface water resources as well as those natural heritage features and habitat which rely upon groundwater inputs and surface water quality and quantity. Development within HVRAs may be permitted provided a Hydrogeological Impact Assessment is conducted which characterizes existing water balance and demonstrates that development will result in no loss to recharge functions attributed to the HVRA.</p>	Revoked and replaced by F20
F8	<p>Achieving a healthy, self-sustaining, connected Natural Heritage System is integral to ensuring a healthy and resilient watershed. Protection of this system is necessary to support ecological integrity including healthy terrestrial, wildlife, wetland and aquatic ecosystems.</p>	Current
F9	<p>The Natural Heritage System (NHS) as identified on Schedule XX of this Plan is a connected system consisting of PSWs, provincially significant ANSIs, important aquatic habitat, riparian corridors, core habitat areas and terrestrial corridors, woodlands >/- 0.5ha, wetlands >/- 0.5ha, and areas identified for natural cover regeneration/restoration which will improve connectivity and habitat. To achieve watershed targets, the Natural Heritage System shall be protected.</p>	Revoked and replaced with F16



Policy Number	Fundamental Municipal Official Plan Policies	Policy Status
F10	Development in the Natural Heritage System is generally restricted to fish and wildlife management; conservation; forestry; existing uses; and, flood or erosion control projects except stormwater management facilities. Public trail development may be permitted provided there will be no negative impact to the features or functions of the Natural Heritage System, to the satisfaction of the Municipality in consultation with the Conservation Authority.	Current
F11	A connected natural system is vital to the health of the watershed. Regional and landscape corridors are part of the Natural Heritage System and identified in CLOCA's Wildlife Corridor Protection and Enhancement Plan. The Municipality is committed to supporting connectivity and continuity of wildlife corridors and ensuring that the function of these corridors will be preserved, enhanced and restored.	Current
F12	<p>Lands within 1 km of the Lake Ontario Shoreline are identified as an important ecological area providing natural heritage features and functions including:</p> <ul style="list-style-type: none"> • coastal wetlands; • migratory stopover; • beach/bluff communities; • shoreline processes including dynamic beaches; • habitat for endangered, threatened, and/or special concern species; and • a regional wildlife movement corridor offering unique habitat and movement opportunities. <p>New development within 1 km of the Lake Ontario Shoreline shall incorporate site design criteria which limits development impact on: migratory species; resident species; important natural heritage features and functions; and on wildlife movement corridors. Where development currently exists, the Municipality shall support education, restoration, rehabilitation and retrofit efforts to enhance natural features and functions.</p>	Current
F13	In areas identified as habitat of an endangered /threatened /species of concern, development shall only be permitted in accordance with the Endangered Species Act, 2007.	Current
F14	<p>The Oak Ridges Moraine, Lake Iroquois Beach and Lake Ontario Shoreline are important landscape features providing important wildlife corridors supporting east-west movement and connectivity with north-south movement corridors. All effort shall be made to maintain and/or restore continuous corridor function within and between these features.</p> <p>The Oak Ridges Moraine and the Lake Iroquois Beach are significant geological features having important groundwater functions and the Municipality shall make every effort to ensure groundwater recharge and discharge functions are protected, including limiting, or prohibiting where appropriate, the introduction and/or expansion of impervious surfaces.</p>	Current



Policy Number	Fundamental Municipal Official Plan Policies	Policy Status
F15	Development shall not result in any downstream impacts such as increased flood levels, stream erosion, or reduction in baseflow. Where every management measure has been taken and downstream impacts persist, alternative stormwater controls may be considered by the Municipality and the Conservation Authority.	Current
F16	The Natural Heritage System as designated in Figure 8 of this Plan is a connected system consisting of PSWs, provincially significant ANSIs, important aquatic habitat, riparian corridors, core habitat areas and terrestrial corridors, woodlands ≥ 0.5 ha, wetlands ≥ 0.5 ha, and areas identified for natural cover regeneration which will improve connectivity and habitat. To achieve watershed objectives and targets, the Natural Heritage System shall be a separate land use designation.	NEW (replaces F9)
F17	Restoration projects that are part of the Natural Heritage System (NHS), identified as flood damage centres or other sites identified as priority through CLOCA's NHS Restoration Prioritization Tool shall be supported for implementation and monitoring.	NEW
F19	<u>Revoke and replace former Key Recommendation K8</u> A minimum buffer of 15 m past the drip line of a wooded area shall be protected. Development within a buffer is restricted to fish and wildlife management, conservation, forestry, existing uses and flood or erosion control projects with the exception of stormwater management facilities. Public trail development may be permitted in the outermost 5 m of this buffer provided it is demonstrated to the satisfaction of the Municipality, in consultation with the Conservation Authority, that there will be no negative impact to the features and/or functions. Where no trail is proposed, the minimum 15 m buffer past the drip line of the wooded area is still required.	NEW (replaces K8)
F20	<u>Reflect new terminology updated from Fundamental Policy F4 and F7</u> Key Hydrologic Areas (KHA) include: Significant Groundwater Recharge Areas (SGRA); and, Highly vulnerable aquifers (HVA) CLOCA encourages municipalities to include Ecologically Significant Groundwater Recharge Areas (ESGRA) in their KHA designations. Development within KHAs may be permitted where it has been demonstrated that the hydrologic functions, including groundwater and surface water quality and quantity, of these areas shall be protected and, where possible, improved or restored.	New (replaces F4 and F7)



Policy Number	Fundamental Municipal Official Plan Policies	Policy Status
F21	A Salt Reduction Design Plan is to be prepared for parking lots, roads and sidewalks adjacent to the Natural Heritage System and KHAs that demonstrates, prior to approval, that the design incorporates post- construction water quality controls and best management practices to reduce salt impacts to surface water as a result of salt storage, salt application and snow storage/ runoff.	New
F22	Excess soil master planning should be undertaken in order to strategically plan for the on-site or local re-use of excess soil produced as part of all forms of development activity. Such planning should seek to identify opportunities and constraints for the creation of community beneficial re-uses.	New
F23	Planning for new greenfield development through Urban Boundary Expansions, Secondary Plans/Part II Plans, will consider alternatives for the on-site and local re-use of excess soil expected to be created as a result of development activity. Such alternatives could include considering development, road and transportation system patterns that preserve or limit disturbance to landforms such as steep slopes, drumlins, valleylands, kames, kettles, ravines and ridges.	New

Policy Number	Key Municipal Official Plan Policies	Policy Status
K1	Generally, development within or adjacent to groundwater discharge areas shall not be permitted unless an Environmental Impact Study and/or Hydrogeological Impact Assessment demonstrating to the satisfaction of the Municipality in consultation with the Conservation Authority there will be no negative impact to the feature, function, and/or groundwater quality and quantity, and that groundwater discharge rates are maintained.	Current
K2	If any groundwater and/or surface water feature is identified within or adjacent to a proposed development area, but is not shown on Schedule XX, the feature shall be delineated and an Environmental Impact Study and/or Hydrogeological Impact Assessment shall be conducted as a requirement of development to the satisfaction of the Municipality in consultation with the Conservation Authority.	Current
K3	The Municipality supports restoration of riparian areas and corridors to protect fish and aquatic resources. Development in riparian areas shall be restricted to fish and wildlife management; conservation; forestry, existing uses, flood or erosion control projects with the exception of storm water management facilities. Public trail development may be permitted provided there will be no negative impact to aquatic habitat to the satisfaction of the Conservation Authority. Riparian areas shall be managed to achieve a naturalized vegetated condition.	Current



Policy Number	Key Municipal Official Plan Policies	Policy Status
K4	The Municipality supports natural stable stream channels and corridors that: allow for natural stream flow patterns; support diverse aquatic habitat; limit sediment loadings; and protect human life, property and infrastructure from risks associated with flooding, erosion and slope instability. Where in-stream work and/or stream realignment is proposed, the principles of natural channel design and use of biological engineering techniques and technologies, to the satisfaction of the Conservation Authority, shall be incorporated in the final design and construction.	NEW Operating Guideline
K5	An Environmental Impact Study (EIS) prepared to the satisfaction of the Municipality and the Conservation Authority shall be required where a natural heritage feature is identified within or adjacent to a proposed development area, but beyond the limits of the Natural Heritage System. The EIS shall delineate the feature and function, determine the significance of the feature and function, assess its contribution to the ecological system including the Natural Heritage System, and evaluate whether it shall be protected or if mitigation can be provided to address any loss to the feature and/or function.	Current
K6	Development adjacent to the Natural Heritage System may be permitted subject to submission of an Environmental Impact Study to the satisfaction of the Municipality in consultation with the Conservation Authority that demonstrates no negative impact to the feature/function and appropriate buffers between development and the Natural Heritage System are identified.	Current
K7	Where possible, new transportation and infrastructure projects shall avoid wildlife corridors, and/or demonstrate that there will be no barrier to wildlife crossing functions. Where every reasonable effort has been taken and wildlife barriers will result, adequate wildlife crossing provisions must be provided as part of the approval, to the satisfaction of the Municipality in consultation with the Conservation Authority. Improvements to existing infrastructure, including roads, shall incorporate measures to eliminate barriers to wildlife movement and include measures to accommodate enhanced wildlife movement.	NEW Operating Guideline
K8	A minimum buffer of 10 m past the drip line of wooded areas shall be protected. Development in the buffer is restricted to; fish and wildlife management, conservation, forestry, existing uses and flood or erosion control projects with the exception of storm water management facilities. Public trail development may be permitted in the buffer provided it is demonstrated to the satisfaction of the Municipality, in consultation with the Conservation Authority that there will be no negative impact to the features and/or functions.	Revoked and replaced with F19



Policy Number	Key Municipal Official Plan Policies	Policy Status
K9	A minimum 30 m buffer shall be provided from provincially significant features within the Natural Heritage System, and a minimum 15 m buffer shall be provided from all other wetlands in the Natural Heritage System. Development in the buffer is restricted to fish and wildlife management, conservation, and flood or erosion control projects with the exception of storm water management facilities. Public trail development may be permitted provided it is demonstrated to the satisfaction of the Municipality in consultation with the Conservation Authority that there will be no negative impact to the features and/or functions.	Current
K10	<p>Invasive species and the spread of invasive species represent a significant threat to watershed health. The Municipality supports best management practices for controlling invasive species including:</p> <ul style="list-style-type: none"> • ensuring native or non-invasive species plantings are used on all publicly owned lands; • ensuring vegetation plantings associated with development approvals use only native or non-invasive species plantings;' • prior to development, site reconnaissance is undertaken to identify and delineate all on-site invasive species and a management/removal plan be prepared in consultation with the Conservation Authority; and • implementing best management practices for control/removal and management of invasive species. 	NEW Operating Guideline
K11	When opportunities for public ownership arise, all reasonable effort will be made to support the acquisition and/or conveyance of lands within the Natural Heritage System.	Current
K12	<p>New lot creation and intensification of development within the drainage basin of Chalk Lake shall be limited and subject to demonstration of no adverse impacts to the Lake through an Environmental Impact Study to the satisfaction of the Municipality in consultation with the Conservation Authority. Enhanced sewage treatment systems shall be required within the drainage basin of Chalk Lake where new development, intensification or significant renovations are approved.</p> <p>New development and/or redevelopment within the drainage basin of Chalk Lake shall be required to address phosphorus impacts and removal as part of the EIS. <i>(Note: this policy is specifically intended for the Township and Scugog and the Township of Uxbridge)</i></p>	Current
K13	Prior to approval of intensification of proposed land uses, in addition to other municipal requirements, a thorough assessment shall be completed to ensure flooding conditions will not be exacerbated for upstream and/or downstream properties.	Current



Policy Number	Key Municipal Official Plan Policies	Policy Status
K14	Prior to approval of urban boundary expansions, in addition to other municipal growth requirements, a thorough assessment shall be completed to ensure flooding conditions will not be exacerbated for upstream and/or downstream properties.	Current
K15	The Municipality supports effective, low impact management of stormwater run-off to protect the ecological health of the watershed and contribute to the protection of human life and property during storm events including incorporation of a best management treatment train approach with increased emphasis on lot level/source, Low Impact Development (LID) technologies and conveyance methods in addition to traditional end-of-pipe methods. Alternative stormwater management designs and practices should be explored for all new developments to minimize and attenuate runoff volumes, peak flow rates to pre-development levels and appropriate temperatures of stormwater discharge to streams. Stormwater management measures that meet multiple objectives (e.g. water quantity, water quality, erosion control, water temperature, infiltration), and meet or exceed stormwater development standards set by the Municipality and CLOCA are expected.	NEW Operating Guideline
K16	Stormwater management facilities are a vital component of municipal infrastructure requiring regular monitoring and management. The Municipality will adopt and maintain a Stormwater Performance Monitoring and Maintenance Plan that sets out a regular performance monitoring and maintenance plan, a retrofit plan for existing facilities, and the identification and prioritization of untreated areas for future stormwater management improvements and upgrades. To support this program, a municipal fund may be established to ensure dedicated funding is available to support the recommendations contained within the Stormwater Performance Monitoring and Maintenance Plan.	NEW Operating Guideline
K17	<u>Reflect new terminology and elevated priority from Voluntary Policy V5</u> New winter/ salt storage facilities shall not be located within 30 metres of a waterbody including wetlands or Key Hydrologic Areas (KHA). Where water quality run-off is mitigated through buffers or treatment demonstrated to the satisfaction of the Municipality and Conservation Authority, there will be no negative impact to water quality in the receiving waterbody. Opportunities to retrofit existing facilities to minimize potential impacts, shall be encouraged.	NEW (replaces V5)



Policy Number	Voluntary Municipal Official Plan Policies	Policy Status
V1	<p>High Volume Recharge Areas (HVRAs) are identified in Figure x of the 2012 watershed plan. Removal or disruption to these areas will impact groundwater and surface water resources as well as those natural heritage features and habitat which rely upon groundwater inputs and surface water quality and quantity. Development within HVRAs may be permitted provided a hydrogeological impact assessment is conducted which demonstrates that development will result in no net loss to recharge functions attributed to the HVRA. A hydrogeological impact assessment shall:</p> <ul style="list-style-type: none"> • identify recharge areas on-site and on adjacent lands; • identify the function and importance of the groundwater system for on-site and adjacent natural heritage features (wetlands, vegetation communities, aquatic habitat and fisheries), surface water quality and quantity, and groundwater discharge areas including seeps, springs, and baseflow contribution zones; • identify groundwater characteristics and linkages between the local groundwater system and surrounding groundwater system including: flow regime and connection to surface water features and functions; relationship to major and local aquifers; water table levels; aquifer vulnerability; ground and surface water quality; • identify existing and proposed local consumptive groundwater uses including location and use of wells within 1 km of the site; • characterize water demand using information attained through Permits to Take Water in a 5km radius of the site; • identify local geologic units, including soil substrates, and assess the role these units have in the hydrogeological system; • confirm water budget/balance that includes detailed water balance on a catchment area basis for existing and post-development conditions; • ensure that development will maintain or enhance pre-development groundwater recharge rates; • ensure that hydraulically connected features including groundwater discharge features are not adversely affected; • confirm that groundwater quality is not impacted; • confirm that impervious surfaces are minimized and measures to increase infiltration are incorporated in site design; and • ensure adaptive management, mitigation and monitoring strategies to ensure ground and surface water integrity. <p>For minor development such as an addition to an existing structure, it shall be determined that the development will have no net loss on the recharge function of the HVRA.</p>	Current
V3	<p>Development impacts affecting stream temperature shall be mitigated through methods such as: providing adequate vegetated riparian buffers; limiting impervious surfaces; providing effective and efficient stormwater management techniques and facilities; and protecting groundwater discharge areas and baseflow to stream shall be encouraged and incorporated into site designs wherever possible.</p>	Current OP



Policy Number	Voluntary Municipal Official Plan Policies	Policy Status
V4	Infrastructure and transportation projects shall demonstrate that there will not be any impediment to stream flow, fish movement or aquatic habitat. Improvements to existing infrastructure, including roads, shall incorporate measures to eliminate any existing and/or future impediment to stream flow, fish movement or aquatic habitat. Where existing instream barriers exist, the Municipality and the Conservation Authority will work together to determine the best method of removal or preservation.	NEW Operating Guideline
V5	New facilities where contaminants including fuel, pesticides, herbicides and road salt may be stored in large quantities and new Municipal snow storage facilities shall not be permitted within HVRAs. Exception may be permitted where it can be demonstrated that there will be no negative impact to groundwater quality. Opportunities to retrofit existing facilities, including municipal snow storage facilities, to minimize potential impacts, shall be encouraged. New Municipal snow storage facilities shall not be located within 30m of a waterbody, including wetlands. Exceptions may be permitted where water quality run-off is mitigated through buffers or treatment demonstrating there will be no negative impact to water quality in receiving streams and/or wetlands. The Municipality will consider undertaking improvements to existing municipal snow storage facilities located within 30m of a waterbody and/or wetland that will mitigate or eliminate untreated runoff to the waterbody/wetland.	Elevated priority and replaced with K17 & New Operating Guideline
V6	The Municipality supports the Region of Durham water conservation practices.	Current
V7	While maintaining public safety, the Municipality will support minimizing road salt usage on public roads in the Natural Heritage System, and areas adjacent to waterbodies and wetlands. The Municipality supports site design of parking lots which reduces the need for salt application and encourages the study and use of alternative methods or technologies on public lands to reduce salt usage.	NEW Operating Guideline
V8	An Environmental Impact Study (EIS), prepared to the satisfaction of the Municipality and the Conservation Authority shall be required to confirm the extent of the Natural Heritage System (NHS), boundaries of natural features within the NHS, determine the ecological function of these features including significance with respect to the Natural Heritage System, demonstrate no negative impact to the feature/function, and identify appropriate buffers between the development and the NHS.	Current
V9	Where every possible alternative has been considered and no other option exists, development may be considered on lands within the Natural Heritage System(NHS) identified for natural cover regeneration/restoration provided it can be	Current



Policy Number	Voluntary Municipal Official Plan Policies	Policy Status
	<p>demonstrated through an Environmental Impact Study (EIS) prepared to the satisfaction of the Municipality and Conservation Authority that:</p> <ul style="list-style-type: none"> the area of additional lands to be added to the NHS will exceed the area of lands removed and the added lands will abut other portions of the NHS on the subject lands; and/or; corridor connectivity will be enhanced/restored and protected. 	
V10	The Conservation Authority has a Level III agreement with the Department of Fisheries and Oceans Canada for the review and approval of proposals/projects where Section 35 of the Canada Fisheries Act is applicable. The Municipality supports the continued collaboration between the Conservation Authority and the Department of Fisheries and Oceans Canada in this regard.	Revoked, legislation changed
V11	Where possible, greenspace areas on publicly owned lands will incorporate natural cover and be managed to achieve a naturalized vegetated condition.	Current
V12	To protect natural features and functions and to limit potential damage to property and human life, the splitting or partitioning of natural areas and/or hazard lands through lot creation will not be permitted.	Current
V13	The aquatic system includes fish and fish habitat, watercourses and waterbodies, riparian areas, and groundwater resources. The quality, quantity and health of these components influence the overall health of the aquatic system. The Municipality recognizes the aquatic system as an important ecological component of watershed health which shall be protected.	Current
V14	Improvements to existing infrastructure located within the Natural Heritage System shall reduce, and where possible, eliminate impacts generated by existing infrastructure. Improvements to infrastructure through the use of appropriate technologies and mitigation measures as well as opportunities to remove or decommission existing infrastructure shall be investigated.	Current
V15	The quality of the air we breathe is an important factor in human health. Air quality also plays a role in ecological health. The impact of development on air quality shall be considered during review of development applications.	Current
V16	The Municipality shall encourage efforts to adequately monitor air quality changes, trends and impacts that could impact human and ecological health.	Current
V17	The Municipality shall support the Conservation Authority's efforts to document baseline indicator conditions and track future changes in conditions to assess impacts of climate change. If negative impacts are identified or predicted through this monitoring work adaptive management strategies will be created in coordination with the Conservation Authority where appropriate.	Current

Policy Number	Voluntary Municipal Official Plan Policies	Policy Status
V18	The Municipality, in consultation with the Conservation Authority shall consider the need for adaptive stormwater management measures including alternative stormwater management facilities and designs to address anticipated increases in storm frequency and magnitude as a result of climate change.	NEW Operating Guideline
V19	The Municipality supports the Conservation Authority's implementation of the requirements of Ontario Regulation 42/06 "Development, Interference with Wetlands and Alteration to Shorelines and Watercourses". In accordance with this regulation, development proposed within the regulated area requires permission from the Conservation Authority. Within the regulated area, the Conservation Authority shall be consulted for: development activities proposed adjacent or close to the shoreline of the Great Lakes and river system and inland lakes that may be affected by flooding, erosion, dynamic beaches; river or stream valleys; hazardous lands; lands in and adjacent to wetlands; and the straightening, changing, diversion or interference in any way with a watercourse.	Current
V20	Municipal transportation plans shall support reducing the number of stream crossings and fragmentation of natural heritage features wherever possible.	NEW Operating Guideline
V21	Diversion of water from an existing drainage catchment to another catchment is discouraged and every effort shall be made to maintain drainage patterns and watershed boundaries.	Current
V22	All new infrastructure shall respect natural drainage patterns, and approval will require confirmation of appropriate minor/major systems, management of external drainage, and discharge to appropriate outlets.	Current
V23	The Municipality will manage Watercourse Improvement Programs and respond to stream erosion where structures and services are at risk.	Current
V24	Applications for development shall include an assessment of hydrologic impacts to demonstrate that peak flow rates will not exceed pre-development rates for the 1:2 year through 1:100 year design storm events and the Regional (Hurricane Hazel) Event. Where possible, appropriate mitigation measures may be considered by the Municipality and the Conservation Authority.	Current
V25	Stormwater quality and quantity, and run-off will be controlled and treated to the satisfaction of the Municipality in consultation with the Conservation Authority. Pre-development runoff rates, flow paths, water quality and stream temperature shall be maintained. Where appropriate, the Municipality and the Conservation Authority may determine that stormwater quantity controls are not required, but in no case shall stormwater quality controls not be in place.	Current
V26	Discharge of stormwater to a receiving watercourse must be outletted in a manner that does not adversely impact channel morphology, stream bank erosion or natural water temperature regimes of the receiving stream /feature. A	Current



Policy Number	Voluntary Municipal Official Plan Policies	Policy Status
	geomorphological investigation shall be conducted to ensure that the impacts of stormwater discharge on streambank erosion are minimized.	
V27	Road, transit and other infrastructure projects that include expansion of an existing service shall incorporate appropriate stormwater management for new and existing services/facilities.	Current
V28	Stormwater management ponds which are entrenched within a watercourse will not be permitted and support will be provided to Conservation Authority efforts to remove these stormwater management ponds from the system.	Current
V29	Where stormwater management facilities do not exist or provide limited water quality treatment, efforts will be made to retrofit all areas with approved stormwater management facilities using the most recent technologies and best management practices.	NEW Operating Guideline
V30	Redevelopment and infill development shall provide measures to improve water quality and quantity controls, including where possible, treatment of run-off from existing adjacent development.	NEW Operating Guideline
V31	The Municipality shall investigate opportunities to provide quantity control in areas identified to have undersized pipes/culverts that could impede water conveyance.	Current
V32	Environmental Management Plans for major infrastructure at the detailed design stage shall be required to address details of mitigation measures during construction.	Current
V33	Major recreation uses such as golf courses, ski facilities and other private/public recreational facilities shall adopt Best Management Practices for pesticides, herbicides, nutrient and water use including water conservation practices.	Current
V34	A sub-watershed Plan shall be prepared prior to undertaking a Secondary Plan. The recommendations and policies contained within this Plan will provide guiding environmental and land use planning principles to be used in the development of the Secondary Plan. The Sub-watershed Plan shall characterize existing sub-watershed conditions, identify opportunities and constraints for development, assess impacts of development on the health of the sub-watershed, and provide protective measures,	Current



Policy Number	Voluntary Municipal Official Plan Policies	Policy Status
	<p>restoration opportunities, mitigative methods and opportunities to manage impacts from development including cumulative development impacts. Specifically, the plan shall:</p> <p>Identify, evaluate and model existing conditions including natural heritage features and functions, natural hazards, hydrogeology, fluvial geomorphology, hydrology and shall:</p> <ul style="list-style-type: none"> • confirm the extent of the Natural Heritage System; • determine natural heritage features/functions beyond the sub-watershed to identify connections with the larger watershed Natural Heritage System; • identify natural heritage features/functions within the sub-watershed outside of the Natural Heritage System; • identify significant groundwater resources and prepare a hydrogeologic impact assessment; • confirm the extent of HVRAs and pre-development recharge rates; • conduct a water budget/balance to include detailed water balance on a catchment area basis for existing conditions; • delineate natural hazards; and • Prepare or update existing hydraulic and hydrology work including hydrological modeling for existing and future stormwater runoff including 2, 5, 10, 25, 100 and regional storm events, and prepare updated flood line mapping where required. <p>Conduct opportunities and constraints analysis to identify and address impacts of development on the Natural Heritage System, ground and surface water resources including:</p> <ul style="list-style-type: none"> • how natural ecological systems and processes, including groundwater and surface water resources, will be maintained and improved; • identification of areas requiring additional buffers to protect the sensitivity of the feature/function; • preparation of a water budget/balance for post development conditions; • identification of opportunities to support infiltration and recharge at pre-development rates; • measure change in imperviousness, run-off, and prepare a stormwater management plan; • identify areas requiring further detailed study prior to site development; and • identify cumulative impacts to all the natural resources within, adjacent to, upstream and downstream of the study area because of the proposed development. <p>Prepare a plan to ensure sub-watershed health is not negatively impacted by the development, which can include protective measures, restoration opportunities and mitigation methods.</p>	
V35	<p>The Municipality supports opportunities to reduce the amount of impervious surfaces, increase infiltration and implement design standards for all new development, redevelopment, including municipal facilities and lands, incorporating LIDs, green design standards, and other available techniques to support sustainable environmental design.</p>	NEW Operating Guideline

Policy Number	Voluntary Municipal Official Plan Policies	Policy Status
V36	At a minimum, as a condition of approval, all development will be required to apply, or maintain, a minimum application of 300 mm of topsoil which can be amended with compost, during final site grading. It shall also be required that scarification of subsurface soils on all lands other than the building footprint be undertaken prior to final grading. Additional soil treatments shall be encouraged where appropriate to mitigate construction compaction impacts and support water infiltration and run-off retention.	NEW Operating Guideline
V37	During construction, topsoil stripping shall be restricted until draft approval is obtained. At no time shall the entire site be stripped, rather removal of topsoil shall be phased to allow site stabilization and revegetation to occur as soon as possible. Appropriate erosion prevention and sediment controls shall be in place prior to topsoil stripping, and shall be consistent with Greater Golden Horseshoe Area Conservation Authorities' Erosion and Sediment Control Guideline for Urban Construction (2006).	NEW Operating Guideline
V38	Where it has been demonstrated to the satisfaction of the Municipality and Conservation Authority that the impact of development cannot be sufficiently addressed, and there is no other reasonable alternative to fully mitigate impacts, compensation may be considered in addition to mitigation efforts as a means of ensuring a net gain to the overall Natural Heritage System.	Current
V39	Opportunities for public acquisition of lands along Highway 407 corridor shall be investigated as potential compensation for ecological losses incurred due to development, use, operation and maintenance of Highway 407.	Current
V40	The potential of archaeological resources within 300 m of a waterbody or stream shall be considered prior to development and the Province shall be contacted for guidance in this matter. <i>(Included as per Ministry of Culture request to recognize in Watershed Plans)</i>	Current
V41	Where a Stormwater Charge Program is in place, consider the inclusion of a rate credits program for property owners that adopt practices and infrastructure that reduces impervious surfaces.	NEW
V42	Municipalities are encouraged to adopt programs which support increasing the resilience of the natural system (i.e. reducing urban heat islands, reduced smog days, lower carbon emissions, etc.)	NEW

Recommended Operating Guidelines

Water quality & quantity

It is recommended that operation staff implementing the recommended procedures and standards are made aware of CLOCA's Watershed Plans and ongoing partnership to achieve the plans goal, objectives and targets.



Utilize CLOCA's natural heritage restoration prioritization tool to assist in workplan development and budget forecasting to include identified restoration opportunities within ongoing operation project scopes as these opportunities arise.
The municipality ensures that salt management plans are regularly updated for their entire jurisdiction. Vulnerable areas including the Natural Heritage System, Key Hydraulic Areas and priority locations should be identified in updated salt management plans to further enhance best management practices while maintaining the approved Council level of service requirements and public safety.
As new equipment is phased in, priority is given to allocating the new equipment to identified vulnerable areas and reallocating the less salt-efficient equipment to less vulnerable areas.
Incorporate site design specifications for new construction or retrofits to reduce the need for salt application. Effective salt reduction designs will consider appropriate grading, stormwater collection, snow pile storage locations, sidewalk and pedestrian flow, landscaping features and reducing imperviousness.
Implement improvements to existing municipal snow and road salt storage facilities located within 30 m of a waterbody, wetland or Key Hydraulic Area (KHA) that will mitigate or eliminate untreated runoff to the waterbody/ wetland or KHA.
Prior to new infrastructure, new development, or higher density infill development, updated hydraulic modelling will be completed to consider upstream and/or downstream impacts that are likely to result from the proposed development areas to the satisfaction of the municipality and Conservation Authority. Identified opportunities to mitigate any negative impacts will be incorporated into construction projects as they occur.
As master drainage plans are reviewed, the priority restoration areas associated with each watershed are incorporated into updates as documented in existing CLOCA action plans (i.e. Instream Barriers, NHS Restoration Plan, Riparian Corridors Restoration Plan, etc.).
All new infrastructure shall respect and maintain natural drainage patterns without diversion from one catchment to another, approval will require confirmation of appropriate minor/major systems, management of external drainage and discharge to appropriate outlets.
A 'suspected combined sewer' protocol will be developed and implemented to ensure that a documented standardized procedure is in place to effectively manage any potential occurrences.
<p>In collaboration with the Conservation Authority, develop and implement a stormwater management pond performance program. This program would include tracking:</p> <ul style="list-style-type: none"> • Locations of all municipal SWM ponds, water quality and quantity (results in line with provincial drinking water quality standards) • Pond sediment depth and benchmark against level dredging is required to maintain pond function (i.e. base elevation) • Ongoing maintenance schedules and associated activities • Protocol to implement mitigation measures as required in response to contamination or climate change impacts



Consideration to install and utilize catch basin deflection shield inserts to shield sediment and grit found in catch basins from being washed out into the natural environment. Potential uses include:

1. In the pre-treatment train for both existing and new low impact development (LID) facilities
2. As a temporary measure in catch basins during construction projects anticipated to have high sedimentation run-off or in proximity to sensitive water features, wetlands, etc.
3. Permanently installed in catch basins that drain into SWM ponds as a pre-treat to reduce sedimentation in SWM ponds and improve water quality output

Once construction and landscaping of a LID facility is complete, a long-term environmental and performance monitoring program should consider:

- Contractor maintenance warranty period for both vegetation and permeable pavement of the LID
- Obtaining final as-built drawings that reflect any features that require ongoing maintenance and inspection
- Required maintenance agreements as well as inspection and maintenance plans that outline responsibilities
- If the facility ownership is turned over to the municipality, any easement requirements for ongoing monitoring and maintenance

The Municipality will manage watercourse improvement programs and respond to stream erosion where structures and services are at risk. This program will also consider existing instream barriers and the Municipality and Conservation Authority will work together to determine the best method of removal or preservation.

Emphasis placed on prioritizing upgrades to existing infrastructure with undersized pipes/ culverts to avoid flooding in consultation with the Conservation Authority. Where feasible, consider incorporating GI or LID's into upgraded designs.

Natural Heritage

Invasive species and the spread of invasive species represent a significant threat to watershed health. The Municipality supports best management practices for preventing the introduction and controlling invasive species including:

- Ensure native or non-invasive plantings are used on all publicly owned lands
- Implement best management practices for control, removal and management of invasive species from publicly owned lands
- Assist in disseminating education materials to raise resident awareness of invasive species prevention and management
- Implement Clean Equipment protocols when working adjacent to natural areas or when handling invasive species to prevent the introduction and spread

Work towards the enhancement of areas within greenspaces or publicly owned lands that have been identified to lack adequate riparian corridors to achieve targets in consultation with the Conservation Authority. Such enhancement activities that could be undertaken include:

- Increasing no-mow buffers, planting native plants
- Controlling invasive species
- Limiting the use of impervious surfaces

Upon completion of infrastructure and transportation projects it shall be demonstrated that there will not be an impediment to stream flow, fish movement, aquatic habitat or wildlife corridors. Where current impediments exist measures shall be taken to eliminate these occurrences. Where every reasonable



effort has been taken and wildlife barriers will result, adequate wildlife crossing provisions must be provided as part of the project in consultation with the Conservation Authority.

Municipally-led development projects will require:

- Application or maintenance of a of minimum 300 mm of topsoil, which can be amended with compost during final site grading
- Scarification of subsurface soils on all lands other than the building footprint be undertaken prior to final grading
- Additional soil treatments are encouraged where appropriate to mitigate construction compaction impacts, support water infiltration and runoff retention
- During construction, topsoil stripping shall be restricted until draft approval is obtained
- At no time shall the entire site be stripped, rather removal of topsoil shall be phased to allow site stabilization and revegetation to occur as soon as possible
- Appropriate erosion prevention and sediment controls shall be in place prior to topsoil stripping

Municipal transportation master plans shall support reducing the number of stream crossings and fragmentation of the natural heritage system whenever possible.

