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Technical Report

Natural Heritage System Mapping

Prepared for

City of Kingston

north-south ENVIRONMENTAL

North-South Environmental Inc. • 101B King Street West • Cambridge, Ontario • N3H 1B5

City of Kingston Land Acknowledgment

We want to take a moment to acknowledge and give thanks to the land on which we live and work, and to the people who have cared for it. This land is the traditional homeland of the Anishinaabe, Haudenosaunee and the Huron-Wendat. As a visitor on this land, we want to recognize how incredibly grateful we are to be here and thank these nations for their continued care and stewardship over the land. We believe we have a responsibility to not only acknowledge the grounds on which we are privileged to live, work, and play, but to continue to grow our learning of Indigenous histories and realities. We acknowledge that these nations have lived in harmony with the land, learning integrated processes that form the foundation of sustainability. We seek to incorporate aspects of this knowledge into the Natural Heritage Study to help protect and conserve the natural environment.

Project Study Team

Benjamin Meinen, GIS Specialist

Heather Ireland, Senior Natural Heritage Planner and Project Manager

Izabela van Amelsvoort, Senior Ecologist

Kristen Pott, GIS Specialist and Ecologist

Nikki Lobsinger, Planning Ecologist

Sal Spitale, Senior Ecologist and Senior Reviewer

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1. Introduction

The City of Kingston (the 'City') is unique in Ontario, partly bound in the south by Lake Ontario and the beginning of the St. Lawrence River to which outlets of the Cataraqui River (the south end of the Rideau Canal), and containing several large Provincially Significant Wetlands, Areas of Natural and Scientific Interest (ANSI) and woodlands. These important aquatic and terrestrial natural features and areas form the ecological core features and corridors that supports an area rich in biodiversity including rare plants and animals in the City. Often, it is these natural features and areas that form and contribute to a Natural Heritage System.

The City is initiating a new Official Plan (OP) in accordance with requirements of the Planning Act and Section 1 of the Provincial Planning Statement (PPS 2024). The protection and enhancement of the natural environment is identified as one of the seven critical public interests associated with the new OP project. Through this project, an updated Natural Heritage System is being developed. Natural Heritage Systems are a set of natural features and areas which are linked by corridors, and are necessary to maintain biodiversity, natural functions, viable populations of species, and ecosystems. Natural features and areas (e.g., significant wetlands, significant woodlands, significant wildlife habitat) are considered important for their environmental and social values as a legacy of the natural landscapes of an area. Natural Heritage Systems have been shown to be the most effective approach for preserving long-term ecological functions and supporting biodiversity within a given geographical area.

Updates to the City's Natural Heritage System are guided by the direction from the City's Strategic Plan (2023-2026) where one of the pillars of the Strategic Plan is "Lead Environmental Stewardship and Climate Action" which has a goal to "maintain the City's natural heritage and environmental assets". From this goal, one of the directives of the Strategic Plan is to "complete a new Natural Heritage Study to identify natural and significant wildlife areas, as a background study to support the OP Project (2024-2025)". This update will contribute to the City's objective of achieving a 30 percent urban and rural tree canopy by 2035, as set forth in Action 2.3.3 of the City's Strategic Plan. However, the City's update to its Natural Heritage System, specifically regarding woodlands mapping and policies primarily addresses woodland cover rather than tree canopy cover.

The City's current OP (2024 Office Consolidation) also establishes the City's vision for planning to 2036, and the goal for the Natural Heritage System as: "[managing] growth and land use in a manner that maintains, restores and enhances the Natural Heritage System within Kingston as a healthy ecosystem that will continue to sustain all life forms over the long term."

The update to the City's Natural Heritage System must consider and implement new approaches so that the new OP reflects current policies, values and methods to natural heritage planning. This approach includes updates to reflect recent provincial guidance and best practices for Natural Heritage System mapping while undertaking an objective and unbiased evaluation of threats (e.g., invasive species and climate change). Consideration of values as envisioned by the broader community are also incorporated as identified through recent community engagement workshops.

Key elements to the update of the City's Natural Heritage System are identifying components, criteria and mapping that incorporate Provincial requirements and that are based on sound science. This Technical Report reviews relevant provincial and municipal policy documents, available guidance documents, and current issues / trends and best practices, as well as direction heard through community engagement that will inform a recommended direction for the mapping of the key natural heritage features and areas, and the overall Natural Heritage System.

2. Policy Setting and Guidance Documents

Natural heritage planning within the City is directed by provincial policy. These policies provide general direction and context for the identification and protection of natural heritage features but do not provide technical direction or guidance with respect to setting targets or criteria for the identification of system components. There are documents available that provide technical guidance and criteria that may be considered in developing the City's Natural Heritage System. A summary of provincial policies, provincial and federal guidance documents, and local guidance documents considered in the identification of the City's natural heritage features is provided below.

2.1. Provincial Policy

The following provincial policy documents and plans provide the planning context within which the Natural Heritage System for the City of Kingston will occur:

- **The Planning Act** (RSO 1990) Last amendment 2024 | Provincial legislation that sets out the ground rules for land use planning in Ontario.
- **Provincial Planning Statement** (PPS 2024) | Sets the policy foundation for regulating the development and use of land; provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment .All municipal land-use planning decisions must be consistent with the PPS.
- **Endangered Species Act** (SO 2007, c. 6) | Sets the policy foundation for protecting species at risk and their habitats, with regard to ecological, social, economic, cultural, and intrinsic values.

2.1.1. The Planning Act (2024)

The Planning Act establishes the basic framework for making land use planning decisions in Ontario. Section 1.1 of the Act states that the purposes of the Act are:

a) To promote sustainable economic development in a healthy natural environment within the policy and by the means provided under this Act;
b) To provide for a land use planning system led by provincial policy;
c) To integrate matters of provincial interest in provincial and municipal planning decisions;
d) To provide for planning processes that are fair by making them open, accessible, timely and efficient;
e) To encourage co-operation and co-ordination among various interests;

f) To recognize the decision-making authority and accountability of municipal councils in planning.

Recognition of the value and import of the natural environment to planning in Ontario is rooted within the Act (sub-section a). Land use planning is guided by Provincial policies (sub-section b) and through them the requirements for the establishment of a natural heritage system. The Act is also clear on the need for municipalities to integrate matters of Provincial interest in their planning decisions; per Section 2 of the Act, this includes several that relate to the identification and mapping of natural systems:

- The protection of ecological systems, including natural areas, features and functions;
- The protection of the agricultural resources of the province;
- The conservation and management of natural resources and the mineral resource base;
- The conservation of features of significant architectural, cultural, historical, archaeological or scientific interest;
- The supply, efficient use and conservation of energy and water;
- The appropriate location of growth and development.
- The mitigation of greenhouse gas emissions and adaptation to a changing climate.

Section 3(5) of the Planning Act requires that decisions 'in respect of the exercise of any authority that affects a planning matter' shall be consistent with the PPS and conform to Provincial Plans.

2.1.2. Provincial Planning Statement (2024)

The PPS "provides policy direction on matters of provincial interest related to land use planning and development" and provides a policy foundation for land use and development. It also provides direction for appropriate development, protection of resources, public health and safety, and the quality of the natural and built environments.

The PPS recognizes municipal OPs as the most important vehicle for implementation of the provincial policy and through which matters of provincial interest are identified and protected (Chapter 1 of the PPS.).

Section 4 of the PPS speaks to 'Wise Use and Management of Resources'. Section 4.1.2 of the PPS outlines protection needs related to biodiversity and connectivity, including protection of both ecological features and function required to maintain biodiversity and functional ecological connectivity. To achieve this, the PPS requires that a Natural Heritage System be identified in Ecoregions 6E and 7E, recognizing that these systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas (Policy 4.1.3). The PPS also notes that the policies represent "minimum standards" and that "planning authorities and decision-makers may go beyond these minimum standards to address matters of important to a specific community, unless doing so would conflict with any policy of the Provincial Planning Statement" (page. 4).

Natural Heritage System, in the PPS (2024), means "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. 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. The Province has a recommended approach for identifying natural heritage systems, but municipal approaches that achieve or exceed the same objective may also be used."

In accordance with the definition in the PPS, a Natural Heritage System is made up of the following natural heritage features and areas and linkages to connect them:

- Significant Wetlands and Significant Coastal Wetlands;
- Other Coastal Wetlands;
- Significant Woodlands;
- Significant Valleylands;
- Significant Wildlife Habitat;
- Significant Areas of Natural and Scientific Interest (ANSI);
- Fish Habitat; and
- Habitat of Endangered Species and Threatened Species.

It is interesting to note that the definition both states that the Natural Heritage System is "made up of natural heritage features and areas" and that it "**can** include natural heritage features and areas, federal and provincial parks and conservation reserves, other natural heritage features, lands that haven 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", While this implies that the natural heritage system is expected to include natural heritage features amongst other areas and features, it also implies that not all of the listed areas are expected to be included or mapped as part of the Natural Heritage System.

This provides some discretion for the municipality on how the Natural Heritage System will be identified, so long as it follows the "recommended approach for identifying natural heritage systems" by the Province and achieves the minimum standards as identified by the Province. It also allows for municipalities to go beyond the minimum standards to address natural heritage matters that are important to a specific community, unless it would cause conflict with any policy of the PPS.

Further, Policy 4.1.9 of the PPS in reference to the Natural Heritage System states 'Nothing in policy 4.1 is intended to limit the ability of agricultural uses to continue'. Instead, natural heritage and agriculture are to be viewed as complementary ensuring that the agricultural working landscape and natural heritage systems remain compatible and can thrive together without conflict.

2.1.3. Endangered Species Act (2007)

The Endangered Species Act (ESA 2007) provides science-based assessment, automatic species protection, and habitat protection, in order to protect species at risk of disappearing from Ontario. Under

Section 9 of the ESA, species are afforded individual protection providing they are listed as Threatened, Endangered, or Extirpated on the Species at Risk (SAR) in Ontario list. Section 10 of the ESA is in place to protect the habitat of Threatened or Endangered species only; where no damage is permitted to the habitat of those species unless under the authorization of the MECP by way of registration or permit. Destruction of SAR and their habitats constitutes a contravention of the ESA.

The ESA (2007) provides automatic legal protection for species classified as Endangered or Threatened. When a species is classified as Endangered or Threatened, their general habitat is also automatically protected. Their 'general habitat' is protected until a species-specific habitat regulation is created. Regulated habitat is species-specific and provides a clearer description of the habitat by identifying features and geographic boundaries, and areas that may impact species recovery.

Habitat for Endangered Species and Threatened species, a natural area and feature type identified by the PPS for inclusion in the Natural Heritage System is defined through the ESA and is confirmed and managed by the Province through their administration of the ESA. Although identified as a natural heritage feature in the Natural Heritage System in the PPS, this natural area and feature type is not typically mapped as a result of access to habitat mapping being generally restricted by the province based on species sensitivity and potential risk to the species should its location be known. Mapping of Habitat for Endangered and Threatened species is incomplete and will change over time as surveys are completed and/or as species designations change (e.g., new species are listed or de-listed as Endangered or Threatened).

Identification of Habitat for Endangered and Threatened species must be completed through desktop screening and site-specific study (e.g., EIS). Addressing Habitat for Endangered and Threatened species through OP policies rather than mapping due to lack of data or data sensitivity is often a strategy adopted by municipalities.

2.2. Provincial and Federal Guidance Documents

Guidance and technical documents provide additional direction with respect to setting targets or criteria for the identification of individual natural heritage system features and areas. The following documents were considered when evaluating criteria recommendation for the City's Natural Heritage System features and areas components:

- **Natural Heritage Reference Manual** (NHRM; OMNR 2010) is a provincial guidance document specifically written to assist in the implementation of the PPS. The NHRM outlines the approach the Province recommends for achieving consistency with the PPS.
- **How Much Habitat is Enough?** (Environment Canada 2013) provides a set of guidelines for protecting and enhancing wetland, riparian, forest and grassland habitats, including recommendations for minimum targets for protection.
- **Significant Wildlife Habitat Technical Guide** (SWHTG) (OMNR 2000) assist planning authorities and other participants in the land use planning system, with identification of significant wildlife habitat.

- **Significant Wildlife Habitat Ecoregion Criteria Schedules** (OMNRF 2015) goes beyond the SWHTG by providing specific criteria for the identification of significant wildlife habitat within an ecoregion.

2.2.1. Natural Heritage Reference Manual (2010)

The Natural Heritage Reference Manual (NHRM) (OMNR 2010) is a provincial guidance document specifically written to assist in the implementation of the Provincial Policy Statement (2005). The NHRM outlines the approach the Province recommends for achieving consistency with the 2005 Provincial Policy Statement. Although it was developed to provide guidance for implementing the 2005 Provincial Policy Statement, the NHRM remains founded on widely accepted ecological principles and is still cited regularly as it contains relevant technical information that is extremely helpful in the identification and protection of natural heritage features and systems. It remains the most comprehensive guidance document available from the Province, particularly as many natural heritage policies are unchanged from the 2005 Provincial Policy Statement.

Moreover, the majority of the science behind the inventory and analysis of natural heritage features, and the process and considerations for developing Natural Heritage Systems, have not substantially changed since 2010, thus the technical guidance in the NHRM is still relevant.

The guidance provided by the NHRM for the identification of Natural Heritage Systems and the following features is still widely used:

- Significant Habitat of Endangered and Threatened Species
- Significant Wetlands and Significant Coastal Wetlands
- Significant Woodlands
- Significant Valleylands
- Significant Wildlife Habitat
- Significant Areas of Natural and Scientific Interest
- Fish Habitat
- Linkages/Corridors
- Buffers

The NHRM describes each of the natural heritage features and areas identified in the PPS, provides a rationale for the need to protect these features/areas, gives criteria and/or evaluation procedures for the identification of these features/areas, and discusses adjacent lands widths. A review of various municipal planning techniques and implementation tools for the protection of features and areas is also included.

The NHRM is focused on technical criteria for identifying ‘significant’ features as such it will primarily be used to support identification of feature-specific criteria. Where more recent direction is available for specific features (e.g., identification and regulation of habitat for Species at Risk [SAR]), this should be consulted and used, where applicable.

2.2.2. How Much Habitat is Enough?

Environment Canada`s publication How Much Habitat is Enough? (Environment Canada 2013) provides a strategic framework and set of guidelines for protecting and enhancing wetland, riparian, forest and grassland habitats. It is intended to serve as a starting point for the development of Natural Heritage Systems. The framework acknowledges the need for a systematic approach that "better captures the complexity of life and the multiple and often known linkages that allow species to flourish." (Environment Canada, 2013). Moreover, is the recommendation to look beyond the boundaries of specific planning units, such as municipal boundaries, and to take into account surviving habitat corridors and to promote linkages across the landscape.

The How Much Habitat is Enough? provides twenty-one minimum guidelines to support ecological requirements with the objective to maintain wildlife populations and prevent local extirpations of species. These guidelines can inform targets for habitat types, and in turn, targets for the natural heritage system.

An assessment of the degree to which select Natural Heritage System targets for forest, wetlands, riparian and grassland habitats are to be protected can be determined by applying minimum guidelines against existing conditions.

The main content of the report describes the four habitat types, their functions, important considerations for shape, proximity to other features, species that rely on them and the rationale for minimum size thresholds. For example, select guidelines for the following features are provided for consideration in developing Natural Heritage System targets for an area:

- Forest habitat
    - At least 30 percent forest cover
    - At least 10 percent of forest cover should be interior forest greater than 100 metres from edge
    - At least one large contiguous forest within each watershed (greater than 200 hectares)
- Wetland habitat
    - At least 10 percent wetland habitat and 6 percent of each subwatershed, or 40 percent of the historic watershed wetland coverage should be protected and restored
    - Protection of a Critical Function Zone (CFZ) of (e.g., 100 metres from edge of wetland)
    - Urbanizing watersheds should maintain less than 10 percent impervious land cover in order to preserve the abundance and biodiversity of aquatic species
- Riparian habitat
    - 75 percent of stream lengths natural vegetated cover
    - Minimum 30 metres vegetated buffer along streams
- Grassland habitat
    - Maintain and create small and large grassland patches in existing and potential local grassland landscapes, with an average grassland patch area of greater than or equal to 50 hectares and at least one 100-hectare patch

Although this technical document provides minimum guidelines for supporting ecological requirements, it does note that a precautionary approach is to strive toward protecting and restoring more complete ecosystems with greater integrity that will be more resilient to change. This involves exceeding the minimum amounts of forests, wetlands, grasslands and riparian areas required to maintain species populations just above extinction thresholds.

2.2.3. Significant Wildlife Habitat Technical Guide (2000)

Significant wildlife habitat (SWH) was identified in the 1996 Provincial Policy Statement as a natural heritage feature. The Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000) was prepared by the Ministry of Natural Resources to assist planning authorities and other participants in the land use planning system, with identification of SWH. The SWHTG provided the most up to date information available at the date of publication on specific technical issues related to the identification and protection of SWH. The document recognizes that the information presented will need to be updated as technology or techniques are improved to identify SWH; as well, the SWHTG recognizes that other acceptable approaches to identifying SWH could be used, providing flexibility for changes in methods, protocols and technologies over time. The SWHTG notes that the document provides guidance and is not intended to add to or detract from policy.

The SWHTG provides detailed technical information on the identification, description, and prioritization of significant wildlife habitat as well as ecological considerations underlying Natural Heritage System planning. This document is intended to provide guidance on “the development of strategies to identify and protect significant wildlife habitat in the municipal planning process.

Although the SWHTG is an older guidance document (almost 25 years), much of the concepts and technical information contained therein are still relevant to the identification of SWH including measures to avoid or mitigate impacts to SWH. This document should continue to be referred to for detailed technical information to support the identification of SWH.

Due to limited and inconsistent availability of existing data available to identify SWH through desktop mapping, municipalities typically due not mapping SWH as part of the Natural Heritage System. Municipalities will protection SWH through policy considerations based on the direction of the PPS and should be assessed and confirmed using the Province’s technical guidance through site-specific study (e.g., Environmental Impact Study) at the time of development applications.

2.2.4. Significant Wildlife Habitat Ecoregion Criteria Schedules (2015)

The purpose of this document is to support the SWH Technical Guide (OMNR 2000).

The Significant Wildlife Habitat Ecoregion Criteria Schedules (SWH Ecoregion Schedules) (OMNRF 2015) provides the recommended guidelines for identifying SWH There is a specific “schedule” for each Ecoregion – 3E, 5E, 6E, and 7E.

The SWH Ecoregion Schedule provides details on the description, criteria, information sources, and assessment methods for SWH in each Ecoregion and the criteria are based on scientific literature and expert knowledge. The following information is provided for each SWH type to assist with evaluation of SWH habitat:

- Rationale for classification as SWH
- Indicator wildlife species
- Candidate SWH indicators:
    - Habitat identifiers based on Ecological Land Classification (ELC) vegetation communities (Lee et al. 1998)
    - Habitat descriptions and information sources
- Confirmed SWH criteria which describes the extent of SWH in relation to the ELC unit and buffers from the ELC unit

The SWH Ecoregion Schedules are useful for the City as a guidance document to allow for screening for and identification of candidate SWH, and to confirm SWH through field surveys.

2.3. Local Documents

2.3.1. City of Kingston Climate Leadership Plan (2021)

Demonstrating leadership on climate action was identified as one of Kingston's five strategic priorities, making the City of Kingston the first municipality in Ontario to declare climate change an emergency that requires a strategic response. To implement the strategic response, the City created a Climate Leadership Plan ("the CLP") that measures the impact of programs and actions taken by the City to reduce greenhouse gas emissions and outlines the steps that need to be taken to achieve the City's goal of being carbon neutral by 2040 (City of Kingston, 2021). The CLP acknowledges the economic benefits of the transition to a low carbon society, and highlights opportunities for economic development and community prosperity. The CLP (2021) also identifies key climate change risks and vulnerabilities, providing guidance on opportunities and adaptation measures to make Kingston more resilient to changing climate conditions and extreme weather events (City of Kingston, 2021).

The CLP (2021) contains ten objectives as outlined below:

Buildings and Energy Production

1. Accelerate local production of renewable and low carbon energy and energy storage.
2. Support Kingston residents to invest in low carbon retrofits for their homes.
3. Partner with Kingston businesses to retrofit and fuel-switch existing commercial buildings.
4. Demonstrate leadership by making all municipal facilities Net Zero Energy by 2040, where feasible, and work with all levels of government to reduce emissions from other publicly owned buildings.
5. Advance the adoption of net zero ready new construction ahead of the release of requirements expected in national building and energy codes in 2030.

Waste

6. Produce renewable natural gas locally from waste sources and encourage adoption of other low carbon fuels.

Transportation

7. Develop active transportation connections and foster transit-oriented development to encourage a shift to sustainable modes and a reduced reliance on personal vehicle use.
8. Transition to electric- and renewably-powered personal, municipal and commercial motorized vehicles.

Food and Forestry

9. Improve the vibrancy of the local food system to help reduce dependence on high carbon imported food.

Climate Change Adaptation and Resilience

10. Proactively manage climate-related impacts to municipal critical infrastructure and services, and support community organizations and businesses in assessing and reducing their own climate risks.

2.3.2. A Natural Heritage Plan for the Land Conservancy of Kingston, Frontenac, Lennox and Addington (North-South Environmental and Land Conservancy of Kingston, Frontenac, Lennox and Addington, 2018)

The Land Conservancy of Kingston, Frontenac, Lennox and Addington (LC-KFLA) report is a strategy to classify and identify land acquisition and stewardship priority lands in the LC-KFLA study area. The report provides guidance for the identification of core areas and primary landscape connections throughout the study area. The report takes a landscape approach to look for the consolidation of protected areas and expansion of patches with an aim of increasing habitat diversity and connectivity across the landscape (North-South Environmental 2018). The area of focus is on habitats south of Provincial Highway 7, as the Land Conservancy works collaboratively with the Mississippi Madawaska Land Conservancy which is active in the area north of Highway 7. The purpose of the Natural Heritage Plan is to guide Land Conservancy habitat protection activities as well as to provide information that may be useful to other conservation partners and initiatives (North-South Environmental 2018). The Natural Heritage Plan was developed in consultation with conservation partners in the region in order to gain feedback on the selection of priorities and to strengthen connections with other organizations with an interest in stewardship and protection of natural heritage (North-South Environmental 2018).

The Natural Heritage Plan identified core areas as significant wetlands, large wetlands (above 30 hectares), waterbodies, lake trout lakes, wooded area (based on size criterion), Areas of Natural and Scientific Interest, and protected areas (e.g. provincial parks and nature reserves). The mapping criteria

were different for the Canadian Shield and Limestone Plain, to respond to the differences in landscape context associated with the differences in landscape cover. Minimum buffer widths were also identified for each type of core areas and are based as minimum widths need as defined in Ministry's NHRM (2010). Primary corridors were identified with the use of available watercourse data plus a minimum of 50 metres of naturally vegetated habitat on both sides of streams as the effective strategy to map prospective linkages along watercourses due to limitations of available data. The spatial data used to define these core areas and corridors was sourced from Land Information Ontario (LIO) for the period between 1998 and 2016 (North-South Environmental 2018).

Weighted criteria of a scale 1 to 5 was than developed for each of the core areas and their buffers to identify priority areas for land stewardship and acquisition. A weighting scale of 1 indicated a low score (i.e. the importance of this variable was considered low on the scale of priorities), and 5 indicating the variable was high on the scale of priorities. A map was than created that shows the potential priority areas and the connectivity between these areas. Weightings for each variable were applied to the data to create a score for each part of the Natural Heritage Plan map. Relevant to the City of Kingston, the higher scores for the Limestone Plain area were determined largely by Provincially Significant Wetlands. The mapping identified an area of high priority in a band approximately 2-3 kilometres south of the Canadian Shield boundary (North-South Environmental 2018). Figure 27 of the Report that maps the Natural Heritage Plan for the Limestone Plain area is shown below in Figure 1.

Additional overlays were also assessed to determine if they could be used as a ‘landscape context’, that could be taken into account when setting overall priorities but were not included in the Natural Heritage Plan mapping. Overlays would be used qualitatively in the future to determine where LC-KFLA priority areas overlap with priority areas identified by other groups (e.g. Alvars, the Land Between, Nature Conservancy’s priority areas) but not included as core areas. (NSE 2018).

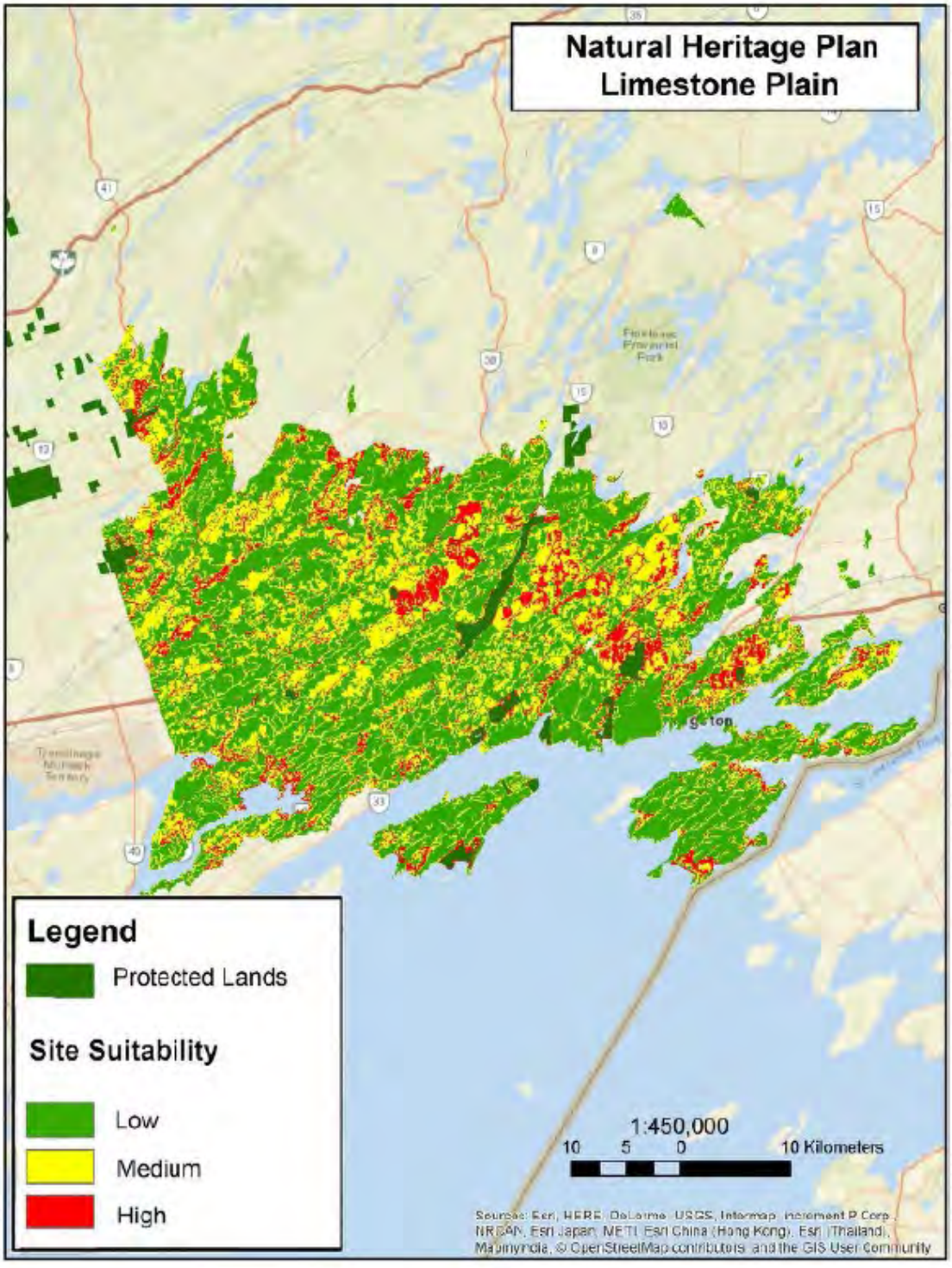

Figure 1 - Map of the Natural Heritage Plan within the Limestone Plain (Report for LC-KFLA)

2.3.3. Central Cataraqui Region Natural Heritage Study (Cataraqui Region Conservation Authority 2006).

The Central Cataraqui Regional Natural Heritage Study (CCRNHS) was undertaken to identify a system of natural features and areas, including wetlands, woodlands, valleylands, and significant wildlife areas. The goal of the report was to assist in updating OP policies for the City of Kingston and Loyalist Township at that time. The study area included all urban and rural lands located within the municipal boundaries of the two municipalities. The CCRNHS also served as the foundation for the natural heritage mapping and policy strategies outlined in the City of Kingston OP (2010).

The purposes of this study were to:

- Identify a 'broad-brush' system of features and areas that supports biodiversity within the City of Kingston and Loyalist Township, with attention to the surrounding area, and
- Suggest ways in which each municipality, in consultation and partnership with the community, might develop a strategy to protect and enhance the habitats and biological diversity of that system

The report contains recommendations for methods to protect and enhance the Natural Heritage System in the Central Cataraqui Region. The health and diversity of the plants, animals and habitats of the remaining natural landscape can be maintained through the recognition, protection, and enhancement, and where needed, restoration of a natural heritage system of significant features and connecting corridors.

The following guiding principles, or general objectives had been identified for consideration to protect and enhance the natural heritage system:

- Protect the best (based on representation/distribution);
- Large natural areas are generally more important than smaller ones (although small areas have benefits as well);
- Foster biodiversity, which is a key determinant of ecological health;
- Minimize disturbance within and adjacent to the natural heritage features; and Promote connectivity/linkages of features.

The following primary features were identified as part of the Natural Heritage System:

- woodlands
    - Five criteria were used to identify significant woodlands. These were:
        - size;
        - presence of interior habitat;
        - proximity to other significant natural features;
        - hydrologic values, and
        - age.

  - The evaluation of significance is based on a minimum standards method, in which a woodland is considered significant if it meets one or more of the criteria.
  - Woodlands within most of the Cataraqui watershed were considered significant if they were 40 ha in size, with the exception of Amherst Island, where woodlands were considered significant if they were 4 ha in size or greater. The reasoning behind this is that the total area of the woodlands on the island was 13.6 percent the land area (in 2006), and Environment Canada notes that in landscapes with less than 15 percent woodland cover, woodlands over 4 ha should be considered significant.
- wetlands and lakes
  - noting that wetlands less than 2 ha in size were not visible on current (2006) mapping
- areas of natural and scientific interest (ANSI's)
- watercourses and valley lands
- specialized communities
- significant wildlife areas

Individual components were mapped for this study based on the best available data at that time, but a final Natural Heritage System including all criteria was not mapped as part of this project, as its objectives were to identify the "broad brush" components of a Natural Heritage System for future study.

3. The City of Kingston Current Natural Heritage System

The natural environment is considered within the City's of Kingston's current OP (2024 Office Consolidation) by applying an ecosystem approach to identifying a Natural Heritage System for the protection of natural features and areas and their ecological functions (OP section 2.3.15.). The City's current Natural Heritage System is also recognized as a valuable resource and asset to help sustain the economic environmental and social health of the City (OP section 2.8). The current goal of the Natural Heritage System is "to manage growth and land use in a manner that maintains, restores and enhances the natural heritage system within Kingston as a healthy ecosystem that will continue to sustain all life forms over the long term".

The City's current Natural Heritage System is 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 (OP Definition). The City's current Natural Heritage System is comprised of Natural Heritage "A" Features and Natural Heritage "B" Features that include the components listed below and are identified in Section 6.1.2 and 6.1.3 of the OP.

Natural Heritage "A" features include the following:

- Areas of Natural and Scientific Interest (ANSI.'s);
- Fish Habitat;
- Provincially Significant Wetlands, Significant Coastal Wetlands and Locally Significant Wetlands;
- Snake and Salmon Islands, located in Lake Ontario; and,

- Rivers, streams and small inland lake systems.

Natural Heritage “B” features include the following:

- Significant Woodlands;
- Significant Valley lands;
- Significant wildlife habitat;
- Unevaluated Wetlands and Coastal Wetlands;
- Linkages and Corridors; and,
- Riparian Corridors.

Species at Risk habitat has been identified as natural heritage feature but has not been classified as Natural Heritage “A” and Natural Heritage “B” features. Due to the sensitive nature of Species at Risk locations and habitats, this information is not shared publicly on maps to ensure their protection.

In the current OP, Natural Heritage ‘A’ features are currently identified as Environmental Protection Areas on Schedule 3A-C: Land Use map, with the features identified separately on Schedules 7A-C: Natural Heritage Area ‘A’ map. Natural Heritage ‘B’ features are identified as constraints on Schedules 8A-C: Natural Heritage Area ‘B’ map.

The natural heritage features and areas in the City’s current OP are based on the CCRNHS (2006), which is discussed in Section 2.3.3.

The policies that are applicable to the Natural Heritage ‘A’ features and Natural Heritage ‘B’ features are located throughout the OP.

Section 3.9 of the OP emphasizes protecting the waterfront as a vital part of the City’s identity, natural heritage, and water resources. It establishes the ‘Ribbon of Life,’ a 30-metre naturalized buffer along the waterfront, which “can help to enhance water quality, minimize soil erosion, provide plant and animal habitat, establish connectivity and wildlife corridors, and contribute to the overall health of shoreline ecosystems, particular fish habitat”. The OP directs the City’s Zoning By-Law to implement the ‘riparian corridor’ and ‘ribbon of life’ as a minimum 30-metre setback from the high-water mark of a waterbody. Schedule 7 of the OP confirms that the riparian corridors are applied as buffers along waterbodies and wetlands, recognizing the interchangeability of the terms ‘riparian corridor’ and ‘Ribbon of Life.’

The Environmental Protection Area Designation policies are located in Section 3.10 of the OP. The intent of this policy section is to ensure the protection of certain environmentally sensitive lands across the City by designating them as Environmental Protection Area. The section defines natural areas that are included in the designation, permitted uses, and when an environmental impact study is required to assess potential development adjacent to or within the Environmental Protection Area. More specific environmental policies related to environmental functions and features, including those related to wetlands, are outlined in Section 6, while Section 5 addresses natural hazard considerations.

The Natural Heritage System policy guidance is in Section 6 of the OP and focuses on protecting the environmental quality of its diverse natural areas, recognizing their critical role in maintaining ecological balance and addresses how the City mitigates climate change while ensuring resilience and sustainability. Specific policies on the Natural Heritage System are detailed in Section 6.1, outlining defined natural features and areas included in the System, adjacent lands, ecological linkages, tree conservation, land stewardship, and requirements for environmental impact studies to assess potential development.

4. Cataraqui Source Protection Plan (2014)

The Clean Water Act, 2006 (CWA) was created to ensure clean, safe and sustainable drinking water for Ontarians, by protecting drinking water sources such as lakes, rivers, and well water from contamination and overuse as the first step in a multi-barrier staged approach. The Drinking Water Source Protection Program was established by the Province under this legislation and has resulted in the development of local source protection plans overseen by Source Protection Authorities. Source Protection Plans contain policies that either recommend or require that actions be taken to address activities identified as threats to drinking water sources.

The Cataraqui Source Protection Plan (2014) is the locally developed plan that covers the Cataraqui Source Protection Area, which includes the City of Kingston. It was approved by the Minister of Environment and Climate Change on November 26, 2014, and it has been in effect since April 1, 2015. The implementation of the Cataraqui Source Protection Plan is being carried out collaboratively by municipalities, local health units, provincial ministries, and the Cataraqui Region Conservation Authority.

One mechanism to implement the Cataraqui Source Protection Plan is through municipal land use planning, where the policies and mapping of this Plan are incorporated into the City's OP. The Cataraqui Source Protection Plan's policies and mapping were incorporated into the City's OP as part of Amendment Number 50 in 2017. It is our understanding that the policies and mapping in the current City's OP are consistent with the Cataraqui Source Protection Plan.

4.1. Sourcewater and the Natural Heritage System

Natural Heritage Systems play an integral role in source water protection by providing ecosystem services such as water filtration, flood regulation, and habitat preservation, all of which can contribute to maintaining water quality and quantity in watersheds. Specifically, wetlands are more often potential areas of groundwater discharge or where surface water enters an underground aquifer, allowing recharging of groundwater supplies (Cataraqui Source Protection Plan, 2014). Wetlands are of particular importance for areas identified as Highly Vulnerable Aquifers and Significant Groundwater Recharge Areas as these areas occupy a large proportion of the City's landscape (Cataraqui Source Protection Plan, 2014).

The groundwater in the Cataraqui Source Protection Area generally lacks the natural protection provided by overlying materials (e.g., soil) so it is easily impacted by sources of contamination (i.e., pollution) such

as fuel spills or leaks and poorly functioning on-site sewage systems (e.g., septic systems) (Cataraqui Source Protection Plan, 2014). Wetlands provide natural cover and offer a natural filtration mechanism that can help mitigate some of these risks by trapping and filtering contaminants before they reach the groundwater (Cataraqui Source Protection Plan, 2014). It is essential to consider the value of not only wetlands, but the natural heritage system (e.g. watercourses, woodlands) as well and the services it provides to the City's drinking water sources by assisting with the long-term sustainability, quality, and availability of safe drinking water for the community. Further, by reducing potential impacts of new or expanding development to protect wetlands and other natural features and areas and identifying opportunities for stewardship and enhancement of these features, this can assist in maintaining both groundwater and surface water quality and achieve targets outlined in the Cataraqui Source Protection Plan.

5. Current Issues and Trends in Natural Heritage Systems

The identification and protection of the natural heritage features and systems has evolved in Ontario. Recognition of the ecosystem services that natural features provide, the costs of not protecting the natural environment, as well as the recognition that the remaining features and ecological functions are continually being threatened and degraded has grown.

Policies are continually being developed and strengthened in recognition of new and emerging threats. For example, there has been an increased recognition of the impacts to natural features and ecological functions resulting from invasive species and climate change. The combination of these impacts may require a new thinking and approach to the identification of component features in the Natural Heritage System and how these features are protected through policy.

This section explores current issues and trends regarding Natural Heritage System planning, including recognition of other approaches needed to maintain and enhance natural feature cover, biodiversity, and system resilience. As previously described, a key element to the update of the City's Natural Heritage System is identifying components, criteria and mapping that is based on sound science. This review explores current science and best practices in natural heritage planning on several topics, including:

- Climate Change
- Biodiversity Loss
- Invasive Species
- Woodland Cover
- Wetlands
- Offsetting
- Headwater Drainage Features
- Buffers to Natural Features and Areas
- Linkages and Corridors
- Enhancement Areas
- Settlement Area Expansions

Considerations of current issues and trends will also be considered through the next phase of the project as part of the Natural Heritage Study, which will develop and summarize policy recommendations relative to the Natural Heritage System for the City's new OP.

5.1. Climate Change

Climate change is recognized as one of the most significant threats biodiversity, ecological functions and Natural Heritage Systems. The impacts of climate change are likely to exacerbate the effects of surrounding land use change on natural features and areas and are expected to result in increased variability in extreme local weather events.

Climate change creates additional stress on ecosystems that are already impacted from fragmentation, invasive species, pollution, and increasing human pressures (e.g., creation of ad-hoc trails, trampling of vegetation, introduction of domestic animals [including off-leash dogs, and free-roaming and feral cats which may result in increased bird and small mammal mortality], noise and light pollution). The following impacts to the natural environment are expected as a result of increased average temperatures and changes in current precipitation patterns (as cited from Penney 2012):

- Increased insect and disease outbreaks in trees and other vegetation (including agricultural crops)
- Warmer winter temperatures will limit the amount of insect and disease die-off that occurs in the deep cold of winter
- Increased stress for woodlands due to summer heat and reduced rainfall, making them more vulnerable to fire
- Increase evaporation and evapotranspiration (the transfer of water from soil to the atmosphere through uptake by plants) leading to lower water tables
- Decline in wetland quality and quantity due to lower water levels, with impacts on wetland plants, marsh-nesting birds, amphibians and fish
- Faster drying of vernal pools impacting species such as frogs and salamanders
- Threats to fish from higher water temperatures, declining water levels in rivers and lakes, reduced flows in some rivers, and reduced levels of dissolved oxygen in summer
- Expansion of some warm water fish and invasive aquatic species such as sea lamprey and zebra mussels
- More outbreaks of Type E botulism causing mass die-offs of mudpuppy salamanders and fish-eating birds in the Great Lakes
- More outbreaks of toxic blue-green algae in the Great Lakes (Lake Ontario) and other smaller in-land lakes

Natural Heritage Systems play a role in mitigating impacts from climate change and must be resilient to impacts from climate change.

5.1.1. Climate Change and Ecosystem Services

The Millennium Ecosystem Assessment (2005) defines 'ecosystem services' as "the benefits people derive from ecosystems", such as food, wood and other raw materials, pollination of crops, prevention of soil erosion, flood attenuation, habitat for wildlife, and water purification. They also include a wide variety of cultural services, such as recreation and a sense of place. The extent of the impacts of climate change on natural features and ecological functions is uncertain. Municipalities need to consider the potential impacts of climate change as part of natural environment planning in order to better protect the Natural Heritage System and reduce economic costs (e.g., flood damage, effect of drought on crops, etc.).

Natural systems that are healthy, diverse and connected have been found to exhibit resilience. An ecosystem is considered to be resilient when it has the ability to recover from disturbance and maintain its normal ecological functions, including wildlife habitat functions, and patterns of nutrient, water, and chemical cycling. A resilient natural heritage system can provide an important role in a climate change context in several ways:

- A healthy natural system has a greater ability to adjust to changes in the environment resulting from climate change.
- Wetlands provide water storage and water quality enhancement ecosystem services.
- Forests and wetlands act as carbon banks (they store carbon which would otherwise become GHG emissions) and are important mitigation tools.
- Naturally vegetated areas (e.g., woodlands) can reduce energy demands and the urban heat island effect (where urban areas experience higher temperatures than their surrounding natural areas due to the concentration of buildings, paved surfaces, and human activities that trap heat) and moderate microclimate conditions.

When natural communities are healthy, diverse, and connected, they form a resilient Natural Heritage System that provides the ecosystem functions and services upon which we depend. These systems are vital for creating habitat, enabling the movement of species, and supporting species richness and ecosystem complexity. Further, ecosystem services include the provision of clean water, erosion control, pollination services, flood damage reduction, air quality, and recreation.

Identification of the Natural Heritage System should consider natural feature resiliency to changes over time. This can be achieved through:

- Identifying a diverse natural system connected through linkages and corridors that enable plant and wildlife movement, which contribute to the biodiversity and ecological functions of the natural environment.
- Providing an increased level of protection for natural features that reduce risk (such as flooding) and mitigate climate change impacts. This could include features such as wetlands and woodlands.

- Identifying enhancement opportunities for natural heritage features and areas, to improve the shape and / or increase the size of the feature to improve its resilience to the increased stressors from changes to adjacent land use and climate change.
- Selecting restoration objectives that consider changes to climate and the resulting changes to species composition, etc. to build or support overall system resiliency through planning and design.

5.1.2. Planning Considerations

Policy direction at the federal, provincial and local level can contribute to preparing for and mitigating the effects of climate change. A variety of tools can be leveraged to manage or reduce exposure to climate risks or mitigate impacts; these include OP documents, regulatory and zoning tools, corporate climate change action plan, voluntary or incentive programs, and education and communication tools. For natural environment planning, that could mean acknowledging the important role natural features and functions play in reducing the exposure to risk and mitigating impacts from climate change. Natural Heritage System mapping and policies could provide an increased level of protection to natural features and functions that reduce risk and mitigate impacts.

5.2. Biodiversity Loss

Biodiversity is critical for the health of the natural environment, including the extensive range of services and functions critical for health and economy at the local, provincial, federal, and global scales.

The term ‘biodiversity’, also known as ‘biological diversity’ or ‘biotic diversity’, is used to refer to all of the living things that can be found in an area and the diversity within life forms (e.g., genetics). Humans rely on the interactions within and between living things for clean water, air and food. Beyond this, humans rely on the natural environment for economic benefits (e.g., forestry), cultural values, and physical and mental health, all of which are affected by biodiversity. Threats to biodiversity include invasive species, habitat loss, and climate change. Recognition of the critical importance of protecting biodiversity through actions such as land protection, sustainable development, and wise use of resources has been and continues to be demonstrated through provincial, national, and international efforts.

Through the City’s 2023 Strategic Plan, the development of a Biodiversity Conservation Strategy has been identified in Section 2.3.2, with the following objectives:

- Establish a strategy for protecting and enhancing biodiversity in the city, by reviewing models such as the Montreal Biodiversity Pledge, defining existing initiatives and identifying additional actions based on the international framework of Sustainable Development Goals (2026)
- Include the identification of options to reduce impacts of invasive species (2026)
- Report on the potential to work towards Nature Canada’s Bird Friendly Certification to Intermediate Level (2024)

5.2.1. Planning Considerations

Ecological linkages and connecting fragmented habitats are crucial for biodiversity conservation, allowing species to move, find resources, and adapt to climate change. Section 4.1.2. of the PPS (2024) sets the context for which enhancements and linkages play a role in natural environment identification and protection, as follows:

“The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features in areas, surface water features and ground water features.”

The identification of a Natural Heritage System conserves biodiversity by protecting a diverse range of natural heritage features and areas (providing diverse habitats / ecosystems) and by maintaining ecological functions, such as movement corridors. Natural Heritage System considerations related to linkages and corridors, and enhancement areas are discussed in Sections 5.8 and 5.9.

5.3. Invasive Species

Invasive species are widely considered to be the second greatest threat to biodiversity after habitat loss (Erlich 1998; Wilson 1992). Invasive species are typically non-native species that displace some or most of the native components of a community (White et al. 1993) and negatively impact the function of the ecosystem, including ecosystem services. These species typically become invasive due to competitive advantages such as aggressive resource consumption (e.g., nutrients, water and light), rapid growth, prolific reproduction and stress tolerance. These competitive advantages result in a loss of native species which can disrupt ecosystems and further contribute to habitat loss. Climate change further facilitates the spread and establishment of many non-native species by creating opportunities for them to become invasive (e.g., by increasing their range / distribution). The impacts of invasive species on ecosystem services have increased awareness about the need to prevent introductions and control established populations.

As with climate change, invasive species threaten the ecosystem services we rely on. A study by Aziz and Van Cappellen (2019) used the Costing Nature model to calculate the potential value of ecosystems in Southern Ontario to be $19.1 ± 0.8 billion per year. This valuation is calculated as direct economic provisioning of ecosystem services. It does not evaluate cultural and social values associated with natural systems that are important to residents and visitors.

In addition to the cost to ecosystem services, there is a direct economic cost resulting from managing the impact of invasive species. The Ontario Invasive Species Strategic Plan estimated that in Ontario alone, $3.6 billion annually is lost from invasive species impacts on agriculture, fisheries, forestry, healthcare, tourism and recreation industries(OMNRF 2023).

Once invasive species have become established, economic costs associated with managing invasive species varies greatly depending on the species, extent of the population, and mechanism used to

manage the species. For example, in 2019, municipal spending for invasive Phragmites control in Ontario was estimated at over $2.8 million/year (Invasive Species Centre 2025).

Examples of some of the most problematic terrestrial invasive flora in the City include Common Reed (*Phragmites australis* subsp. *australis*), Common Buckthorn (*Rhamnus cathartica*), and Dog-strangling Vine (*Cynanchum rossicum*). Common Reed is a fast-growing invasive grass which negatively impacts wetlands not only by crowding out invasive plants, but also by reducing open water habitat crucial for some fauna (e.g., waterfowl and turtle), as well as by potentially lowering water levels and impacting wetland hydrology. Common Buckthorn significant impacts woodlands by altering soil nitrogen levels and shading out understory layers, which inhibits the growth of native species. The species can form dense thickets, leading reduced diversity and altered forest composition. Dog-strangling vine has been shown to reduce native plant species richness, pollinator diversity, and nutrient availability.

Municipalities play an important role in the management of invasive species on municipal lands and can provide planning tools to support management of invasive species. Additionally, municipalities can play a major role in:

- The detection of new introductions;
- The management of new and established invasive species; and,
- The control of noxious vegetation that poses a human health risk.

The Ontario Invasive Plant Council has prepared *Creating an Invasive Plant Management Strategy: A Framework for Ontario Municipalities* (Sherman 2015), which provides guidance to municipalities on invasive plant management strategies. The province released the Invasive Species Act, 2015 (S. O. 2015, c. 22 –Bill 37) which provides a framework for preventing and managing invasive species in the province. It aims to protect Ontario's natural environment and socio-economic well-being by prohibiting and restricting the movement and possession of certain species. The Act outlines mechanisms for identifying, classifying, and managing invasive species, including those that threaten the natural environment.

5.3.1. Planning Considerations

OP documents can include policies and guidance to support the management of invasive (or non-native) species and reduce the impact to the natural environment. The direction provided for in OP policies various across municipalities, some do not mention invasive species, while others include a broader set of policies.

For example, the City of Guelph's OP (2022) includes policies for invasive species in Section 4.1.7.1, as follows:

1. Management and control of non-indigenous and invasive species will be undertaken on City owned and managed properties.
2. Plantings on municipal properties shall be indigenous species where feasible and appropriate, except where harsh environmental conditions would limit their survival.

3. Management and control of non-indigenous, invasive species is encouraged on lands owned by other public agencies and utilities.
4. Plans prepared in conjunction with development and site alteration applications will require indigenous plants, trees and shrubs except where harsh environmental conditions would limit their survival.
5. Indigenous species will be encouraged on private lands and particularly on those adjacent to the Natural Heritage System.

At the municipal-level, local by-laws and permitting requirements can aid in managing the introduction and spread of invasive species. Tools available at the municipal level include by-laws under various sections of the Municipal Act. Although rarely enforced, nuisance weed By-laws are another tool that can be used by municipalities to manage invasive species. For example, the City of Mississauga By-law Number 0267-2003 prescribes standards for maintenance of nuisance weeds (e.g., European Buckthorn and Garlic Mustard) on private lands: “Every owner of land shall destroy and remove all nuisance weeds and weed seeds on their lands”.

5.4. Woodland Cover

The ecological integrity of woodlands in southern Ontario, especially those in urban settings, are subject to several threats and stressors, such as:

- Climate change: which has the potential to result in changes in temperatures, increase number and severity of extreme weather events, and cause changes in hydrology due to precipitation and/or transpiration/evapotranspiration fluctuations
- Invasive species, pests and diseases: which outcompete or displace native wildlife, reducing the biodiversity and ecological function of natural features. Increases in tree pests and diseases can result in the loss of some species of trees from a woodland community
- Edge effects: woodland edges, compared with the woodland interior, are exposed to increased light and wind (resulting in changes in microclimate and soil moisture), higher prevalence of predatory animals (e.g., cats, racoons, coyotes, etc.), increased noise and light pollution from adjacent developed areas, and typically a higher number and abundance of non-native (including invasive) plants
- Anthropogenic impacts: partial removal of woodlands, encroachment, dumping, unauthorized removal of vegetation, ad-hoc trails, unauthorized camp sites and other alterations.

As a result of these threats and stresses, the form and function of a woodland could change. This impacts the characterization of the feature as a ‘woodland’ based on current conventional definitions and criteria (e.g., density and possibly size of trees). For example, woodlands in southern Ontario dominated by ash trees are undergoing a major transformation as a result of Emerald Ash Borer (*Agrilus planipennis*), an invasive insect, that infests ash (*Fraxinus spp.*) trees causing their death. With the loss of ash trees from a woodland where the dominant species in the canopy is ash, this can result in the complete change in community structure and function whereby the woodland no longer exhibits the characteristics or functions (e.g., habitat for forest dependent wildlife species) of a woodland.

Following the loss of the treed canopy, woodlands that have previously been identified based on the conventional set of criteria (e.g., density of trees per hectare) may no longer meet the definition of woodland, particularly when the sub-canopy or understory (i.e., the regenerating woody layer or woody species succeeding into the canopy) is dominated by shrub species, such as invasive European Buckthorn (*Rhamnus cathartica*). The consequence of the change of status from "woodland" to a feature that is not afforded protection under conventional natural heritage policies (e.g., cultural woodland or cultural thicket) would reduce the certainty that the natural cover would be maintained or enhanced.

5.4.1. Planning Considerations

Generally, there is recognition that change from either anthropogenic influences or natural events are likely, and that monitoring is required to detect, and preferably measure, the change. Municipalities can address changes in the natural environment through policies that require or encourage monitoring features within a Natural Heritage System, particularly when it is associated with a development application that may impact a feature. What is not as well addressed is how to respond to change, especially when it involves degradation that changes the status or characterization of a feature.in

Woodlands within a Natural Heritage System may be comprised of both significant and 'other / contributory' woodlands. Per the PPS, a Natural Heritage System will include Significant Woodlands, which are identified based on NHRM criteria, such as size, interior habitat and proximity to other features. The inclusion of contributory woodlands, which may include non-significant woodlands or treed areas that have a lower tree cover (e.g., 35 percent - 60 percent) may be used to provide some protection to these features while achieving woodland cover targets. The approach recognizes that non-significant and successional woodlands (those with lower tree densities) have important ecological functions, contribute to the tree canopy cover of the City, and in the case of successional woodlands will in time increase in density and succeed into forests.

The City is taking a progressive approach to address potential threats and stressors to woodland cover by identifying targets (e.g. forest cover) and strategically planning for opportunities to enhance and protect its woodlands as described below.

5.4.1.1. City of Kingston Official Plan (2024 Office Consolidation)

The City's current OP (Section 2.8.2) identifies that forests and trees are recognized as a critical part of the City's health and character. Accordingly, the City has identified a 30 percent minimum forest cover target, consistent with Environment Canada (2013) guidelines.

5.4.1.2. City of Kingston Forest Management Strategy

The City is developing a Forest Management Strategy for its rural and urban forest and woodland areas. The City's forests include all trees, forests, green space, soils and ecosystems located within the municipality's boundary, including those in urban and rural areas, and on public and private land. The Forest Management Strategy is being created to support the City in fulfilling Strategic Plan Action 2.3.3, which targets a 30% urban and rural tree canopy by 2035. The new Forest Management Strategy will

have a 20-year planning horizon that will include a strategic framework detailing policy, procedural, operational and regulatory program adjustments towards the achievement of a community-defined vision. The Forest Management Strategy will help achieve this by:

- Establishing a community-supported vision for Kingston's rural and urban forest;
- Assessing the current state of the City's rural and urban forest;
- Summarizing community needs and aspirations; and,
- Developing a framework of goals, strategies, actions, indicators, and targets.

The new Forest Management Strategy is anticipated to be finalized before the end of 2025.

Although the projects are focusing on trees, there is a difference between tree canopy and woodland canopy. Tree canopy considers the canopy cover of all trees, including those which occur in woodlands and other treed communities, as well as individually occurring trees such as in urban settings (e.g. street trees). Woodland canopy cover considers the canopy cover of trees occurring in woodland communities only.

The Natural Heritage System update project for the new City of Kingston OP and the new Forest Management Strategy project should be coordinated, where necessary, to effectively support its strategic goal to maintain the City's natural heritage and environmental assets.

5.5. Wetlands

Wetlands play an important ecosystem role by providing flood protection, water purification, wildlife habitat and climate change resilience. Wetlands are a critical part of integrating protection of the diversity of hydrological and hydrogeological processes and support biodiversity in the landscape. Small and large wetlands are also important for providing hydrological and hydrogeological support of other features and support of biodiversity.

Over the last few years in Ontario, changes to the provincial direction on wetland evaluation and protection has left wetlands more vulnerable to impacts from land use change and development. In 2023, changes to the Ontario Wetland Evaluation System (OWES) resulted in criteria that make it more difficult for wetlands to receive and maintain Provincially Significant Wetland (PSW) status. As a result, wetlands that are no longer considered significant under the PPS, due to their re-designation from PSW, would no longer receive the protections provided by the PPS.

Further, recent amendments to the Conservation Authorities Act and the new Ontario Regulation 41/24 have removed the 'conservation of land' from their mandate, which has restricted their ability to review wetlands from an ecological perspective. As a result, many non-PSW wetlands are no longer regulated by the conservation authorities, or where they are, ecological considerations have been limited.

5.5.1. Planning Considerations

As discussed, the PPS allows a municipality to go beyond the minimum standards where it does not conflict with other policies. When updating their OPs, municipalities can include non-PSWs as part of their Natural Heritage Systems and ensure policies are developed to support their protection and enhancement. This flexibility regarding inclusion of non-PSW wetlands can support system targets and to achieve a resilient / robust Natural Heritage System. The identification of locally significant and unevaluated wetlands as part of the Natural Heritage System is an approach being taken by other municipalities (as identified through the jurisdictional scan discussed in Section 6).

5.6. Offsetting

Offsetting, including conservation offsetting, ecological offsetting, and biodiversity offsetting are all terms used to describe the action taken to counteract the negative impacts of land use change on the Natural Heritage System through the creation, restoration, or enhancement of natural features and their functions. This approach involves a trade-off of accepting harm on one system component that is then counterbalanced by beneficial actions so that in the end there is not a loss to the features and ecological functions of the system – or ideally there is an overall gain to the features and ecological functions of the system.

Offsetting differs from other forms of replacement or compensation in that it is predetermined and approved through a site-specific study. While replacement of or compensation for individual trees is commonly required as part of municipal tree by laws (whether through a permitting process or a result of an infraction), the requirement to offset impacts to a feature or ecological function as an approach to achieve no net loss or a net gain has until recently not been an accepted approach in Ontario municipal planning.

Due to the recent changes to the provincial direction on wetland evaluation and protection, wetland offsetting is increasingly being discussed amongst municipalities as it has left wetlands more vulnerable to impacts from land use and development. Changes to the wetland criteria in the OWES, as described above, has made it more difficult for a wetland to receive and maintain PSW status. Also, recent amendments to the Conservation Authority Act have restricted conservation authorities' ability to review wetlands from ecological perspective. As a result of these new gaps in Ontario's land use planning framework and increase pressure on municipalities advancing housing, municipalities are struggling to determine how to continue to protect wetlands and where wetlands are no longer considered provincially significant, how can they mitigate for impacts and potential losses of wetland area. Municipalities are now contemplating offsetting as a tool to mitigate wetland loss as part of a 'no net loss' or 'net gain' approach to meeting their natural heritage system objectives.

In addition to offsetting for wetlands, a few municipalities are considering ecological offsetting for other features (e.g., woodlands).

While the intention of formalizing offsetting policy is to ensure that there are still mechanisms in place to address the loss of natural features, there are concerns that existing protections may be undermined

because of poorly written policies or regulations, incorrect interpretation, and / or lack of enforcement of the policies or regulations. These cases could lead to further reduction in area or loss of functions that could not be replicated (within a reasonable ecological timeframe due to time lag between development of the feature and development of the function). Additionally, limited monitoring durations and the absence of financial safeguards by the municipality may lead to failed offsetting efforts, with no way to address the failure due to limited municipal resources.

5.6.1. Planning Considerations

Through the planning and development process, non-provincially significant natural features that are not protected by the PPS or any other Provincial or federal regulation may be permitted to be impacted by the planning approval authority, under some conditions, including the PPS test of 'no negative impact'.

It is recognized that the PPS test of 'no negative impact' can be met through mitigation. Further, Section 13.2 of the NHRM identifies an example where the replacement of a woodland component and its associated function can be considered a form of mitigation. However, this approach is generally not applied to mature or complex features due to the difficulty in replacing the features (e.g., trees, associated plant species, soil ecosystem, moisture regime, etc.) and their ecological functions (e.g., wildlife habitat, nutrient and water cycling) within a reasonable timeframe (considering the lag time for more complex ecosystems to develop) or with a high level of certainly of success.

Offsetting differs from other forms of replacement or compensation; while replacement for individual trees is commonplace (for example some municipalities require, through tree by-laws, the compensation for tree removal). Should a municipality consider an offsetting policy as a requirement or opportunity to offset impacts to non-provincially significant features and/or significant features where development is permitted subject to the no negative impact test in the PPS, the policy should aim to achieve 'no net loss' or a 'net gain' in natural feature area. Offsetting should only be permitted after applying the mitigation hierarchy approach, demonstrating efforts to find alternatives to the development have been exhausted and the no negative impact test has been met, and only be applied under limited circumstances where the feature's form and function can be replaced within a reasonable timeframe (e.g., 5 years for wetlands). An offsetting policy must be robust and directive, and there should be clear guidance for implementation and monitoring, with an established governance process by the municipality. Municipalities should consider the request for securities to ensure a project is executed in accordance with the approved offsetting plan.

5.7. Headwater Drainage Features

Headwater Drainage Features (HDF's) are a surface water feature type. These are ill-defined, non-permanently flowing drainage features that may not have defined bed or banks; they are zero-order intermittent and ephemeral channels, swales, and rivulets, but do not include rills or furrows.

HDF's are important for watershed health, playing vital roles in water quality, storage, and habitat provision, ultimately supporting downstream aquatic ecosystems through maintenance of downstream functions of watercourses and provision of food, sediment and nutrients. Their small size and the fact

that they do not always flow year-round makes HDF's vulnerable to impacts such as piping, channelization, flow diversion, grade lowering, and realignment.

5.7.1. Planning Considerations

HDF's evaluated as worthy of "Protection" or "Conservation" (generally according to criteria developed by a Conservation Authority) may be considered for identified as part of the Natural Heritage System. or, together with other types, addressed through the site-specific studies in terms of water quantity and quality (e.g., through watershed or sub-watershed studies, or through the identification of a Water Resource System).

5.8. Linkages / Corridors

In the context of Natural Heritage System planning, linkage means an area intended to provide connectivity supporting a range of community and ecosystem processes enabling plants and animals to move between natural heritage features over multiple generations. Linkages are preferably associated with the presence of existing natural areas and functions, and they are to be established where they will provide an important contribution to the long-term sustainability of the overall Natural Heritage System.

Ensuring the connectivity (i.e., linkages) between features is maintained or enhanced is an important component of ensuring the resiliency of these ecosystems and their cumulative biodiversity. Linkages / Corridors facilitate the movement of animals and plants through the landscape. It has been estimated that climate change is causing northward movement of animals in Quebec at 45 km per decade (NCC 2021), and future corridors must accommodate a higher diversity of species, and provide them with habitats that foster movement better, in the face of an increasingly hostile matrix.

Further, local extirpations of wildlife populations may occur within forests due to failed reproductive efforts linked to (often random) events such as predation, parasitism, adverse weather conditions, natural catastrophes (e.g., fire and floods) and insufficient food. Where forest (and other) habitats are well-connected, patches naturally become recolonized by individuals from adjacent areas. However, as the amount of overall natural area declines and opportunities for movement of populations of wildlife decrease, recolonization may lead to local extirpations.

Linkages / Corridors are important as a means to connect natural features in an area to help support long-term ecological function and biodiversity of natural heritage systems. Potential linkage areas may or may not be associated with the presence of existing natural features and areas. They help provide and maintain ecological connectivity between natural heritage features and support a range of community and ecosystem processes. This enables plants and animals to move among natural heritage features, in some cases over multiple generations, thereby supporting the long-term sustainability of the overall Natural Heritage System. Linkages can be identified at multiple scales to support both landscape-level movement and localized interactions. Providing linkage functions at multiple scales is critical to ecological function of the Natural Heritage System and its connection to lands beyond the City.

Section 4.1.2 of the PPS sets the context for which linkages play a role in natural environment identification and protection, as follows:

> "The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features in areas, surface water features and ground water features."

The PPS then goes further to require the maintenance of these linkages to protect, improve or restore the quality and quantity of water (Section 4.1.2).

The NHRM describes that "linkages…should be designed to accommodate the natural movement patterns of plants and animals because movement is necessary for biodiversity conservation and the long-term viability of ecological systems" (Section 3.4.2.2). In order to be ecologically functional, a linkage should be of sufficient width, especially in proportion to length, and composed of appropriate habitat to allow the movement of wildlife and dispersal of flora.

The NHRM reviews considerations for identifying ecologically functional linkages:

- The ecological function that a linkage is intended to perform.
- The length and width (generally, a wider linkage is better than a narrow one and width should increase relative to length), composition, orientation and configuration depending on the needs of the target species.
- Generally, linkages are identified and designed to meet the known movement requirements of the more demanding species (e.g., species prone to predation or averse to openings, or species that move very slowly).
- Where natural cover is not continuous through a linkage, smaller patches of natural cover that are closely spaced can serve as stepping stones for species movement and provide the linkage function.
- Avoid, where possible, identifying a linkage where a physical barrier may adversely impact the ecological function of the linkage (e.g. major roads or urban areas).
- Redundancy in linkages would ensure the system retains its overall connectivity and ecological integrity for the long-term.

Environment Canada (2013) provides guidance with regards to fragmented landscapes and the role of corridors in relation to forest habitat, recognizing that 'connectivity width will vary depending on the objectives of the project and the attributes of the forest nodes that will be connected'. The document recommends a minimum of 50 metres to 100 metres and that the corridors need to be designed to accommodate breeding habitat for specialist species to meet the habitat requirements of those target species and account for the effects of other land uses.

The criteria used to identify linkages may vary depending on the scale being considered. Regional-scale linkages form the major movement corridors within a landscape and are typically identified by Provincial

or Regional municipal level. Local-landscape scale linkages are important connections between habitat areas (i.e., they may connect multiple natural heritage features). Meanwhile, site-scale linkages are small connections between isolated features; these are important for movement of species with small habitat ranges or those who require multiple habitat types to complete their lifecycles within a small geographic area (e.g., amphibians).

5.8.1. Planning Considerations

As demonstrated above, linkages are a critical component of a Natural Heritage System that maintain connectivity between natural features and areas, particularly when there is a change in land use from a permeable landscape (e.g., agricultural land use) to an impermeable landscape (e.g., residential, commercial, industrial land use). Linkages are also potential areas where municipalities can direct their enhancement and restoration efforts to create a more resilient and robust natural heritage system to mitigate impacts from climate change, invasive species, and biodiversity loss as discussed in previous sections. Linkages that are identified on lands that are currently in agricultural production may also provide connectivity between natural areas and naturalization of these linkages may be appropriate through a change of land use or are no longer in active production.

When municipalities are developing their OP policies and mapping, linkages may be identified in policy as well as mapped as part of the Natural Heritage System. The approach must be defensible when identifying linkages and corridors and clearly defined as areas intended to connect natural heritage features to facilitate movement and enhanced habitat opportunities within the municipality and surrounding region, which is consistent with the direction from the PPS and the NHRM.

5.8.2. Road Ecology

Fish, mammals, birds, reptiles and amphibians are all vulnerable to the impacts of roads, which includes effects to species abundance and diversity. These impacts have been particularly detrimental to reptiles and amphibians due to their biology and behaviour (e.g. thermoregulation on warm asphalt, nesting on gravel roads and shoulders, slow moving, low fecundity and late age of maturity) (CVC 2017).

The impacts of roads can be direct or indirect. Direct impacts include habitat loss, road mortality and injury. Indirect impacts include habitat fragmentation, wildlife population decline, habitat degradation, barriers to fish passage and road avoidance behaviour by wildlife (CVC 2017). Poorly designed crossings impact fish by limiting access spawning, feeding, nursery or refuge areas. It is important to consider that the roads do not impact all species similarly and it may take several generations for impacts to be realized. Both long- and short-term effects of transportation design on wildlife must be considered to minimize future impacts (CVC 2017).

Ecological linkages / corridors are stepping stones of natural land that enhance the ability of plants and wildlife to move between larger habitat patches (Gregory et al. 2021). It is important to identify key linkages / corridors for wildlife movement to ensure that roads and highways do not create barriers to

wildlife movement, causing habitat fragmentation. Identifying linkage / corridors provide opportunities for targeting locations where road design (e.g. road reconstruction) could contemplate wildlife crossings.

When properly designed, culverts and bridges can function as crossing structures to safely and effectively allow fish and wildlife to cross beneath a road. This reduces the number of wildlife-vehicle interactions and enables fish and wildlife to access habitat that may otherwise be inaccessible. Crossing structures tied in with fencing to funnel wildlife to the structure are even more effective since they prevent wildlife from crossing a road overland. Studies indicate that fencing that extends beyond the natural area can further reduce wildlife-vehicle collisions (CVC 2017).

5.8.3. Planning Considerations

Reconstruction of existing roads or construction of new roads should consider the ecological linkages / corridors when creating wildlife exclusion fencing and installing fish and wildlife crossing opportunities. The inclusion of linkages in the Natural Heritage System mapping will assist municipal road operations in identifying priority corridors for wildlife movements early in the project planning. In addition to installing fish and wildlife crossing systems, municipalities can incorporate Best Management Practices into the design of a road, through the construction, operation and maintenance stages.

5.9. Enhancement Areas

Enhancement areas are ecologically supporting areas adjacent to natural heritage features and / or measures internal to the natural heritage features that increase the ecological resilience and function of an individual natural heritage feature or groups of natural heritage features. As such, enhancement areas are identified as a component of a Natural Heritage System, with the purpose of improving size, form, and/or function of a Natural Heritage System through adding new or modifying existing features and areas. Identified enhancement areas are then used to encourage stewardship, guide land use planning (e.g., form part of mitigating impacts to natural features and areas when there are proposed changes in land use) and inform land acquisition for conservation purposes.

Environment Canada`s publication How Much Habitat is Enough? (2013) provides a strategic framework and guidelines for protecting and enhancing wetland, riparian, forest and grassland habitats. Guidelines identified in Environment Canada's (2013) report related to enhancement considerations include the following:

- For effective restoration (or enhancement), consider local site conditions, use local sources to propagate new vegetation, and wherever possible refer to historic locations or conditions for wetlands (however this could apply to other habitat types as well).
- Restore and create native grassland patches to their historic extent and type at a county, municipal and /or watershed level, taking into consideration past, present and current conditions.

Enhancement areas contribute to the Natural Heritage System by protecting and restoring critical ecological functions such as ecological connectivity among natural area patches, surface water catchment areas for wetlands, reduce edge effect and enlarge interior habitat. Enhancement areas

identified in a Natural Heritage System will often focus on ‘infill’ opportunities such as ‘holes’, ‘inlets’ or ‘bays’ within a feature, connecting clustered features in close proximity to create complex habitat patches and linkage enhancements such as widened riparian areas. They may also include lands that may be without obvious natural heritage features such as agricultural land and successional habitat (e.g. meadows, thickets, etc.).

Considerations are made for enhancement areas to improve the quality and function of the environmental features such as restoring degraded areas, managing invasive species, installing wildlife habitat features and restoring buffers to features.

5.9.1. Planning Considerations

The benefit of identifying enhancement areas in policy and mapping of the Natural Heritage System is that there is a predetermined location for enhancement that can be evaluated and implemented at the time of land use change as part of a development application. Both OP policies and mapping must be defensible, grounded in science and be directive in describing how the enhancement areas were defined and what the objectives are in achieving enhancement or restoration for these areas. In land use planning, enhancement areas help to mitigate impacts from changes in adjacent land and can be considered as part of demonstrating no negative impact.

Enhancement areas can also assist a municipality in achieving municipal targets for woodland/wetland cover and biodiversity by identifying potential areas for stewardship and restoration.

Identifying enhancement areas is particularly important as part of a municipal-led “greenlands stewardship” program (for example), where stewardship opportunities or offsetting measures are directed, and offsetting can be implemented as part of a requirement for replacement of natural features subject to an offsetting policy.

It is important to note in all cases that mapping of enhancement areas outside of natural heritage features and areas is not intended to impose restrictions on current land uses of that area. (e.g., current farming practices or residential uses). Enhancement areas are intended to identify the best opportunities to improve the natural heritage system and are used to encourage stewardship, guide land use planning (e.g., in the case of rural to urban transitions), inform land acquisition for conservation purposes, etc.

5.10. Buffers to Natural Features and Areas

In the context of Natural Heritage System planning, buffer means an area of land located adjacent to a natural heritage feature and usually bordering lands that are subject to development or site alteration. The purpose of a buffer is to protect the feature and ecological functions of the Natural Heritage System by mitigating impacts of a proposed development, change in adjacent land use, or site alteration. Where new development is proposed, the extent of the buffer and activities that may be permitted within it should be based on the sensitivity and significance of the natural heritage feature and their contribution to the long term ecological functions of the overall Natural Heritage System as determined through

aecologically and/or hydrologically-based study (e.g., Subwatershed Study, Environmental Impact Study, or other similar study) that examines a sufficiently large area.

The NHRM provides a review of buffers and their role in mitigating impacts of land use changes on adjacent lands to natural features. They are generally defined as “the physical separation of development from natural feature boundaries using vegetated protection areas or vegetation protection zones” (Section 13.5.4.2). Buffers should be wide enough to sufficiently mitigate impacts of site alteration / development to avoid a negative impact (i.e., a threat to the health and integrity of the natural feature and its ecological functions). The NHRM provides a review of the following considerations to inform the width of a buffer:

- Reduction of encroachment – vegetated buffers reduce the potential and extent of encroachment from adjacent land uses (e.g., residential yards)
- Reduction of light and noise – the physical separation between the adjacent land use and the natural feature, and planting of vegetation within the buffer reduce the impact of light and noise on the natural feature.
- Space for tree-fall – Edge trees of a woodland are important wildlife habitat and provide an important contribution to the ecological function to the feature. The buffer should be wide enough to permit edge trees (considering the height of a full-grown tree (e.g., 30 m for a Sugar Maple)), to persist, regardless of health and form, to fall without the need for hazard tree management.
- Protection of root zones – root can extend two times the distance of the width of the canopy of the tree. The buffer should be wide enough to protect the root zone of trees.
- Enhancement of woodland interior – while the primary function of the buffer is to mitigate impacts to the feature, the buffer may provide an indirect enhancement to the size of woodland interior habitat.
- Allowance for hunting habits of cats and dogs – domestic pets can have a significant impact on wildlife, specifically the predatory nature of cats. Since domestic pets tend to stay closer to the edge of the feature, buffers will help to reduce the distance into the feature which domestic pets will prey on wildlife
- Location for trails – trails can be in buffers, assuming the width of the buffer is expanded to maintain the function of the buffer and accommodate the trail
- Attenuation of runoff – buffers slow runoff and provide a filtering function, both in the form of permitting infiltration of runoff and filtering out sediment that moves through the vegetation in the buffer. Wetlands are particularly vulnerable to impacts on water quality, as such, literature and best practices often recommend a buffer of 30 metres to wetlands to mitigate impacts to water quality.

Buffers are typically vegetated, whether through planting or natural regeneration; as such, they become ‘natural’ and provide habitat for wildlife. The vegetation within buffers enhances the function of the buffer to mitigate impacts to the feature. While naturally vegetated buffers will provide habitat for wildlife and potentially enhance the functions of the feature, they should not (according to their intended purpose) be

identified or managed as part of the feature; rather, they should be treated and managed for the function they were intended to fulfil, which is to mitigate impacts resulting from changes in adjacent land use.

5.10.1. Planning Considerations

The PPS requires demonstration of no negative impact within lands adjacent to most natural heritage features. Buffers provide the primary mitigation tool to separate natural features from direct and indirect impacts of development. Prescribed buffers may be developed as a strategy for protection of features within a Natural Heritage System.

Municipal approaches to prescribing buffers in policy varies; where OPs prescribed a buffer width, there is typically a requirement that the adequacy of the buffer be assessed to demonstrate that it is sufficient to avoid a negative impact. Municipal OPs also vary in their approach to mapping buffers as part of the Natural Heritage System. Where they are mapped, they are often 30 metres in width, which follows the precautionary approach. As defined in the NHRM, the precautionary approach is “an approach that is designed to prevent environmental degradation where there are threats of serious or irreversible damage or lack of full scientific certainty” (Appendix D). The refinement (i.e., reduction or increase) of the buffer width would be undertaken as part of a site-specific study (e.g., Environmental Impact Study) that evaluates the sensitivity of the feature and its ecological functions and assesses impacts from the adjacent land use to ensure the refined buffer width is sufficient to avoid a negative impact and meet the goals and objectives of the natural heritage policies.

5.11. Urban Development Pressures

The province has set a goal of building 1.5 million homes by 2031. To achieve this goal, the province assigned housing targets to the 50 largest, fast-growing municipalities, which includes the City of Kingston. Through municipal OP reviews, municipalities are preparing long-term growth analysis and urban land needs assessments to determine how they can meet their projected growth targets by 2051 as well as to reach the Provincial housing targets. To achieve these forecasts, municipalities are analysing opportunities for infill development within the existing settlement boundaries and the potential for settlement area boundary expansions.

As part of the City’s OP project, a study was undertaken by Waterson & Associated Economists Ltd., ‘Population, Housing and Employment Growth Analysis Study Final Report’ (dated September 3, 2024). The study identified that the Kingston Census Metropolitan Area (CMA), which includes the City of Kingston, Loyalist Township, the Township of South Frontenac and the Township of Frontenac Islands, permanent population is expected to reach 253,800 by 2051, representing an increase of approximately 76,000 from 2021 to 2051. According to the study, the majority of this population growth is anticipated to be in the City of Kingston. For the City, this population growth will need to be accommodated through infill development and an expansion to the settlement area boundary.

Urban development exerts significant pressure on natural features and areas, often leading to habitat loss, fragmentation, and environmental degradation. As cities grow, woodlands, wetlands, and other ecologically sensitive lands can be impacted by infrastructure, housing, industrial and commercial land

uses. Increased impervious surfaces, such as roads and buildings, contribute to stormwater runoff, affecting water quality in nearby rivers and lakes. Pollution, noise, and light from urban areas also have the potential to further impact the natural environment, diminishing biodiversity and ecological functions. A recent report by the Ontario Auditor General's 'The State of the Environment in Ontario' (May 2023) highlights the importance of conservation efforts and policies aimed at protecting ecologically sensitive areas and the challenges in maintaining ecological integrity amid increasing development pressures.

With the identification of a Natural Heritage System as per the PPS and implementing policies for the protection of its various components, the role of the Natural Heritage System is to aid in the mitigation of impacts and stresses on the natural environment associated with land use change and urbanization. The identification of a Natural Heritage System and the implementation of protective policies can help counteract these stresses by ensuring sustainable land use planning, preserving vital natural areas and maintaining ecological connectivity. By identifying natural features and areas through system-based planning, municipalities can balance growth with conservation and promote long-term environmental resiliency and sustainability. As part of a balanced approach to municipal planning including achieving growth targets, natural heritage planning will require adequate identification and protection of natural features and linkages as part of achieving the goals and objectives for the natural environment.

5.11.1. Settlement Area Expansions

The City undertook additional long-term growth analysis and urban land needs assessments that were completed by Watson & Associates Economists Ltd (Community Area Land Needs Assessment and Intensification Analysis, the Employment Area Lands Review, and the Commercial Land Review & Strategic Directions) that have determined that the City does not have enough land within the current urban boundary to accommodate the City's growth forecast to the year 2051. To accommodate new housing, businesses, industry, institutional uses, commercial uses, parks, and supportive uses, and associated infrastructure to support the population and employment growth, the City will need to expand its urban boundary by approximately 745 hectares.

Settlement area boundary expansions are crucial decisions that must strike a balance between growth, environmental preservation, community well-being, and long-term sustainability. As municipalities review and develop their Natural Heritage Systems, they are having to consider the potential impacts of a settlement area expansion on the natural heritage features and areas and their ecological functions. Thoughtful planning and identification of mitigation strategies as part of the community planning can help minimize impacts to natural heritage features and areas while promoting a sustainable balance between urban growth and environmental protection. The identification of a robust Natural Heritage System that adequately protects natural features and their ecological functions and provides ecologically functional linkages is essential when planning for whole communities.

5.11.2. Planning Considerations

The PPS Water (Section 4.2) contains policies that requires those municipalities identified as the 'larger and fast-growing municipalities' (and encourages other municipalities) to undertake watershed planning

water and waste services and stormwater management to ensure the protection, improvement or restoration of the quality and quantity of water. While not explicitly stated as a requirement of watershed planning in the PPS, as part of these watershed plans or through a concurrent review, municipalities are also examining their Natural Heritage System mapping to identifying high constraint areas of natural heritage features and areas to determine areas of avoidance to assist in planning communities within the settlement boundary expansions lands. Natural heritage system planning at the watershed and subwatershed levels enables a system-based approach that guides the next stage of development while maintaining ecological integrity, connectivity, and the sustainability of natural features and areas across the landscape. Municipalities have also started to include in their OP's policies for settlement area boundary expansion the requirement for the protection and mitigation of negative impact on the natural heritage system and requiring demonstration of conformity with those policies through a Watershed Plan or equivalent study (e.g. County of Brant OP, 2024).

A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020), (which since has been revoked by the Province) contained settlement area boundary expansion policies that spoke to avoidance of key hydrology areas and the Natural Heritage System for the Growth Plan, where possible and the assessment of the potential impacts to the Natural Heritage System as part of considerations for land expansions. While not directly relevant to the City, the Growth Plan policies illustrate how the natural heritage system can be considered through the settlement area expansion. Nevertheless, the PPS natural heritage policies described in Section 2.1.2 of this report must be considered as part of municipalities review of potential settlement boundary expansions.

6. Jurisdictional Scan

A review of comparator municipal approaches to mapping was conducted to inform considerations for criteria for natural features and areas, and to inform the mapping of components of the Natural Heritage System based on the OP definitions and mapping schedules of three municipalities: the City of Guelph, Niagara Region, and the County of Brant. This desktop analysis utilized publicly available OP documents. Background technical reports were not publicly available. The City of Guelph's Natural Heritage System, approved in 2022, served as a reference due to its similar geographical scale, populations and environmental conditions in its urban area to the City. Niagara Region's Natural Heritage System, also approved in 2022, provided additional context for provincial policy implementation with a recently created Natural Environment System and provides examples to approaches for woodlands identification and mapping within in urban and rural areas that are facing similar development pressures to the City. The County of Brant's Natural Heritage System, approved in October 2024, was offered as the most recent approach to natural heritage system planning. The jurisdiction scan, as it relates to recommended Natural Heritage System components, is summarized in Table 20, in Appendix A (due to accessibility, this table will be made available upon request).

It is recognized that the County of Lennox and Addington is currently working on a Natural Heritage Study as part of the County's OP review. The County's Natural Heritage Study was not included as a comparator municipality as, at the time of preparing this Technical Report, the County's Natural Heritage

Study and associated policies have not yet been finalized. Being an adjacent municipality to the City of Kingston, considerations are being made for mapping natural heritage features within 1 kilometre of the municipal boundary to ensure continuity of linkages.

7. Community Workshops Feedback Summary

The City of Kingston hosted in February 2025, a series of community workshops that provided information about the Natural Heritage Study project including the objectives, scope of work, methodology and project timelines. Members of the development industry, environmental and agricultural communities and Indigenous Peoples were invited to participate in these workshops. Participants were asked to provide feedback on the current Natural Heritage System policies and mapping in the City's OP and explore how the City can best plan for the future of its natural areas. The feedback received from the community workshops can be found in Appendix C.

We have summarized the feedback into key points related to the mapping of natural heritage features, areas, and the overall natural heritage system. These key points were considered in developing the criteria for mapping discussed in this report. Additional comments will be considered as the project moves forward with the development of the Natural Heritage Study which includes recommendations for policy development (see Section 11 for Overview of Next Steps).

The feedback related to mapping can be summarized as follows:

- Criteria for mapping must be clear and straightforward.
- Mapping should be as accurate as possible and be based on the criteria as defined.
- Greater consideration of the 'system' approach to conservation.
- Watercourses, creeks and valleys throughout the municipality are important.
- Wetlands often contain many culturally significant species and resources. Unevaluated wetlands should be evaluated and then formally protected.
- Alvars often contain sensitive species and should be identified and protected.
- Stronger tree protection is necessary in the urban area.
- Shorelines and riparian areas are important for wildlife movement.
- Turtles should be specifically addressed within the Natural Heritage System, distinct from other significant species, similar to the way Fish Habitat is uniquely recognized.
- Planning should prioritize identifying natural heritage areas first, then design around them, ensuring connections are maintained through corridors.
- Corridors are important, but there needs to be specific criteria used to identify where they are required, which will help create a more defensible methodology and provide greater support.

8. Proposed Components of the City of Kingston's Natural Heritage System

As described, the identification of Natural Heritage System components and mapping criteria is based on Provincial requirements, relevant policy and guidance documents, considerations of current issues, trends and best practices, the vision, goal, objectives and targets for natural heritage as identified in the

City's Strategic Plan (2023-2026) and the City's current OP, as well as feedback heard through the community engagement workshops.

The objectives of Natural Heritage planning as part of the preparation of the new OP are to identify a robust Natural Heritage System, containing natural heritage features and connecting linkages, that will protect and conserve the existing natural features and their ecological functions and improve and restore biodiversity, within the City while addressing future pressures and support resiliency to climate change.

This section describes in detail the recommended components of the City's Natural Heritage System and provides the proposed definitions, mapping criteria and mapping methodology for each natural heritage features and areas. The level of detail provided in this section on the key natural features and areas is intended to ensure a clear, transparent, and replicable method for producing the mapping of these natural features, which is a key objective of the Natural Heritage Study project.

Table 21 in Appendix B (due to accessibility, this table will be made available upon request) provides a more detailed summary on the definitions and mapping criteria for the natural features and areas, compares the definitions and mapping criteria from the CCRNHS (2006), which were used to identify the City's current Natural Heritage System, with those definitions and mapping criteria proposed in the update to the Natural Heritage System for the new OP. It is recommended that certain definitions and mapping criteria be revised, as identified in Table 21, in Appendix B, to align with the current definitions in the PPS, consider the guidance outlined in the NHRM, and other relevant provincial and federal guidelines, current best practices, emerging trends, and the latest available GIS data for improved accuracy.

The feedback that as summarized in Section 7 from the Community Engagement Workshops held in February 2025 also been reflected in the "What We Heard" subsection for each component discussed below.

8.1. Woodlands

Woodlands provide a broad range of ecological services including biodiversity support, habitat functions, carbon sequestration, oxygen production, nutrient cycling, and cooling effects that can help mitigate the impacts of climate change (through evaporation and shading). They also support important human activities including economic, agricultural and recreational opportunities. Previously, the CCRNHS (2006) was undertaken to identify woodland features in the City. Given almost 20 years has passed since this mapping was completed, significant changes in woodland cover have likely occurred on the landscape through forest succession as well as clearing in support of development projects. The City's Strategic Plan (2023-2026), recognizes the protection of provincially significant woodlands as defined by the PPS for their carbon-capturing benefits and as part of the City's green assets (2.1.3). The Strategic Plan also identifies a target of 30 percent urban and rural tree canopy by 2035 (2.3.3), to which woodland canopy cover contributes.

The PPS definition of woodland is as follows:

> Woodland means treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities, and the sustainable harvest of a wide range of woodland products. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial levels. Woodlands may be delineated according to the Forestry Act definition or the Province's Ecological Land Classification system definition for "forest".

Not all woodlands that meet the above definition are considered significant. A significant woodland is defined by the PPS as "an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history. These are to be identified using criteria and procedures established by the Province".

Woodlands within a Natural Heritage System may be comprised of both significant and non-significant (i.e., contributory) woodlands and also may included other treed areas which includes vegetation communities with 25 percent to 60 percent tree cover. As described in section 2.1.2 of this report, the PPS definition for natural heritage systems identifies that the system may include other natural heritage features. Non-significant woodlands and other treed area' would be considered other natural heritage features.

Significant and contributory woodlands will generally have different policies within an OP that determine permissible activities, development, etc. within these features. Different levels of protection will be considered whereby greater activity restrictions may apply to significant woodlands compared to contributory woodlands. Recommendations for policies will be made in the forthcoming Natural Heritage Study.

The City is also developing a Forest Management Strategy that involves assessing tree canopy coverage, including individual trees, across the municipality. This initiative is further detailed in Section 5.4.1.2. The Natural Heritage Study (which includes this Technical Report) is focused on identifying woodlands and significant woodlands in accordance with the PPS, with an emphasis on the ecological functions of these areas. It is important to differentiate these two projects and their objectives when reviewing woodlands. There will be differences in the mapping between the Forest Management Strategy and the Natural Heritage Study given the different project objectives.

What We Heard at the Community Engagement Workshops

- Protecting woodlands is a priority for community members, and stronger protections are needed in urban areas.
- Trees are deeply connected to Mother Earth, guiding us to approach development with care and respect.

- Forests, particularly those with native tree species, hold significant cultural value for Indigenous communities.
- The current woodland mapping in the City's OP requires a review for accuracy, and any updates to the criteria or methodology for mapping woodlands should be clearly defined and aligned with provincial guidance.

Recommended Approach

Recommended approach for woodland definitions and criteria are described under specific feature sub-headings below.

8.1.1. Woodlands

8.1.1.1. Definition

It is recommended that the current OP definition for 'woodlands' remain consistent with the PPS definition (found in Section 8.1), with additional considerations regarding plantations, orchards, woodland gaps, and hedgerows. Those considerations include:

- Includes plantations, except fruit orchards or Christmas tree plantations
- Woodlands bisected by an opening 20 m or less are considered contiguous.
- Hedgerows are excluded where they are comprised of a row of trees that is less than 40 metres in width.

8.1.1.2. Mapping Criteria

Consistent with the PPS (2024) (definition of forest from ELC) treed areas with greater than 60 percent tree cover are mapped as 'woodland'. This is a consistent approach used across Ontario.

Note for identification of Woodlands:

- Woodlands bisected by an opening 20 metres or less are considered contiguous in accordance with delineation criteria (NHRM Section 7.3.2).
- Hedgerows – trees that are attached to woodlands or that consist of an isolated row of trees that is less than 40 metres in width will be excluded from mapping.
- Includes plantations, except fruit orchards or Christmas tree plantations.

8.1.1.3. Mapping Methodology

A new woodlands dataset was created using LiDAR-derived products, sourced from the Ontario Geohub (Eastern Ontario 2021-22 LiDAR Package), and refined with Nearmap's orthoimagery (leaf-on imagery, August 29, 2024; leaf-off imagery, April 25, 2023). The following workflow was used to derive the layer.

Height Model Derivation from LiDAR. The basis for the Woodlands dataset was a height model created from MNRF's LiDAR-derived Ontario Digital Surface Model (DSM) and Digital Terrain Model (DTM; spatial resolution of 0.5 meters). This height model was segmented, filtered, and converted into a

vector-based canopy model based on a minimum mappable unit of 0.1 hectares and height threshold of 2 metres.

- **Raster Calculator (ArcGIS Pro)**
  - Input: DSM – DTM
  - Output: Height_Model
- **Reclassify (ArcGIS Pro)**
  - Input: Height_Model
  - Parameters: 0-2 m = NoDATA, >2 m = 1
  - Output: Height_Model_2m
  - Note: A 2-metre height threshold was applied to distinguish tree canopy from ground vegetation, aligning with common practice in remote sensing studies where tree canopy thresholds typically range from 2 to 4 metres. A 2-meter threshold effectively filters out noise in the LiDAR-derived height model and accurately maps the separation between ground cover and tree canopy
- **Resample (ArcGIS Pro)**
  - Input: Height_Model_2m
  - Parameters: Cell size (1,1), bilinear interpolation
  - Output: Height_Model_R
- **Expand (ArcGIS Pro)**
  - Input: Height_Model_R
  - Parameters: Cells: 2, Zone Value: 1
  - Output: Height_Model_2m_E
- **Shrink (ArcGIS Pro)**
  - Input: Height_Model_2m_E
  - Parameters: Cells: 2, Zone Value: 1
  - Output: Height_Model_2m_S
- **Majority Filter (ArcGIS Pro)**
  - Input: Height_Model_2m_S
  - Parameters: Neighborhood: 4, method: majority
  - Output: Height_Model_2m_F
- **Raster to Polygon (ArcGIS Pro)**
  - Input: Height_Model_2m_F
  - Output: Height_Model_Poly
- **Delete Holes (QGIS)**
  - Input: Height_Model_Poly
  - Parameters: Area: 250m^2
  - Output: Height_Model_Poly
- **Manual Segmentation (ArcGIS Pro)**
  - The Height_Model_Poly layer underwent a comprehensive manual segmentation process to refine woodland boundaries, remove non-woodland features from the

height model (e.g., buildings), and remove hedgerows (i.e., treed areas that consist of narrow row of trees that is less than 40 metres in width).
    - The minimum mappable unit was set to 0.1 hectares; all areas less than this threshold were removed.
- **Simplify (QGIS)**
    - Input: Height_Model_Poly
    - Parameters: Area: Visvalingam; Tolerance: 2 m
    - Output: Height_Model_Poly_S
- **Smooth (QGIS)**
    - Input: Height_Model_Poly_S
    - Parameters: Iteration: 1; Offset: 0.25
    - Output: **Woodlands**

Percent Cover Threshold. Each woodland polygon was reviewed to see if it met the ecological criteria for being a woodland, i.e., 60 percent woodland cover. Woodland cover was calculated as the total percent coverage of the raster height model (Height_Model_2m_F) for each polygon segment. Any woodland polygon that failed to meet this cover criteria was removed from the dataset.

Spatial Contiguity. All woodlands were spatially joined together based on their contiguity as defined in the NHRM where "woodland areas are considered to be generally continuous even if intersected by narrow gaps 20 metres or less in width between crown edges", i.e., woodlands were defined as multipart features if they were within 20 metres of another woodland. To create these multipart features, a temporary copy of the woodlands layer was created to identify woodland contiguity.

- **Buffer (ArcGIS Pro)**
    - Input: Woodlands_Copy
    - Parameters: Buffer Distance: 10m
    - Output: Woodlands_Copy_B
- **Dissolve (ArcGIS Pro)**
    - Input: Woodlands_Copy_B.
    - Output: Woodlands_Copy_D
- **Singlepart to Multipart (ArcGIS Pro)**
    - Input: Woodlands_Copy_D.
    - Output: Woodlands_Copy_S
- **Attribute Table Revisions (ArcGIS Pro)**
    - A Unique ID was assigned to each polygon in Woodlands_Copy_S
- **Spatial Join (ArcGIS Pro)**
    - The Woodlands_Copy_S was spatially joined back to the original Woodlands layer. The original Woodlands layer was assigned the unique ID from Woodlands_Copy_S. The unique ID identified all woodlands that were considered generally continuous.
- **Dissolve (ArcGIS Pro)**
    - Input: Woodlands
    - Parameters: Dissolve by Field: Unique ID

- Output: Woodlands.

8.1.1.4. Cover Statistics

As described in preceding sections, the City has identified a woodland cover target of 30 percent. Current woodland cover (>60 percent) has been identified at 27.1 percent of the land area within the municipality, based on the new woodlands (as defined in the PPS) dataset (refer to Table 1).

Woodland cover statistics (for communities with greater than 60 percent canopy cover), including a comparison of cover within urban and rural areas (see Section 8.1.2 A Note on woodland cover in Urban and Rural Areas), is provided in Tables 1-3, below. These statistics were used to determine criteria to identify significant woodlands, as discussed in Section 8.1.3.

Table 1. City of Kingston. Woodland Statistics.

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area (hectares)	Percentage (%) of Kingston Land Area[1]
>20	76	9,759	21.6
10 - 20	64	867	1.9
4 - 10	118	741	1.6
2 - 4	133	379	0.8
1 - 2	181	262	0.6
<1	536	251	0.6
Total:	**1,108**	**12,258**	**27.1**

1 Note that Kingston Land Area is a calculation of the total municipal area excluding major surface water bodies (Land Area: 45,173 hectares)

Table 2. Urban Areas. Woodland Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area[2] (hectares)	Percentage (%) of Kingston Urban Land Area[1]
>20	7	205	2.5
10 - 20	15	156	1.9
4 - 10	27	159	1.9
2 - 4	32	90	1.1
1 - 2	40	54	0.7
<1	115	55	0.7
Total:	**236**	**717**	**8.7**

1 Note that urban land area is a calculation of the total urban area excluding major surface water bodies (Urban Land Area: 8,217 hectares)

2 Note the total area is representative of the area within the urban area boundary, even if the woodland extends into the rural area

Table 3. Rural Areas. Woodlands Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area[2] (hectares)	Percentage (%) of Kingston Rural Land Area[1]
>20	74	9,552	25.8
10 - 20	53	711	1.9
4 - 10	96	582	1.6
2 - 4	103	286	0.8
1 - 2	144	208	0.6
<1	425	196	0.5
Total:	**895**	**11,535**	**31.2**

1 Note that rural land area is a calculation of the total rural area excluding major surface water bodies (Rural Land Area: 36,956 hectares)

2 Note the total area is representative of the area within the rural area boundary, even if the woodland extends into the urban area

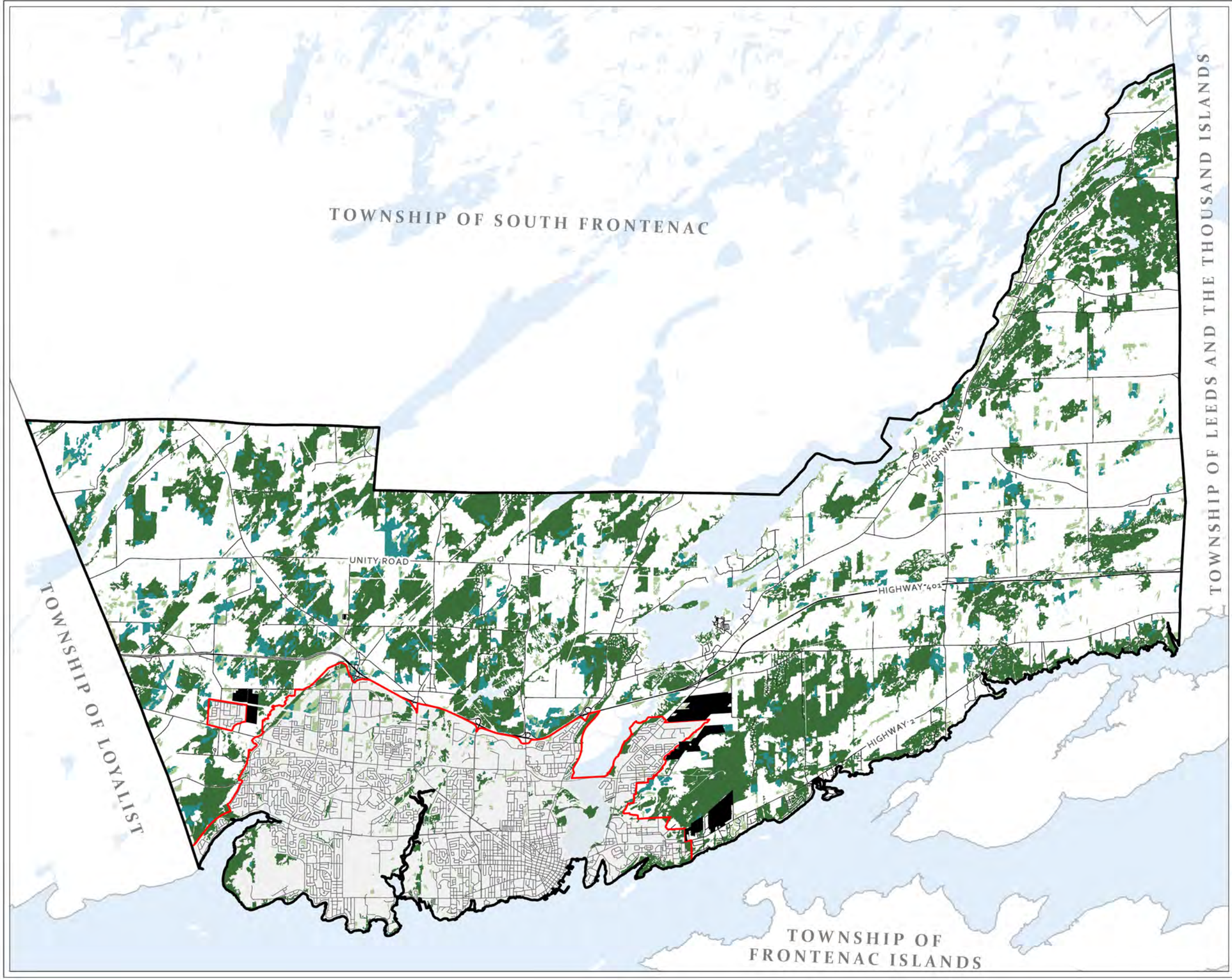

Figure 2 | City of Kingston
Boundary of Urban and Rural Lands

Legend

- City of Kingston
- Subject to an Urban Boundary Expansion Application. To Be Determined
- Urban Area Boundary

Woodlands

- Significant Woodland
- Contributory Woodland

Other Treed Areas

- Other Treed Areas

0 2 4 6 8 Kilometers

Project Number	Date:	N
24-1473	2025-05-28	

north-south ENVIRONMENTAL

8.1.2. A Note on Woodland Cover in Urban vs. Rural Areas

Pressures on and potential impacts to woodlands vary based on the surrounding land use(s). In a municipal planning context, these considerations could influence size-based criteria but could also influence ecological function criteria for the identification of what is 'significant' in different landscape contexts. The PPS recognizes this in policy 4.1.3 noting that "natural heritage systems shall be identified in Ecoregion 6E and 7E, recognizing that natural heritage systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas". The NHRM notes that "due to the proximity of people and traffic in settlement areas, natural features and areas, and linkages between and among them, may be subject to more stressors that their counterparts in rural areas. This makes it important to include lands within a natural heritage system that will help to maintain its long-term ecological function and biodiversity" (Section 3.4.6.2).

For example, a woodland in a rural or agricultural land use context may experience one or many of the following uses / pressures:

- Often discontinuous features, but generally permeable surrounding landscape matrix
- Harvesting (selective, high or low intensity)
- Edge impacts and / or removals for expansion of agricultural practices and development
- Trail building and use (low to moderate use frequency)
- Introduction of invasive species

For woodlands in a settlement area or urban context, there may be increases in some of the above, or new pressures / uses:

- Discontinuous to isolated features and generally low permeability or impermeable surrounding landscape matrix
- Complete or partial removal or fragmentation to facilitate development and/or infrastructure
- Trail building and use (moderate to high use frequency)
- Dumping / fill / trash (broad range of materials – yard waste through to furniture, hazardous waste, etc.)
- Increased populations of domestic animals (predation of wildlife, disease transfer, potential reduction of habitat availability due to disturbance)
- Light impacts
- Noise impacts

Where woodlands in rural and agricultural landscapes display impacts associated with human activity, those located in near-urban and urban settings see substantially greater pressures on their form and function. As such, some municipalities (e.g. City of Hamilton) have developed criteria specific to their urban and rural areas to reflect the land use needs (e.g. agriculture) and pressures (e.g. trails) in identifying significant woodlands. In addition, the size-based criteria are informed by woodland cover in urban areas, which due to past development activities is lower than in rural areas. Recognizing both the

value of natural areas near communities/neighbourhoods (e.g., ecosystem services) as well as the greater extent of impacts to woodlands in urban areas, a smaller size threshold for woodlands in urban areas is recommended, which is reflected in the criteria for both Significant Woodlands and Contributory Woodlands. This approach is also consistent with the NHRM (2010) which recommends different size thresholds "related to scarcity of woodland in the landscape … with consideration of differences in woodland coverage among sub-units" (Table 7-2).

8.1.3. Significant Woodlands

8.1.3.1. Definition

It is recommended that the current OP definition be revised to remove reference to the CCRNHS, retaining only the reference to MNRF criteria (i.e., the NHRM), as the recommended mapping criteria revisions align with this approach.

Current OP definition: Significant Woodlands as identified by CCRNHS (2006) or using OMNRF criteria "which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past forest management history.

8.1.3.2. Significance Criteria

Existing woodland cover calculations for the City (based on a new dataset completed as part of this study, see methodology in Section 8.1.1) identified notable differences in woodland cover between rural and urban areas, at approximately 31.2 percent and 8.7 percent, respectively (see Tables 2 and 3 above).

Accordingly, based on Table 7-2 Recommended Significant Woodland Evaluation Criteria and Standards in the NHRM, different criteria size thresholds for significance apply in rural and urban areas. The NHRM recommends that in areas of 5-15 percent cover, a significance threshold of 4 hectares be applied, and in areas of 15-30 percent cover, a significant threshold of 20 hectares be applied. Table 7-2 also provides guidance, with consideration of minimum area thresholds for woodland interior habitat, proximity to other woodlands or other habitats, linkages, water protection, woodland diversity, unique species composition and economic and social function values.

The following criteria have been recommended for Significant Woodlands based on the guidance from the NHRM and informed by the current woodland cover statistics provided in Tables 2 and 3, above. NHRM criteria were applied where data availability allowed (i.e., not all criteria could be applied due to data limitations) and in accordance with the guidance offered within Table 7-2 of the NHRM, size thresholds have been reduced to reflect the absence of information for all criteria. Specifically, data availability enables the Natural Heritage System to consider size, interior habitat, proximity to other woodlands and other habitats, linkages and water protection within the mapping. Data is not available for woodland diversity, unique species composition, or economic and social function values.

Although woodland cover in rural areas was identified as 31.2 percent (Table 3), it has been recommended that the 15-30 percent cover threshold be applied, i.e., a 20-hectare size threshold. The reduction in threshold is to account for a margin of error in mapping, as well as a precautionary principle as identified in the NHRM. Thresholds applied for ecological function criteria fall within ranges recommended by the NHRM, relative to the woodland cover (e.g., where the NHRM recommends a range of 0.5-20-hectare threshold for proximity to other habitats, a 10-hectare threshold was applied, similar to how, within a recommended 2–50-hectare threshold range for woodland size, 20 hectares was applied).

In the rural area, woodlands that meet the following criteria are significant:

a. Woodlands Size Criteria: ≥20 hectares in an area size; or
b. Woodland Interior: Woodlands with ≥2 hectares of interior habitat (measured 100 metres from a woodland edge); or
c. Proximity to Other Woodlands or Other Habitats: ≥10 hectares in size and meeting at least one of the following criteria:
    i. wholly or partially within 30 metres of a provincially significant wetland, Life Science ANSI, locally important wetland, Significant Wildlife Habitat, Significant Valleylands, watercourse, or fish habitat likely receiving ecological benefit from the woodland;
d. Uncommon Woodland Characteristics: ≥2 ha in size and containing 10 or more trees per hectare greater than 100 years old or 50 centimetres or more in diameter; or
e. Uncommon Woodland Characteristics:0.5 hectares or greater in size meeting at least one of the following criteria:
    i. a provincially rare treed vegetation community with an S1, S2 or S3 in its ranking by the MNRF's NHIC; or
    ii. habitat of a woodland plant species with an S1, S2 or S3 in its ranking or an 8, 9, or 10 in its Southern Ontario Coefficient of Conservatism by the NHIC, consisting of 10 or more individual stems or 100 or more square meters of leaf coverage.

Woodland cover in urban areas is identified as 8.7 percent cover therefore a significance threshold of 4 hectares is applied (in accordance with the threshold recommended by NHRM for areas of 5-15 percent cover). Thresholds applied for ecological function criteria fall within ranges recommended by the NHRM, relative to the woodland cover (see example above). In the urban area, the size threshold for criteria c. is based on the guidance from the NHRM (OMNR Page 69) regarding proximity to other features. Within urban areas, a smaller size threshold has considerably more ecological value and benefit due to the limited amount of woodlands.

In the urban area, woodlands that meet the following criteria are significant:

a. Woodlands Size Criteria: ≥4 ha in an area size; or
b. Woodland Interior: Woodlands with any interior habitat (measured 100 metres from a forest edge); or

c. Proximity to Other Woodlands or Other Habitats: ≥1 hectares in size and meeting at least one of the following criteria:
    i. wholly or partially within 30 metres of a provincially significant wetland, Life Science ANSI, locally important wetland, Significant Wildlife Habitat, Significant Valleylands, watercourse, or fish habitat likely receiving ecological benefit from the woodland; or
    ii. 10 or more trees per hectare greater than 100 years old or 50 centimetres or more in diameter;
d. Uncommon Woodland Characteristics: 0.5 hectares or greater in size meeting at least one of the following criteria:
    i. a provincially rare treed vegetation community with an S1, S2 or S3 in its ranking by the MNRF's NHIC;
    ii. habitat of a woodland plant species with an S1, S2 or S3 in its ranking or an 8, 9, or 10 in its Southern Ontario Coefficient of Conservatism by the NHIC, consisting of 10 or more individual stems or 100 or more square meters of leaf coverage.

The significant woodland criteria for urban areas should be applied to any rural lands incorporated into the urban area through settlement expansion (Section 5.10). It is recommended that, when evaluating natural heritage constraints as part of the settlement area expansion review, the criteria for significant woodlands in urban areas be applied. Applying the significant woodland criteria for urban areas to newly incorporated rural lands ensures consistency in application of the woodland criteria and protection across expanding settlement areas. Urban expansion intensifies development pressure, potentially compromising woodlands and their ecological roles, resulting in a reduction of woodland canopy cover and habitat quality. Further, as woodland canopy contributes to the City's Strategic Plan objective to target of 30 percent urban and rural tree canopy by 2035 (2.3.3) and also to achieve the City's 30 percent woodland cover target, maintaining a consistent approach to applying woodland criteria is essential for meeting these objectives.

8.1.3.3. Mapping Methodology

In the rural area, the following criteria were applied to identify significant woodlands:

a. Woodlands ≥20 hectares in size; or
b. Woodlands with ≥2 hectares of interior habitat (measured 100 metres from a woodland edge); or
c. Woodlands ≥10 hectares in size and meeting at least one of the following criteria:
    i. wholly or partially within 30 metres of a provincially significant wetland, Life Science ANSI, locally significant wetland, watercourse, or waterbody

In the urban area, the following criteria were applied to identify significant woodlands:

a. Woodlands ≥4 hectares in an area size; or
b. Woodlands with any interior habitat (measured 100 metres from a forest edge); or
c. Woodlands ≥1 hectares in size and meeting at least one of the following criteria:
    i. wholly or partially within 30 metres of a provincially significant wetland, Life Science ANSI, locally significant wetland, watercourse, or waterbody

All woodlands that fail to meet this significance criteria are reviewed against the Contributory Woodland criteria and may be mapped accordingly.

8.1.3.4. Cover Statistics

Table 4. City of Kingston. Significant Woodland Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area (hectares)	Percentage (%) of Kingston Land Area[1]
>20	76	9759	21.6
10 - 20	62	846	1.9
4 - 10	21	133	0.3
2 - 4	21	60	0.1
1 - 2	17	23	0.1
<1	N/A	N/A	N/A
Total:	**197**	**10,820**	**24.0**

1 Note that Kingston land area is a calculation of the total municipal area excluding major surface water bodies (Land Area: 45,173 hectares)

Table 5. Urban Areas. Significant Woodland Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area[2] (hectares)	Percentage (%) of Kingston Urban Land Area[1]
>20	7	205	2.5
10 - 20	13	135	1.6
4 - 10	21	123	1.5
2 - 4	21	59	0.7
1 - 2	17	22	0.3
<1	N/A	N/A	N/A
Total:	**79**	**543**	**6.6**

1 Note that urban land area is a calculation of the total urban area excluding major surface water bodies (Urban Land Area: 8,217 hectares)

2 Note the total area is representative of the area within the urban area boundary, even if the woodland extends into the rural area

Table 6. Rural Areas. Significant Woodland Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area[2] (hectares)	Percentage (%) of Kingston Rural Land Area[1]
>20	74	9554	25.9
10 - 20	53	711	1.9
4 - 10	3	11	0.0
2 - 4	2	0	0.0
1 - 2	3	1	0.0
<1	N/A	N/A	N/A
Total:	**135**	**10276**	**27.8**

1 Note that rural land area is a calculation of the total rural area excluding major surface water bodies (Rural Land Area: 36,956 hectares)

2 Note the total area is representative of the area within the rural area boundary, even if the woodland extends into the urban area

8.1.4. Contributory Woodlands and Other Treed Areas

The City's current OP includes 'contributory woodlands' as components of the Natural Heritage System. In the current OP, these are woodlands that do not meet the criteria of significance as defined in Section 8.1.3.2. While 'contributory woodlands' are not a required component of a Natural Heritage System as defined in the PPS, inclusion of 'contributory woodlands' as part of the Natural Heritage System is recommended to support the achievement of the City's woodland cover target. Moreover, feedback from the Community Engagement Workshops clearly indicated that protecting woodlands is a key priority for community members. While not discussed in this technical report, a policy framework for 'contributory woodlands and other treed areas' would generally provide more flexibility for land use planning and management than Significant Woodlands.

Further, treed areas with 25 percent to 60 percent tree cover are not considered "Forest" under the ELC definition and are therefore excluded from the PPS definition of woodland (these are considered "Savannah" and "Woodland" under ELC definitions). However, it is recognized that these treed areas have important ecological functions, contribute to the tree canopy cover of the City, and with time may increase in density and succeed into forests thereby supporting the City with meeting the woodland cover target of 30 percent. Protecting these features also contributes to ecosystem resilience in addressing issues like climate change, biodiversity loss, etc., as discussed in Section 5.

Through the jurisdictional scan of other recently approved municipal OP's (Table 20, Appendix A), Niagara Region identifies 'other woodlands' as part of the Natural Heritage System in order to achieve targets for woodland cover as identified by the Region. 'Other woodlands' means woodlands determined to be ecologically important in terms of features, functions, representation, or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system. 'Other woodlands' include all terrestrial treed vegetation communities where the percent tree cover is greater than 25 percent. Other woodlands would not include woodlands meeting the criteria as significant woodlands (Niagara Region OP, 2022).

The City of Guelph's OP (2022 consolidated version) notes in policy 4.1.1.4 that the Natural Heritage System consists of Significant Natural Areas (including Ecological Linkages), Natural Areas, and Wildlife Crossings. Natural Areas including 'cultural woodlands', which are defined as follows:

> "a woodland with tree cover between 35 percent and 60 percent originating from, or maintained by, anthropogenic, influences and culturally based disturbances (e.g., planting or agriculture, clearing, recreation, grazing or mowing); often having a large proportion of introduced (i.e., non-indigenous) species (as per the Ecological land Classification System for southern Ontario) and with shrubs, grasses, and/or herbaceous ground cover. These may be second or third growth woodlands that occur on land that has been significantly altered by human disturbance where the

original forest was completely or mostly removed at various points in time (e.g., from agriculture, grazing, gravel extraction) and may include a small proportion of planted trees but has undergone natural succession to the point where tree cover is between 35 percent and 60 percent, with grass and herbaceous ground covers, and possibly shrubs as well."

According to policy 4.1.4.3 in the City of Guelph's OP, cultural woodlands "are generally considered of less ecological value than those categorized Significant Woodlands, however the City of Guelph recognizes the environmental benefits and services they provide." Development is generally discouraged in cultural woodlands, but where development is approved, a 'vegetation compensation plan' is required for the replacement of all healthy, non-invasive trees measuring over 10 cm dbh (diameter at breast height) that are proposed to be removed as part of development or site alteration (policy 4.1.4.3.8).

Based on the discussion above, it is recommended that 'contributory woodlands and other treed areas' (as defined below) are included as a component in the City's Natural Heritage System.

8.1.4.1. Definition

Contributory Woodlands means woodlands (treed communities with greater than 60 percent cover), which do not meet the criteria for 'significance'. This definition is recommended to be carried forward into the new OP.

Other Treed Areas means treed communities with 25 percent to 60 percent tree cover (recognizing their potential for succession). This definition is recommended to be carried forward into the new OP.

In addition to the defined terms, Contributory Woodlands and Other Treed Areas must meet specific mapping criteria, defined below.

8.1.4.2. Mapping Criteria

The following criteria have been recommended for Contributory Woodlands and Other Treed Areas based on the evaluation of the City's current percentage of woodland cover, and to support the City's goal of reaching their 30 percent woodland cover target:

Woodlands that are not identified as significant and other treed areas that have ≥ 25 percent tree cover and meet the following criteria are qualify as Contributory Woodlands and Other Treed Areas:

1. The Woodland or Treed Areas occurs in a rural area and has an average minimum width of 40 metres and is ≥1 hectares, measured to crown edges; or
2. The Woodland or Treed Areas occurs in an urban area and has an average minimum width of 40 metres and is ≥0.5 hectares, measured to crown edges; or
3. Any Woodland or Treed Areas of any size abutting a significant woodland, wetland or permanent stream.

Treed areas that "abut" a significant woodland, wetland or permanent stream are considered adjacent when located within 20 metres of each other.

8.1.4.3. Contributory Woodlands - Mapping Methodology

All Woodlands that did not qualify as Significant Woodlands were mapped as Contributory Woodlands where they met the following criteria:

1. The Woodland occurs in a rural area and has an average minimum width of at least 40 metres and is ≥1 hectares, measured to crown edges; or
2. The Woodland occurs in an urban area and has an average minimum width of at least 40 metres and is ≥0.5 hectares, measured to crown edges; or
   Any woodland of any size abutting (i.e., within 20 metres) a significant woodland, wetland, watercourse, or waterbody.

All woodlands that did not meet the criteria for being a Significant or Contributory Woodland were excluded from the feature mapping.

8.1.4.4. Other Treed Areas - Mapping Methodology

A new treed area dataset, comprised of areas with 25 to 60 percent tree cover, was delineated using Nearmap's leaf-on orthoimagery and the previously generated LiDAR-derived height model. All treed areas, as identified in the LiDAR-derived height model, were manually reviewed using Nearmap's orthoimagery to visually identify if they met the criteria of greater than 25 percent tree cover. All areas meeting the tree cover criteria were manually digitized.

All Treed Areas that did not meet the following criteria were excluded from the feature mapping:

1. The Treed Area occurs in a rural area and has an average minimum width of at least 40 metres and is ≥1 hectares, measured to crown edges; or
2. The Treed Area occurs in an urban area and has an average minimum width of at least 40 metres and is ≥0.5 hectares, measured to crown edges; or
3. Any Treed Area of any size abutting (i.e., within 20 metres) a significant woodland, wetland, watercourse, or waterbody.

8.1.4.5. Cover Statistics

Table 7. City of Kingston. Contributory Woodland Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area (hectares)	Percentage (%) of Kingston Land Area[1]
>20	N/A	N/A	N/A
10 - 20	2	21	0.0
4 - 10	97	608	1.3
2 - 4	112	319	0.7
1 - 2	164	239	0.5

<1	345	169	0.4
Total:	**720**	**1357**	**3.0**

1 Note that Kingston land area is a calculation of the total municipal area excluding major surface water bodies (Land Area: 45,173 hectares)

Table 8. Urban Areas. Contributory Woodland Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area[2] (hectares)	Percentage (%) of Kingston Urban Land Area[1]
>20	N/A	N/A	N/A
10 - 20	2	21	0.3
4 - 10	6	36	0.4
2 - 4	11	30	0.4
1 - 2	23	31	0.4
<1	90	46	0.6
Total:	**132**	**166**	**2.0**

1 Note that urban land area is a calculation of the total urban area excluding major surface water bodies (Urban Land Area: 8,217 hectares)

2 Note the total area is representative of the area within the urban area boundary, even if the woodland extends into the rural area

Table 9. Rural Areas. Contributory Woodland Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area[2] (hectares)	Percentage (%) of Kingston Rural Land Area[1]
>20	N/A	N/A	N/A
10 - 20	N/A	N/A	N/A
4 - 10	93	572	1.5
2 - 4	101	289	0.8
1 - 2	141	207	0.6
<1	259	123	0.3
Total:	**594**	**1191**	**3.2**

1 Note that rural land area is a calculation of the total rural area excluding major surface water bodies (Rural Land Area: 36,956 hectares)

2 Note the total area is representative of the area within the rural area boundary, even if the woodland extends into the urban area

Table 10. City of Kingston. Other Treed Area Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area (hectares)	Percentage (%) of Kingston Land Area[1]
>20	3	119	0.3
10 - 20	10	128	0.3
4 - 10	79	478	1.1
2 - 4	105	299	0.7
1 - 2	160	234	0.5
<1	212	123	0.3
Total:	**569**	**1380**	**3.1**

1 Note that Kingston land area is a calculation of the total municipal area excluding major surface water bodies (Land Area: 45,173 hectares)

Table 11. Urban Areas. Other Treed Area Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area[2] (hectares)	Percentage (%) of Kingston Urban Land Area[1]
>20	N/A	N/A	N/A
10 - 20	N/A	N/A	N/A
4 - 10	2	2	0.0
2 - 4	8	20	0.2
1 - 2	5	5	0.1
<1	12	7	0.1
Total:	**27**	**33**	**0.4**

1 Note that urban land area is a calculation of the total urban area excluding major surface water bodies (Urban Land Area: 8,217 hectares)

2 Note the total area is representative of the area within the urban area boundary, even if the woodland extends into the rural area

Table 12. Rural Areas. Other Treed Area Statistics

Woodland Patch size (hectares)	Number of Woodland Patches	Total Woodland Area[2] (hectares)	Percentage (%) of Kingston Rural Land Area[1]
>20	3	119	0.3
10 - 20	10	128	0.3
4 - 10	79	476	1.3
2 - 4	99	280	0.8
1 - 2	156	229	0.6
<1	202	116	0.3
Total:	**549**	**1347**	**3.6**

1 Note that rural land area is a calculation of the total rural area excluding major surface water bodies (Rural Land Area: 36,956 hectares)

2 Note the total area is representative of the area within the rural area boundary, even if the woodland extends into the urban area

The summary of statistics for Significant Woodlands, Contributory Woodlands, and Other Treed Areas, as proposed through the updated mapping, achieves 30.1% of City's land area, as shown in Table 13. This meets the woodland cover target of 30% identified in the City's OP. However, only a Significant Woodlands will be protected in accordance with the policy direction outlined in the PPS, as described in Section 2.1. It is recommended that through the Natural Heritage Study that policy recommendations be explored that could provide flexibility for Contributory Woodlands and Other Treed Areas, ensuring that they maintain or increase the woodland and tree canopy cover in the City.

Table 13. City of Kingston. Summary Statistics for Significant Woodland, Contributory Woodlands, and Other Treed Areas

NHS Feature	Number of Patches	Total Area[2] (hectares)	Percentage (%) of Kingston Land Area[1]
Significant Woodland	197	10820	24.0
Contributory Woodland	720	1357	3.0
Other Treed Areas	569	1380	3.1
Total:	**1486**	**13557**	**30.1**

1 Note that Kingston land area is a calculation of the total municipal area excluding major surface water bodies (Land Area: 45,173 hectares)

8.2. Wetlands

Wetlands are lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic (growing in water) plants or water tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens.

As described throughout Section 5, wetlands are important features in providing flood protection, water purification, wildlife habitat, biodiversity and climate change resilience.

As described further below, there are different classifications of wetlands. Significant Wetlands (i.e., Provincially Significant Wetlands (PSW)) are a required component of the Natural Heritage System There is flexibility regarding inclusion of non-PSW wetlands as to support system targets and achieve a resilient / robust Natural Heritage System.

What We Heard at the Community Engagement Workshops

- Wetlands are home to many culturally significant species and resources.
- Unevaluated wetlands should be assessed and formally protected.
- Current natural heritage system mapping and policies provide protection for wetlands.
- Concerns exist about wetland loss due to recent changes in provincial criteria.

Recommended Approach

Recommended approach for wetland definitions and mapping criteria are described under specific feature sub-headings below.

8.2.1. Significant Wetlands

Significant Wetlands are a required component of the Natural Heritage System and are identified in the PPS as Significant Wetlands.

8.2.1.1. Definition

It is recommended that the current OP definition for Significant be updated to reflect the slight language changes which occur in the PPS 2024.

Current OP definition: “An area identified as provincially significant by the Ontario Ministry of Natural Resources and Forestry using evaluation procedures established by the Province, as amended from time to time”.

PPS 2024 definition: “a) An area identified as provincially significant using evaluation criteria and procedures established by the Province, as amended from time to time.” This definition is recommended to be carried forward into the new OP.

8.2.1.2. Criteria

Criteria used to identify significant wetlands is established by the Province in the Southern Ontario Wetland Evaluation System (OWES 2023). Mapping of significant wetlands is maintained through Land Information Ontario (LIO), a provincial initiative that manages and distributes geospatial data across Ontario.

8.2.1.3. Mapping Methodology

Mapping methodology for Significant Wetlands is described in Section 8.2.4.

8.2.2. Coastal Wetlands / Significant Coastal Wetlands

Coastal wetlands are a required component of the Natural Heritage System, as outlined in the PPS. They may also be identified as significant if they meet the criteria defined in the PPS. Significant coastal wetlands are likewise required components of the Natural Heritage System under the PPS.

8.2.2.1. Definition

It is recommended that the current OP definition of Coastal Wetlands be updated to reflect the slight language changes which occur in the PPS 2024.

Current OP definition: “a. any wetland that is located on one of the Great Lakes or their connecting channels (for the City of Kingston, this would be the St. Lawrence River); or b. any other wetland that is on a tributary to any of the above-specified waterbodies and lies, either wholly or in part, downstream of a line located two kilometres upstream of the 1:100-year floodline (plus wave **uprush**) of the large waterbody to which the tributary is connected.”

PPS 2024 definition: “a. any wetland that is located on one of the Great Lakes or their connecting channels (for the City of Kingston, this would be the St. Lawrence River); or b. any other wetland that is on a tributary to any of the above-specified waterbodies and lies, either wholly or in part, downstream of a line located two kilometres upstream of the 1:100-year floodline (plus wave **run-up**) of the large

waterbody to which the tributary is connected." This definition is recommended to be carried forward into the new OP.

As identified in Section 8.2.1.1, the definition for Significant should be updated to reflect the slight changes in the PPS.

Current OP definition: "An area identified as provincially significant by the Ontario Ministry of Natural Resources and Forestry using evaluation procedures established by the Province, as amended from time to time".

PPS 2024 definition: "a) An area identified as provincially significant using evaluation criteria and procedures established by the Province, as amended from time to time." This definition is recommended to be carried forward into the new OP.

8.2.2.2. Criteria

Coastal wetlands are those which occur on a connected tributary, within a given distance (2 kilometres of the 1:100-year floodline [plus wave run-up]), of one of the Great Lakes or their connecting channels (i.e., within the City of Kingston, this is Lake Ontario and the St. Lawrence River).

8.2.2.3. Mapping Methodology

Mapping methodology for Significant Wetlands is described in Section 8.2.4.

8.2.3. Locally Significant Wetlands & Unevaluated Wetlands

There is flexibility regarding inclusion of non-PSW wetlands to support system targets and achieve a resilient / robust Natural Heritage System. Wetlands also provide for flood protection, water purification, wildlife habitat and climate change resilience as discussed in proceeding section. Wetlands are a critical part of integrating protection of the diversity of hydrological and hydrogeological processes and support biodiversity in the landscape. Small and large wetlands are also important for providing hydrological and hydrogeological support of other features and support of biodiversity.

Feedback gathered from the Community Engagement Workshops indicated that community members highly value wetlands, are concerned about wetland loss due to recent changes to provincial wetland criteria and believe that unevaluated wetlands should be assessed and officially protected. It was shared during these workshops that wetlands are home to many culturally significant species and resources for Indigenous communities.

More importantly, with the recent changes to provincial criteria (OWES 2024) on wetlands as discussed in Section 5.5, there is a potential for wetland loss due to lessening of protection for non-PSW wetlands. The identification of locally significant and unevaluated wetlands as part of the Natural Heritage System is a consistent approach being taken by other municipalities as identified through the jurisdictional scan (Table 20, Appendix A).

Therefore, it is recommended that both locally significant and unevaluated wetlands continue to be included within the City's OP and mapped accordingly.

Guidance from How Much Habitat is Enough? states that 'to ensure no net loss of wetland area, a focus should be on maintaining and restoring wetland functions at a watershed and subwatershed scale based on historic reference conditions' (Environment Canada 2013, Page 19). 'No net loss' is based on current conditions, as presented in Table 16. The guideline provides that "at a minimum, the greater of 10 percent of each major watershed and 6 percent of each subwatershed, or 40 percent of the historic watershed wetland coverage, should be protected and restored" (Environment Canada 2023.Table 2 Page 19). These percentages amount to the estimated critical thresholds for wetland cover in a watershed in order to maintain key ecological and hydrological functions of that watershed. The current wetland cover per watershed ranges from 3 percent in Northeast Lake Ontario Shoreline Watershed to 15.3 percent in Napanee River, as presented in Table 14. These wetlands statistics are further broken down into subwatershed watershed in Table 15. Overall, certain Watershed minimally exceed the 10 percent minimum or 6 percent of each subwatershed, while others are below the threshold.

The current wetland cover for the City is 11.9 percent (which includes land cover area and open water communities), as presented in Table 16. Locally Significant Wetlands and Unevaluated wetlands contribute to 53.1 percent of that wetland cover percentage.

Table 14. City of Kingston. Wetland statistics by Tertiary watershed.

Watershed Name	Total Wetland Area (hectares)	Percentage (%) of Watershed Area within the City of Kingston	Watershed Area (hectares) within the City of Kingston
Cataraqui River - St. Lawrence River	3621	10.9	33112
Napanee River	1941	15.3	12716
Northeast Lake Ontario Shoreline	43	3.0	1443
Total:	**5,605**	**11.9**	**47271**

Table 15. City of Kingston. Wetland statistics by Quaternary watershed.

Watershed Name	Total Wetland Area (hectares)	Percentage (%) of Watershed Area within the City of Kingston	Watershed Area (hectares) within the City of Kingston
Collins Creek	1628	15.2	10693
Lake of the Isles - St. Lawrence River	1448	10.2	14232
Wilton Creek - Little Creek	30	9.6	316
Gananoque River	552	8.9	6167

Cataraqui River	1621	12.7	12712
Millhaven Creek	283	16.6	1707
Northeast Lake Ontario Shoreline (Tertiary)	43	3.0	1443
Total:	**5,605**	**11.9**	**47271**

8.2.3.1. Definition – Locally Significant Wetlands

The recommended definition for locally significant wetlands is “those significant wetlands which have been evaluated using the evaluation procedures established by the Province but are not deemed to be provincially significant”.

8.2.3.2. Criteria – Locally Significant Wetlands

The criteria for locally significant wetlands are identical to the definition.

8.2.3.3. Definition – Unevaluated Wetlands

The recommended definition for unevaluated wetlands is “those unevaluated wetlands that have not been evaluated according to evaluation procedures established by the Province”.

8.2.3.4. Criteria – Unevaluated Wetlands

When establishing the mapping criteria for unevaluated wetlands, consideration was given to current issues and trends around biodiversity loss (Section 5.2) and Linkages/Corridors (Section 5.8), ensuring that these factors were integrated into the assessment of unevaluated wetlands. The following criteria are recommended for unevaluated wetlands based on the percentage of unevaluated wetlands that contribute to the City maintaining its current wetland cover as per the guidance from How Much Habitat is Enough? (Environment Canada 2013):

a. wetlands of any size that are physically continuous with a PSW.; or
b. wetlands greater than 0.5 hectares that are not PSWs or Locally Significant Wetlands; or
c. wetlands 0.2 hectares to 0.5 hectares that meet one or more of the following criteria:
    i. Located within a floodplain; or
    ii. Contiguous (i.e., within 20 metres) with a permanent or intermittent watercourse, a Significant Valleyland, Significant Woodland, Significant Wildlife Habitat or Life Science ANSI; or
    iii. Identified as part of an ecologically functional corridor or linkage between natural heritage features.

8.2.3.5. Mapping Methodology

Mapping methodology for Significant Wetlands is described in Section 8.2.4.

8.2.4. Mapping for Significant Wetlands, Significant Coastal Wetlands, Coastal Wetlands, Locally Significant Wetlands and Unevaluated Wetlands

Existing mapping of Wetlands was sourced from the Ontario Geohub (Wetland, OMNRF.; 2025) and from the City of Kingston (Marshes, City of Kingston). The OMNRF Wetlands layer "provides a spatial representation and attribute information for wetlands in Ontario. Wetland polygons are mapped independently from other hydrographic data classes and may overlap water bodies or other hydrographic data"; this layer includes information for wetlands evaluated with the Ontario Wetland Evaluation System (OWES). The OMNRF Wetlands layer contains two different designations used in the Natural Heritage Study:

- **Wetland Significance** | Evaluated-Provincial, Evaluated-Other
  - "Level of significance designated by an OWES evaluation. Provincially Significant Wetlands (PSW) are protected under the Provincial Policy Statement 2005, policy 2.1 (LIO Class Description – Metadata)"
  - A <Null> value indicates the wetland is unevaluated
- **Coastal Ind |** Yes, No
  - "A Yes/No indicator for any wetland that is located on one of the Great Lakes or their connecting channels (Lake St. Clair, St. Marys, St. Clair, Detroit, Niagara and St. Lawrence Rivers); or any other wetland that is on a tributary to any of the above-specified water bodies, and lies either wholly or in part, downstream of a line located 2 kilometres upstream of the 1:100 year floodline (plus wave run-up) of the large water body to which the tributary is connected (LIO Class Description – Metadata)"
  - A value of "Yes" indicates that the wetland is classified as a Coastal Wetland

The Kingston Marshes layer was mapped as part of the 2004 Basemap Project and is updated via orthophoto interpretation (most recently updated with April 2018 orthoimagery). The Kingston Marshes layer does not contain any attribute information with respect to Wetland Significance or Coastal Indicators and was mapped completely separately from the OMNRF Wetlands layer. All Wetlands in the Kingston Marshes layer were assigned a Wetland Significance of unevaluated, and all Wetlands that met the Coastal Ind criteria, as specified above, were assigned a Coastal Indicator of 'Yes'.

For mapping the spatial location of all wetlands in the City, both sources of existing wetland mapping were merged and underwent a series of refinements. Where layers overlapped, layer attributes were informed by the OMNRF Wetlands layer. Wetlands with an Evaluated-Provincial significance (i.e., PSW) were not modified in any way. All Evaluated-Other and Unevaluated Wetlands underwent the following series of refinements to improve the accuracy of the layer.

Identify wetlands that occur in appropriate topographic positions, i.e., low-lying areas or with concave geometry. All wetlands that occur in topographically elevated positions or have convex geometry, conditions that are generally inconsistent with wetland hydrology, are identified and removed. This process involved smoothing a LiDAR DTM to capture broader landform patterns, then calculating the relative position of each wetland compared to the surrounding landscape.

- **Resample (ArcGIS Pro)**
  - Input: DTM_0.5m
  - Parameters: Cell Size (4,4), bilinear interpolation
  - Output: DTM_4m
- **Focal Statistics (ArcGIS Pro)**
  - Input: DTM_4m
  - Parameters: Circle, Radius: 75m, Statistics: Mean
  - Output: Focal_d150
- **Raster Calculator (ArcGIS Pro)**
  - Input: Focal_d150 – DTM_4m
  - Output: Focal_Landform
  - Note: this raster identifies the relative topographic position of each point on the landscape within 75m and can be used as a proxy for concavity
- **Reclassify (ArcGIS Pro)**
  - Input: Focal_Landform
  - Parameters: -100 - -0.1 = NoDATA, -0.1 - 100 = 1
  - Output: Topographic_Landform
  - Note: A value of 1 indicates a potential wetland landform
- **Raster to Polygon (ArcGIS Pro)**
  - Input: Topographic_Landform
  - Output: Topographic_Landform_P
- **Pairwise Buffer (ArcGIS Pro)**
  - Input: Topographic_Landform_P
  - Parameters: Buffer: 5m, dissolve
  - Output: Topographic_Landform_P1
- **Singlepart to Multipart (ArcGIS Pro)**
  - Input: Topographic_Landform_P1
  - Output: Topographic_Landform_P2
- **Delete Holes (QGIS)**
  - Input: Topographic_Landform_P2
  - Parameters: Area: 1000m^2
  - Output: Topographic_Landform_P3
- **Pairwise Buffer (ArcGIS Pro)**
  - Input: Topographic_Landform_P3
  - Parameters: Buffer: -5 m, dissolve
  - Output: Topographic_Landform_P4
- **Single part to Multipart (ArcGIS Pro)**
  - Input: Topographic_Landform_P4
  - Output: Topographic_Landform_P5
- **Pairwise Erase (ArcGIS Pro)**
  - Input: Wetlands
  - Erase Features: Topographic_Landform_P5
  - Output: Wetlands

    - All portions of a wetland located in an elevated topographic position and/or exhibiting convex geometry were erased

Identify wetlands that have appropriate slope conditions. Since wetlands typically occur in relatively flat or gently sloping areas, portions of wetlands that extend onto steeper slopes were removed. This process involved identifying areas of pronounced slope (i.e., >7.5 percent) and modifying wetland boundaries to exclude these high-slope areas, ensuring that wetlands are positioned downslope of steeper terrain and/or remain within appropriate low-slope landscape settings.

- **Surface Parameters (Slope; ArcGIS Pro)**
    - Input: DTM_0.5m
    - Parameters: Percent Slope, Planar, radius = 3 m, quadratic
    - Output: DTM_Slope
- **Resample (ArcGIS Pro)**
    - Input: DTM_Slope
    - Parameters: Cell Size (1,1), bilinear interpolation
    - Output: DTM_Slope_R
- **Reclassify (ArcGIS Pro)**
    - Input: DTM_Slope_R
    - Parameters: 0 - 7.5% = NoDATA, >7.5% = 1
    - Output: DTM_Slope_R_Reclass
    - Note: This raster identifies all areas with a pronounced slope (>7.5 percent). A 7.5 percent slope threshold was applied as a conservative cutoff to exclude false positives from wetland mapping, while still allowing the inclusion of moderately sloped, legitimate wetland areas. This value is supported by Medland et al. (2020), who found that wetlands in Ontario's Mixedwood Plains Ecozone have an average slope of 1.12 degrees (approximately 2 percent). While the cut-off threshold is subjective, wetlands objectively occur most commonly in very-low slope environments.
- **Raster to polygon (ArcGIS Pro)**
    - Input: DTM_Slope_R_Reclass.
    - Output: Slope_Polygon
- **Delete Holes (QGIS)**
    - Input: Slope_Polygon
    - Parameters: Area: 250m^2
    - Output: Slope_Polygon_Clean
- **Pairwise Erase (ArcGIS Pro)**
    - Input: Wetlands
    - Erase Features: Slope_Polygon_Clean
    - Output: Wetlands
    - Note: All portions of a wetland that intersected an area of pronounced slope were erased

Identify wetlands that are mapped within actively cultivated agricultural fields. Wetlands that no longer have visible wetland vegetation, but were mapped based on their topographic position, i.e., within a topographic depression in a field, are to be removed from the wetland mapping. This ensures alignment with the following definition in the NHRM: "Periodically soaked or wet lands being used for

agricultural purposes, which no longer exhibit wetland characteristics, are **not** considered to be wetlands for the purposes of this definition" (NHRM; p.56).

- **Manual Refinements (ArcGIS Pro)**
  - The Wetland layer was manually reviewed using Nearmap's leaf-off orthoimagery to refine the boundary of, or remove, wetlands that coincided with actively cultivated agricultural fields and had no visible wetland vegetation.

Identify wetlands that have been mapped incorrectly or removed through development. All wetlands that intersect built-up or impervious area (i.e., the wetland is a false positive or has been removed for development) are to be removed from the wetland layer.

- **Manual Refinements (ArcGIS Pro)**
  - The Wetland layer was manually reviewed using Nearmap's leaf-off orthoimagery to refine the boundary of, or remove, wetlands that coincided with built-up or impervious areas.

Standardize the Wetland layer. To ensure a consistent vertex count and geometric complexity, the wetland dataset was standardized using the QGIS toolset. All wetlands coincident with PSWs, since they were not being modified, were not included in this refinement.

- **Fix Geometries (QGIS)**
  - Input: Wetlands.
  - Output: Wetlands
- **Simplify (QGIS)**
  - Input: Wetlands
  - Parameters: Area: Visvalingam; Tolerance: 2 m
  - Output: Wetlands
- **Smooth (QGIS)**
  - Input: Wetlands
  - Parameters: Iteration: 1; Offset: 0.25
  - Output: Wetlands

Once all boundary refinements were completed, wetlands were then classified into their respective system components based on the following criteria:

Significant Wetlands. All wetlands with a Wetland Significance of 'Evaluated-Provincial' and that have a Coastal Indicator of 'No'.

Significant Coastal Wetlands: All wetlands with a Wetland Significance of 'Evaluated-Provincial' and that have a Coastal Indicator of 'Yes'.

Coastal Wetlands. All wetlands with a Coastal Indicator of 'Yes' and that did not have a Wetland Significance of Evaluated-Provincial.

Locally Significant Wetlands. All wetlands with a Wetland Significance of Evaluated-Other with a Coastal Indicator of 'No'.

Unevaluated Wetlands. All wetlands with no Wetland Significance (i.e. unevaluated) with a Coastal Indicator of 'No', that also met the following criteria, were included as unevaluated wetlands:

a. wetlands of any size that are physically continuous with a PSW.; or
b. wetlands greater than 0.5 hectares that are not PSWs or Locally Significant Wetlands; or
c. wetlands 0.2 hectares to 0.5 hectares that meet one or more of the following criteria:
    i. Located within a floodplain; or
    ii. Contiguous (i.e., within 20 metres) with a watercourse, a Significant Valleyland, Significant Woodland, or Life Science ANSI or
    iii. Identified as part of an ecologically functional corridor or linkage between natural heritage features.

8.2.4.1. Wetland Cover Statistics

Table 16. City of Kingston. Wetland Statistics.

Wetland Type	Total Wetland Area (hectares)	Percentage (%) of Kingston[1]
Significant Wetland[2]	1,508	3.2
Significant Coastal Wetland[2]	899	1.9
Locally Significant Wetland	120	0.3
Coastal Wetland	221	0.5
Unevaluated Wetland	2,858	6.0
Total:	**5,605**	**11.9**

1 Note that Kingston here is a calculation of the total municipal area (Area: 47,271 hectares)

2 Note that Significant Wetlands and Significant Coastal Wetlands include open aquatic communities

8.3. Valleylands

Valleylands are landform features generally associated with and formed by watercourses. Often, because of their topography (e.g., deep valleys, steep slopes, often wooded, sometimes containing seepage areas, etc.) they have some of the most prominent and enduring natural features on the landscape in southern Ontario. Other features, such as forests and wetlands, have more frequently been removed or filled over the course of settlement, agriculture and development.

In the PPS 2024, valleylands are defined as: "… a natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year."

What We Heard at the Community Engagement Workshops

- Valleylands throughout the municipality are important.
- Current natural heritage system mapping and policies provide protection for valleylands.

Recommended Approach

Recommended approach for valleylands and significant valleylands definitions and criteria are described under specific feature sub-headings below.

8.3.1. Valleylands

8.3.1.1. Definition

It is recommended that the current OP definition of valleylands be updated to be consistent with the PPS 2024 as: “an area identified using criteria established by the OMNRF, which occurs in a valley or other landform depression that has water flowing through or standing for some period of the year and is ecologically important because it provides short term storage for storm and melt waters, performs nutrient and sediment transport, provides fish and wildlife habitat, or forms natural linkages and corridors between other natural heritage features and areas”.

8.3.1.2. Mapping Criteria

This feature is not mapped.

8.3.1.3. Mapping Methodology

This feature is not mapped.

8.3.2. Significant Valleylands

Significant Valleylands are a required component of a Natural Heritage System. Criteria are to be developed that meet or exceeds provincial guidance.

Through the jurisdictional scan of municipal OPs (Table 4, Appendix A), valleylands are typically defined as per the PPS and reference is made to the criteria established by the Province (e.g. NHRM). Municipalities do not typically map valley lands and defer the assessment to subwatershed or site-specific studies. Valleylands and confined watercourses are also often considered for their ecological linkages between natural features (Section 5.8).

8.3.2.1. Definition

It is recommended that the definition is updated to remove reference to the CCRNHS report and to reflect the definition in the PPS.

The recommended definition is “a valleyland that is ecologically important in terms of features and functions and contributes to the quality and diversity of an identifiable geographic area or natural heritage system, as identified using criteria established by the Province (PPS 2024).

8.3.2.2. Mapping Criteria

Mapping criteria is based on guidance in Table 8-1 of the NHRM for the identification of significant Valleylands and includes:

- The valley system must be greater than or equal to 100 metres wide on average (as recommended by the NHRM Linkage Function criteria);
- The valley system must be an area of water conveyance from a catchment of 50 hectares or greater (as recommended by the Surfacewater Functions criteria);
- Have a well-defined valley morphology, i.e., valley wall greater than 5 metres in height, and greater than 15 percent slope on at least one side of the valley (as recommended by the Landform Prominence criteria); and
- Have greater than 25 percent natural cover (as recommended by the Degree of Naturalness criteria).

8.3.2.3. Mapping Methodology

A Significant Valleylands dataset was created using LiDAR-derived products, sourced from the Ontario Geohub, (Eastern Ontario 2021-22 Package; DTM and DSM), and existing reference datasets (i.e., Wetlands and Flooding Hazard Limits). Only Valleylands deemed significant were included in the dataset; non-significant Valleylands were excluded from mapping.

A preliminary mapping of valleylands was created and later refined into the Significant Valleylands dataset using a multi-step workflow. Areas of depressional topography were identified from a DTM using focal statistics and topographic position indices, converted to polygons, and cleaned through smoothing, gap-filling, and alignment with adjacent slopes to create a valleylands dataset. These valleyland polygons were then filtered using hydrologic, geomorphic, and ecological criteria, which included minimum contributing drainage area, average valley width, slope thresholds, and percentage of natural cover. Final manual refinements ensured the delineation of boundaries aligned with key landform features and slope thresholds.

Identify areas of depressional topography likely to be valleylands (1). This process involves comparing the ground elevation on a DTM to the surrounding elevation at four different scales (i.e., circular focal neighbourhood of 100, 200, 300, and 400 m); areas where the cumulative elevation difference across all four scales was below the local mean were classified as depressional topography. These depressional areas were delineated, converted to polygons, and processed to fill small gaps smooth boundaries, and create a potential valleylands dataset. Manual refinements were applied to connect discontinuities in the potential valleylands dataset system and to align features with adjacent steep slopes.

- **Resample (ArcGIS Pro)**
    - Input: DTM
    - Parameters: Cell Size (4,4), bilinear interpolation
    - Output: DTM_4m

- **Focal Calculations / Raster Calculator (ArcGIS Pro)**
  - **Focal Statistics**: Input: DTM_4m (Circle. Radius: 100m. Mean). Output: Focal_d200.
  - **Raster Calculator**: Input: Focal_d200 – DTM_4m. Output: Focal_Landform200.
  - **Focal Statistics**: Input: DTM_4m (Circle. Radius: 200m. Mean). Output: Focal_d400.
  - **Raster Calculator**: Input: Focal_d400 – DTM_4m. Output: Focal_Landform400.
  - **Focal Statistics**: Input: DTM_4m (Circle. Radius: 300m. Mean). Output: Focal_d600.
  - **Raster Calculator**: Input: Focal_d600 – DTM_4m. Output: Focal_Landform600.
  - **Focal Statistics**: Input: DTM_4m (Circle. Radius: 400m. Mean). Output: Focal_d800.
  - **Raster Calculator:** Input: Focal_d800 – DTM_4m. Output: Focal_Landform800.
- **Raster Calculator (ArcGIS Pro)**
  - Input: Focal_Landform200 + Focal_Landform400 + Focal_Landform600 + Focal_Landform800
  - Output: Topographic_Position_Index
- **Reclassify (ArcGIS Pro)**
  - Input: Topographic_Position_Index
  - Parameters: <7.5 = NoDATA, >7.5 = 1
  - Output: Depressional_Topography
  - Note: Areas with a value of 1 in this raster identify depressional topography, i.e., where the cumulative elevation difference across all four scales was below the local mean, which is typical of valleyland geomorphology
- **Raster to Polygon (ArcGIS Pro)**
  - Input: Depressional_Topography
  - Output: Depressional_Topography_Polygon
- **Attribute Calculation (ArcGIS Pro)**
  - Depressional_Topography_Polygon, where Shape_Area < 250m2, Delete
- **Simplify (QGIS)**
  - Input: Depressional_Topography_Polygon
  - Parameters: 3m; Distance (Douglas-Peucker)
  - Output: Depressional_Topography_Polygon_S
- **Delete Holes (QGIS)**
  - Input: Depressional_Topography_Polygon_S
  - Parameters: Area < $25m^2$
  - Output: Depressional_Topography_Polygon_D
- **Smooth (QGIS)**
  - Input: Depressional_Topography_Polygon_D
  - Parameters: Iteration: 1, Offset: 0.25
  - Output: Potential_Valleys.
  - Note: The Potential_Valleys layer is discontinuous but effectively maps complete valley systems for smaller valleys. In larger valleys, it captures the edges but may omit the center portion of the valley
- **Manual Refinements (ArcGIS Pro)**

- Where the Potential_Valleys layer identified two depressional landforms with a wetland or surface water feature between them, the intervening area was manually merged to form a single continuous valley polygon.

Identify areas of depressional topography likely to be valleylands (2). To improve continuity and represent full valley systems, boundaries of the Potential_Valleys layer were further refined based on slope.

- **Slope (ArcGIS Pro)**
  - Input: DTM_4m
  - Parameters: Percent Slope, Planar
  - Output: DTM_4m_Slope
- **Reclassify (ArcGIS Pro)**
  - Input: DTM_4m_Slope
  - Parameters: 0-15 = NoDATA, >15 = 1
  - Output: DTM_4m_Slope_Reclass
- **Buffer (ArcGIS Pro)**
  - Input: Potential_Valleys
  - Parameters: Buffer: 10m
  - Output: Potential_Valleys
  - Note: This additional processing step was done to produce a better alignment with the top of the >15 percent slope contour across the valleylands polygon
- **Manual Refinements (ArcGIS Pro)**
  - For all valley systems, where applicable, the Potential_Valleys boundary was manually refined to match the top of the adjacent >15 percent slope and be generally continuous between adjacent polygons. The Potential_Valleys boundaries were refined to improve continuity and represent complete landforms. Boundaries were adjusted where valleys exhibited poorly defined topography, often extending limits to the next discernible slope break, flooding hazard boundary, or adjacent wetland, ensuring that valley systems were mapped comprehensively:
    - Where the valley slope was well defined on one side with a less defined slope on the opposite side of the valley, the less-defined limit was manually refined to match the top of the next slope contour, i.e., 10-15 percent slope contour; or
    - Where the valley slope was well defined on one side with no discernable slope on the other side of the valley, the limit was refined to match the flooding hazard limit and interpolated to match the adjacent valley limits. If no information was available on flooding hazard limits, the less-defined limit was mapped as the contiguous wetland boundary

Hydrologic Criteria. The Valleyland must meet the hydrologic criteria of being a Valleyland, i.e., “The valley system must be an area of water conveyance from a catchment of 50 hectares or greater (as recommended by the Surface water Functions criteria).”

- **Select by Location (ArcGIS Pro)**

    - Potential_Valleys that don't intersect with a feature in the Surfacewaterbody (surface water line and surface water polygon) layer were removed
- **Hydrology toolset.** The headwater of each valley system must have a catchment area >50 hectares as determined by a pour point where the contiguous watercourse first intersects the valley polygon; catchment areas are calculate using a simple Watershed Model.
    - **Resample (ArcGIS Pro)**
        - Input: DTM
        - Parameters: Cell Size (4,4), bilinear interpolation
        - Output: DTM_4m
    - **Fill (ArcGIS Pro)**
        - Input: DTM_4m
        - Output: DTM_4m_Fill
        - Where it was required, stream lines were also burned in to properly match culverts and bridges where flow would be discontinuous in a flow accumulation model
    - **Flow Direction (ArcGIS Pro)**
        - Input: DTM_4m_Fill
        - Parameters: D8 method
        - Output: DTM_4m_FlowD
    - **Watershed (ArcGIS Pro)**
        - Input: DTM_4m_FlowD, PourPoints
        - Output: Valley_Catchments
        - Note: Pour Points were manually created at all valley headwaters where the contiguous watercourse first intersected the valley polygon and where the catchment area had a likelihood of being less than 50 hectares
    - **Manual Refinements (ArcGIS Pro)**
        - For all valleylands that had a watershed area of less than 50 hectares at the headwater, the pour point was adjusted downstream to where the system had a headwater watershed area of greater than 50 hectares and the valleyland polygon was modified to start at this point

Geomorphic Criteria (1). The Valleyland must meet the geomorphic criteria of being a Valleyland, i.e., "the valley system must be greater than or equal to 100 metres wide on average (as recommended by the N.H.R.M. Linkage Function criteria)".

- Valley width measurements are approximated by a manual measurement perpendicular to the direction of flow within the polygon and the following criteria is used for the inclusion/removal of a polygon:
        - The start of the valleyland polygon must be greater than 100m in width and each part of the valleyland polygon must be greater than 100m in width, with the following exception:
            - **Exception.** The valleyland polygon may narrow below 100 m where removal would fragment the valley system, as long as the overall system above, including the narrow section, remains over 100 m wide on average.

Geomorphic Criteria (2). The Valleyland must meet the geomorphic criteria of being a Valleyland, i.e., "the valley must have greater than 15 percent slope on at least one side of the valley (as recommended by the Landform Prominence criteria).

- Based on the DTM_4m_Slope raster, one side of the valley must have a slope exceeding 15 percent. If the valley did not meet this criteria, it was removed, with the following exception:
    - **Exception.** Small sections of unconfined downstream valley systems were retained if excluding them would fragment an otherwise continuous valleyland
- Note: Valley wall height was not included as a geomorphic criteria in the methodology for defining Significant Valleylands due to the absence of an objective and consistent GIS methodology that could be applied across the study area. The variability in valley wall heights, widths, and the presence of discontinuities in valley systems limited the feasibility of accurately and uniformly measuring wall heights at a broad spatial scale.

Ecological Criteria. The Valleyland must meet the ecological criteria to be a Significant Valleyland, i.e., "Have greater than 25 percent natural cover (as recommended by the NHRM Degree of Naturalness criteria).

- Natural cover is approximated by the amount of woodland, wetland, and waterbody coverage in each unique valleyland polygon; valleylands failing to meet the 25 percent threshold were removed. Percent values are calculated for the entire polygon whereby some areas of the valleyland, based on geomorphic criteria, may still fall in developed and built-up areas with no natural cover.

Manual Refinements and Quality Control. A final manual review ensured boundaries aligned with the top of the >15 percent slope contour where applicable and represent complete, continuous valley systems.

8.3.2.4. Valleyland Cover Statistics

Table 17. City of Kingston. Significant Valleyland Statistics

	Number of Valleylands	Total Area (hectares)	Percentage (%) of Kingston Area[1]
Significant Valleylands	47	6,754	14.3

1 Note that Kingston area is a calculation of the total municipal area (Area: 47,271 hectares)

8.4. Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) is generally identified as areas of ecological importance for supporting and providing specialized wildlife habitat form and/or function. They represent the best quality examples of these habitat types available on the landscape. SWH is a required component of a Natural Heritage System in accordance with the PPS.

The province prepared Significant Wildlife Habitat Criteria Ecoregion Schedules (OMNRF 2015) to provide geographically based guidance for identifying significant habitat. Although municipalities can identify their own criteria for identifying SWH, the SWH Criteria Schedules are generally used as the basis for identification of SWH at the municipal level. The Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (OMNRF 2015). SWH includes the following general types of habitat:

- Seasonal concentration areas (for example, waterfowl and landbird stopover habitat, bat and reptile hibernacula);
- Rare vegetation communities or specialized habitat for wildlife (for example rare vegetation communities include alvar, and specialized habitat for wildlife includes turtle nesting areas and amphibian breeding habitat);
- Habitat for species of conservation concern (not including Endangered or Threatened species), for example habitat for marsh-obligate nesting birds and forest area-sensitive birds, special concern and rare wildlife species; and
- Animal movement corridors (for example corridors between amphibian breeding habitat and overwintering habitat).

What We Heard at the Community Engagement Workshops

- Turtles should be specifically addressed within the Natural Heritage System, distinct from other significant species, similar to the way Fish Habitat is uniquely recognized.
- Alvars often contain sensitive species and should be identified and protected.

Recommended Approach

8.4.1. Significant Wildlife Habitat

8.4.1.1. Definition

It is recommended that the current OP definition for SWH be updated to reflect the direction in the PPS. The recommend definition is: “Wildlife habitat that is ecologically important in terms of features, functions, representation, or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system. These are to be identified using criteria established by the Province”.

8.4.1.2. Mapping Considerations

Due to limited / inconsistent existing data available to identify SWH through desktop mapping, SWH is not recommended for mapping in the City’s Natural Heritage System. SWH will be protected through policy considerations (to be addressed through the Natural Heritage Study) and should be assessed and confirmed through site-specific study (e.g., Environmental Impact Study) at the time of development applications. Addressing SWH through policies is a strategy adopted by other municipalities, as observed in the jurisdictional scan (Table 20, Appendix A), due to the limited and inconsistent availability of existing data.

As noted through community engagement workshops, protection of turtles and their habitat has been identified as important to the City and its residents. In addition to a number of turtle species being protected under the ESA (2007) where they are listed as Endangered and Threatened Species, habitat for Special Concern species, and waterbodies / wetlands with a higher abundance of individuals is also protected through the identification of SWH, specifically turtle overwintering habitat, turtle nesting habitat, and habitat for Special Concern species. Moreover, access to habitat mapping is generally restricted by the province based on species sensitivity and potential risk to the species should its location be known. While SWH is not recommended for mapping, these species and their habitats are afforded protection through applicable regulations (i.e., ESA 2007) and policies, and will be protected through OP policies (to be addressed through the Natural Heritage Study).

8.5. Fish Habitat

Fish habitat is a required component of the Natural Heritage System as per the PPS and is identified in accordance with the definition under the Fisheries Act (as referenced by the PPS) where “Fish habitat means water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas”.

In accordance with the NHRM (Section 11.3), where no, or insufficient habitat mapping is available, Fish Habitat will be considered “all water features” including permanent or intermittent streams, headwaters, seasonally flooded areas, municipal or agricultural surface drains, lakes and ponds (except human-made off-stream ponds).

Recommended Approach

8.5.1. Fish Habitat

8.5.1.1. Definition

It is recommended that the current OP definition for Fish habitat be updated to reflect the current PPS definition: “Fish habitat means water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas”

8.5.1.2. Mapping Criteria

As described above, waterbodies and watercourses may be used as a proxy for the identification of Fish Habitat. Surface water features are described in Section 8.8.

8.5.1.3. Mapping Considerations

All Waterbodies and Watercourses can be considered as a proxy to screen for Fish Habitat.

8.6. Habitat of Endangered and Threatened Species

Habitat of Endangered Species and Threatened species is defined through the Endangered Species Act (2007) and is confirmed and managed by the province through their administration of the Endangered Species Act (2007). Habitat of Endangered and Threatened species is generally identified through a variety of project processes (e.g., a subwatershed study) where survey information has confirmed presence of habitat for these species. Surveys must follow established protocols (including appropriate timing windows), and typically require access to privately owned lands. It is important to note that habitat mapping is different than occurrence mapping; habitat mapping represents the protected area of habitat associated with a species that is protected under the Endangered Species Act (2007) while occurrence mapping represents where the species was observed.

What We Heard at the Community Engagement Workshops

- Turtles should be specifically addressed within the Natural Heritage System, distinct from other significant species, similar to the way Fish Habitat is uniquely recognized.

Recommended Approach

8.6.1. Habitat of Endangered and Threatened Species

8.6.1.1. Definition

It is recommended that the current OP definition for Habitat for Endangered and Threatened species be updated to reflect the PPS wording (which allows room for any future revisions to Provincial regulations). The PPS definition: means habitat within the meaning of Section 2 of the *Endangered Species Act, 2007*.

8.6.1.2. Mapping Considerations

Access to habitat mapping is generally restricted by the province based on species sensitivity and potential risk to the species should its location be known. Mapping of Habitat for Endangered and Threatened species is incomplete and will change over time as surveys are completed and/or as species designations change (e.g., new species are listed or de-listed as Endangered or Threatened). Identification of Habitat for Endangered and Threatened species must be completed through desktop screening and site-specific study (e.g., EIS). Addressing Habitat for Endangered and Threatened species through policies is a strategy adopted by other municipalities, as observed in the jurisdictional scan (Table 20, Appendix A), due data sensitivities.

As identified through community feedback, protection of turtles and their habitat has been identified as important to the City and its residents. In addition to a number of turtle species being protected through Habitat for Endangered and Threatened Species, their habitat is also protected through the identification of SWH and, where applicable, through the Conservation Authority Act which protects regulated wetlands. Although not recommended for mapping, these species and their habitats are protected through applicable legislation (e.g., ESA 2007) and policies (e.g., PPS (2024) and the City's new OP).

8.7. Significant Areas of Natural and Scientific Interest

Areas of Natural and Scientific Interest (ANSI's) are "areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education" (PPS 2024).

Life Science ANSI's are identified as being high quality example(s) of ecological form and function in each Ecodistrict in the province (provincially significant) and the Region (regionally significant) and are generally defined by natural heritage features (e.g., a woodland, valley top of bank, etc.) and generally exclude anthropogenic land uses (e.g., residential areas / properties).

Earth Science ANSIs' represent the best examples of geologic and geomorphic landforms and areas (e.g., a moraine) in each Ecodistrict in the province (provincially significant) and the Region (regionally significant). They may include a single feature or a group of related features (e.g., a drumlin field). As geologic / geomorphic landforms, the overlying land use may include natural and anthropogenic uses (e.g., woodland, agricultural, rural residential, etc.).

Recommended Approach

8.7.1. Significant Areas and Natural and Scientific Interest

8.7.1.1. Definition

The current OP definition is consistent with the PPS stated above; no changes are recommended.

8.7.1.2. Mapping Criteria

The OMNRF identifies ANSI's and provides available mapping to municipalities.

8.7.1.3. Mapping Methodology

Existing mapping of ANSI's sourced from the Ontario Geohub (OMNRF; 2025) is authoritative and was not modified.

8.8. Surface Water Features

Surface water features are "water-related features on the earth's surface, including headwaters, rivers, stream channels, inland lakes, seepage areas, recharge/discharge areas, springs, wetlands, and associated riparian lands that can be defined by their soil moisture, soil type, vegetation or topographic characteristics" (PPS 2024).

As described in Section 5.7, Headwater drainage features (HDF's) are also an important type of surface water feature supporting watershed health through water quality, storage, and habitat provision.

What We Heard at the Community Engagement Workshops

- Any areas with existing corridors in the landscape, particularly along watercourses and riparian habitats are important.
- Both sides of watercourses need to be protected.
- Watercourses and creeks throughout the municipality are important.
- Protection of watercourses seem to be reduced through development applications,but seem to be expanded within rural and agricultural areas.

Recommended Approach

8.8.1. Surface Water Features

8.8.1.1. Definition

The current OP definition is consistent with the PPS stated above; no changes are recommended.

8.8.1.2. Mapping Criteria

Surface water features that can be mapped in the new OP include wetlands (in accordance with Section 8.2), waterbody feature class as all areas with permanent surface water (e.g. river, stream, lakes, ponds) that are greater than 2 metres in width, and watercourses are mapped as all permanent and intermittent watercourses and HDF. Associated riparian areas (in accordance with Section 8.9), recharge/discharge areas, springs and seepage areas will be required to map as part of a future environmental study due to data availability.

It is acknowledged that, due to changes on the landscape, mapping of surface water features may not always be reflective of current site conditions. The identification and mapping of surface water features (including those which have not been mapped) may be refined or further identified where applicable through more detailed studies such as subwatershed studies completed in accordance with watershed planning guidelines and best practices. Policies in the OP related to the protection of surface water features protect features that appear on the landscape, regardless of whether they are mapped.

8.8.1.3. Mapping Methodology

A Surface Water Feature class was created that consists of Waterbodies (e.g. any feature with permanent water), mapped as polygons, and Watercourses (e.g. permanent and intermittent streams and HDFs), mapped as polylines. Waterbodies are defined as all areas with permanent surface water that are greater than 2 m in width, excluding stormwater management ponds. Watercourses are defined as all creeks, streams, and headwater drainage features, that are less than 2 m in width.

8.8.2. Waterbodies

A Waterbodies dataset was created using LiDAR-derived products, sourced from the Ontario Geohub, (Eastern Ontario 2021-22 Package), and existing reference datasets (i.e., Surface Water Features; City of Kingston). Mapping of large waterbodies (e.g., lakes, ponds) was automated using OMNRF's LiDAR-

derived Ontario Digital Terrain Model (DTM); elevation values were iteratively identified for each waterbody and reclassified to identify the shoreline elevation breakpoints. The raster of shorelines was converted to a vector dataset and smoothed to create an initial Waterbody layer. All areas not identified in this initial Waterbody layer, that were captured in the existing Surface Water feature class from the City of Kingston, were merged with the initial layer. The geometry of each feature was edited using Nearmap's leaf-off orthoimagery to manually refine boundaries. Permanent watercourses that had a very small and variable width, i.e., 2 – 3 m, were initially mapped as polylines and then buffered by 1 metre and merged into the Waterbodies feature class. All Stormwater Management Ponds were removed from the dataset at completion based on the Active Storm Basin feature class provided by the City of Kingston.

8.8.3. Watercourses

A Watercourses dataset was created by updating the existing River Segment feature class from the City of Kingston. Nearmap's leaf-off orthoimagery was used to refine the boundaries of all permanent watercourses in the River Segment feature class that could be identified in the orthoimagery; no edits were made to headwater drainage features or intermittent watercourses from the original feature class. The Watercourses dataset mapped all creeks, streams, and headwater drainage features.

8.9. Riparian Corridors

Riparian corridors include lands adjacent to a watercourse, water body and wetland, that have a fresh to moist soil moisture regime or are comprised of vegetation that includes wetland indicator species, or provide an important function in maintaining water quality.

Currently, the City maps riparian corridors as the area within 30 metres around all waterbodies and wetlands regardless of surrounding natural vegetation; as such, it may not be representative of riparian 'habitat'.

What We Heard at the Community Engagement Workshops

- Any areas with existing corridors in the landscape, particularly along watercourses and riparian habitats are important.

Recommended Approach

Due to inconsistencies / gaps in data and its availability mapping of these features is not recommended. Riparian corridors should be identified through more detailed studies such as watershed and subwatershed planning. Policies in the OP related to the protection of riparian corridors protect features that appear on the landscape, regardless of whether they are mapped.

8.9.1. Riparian Corridors

8.9.1.1. Recommended Definition

The recommended definition is as follows: “Riparian corridors include lands adjacent to a watercourse, water body and wetland, that have a fresh to moist soil moisture regime, are comprised of vegetation that includes wetland indicator species, or provide an important function in maintaining water quality”.

8.10. Karst and Alvar

Karst is a type of landscape where the dissolving of soluble bedrock, often limestone, has created sinkholes, crevices, and fissures, permitting infiltration, movement and recharge of groundwater, sometimes emerging as a spring.

Alvars, a type of karst landform, are a rare biological community which can occur on calcareous bedrock pavements. Alvars support a range of habitat functions and provide habitat for a diverse range of plant and animal species, including many unique flora and fauna. The city of Kingston contains a large proportion of the alvars present in Ontario. Protection of these habitats is important for this habitat type at the municipal, provincial, federal and global scale.

Alvar communities as identified by the ELC for Southern Ontario (Lee et al. 1998) are protected as Significant Wildlife Habitat (Rare Vegetation Communities). However, because of their extreme rarity and the role the City can play in the protection of these areas, they are identified as an independent component of the Natural Heritage System to ensure they are preserved and protected in the long-term. Approaches for their protection through policy will be reviewed in the Natural Heritage Study.

What We Heard at the Community Engagement Workshops

- Karst and Alvars are features which have been identified as being ‘of interest’ for protection by environmental groups

Recommended Approach

8.10.1. Karst

In Ontario, karst is often recognized as a hazard, which are areas with unstable bedrock susceptible to sinkholes and other geotechnical and safety issues. Therefore, it is recommended that karst is considered as part of the hazard lands in the City’s new OP, which is consistent with other municipalities that were reviewed as part of the jurisdictional scan (Table 20, Appendix A).

8.10.2. Alvar

8.10.2.1. Definition

It is recommended that Alvars are defined in the new OP as follows (based on the ELC definition [Lee et al. 1998]):

“Alvar means a vegetation community based on a level, unfractured limestone (carbonate) bedrock with thin or no soil substrate; vegetation cover may vary from patchy and barren to more closed and treed.”

The recommended definition for Alvars is consistent with other municipalities reviewed as part of the jurisdictional scan (Table 20, Appendix A).

8.10.2.2. Mapping Criteria

The mapping of the Alvar north of Highway 401 was provided by the Natural Heritage Information Centre (NHIC) and was mapped without refinements. Criteria for identifying and assessing any potential unmapped Alvars should follow the Ecological Land Classification System for Southern Ontario (Lee et al., 1998) for the identification and delineation of alvar vegetation communities.

8.10.2.3. Mapping Methodology

The mapping of the Alvar north of Highway 401 was provided by the Natural Heritage Information Centre (NHIC) and was mapped without refinements.

8.11. Linkages

Linkages are areas that provide connections between larger natural areas to support a range of community and ecosystem processes and enable plants and animals to move amongst the landscape. Linkages are a critical component of a Natural Heritage System that maintain connectivity between natural features and areas, particularly when there is a change in land use from a permeable landscape (e.g., agricultural land use) to an impermeable landscape (e.g., residential, commercial, industrial land use). One objective of the City’s Natural Heritage Study is to “Develop a defensible approach to identify linkages and corridors to connect natural heritage features to facilitate movement and enhanced habitat opportunities within the municipality and surrounding region”.

A discussion of Linkages is provided in Section 5.8. Additional considerations relative to the identification of this component within the City of Kingston’s Natural Heritage System are provided below.

Section 2.1.2 of the PPS (2024) states: “The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of Natural Heritage Systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features in areas, surface water features and ground water features.”

It is important to note that “the identification of linkages in agricultural areas would indicate an intention for both interests to be accommodated in the working landscape, for example, through good farming practices and stewardship, and not an intention to restrict existing agricultural uses through land use controls” (OMNR 2010, NHRM Section 3.4.5., p. 34). This is in recognition that the Natural Heritage Systems, including implementation of linkages, is intended to mitigate the impacts of development, particularly when there is a change in land use from a permeable landscape (e.g., agricultural land use) to an impermeable landscape (e.g., residential, commercial, industrial land use).

The NHRM (2010) provides in Table 3-3, a list of characteristics of features and areas that can function as linkages in a Natural Heritage Systems (not all characteristics need to be present). The manual indicates that the width of the linkage should be sufficient, especially in proportion to length, and composition of appropriate habitat or potential to restore habitat to allow the movement of wildlife and dispersal of flora. Orientation and configuration of these linkages /corridors should be designed to avoid certain areas (e.g. highways, urban areas). Section A.2.3.5 of the NHRM (2010) recommends local corridors have a minimum width of 50 to 200 metres while regional corridors have a minimum width of 300 to 400 metres. Additional trends / best practices relating to linkages and their identification are presented in Section 5.8.

A jurisdictional scan revealed each reviewed municipality defined linkages as part of their natural heritage systems, with the OP's for City of Guelph and Niagara Region mapping linkages as a component of the system. The definitions of linkages focused on ecological connections between core areas, consisting of natural features and areas and to support a range of community and ecosystem processes enabling plant and wildlife movement across the landscape. Although the County of Brant's OP did not identify linkages in the natural heritage system mapping, it did provide reference to Environment Canada (2013) to achieve minimum targets and a minimum width of 50 metres. All three OPs have policies that speak to the requirements to assess linkages as part of watershed and subwatershed planning and through detailed study (e.g. environmental impact studies) and that opportunities for refinement as well as the need to enhance/restore the linkage/corridors will be determined through those studies.

The LC-KFLA Natural Heritage Plan was assessed for its method of identifying primary corridors. Primary corridors were determined by using available watercourse data, along with a minimum of 50 meters of naturally vegetated habitat on both sides of streams. This approach was chosen as an effective strategy for mapping potential linkages along watercourses, given the limitations of the available data as part of that study. The purpose and function of the primary corridors were to connect core areas throughout the study area and identify opportunities for stewardship, restoration and land acquisition.

Linkages are generally conceptual and mapping of corridors at site-scale should be refined through detailed studies associated with future development applications approved by the City.

What We Heard at the Community Engagement Workshops

- Patches and corridors should be identified and protected prior to development, as they are crucial for providing stepping stones for habitat movement to and from more significant areas.
- Corridors are important, but clear criteria must be established to identify where they are needed, ensuring defensible methodology and stronger support.
- Corridors are increasingly more valuable for wildlife.
- Corridors along watercourses (e.g., Collins Creek) appear to be shrinking due to development applications, while corridor setbacks and regulations seem to be expanding for agricultural communities. This creates a disconnect between land uses.

- Any areas where corridors exist on the landscape, especially along watercourses and riparian habitats are important.
- Opportunity to protect hedgerows and fence lines and regulate tree cutting to enhance or maintain connectivity and linkages across the landscape.
- Corridors need to be designed to accommodate the species that are present, otherwise they will not be ecologically appropriate.
- Corridors are protected well in the current Natural Heritage System.

Recommended Approach

8.11.1. Linkages

8.11.1.1. Definition

Currently, Linkages are not defined in the City's OP. It is recommended the City's OP define Linkages as follows:

"An area, that may or may not be associated with the presence of existing natural features and areas, that provides and maintains ecological connectivity at both the landscape scale and site scale between 'core areas' consisting of natural features and areas, and supports a range of community and ecosystem processes enabling plants and animals to move among natural heritage features, in some cases over multiple generations, thereby supporting the long-term sustainability of the overall natural heritage system."

8.11.1.2. Mapping Criteria

Two scales of linkages are recommended within the City's Natural Heritage System:

Landscape Scale Linkages are important connections between natural features and areas. Specifically, they are intended to connect major blocks of natural heritage features areas (also referred to as "core areas"). Criteria considerations include:

- Minimum vegetated width of 60 – 100 metres
- The width should be larger for longer linkages (e.g., depending on the intended function of the linkages and species requirements, a 1:3 width to length ratio may be appropriate).
- Connections between Core Areas ≥50 hectares

The NHRM identified that a linkage can extend up to 1.6 kilometers in width. In Southern Ontario, establishing a landscape linkage wider than 100 metres is generally impractical in both urban and rural settings due to the surrounding landscape context (e.g. considerations for the working landscape. A minimum width of 60 metres is commonly selected as linkages tend to follow watercourse corridors, which generally incorporate a 30-meter buffer on each side of a watercourse.

Site-Specific Linkages are connections between smaller features. These are often identified in infill development, when there are existing development constraints. These are important for movement of

species with small habitat ranges, and/or that require multiple habitat types to complete their lifecycle process. Criteria considerations include:

- Minimum vegetated width of 30 metres
- The width should be larger for longer linkages (e.g., depending on the intended function of the linkages and species requirements, a 1:3 width to length ratio may be appropriate). Where this cannot be achieved, ensure 'stepping stones' (e.g. tend to be smaller, treed areas that provide refuge for wildlife as they move between larger blocks of natural habitat) provide suitable refuge habitat to support a narrowed width.
- Connections between Core Area ≥10 hectares

A 30 metre minimum linkage width has been identified as achieving a wider linkage may not be feasible due to existing development, infill, and site-specific constraints. This minimum width helps maintain habitat connectivity while recognizing existing development. While the 30 metre width is less than referenced within the NHRM, the approach acknowledges the broader landscape context, ensuring that linkages remain functional and feasible within the urban setting.

While "core areas" are not a component of the Natural Heritage System, mapping of "core areas" is often used to inform the location of ecologically important linkages, such as what applied for the mapping of the Natural Heritage System for the Growth Plan (now repealed). For the purpose of mapping linkages that connect "core areas", the following definition is used:

> Core areas means an individual natural features and areas, or a group of features and areas in close proximity to each other (i.e., less than or equal to 30 metres distance in the urban area, less than or equal to 60 metres distance outside of the urban area) that have functional ecological connectivity (i.e., their proximity to each other supports ecological functions, such as wildlife habitat, exchange of genetic material, etc.).

The minimum core size area of ≥50 hectares was selected for the landscape scale linkages because smaller forest patches (<50 hectares) have few area-sensitive forest birds (Environment Canada 2013) and small habitat fragments may consist entirely of edge habitats that are avoided by many species due to habitat loss and fragmentation (Hilty et al. 2006).

The minimum core size area of ≥10 hectares was identified for local-scale linkages considering the fragmentation of natural features in the urban landscape and to recognize that small habitat patches can cumulatively play an important role in protecting biodiversity and providing ecosystem services, especially in areas where there is limited natural cover on the landscape (Bentrup 2008; OMNR 2010).

It is important to note that linkages identified through the criteria identified above are conceptual at the time of identification. Additional landscape scale linkages and site-specific linkages may be required as determined through a site-specific study (e.g., EIS) in order to maintain connectivity between natural features and areas and to avoid a negative impact. There is no immediate change to existing land uses where linkages are identified. Implementation / establishment of linkages (e.g., establishment of self-

sustaining vegetation) is undertaken through voluntary actions (e.g., enhancement or restoration opportunities), voluntary land acquisition, however, may be required through development applications under the Planning Act, where a significant change in land use is proposed. Retaining or creating natural cover (e.g., woodland, wetland, meadow, etc.) is encouraged above and beyond the requirements of the system. Providing natural cover as 'stepping stone' habitat, and ideally throughout the length of the linkage(s) is important to support movement of a range of species (plants and animals) across the landscape. Opportunities to focus stewardship activities within linkages should be explored to support their form and function on the landscape.

For the purpose of the City's natural heritage system mapping, it is recommended that landscape scale linkages be mapped to be consistent with the system-based approach consistent with 4.1.2 of the PPS, to recognize linkages between and among natural heritage features and areas. Site-specific linkages should be evaluated using the criteria identified above, through an environmental study at the time of a development application to account for the working landscape and existing development.

8.11.1.3. Mapping Methodology

Site-level linkages were not mapped as part of the Natural Heritage System as these linkages would be informed by the detailed studies, such as Environmental Impact Statements, associated with the development applications. Future site-level linkages should be situated based on the mapping criteria identified in the previous section.

Landscape Scale Linkages were mapped using the current implementation of Omniscape (Landau et al. 2021) in Julia 1.6.2. Omniscape implements the connectivity algorithm developed by McRae et al. (2016) which models omni-directional habitat connectivity. Ecological flow is modelled as electrical current (i.e., a circuit-theory model) based on a spatial continuous suitability map. For modelling ecological flow, species are assumed to be aware of their immediate surroundings, but not of the entire landscape, and are modelled as moving between natural features based on the suitability and distance between natural features. Omniscape produces a current map showing the likelihood that an area between primary natural features will support "electrical current" (i.e., ecological flow); this current map is then used as a proxy for modelling linkages.

A spatially continuous suitability raster was generated based on the Natural Heritage System feature mapping and the Ontario Land Cover (OLC v1.0) dataset as the input into the circuit model. The suitability raster consists of core areas (i.e., large groupings of natural heritage features; no resistance), other natural heritage features (low resistance), agricultural areas (medium resistance), and built-up areas (high resistance). Ecological flow is modelled between core areas and preferentially routed across features with a low resistance (i.e., high suitability) to form links between core areas; areas with a higher resistance (i.e., built-up areas) have a much lower likelihood of having linkages form through them.

The ecological flow raster generated from Omniscape was used as the basis for modelling landscape-scale linkages. A vector linkage layer was manually created that followed the path of least resistance between each core area, that preferentially followed watercourses where applicable. All linkages were

buffered by 50 metre to form 100 metre wide landscape-scale linkages. Where linkages intersected natural features, the natural feature was clipped out, such that the linkage only modelled the connection between natural features. A precautionary approach was used to map the 100-metre-wide landscape-scale linkage, ensuring that the potential linkage width based on the mapping criteria was identified in the draft Natural Heritage System mapping. It is recommended that policy recommendations consider opportunities to refine the landscape-scale linkages mapping could occur through an Environmental Impact Study at the time of a Planning Act application.

Core areas means an individual natural feature and areas, or a group of features and areas in close proximity to each other (i.e., less than or equal to 30 metres distance in the urban areas, less than or equal to 60 metres distance outside of the urban area) that have functional ecological connectivity (i.e., their proximity to each other supports ecological functions, such as wildlife habitat, exchange of genetic material, etc.).

Core areas are identified as, for the purposes of mapping landscape-scale linkages, all groupings of natural features that have a combined area of ≥50 hectares. To account for linkages to adjacent municipalities, core areas are identified not only within the municipal boundaries of Kingston but are also inclusive of all grouping of natural features meeting the above criteria within 500 m of the municipal boundary.

8.12. Specific Areas to Kingston

8.12.1. Snake and Salmon Islands

Continued inclusion of these islands in the Natural Heritage System is recommended as they are culturally and ecologically important to the City. These islands may be important for colonial nesting birds, and the near-shore area for spawning fish, particularly Lake Trout.

8.12.1.1. Mapping Methodology

Snake and Salmon Island were digitized using Nearmap's orthoimagery (leaf-on imagery, August 29, 2024).

9. Other Considerations

9.1. Enhancement Areas

Enhancement Areas provide an opportunity to identify lands that have been restored or have the potential to be restored to a natural state. While not a required component of a natural heritage system, enhancement areas can be an important part of maintaining and improving the health and integrity of natural features and ecological functions.

A discussion of Enhancement Areas is provided in Section 5.9. Additional considerations relative to the identification of this feature within the City's Natural Heritage System are provided below.

The PPS directs that features and systems should be “restored” or “where possible, improved.” Furthermore, the definition of Natural Heritage System in the PPS states that a natural heritage system can include “lands that have been restored or have the potential to be restored to a natural state” As such, identifying or providing direction on enhancements is consistent with the PPS. Further, it is good natural heritage planning practice to identify or provide direction for enhancements to support goals and targets for robust and healthy natural systems (e.g., habitat diversity), and to address existing issues (e.g., shoreline erosion and water quality).

Enhancement Areas can include lands that may be without obvious natural heritage features and include areas such as agricultural land and successional habitat (e.g. meadows, thickets, etc.). Enhancement areas contribute to the Natural Heritage System by protecting and restoring critical ecological functions such as, ecological connectivity among natural area patches, surface water catchment areas for wetlands, minimum core area thresholds and improved core area shape that reduce edge effect and enlarge interior habitat.

Enhancement Areas are regarded as necessary components of a robust Natural Heritage System, as such have been identified in the Natural Heritage System by many municipalities in their OPs. However, enhancement areas are not consistently defined or mapped in the same way across municipal Ops and there is a lack of criteria for the identification and delineation of enhancement areas in the Natural Heritage System. Often, the identification of enhancement areas will vary depending on the level of urbanization and extent of natural features and will also differ between rural and urban areas.

The City of Guelph’s OP (2022) identifies restoration areas on a Schedule and directs through policies if/how/when restoration of those areas may occur. Niagara Region’s OP (2022) provides clear criteria for the identification of enhancement areas, locational characteristics and differences between settlement and rural areas. However, it does not map enhancement areas as part of the Natural Heritage System, rather directs through policies that opportunities for enhancement areas should be determined through subwatershed studies and/or detailed study (typically associated with development applications). The County of Brant’s OP (2024), through a policy approach, directs enhancements to linkages and woodlands with the objective to improve the ecological resilience and functions of individual features or groups of features, as well as building resiliency to climate change.

What We Heard at the Community Engagement Workshops

- Look for opportunities to enhance forests in areas of lower quality or shallower soil cover.
- There are opportunities to restore and enhance natural areas, particularly along watercourses, by retreating the cultivated edge of fields a few meters to allow natural vegetation to regrow. This would help reduce erosion, decrease nutrient loading, and provide habitat and cover.
- Giving the land to restore itself and how to incorporate generational knowledge into the plantings/long-term goal.
- As part of a site assessment or ecological study, the developer is required to "restore" the EPA at their own expense (e.g., by removing invasive species). There are concerns about developers being responsible for implementing stewardship at their own cost.

Recommended Approach

Enhancement areas will not be identified as a component of the Natural Heritage System, instead, policies of the OP will provide recommendations to encourage ecological restoration, including as part of site-specific plans and site plan applications. Recommendations on policies will be addressed through the Natural Heritage Study.

9.2. Buffers to Natural Features and Areas

The City's current OP defines buffers to natural heritage features and areas, as a "width of land in which development or site alteration is limited or prohibited in order to protect the natural heritage feature or area or its ecological function from negative impacts".

A detailed discussion of Buffers is provided in Section 5.10. As described in that section, buffers are typically vegetated, whether through planting or natural regeneration. The vegetation within buffers enhances the function of the buffer to mitigate impacts to the feature and therefore, is not intended to treated as part of the natural feature. The purpose of a buffer is specifically intended to protect the natural heritage feature and associated ecological functions by mitigating impacts of a proposed development, change in adjacent land use, or site alteration.

In land use planning, it is recognized that development adjacent to regulated features, such as wetlands and watercourses, should be setback a defined distance to minimize impacts. A setback, by definition, refers to a measured separation from the edge of a feature and area, intended to protect people and property from natural hazards and provide access for maintenance, which are functions that make setbacks a key component of regulations under the Conservation Authorities Act. While the terms setback and buffer are sometimes used interchangeably, a setback is a planning tool focused on establishing minimum separation distances from features or lot lines and is not inherently based on ecological criteria, though it may encompass or coincide with ecological buffers.

Unlike setbacks, which are typically standardized distances defined in zoning or planning documents, buffers are variable and determined based on the specific ecological characteristics and sensitivities of a given natural feature and the degree of impacts anticipated from the adjacent land use / development. As such, where new development is proposed, the width of the buffer and activities that may be permitted within it should be based on the sensitivity and significance of the natural heritage feature and their contribution to the long-term ecological functions of the overall Natural Heritage System. Identifying an appropriate ecological buffer width requires detailed information and technical study to provide sufficient site-specific detail to undertake risk and science-based analysis. Nevertheless, determination of buffers should occur at the earlier possible stage in the development process and be considered at the largest possible scale. Buffers and widths are typically determined through an ecologically and/or hydrologically-based study (e.g., Subwatershed Study, Environmental Impact Study, or other similar study) at the time of a development application and/or Secondary Plan.

What We Heard at the Community Engagement Workshops

- Setbacks should be consistent with provincial standards.

Recommended Approach

It is recommended that buffers not be pre-mapped, but rather determined through an Subwatershed Study, Environmental Impact Study, or other similar study, determined in accordance with guidelines established by the City, which ensures that their extent is based on site-specific conditions, ecological sensitivities, and the potential impacts of the proposed development on the surrounding natural features.

9.2.1. Buffers

9.2.1.1. Recommended Definition

It is recommended that the following definition is included in the new OP: “Buffer means an area of land located adjacent to natural heritage features and areas, wetlands and watercourses and usually bordering lands that are subject to development or site alteration. The purpose of a buffer is to protect the features and areas and their ecological functions by mitigating impacts of the proposed development or site alteration. The extent of the buffer shall be based on the sensitivity and significance of the feature and area and their contribution to the long-term ecological functions of Natural Heritage System as determined through a Subwatershed Study, Environmental Impact Study, or similar studies that examine a sufficiently large area. The buffer shall consist of natural self-sustaining vegetation as a condition of development.”

10. Draft Natural Heritage System Mapping

10.1. Proposed Components Summary of the City of Kingston’s Natural Heritage System

The natural heritage features and areas listed below have been mapped in the draft Natural Heritage System mapping as described in Section 8.

- Significant Wetlands – Section 8.2.1
- Significant Coastal Wetlands – Section 8.2.2
- Significant Woodlands – Section 8.1.3
- Significant Valleylands – Section 8.3
- Significant Areas of Natural and Scientific Interest – Section 8.7
- Fish Habitat (proxy – waterbodies and watercourse) – Section 8.5
- Surface Water Features – Section 8.8
- Coastal Wetlands – Section 8.2.2
- Locally Significant Wetlands – Section 8.2.3
- Unevaluated Wetlands – Section 8.2.3
- Contributory Woodlands – Section 8.13
- Other Treed Areas – Section 8.13

- Linkages (landscape scale linkages) – Section 8.11
- Alvars – Section 8.10.2
- Snake and Salmon Islands – Section 8.12.1

As discussed in Section 8, the natural heritage features and areas mapped in the draft Natural Heritage System are based on the best geographically available data and are consistent with the definitions and mapping criteria outlined in that section. The boundaries of the City's Natural Heritage System may need to be confirmed through a site-specific study (e.g., an Environmental Impact Study) at the time of a development application and any future boundary adjustments areas should be consistent with the definitions and mapping criteria in Section 8 of this report and with municipal and provincial guidance as discussed in Section 2.

Although not currently mapped as part of the draft Natural Heritage System, the natural heritage features and areas listed below are identified as unmapped components of the City's Natural Heritage System.

- Significant Wildlife Habitat – Section 8.4
- Habitat for Threatened and Endangered Species– Section 8.6
- Linkages (site-specific linkages) – Section 8.11
- Riparian Corridors – Section 8.9

These natural heritage features and areas will be protected through policies in accordance with the PPS and policy recommendations made through the Natural Heritage Study, which is the next phase of this project. The assessment and confirmation of these unmapped natural heritage features and areas should be conducted through a site-specific study (e.g., an Environmental Impact Study) at the time of development applications. Addressing these unmapped components through policies is a strategy adopted by other municipalities, as observed in the jurisdictional scan (Table 20, Appendix A), due to the limited and inconsistent availability of existing geographical data. In the case of site-scale linkages, this assessment should be conducted at the time of a development application to account for the working landscape and existing development. The evaluation of these unmapped natural heritage features and areas should be consistent with the definitions and mapping criteria in Section 8 of this report and with municipal and provincial guidance as discussed in Section 2.

The draft Natural Heritage System is illustrated as shown on Figure 3 - Draft Natural Heritage System Mapping. The draft Natural Heritage System mapping incorporates existing development approvals as discussed in Section 10.2. It is recommended that, through the Natural Heritage Study, policy recommendations include the opportunity for the mapping to be refined through an Environmental Impact Study, subject to approval from the City, at the time of submission of a Planning Act application. This would provide an opportunity to confirm the boundaries of key natural heritage features and to conduct a detailed assessment of these features at a site-specific scale at the time of application

10.2. Recognition of Existing Development Approvals

A review was conducted of the draft Natural Heritage System mapping in relation to recent development application approvals, City-owned lands and Ontario Land Tribunal (OLT) decisions to identify areas where the boundaries of natural heritage features and areas may have been refined through approved Environmental Impact Studies, ensuring that any mapping conflicts were addressed. This review considered development applications and OLT decisions from the 2019 until early 2025 timeframe, as well as earlier area approvals within the Cataraqui West Secondary Plan, dating back to 2007. In total, 4 development applications, 1 OLT decision, 1 Secondary Plan Area and 3 City-Owned lands were reviewed.

In some instances, the draft mapping required refinements to the draft NHS mapping (e.g. boundary adjustments, removals) while in others, it successfully aligned with boundaries that did not conflict with more recent development approvals. Details of these mapping refinements have been documented within the GIS attribute tables for each natural heritage feature class that underwent refinement.

The City is currently reviewing 8 development applications seeking expansions to the urban boundary. As those properties are under current review, a labeled has been included on Figure 3 for these properties as “Subject to an Urban Boundary Expansion Application.

10.3. Summary of the Comparison of the Draft Natural Heritage System mapping to the CCRNHS 2006 / Current City’s Natural Heritage System

A comparison of definitions and mapping criteria was conducted between the draft Natural Heritage System mapping and the CCRNHS 2006 / Current City’s Natural Heritage System. The results are summarized in Table 21, Appendix B (which will be made available upon request for accessibility reasons). Figure 3 shows the proposed Draft Natural Heritage System mapping and Figure 4 shows the Natural Heritage System Mapping as identified in the City’s current OP.

In Table 21 and Section 8, where recommended revisions to the definitions and mapping criteria for key natural heritage features and areas are identified, explanations for the proposed revisions are provided. The recommendation for revisions is primarily a result of updated definitions in the PPS and changes to the mapping criteria to align with provincial guidance (e.g., NHRM).

Table 18 provides a comparison of the area calculations for the current Natural heritage System and draft Natural Heritage System. To illustrate the outcome of these revisions, Table 19 provides a comparison of certain natural heritage features from the current and draft Natural Heritage System. It is important to recall when reviewing these statistics that the mapping criteria and methodology in both systems are different due to updated definitions and mapping criteria and available data as described in Table 21 and Section 8. Further, not all natural heritage features and areas from the current and draft Natural Heritage System can be compared due to differences in mapping methodology (e.g., how linkages are mapped as polygons in the draft Natural Heritage System and as linear lines in the current Natural Heritage System, making area calculation impossible), as well as the addition of natural heritage

features (e.g., Alvars) to the draft Natural Heritage System mapping. The same limitation applies to the comparison of the overall total area between the current and draft Natural Heritage Systems in Table 18, as differences in mapping methodology, available data, and the addition of new natural heritage features (e.g., Alvars) have influenced the results. It may also appear that the area coverage for each component in Table 18 exceeds the total area coverage for the entire Natural Heritage System in Table 19. This is since many natural heritage features overlap with each other; for example, a significant wetland may overlap with significant woodland due to their feature characteristics and ecological functions.

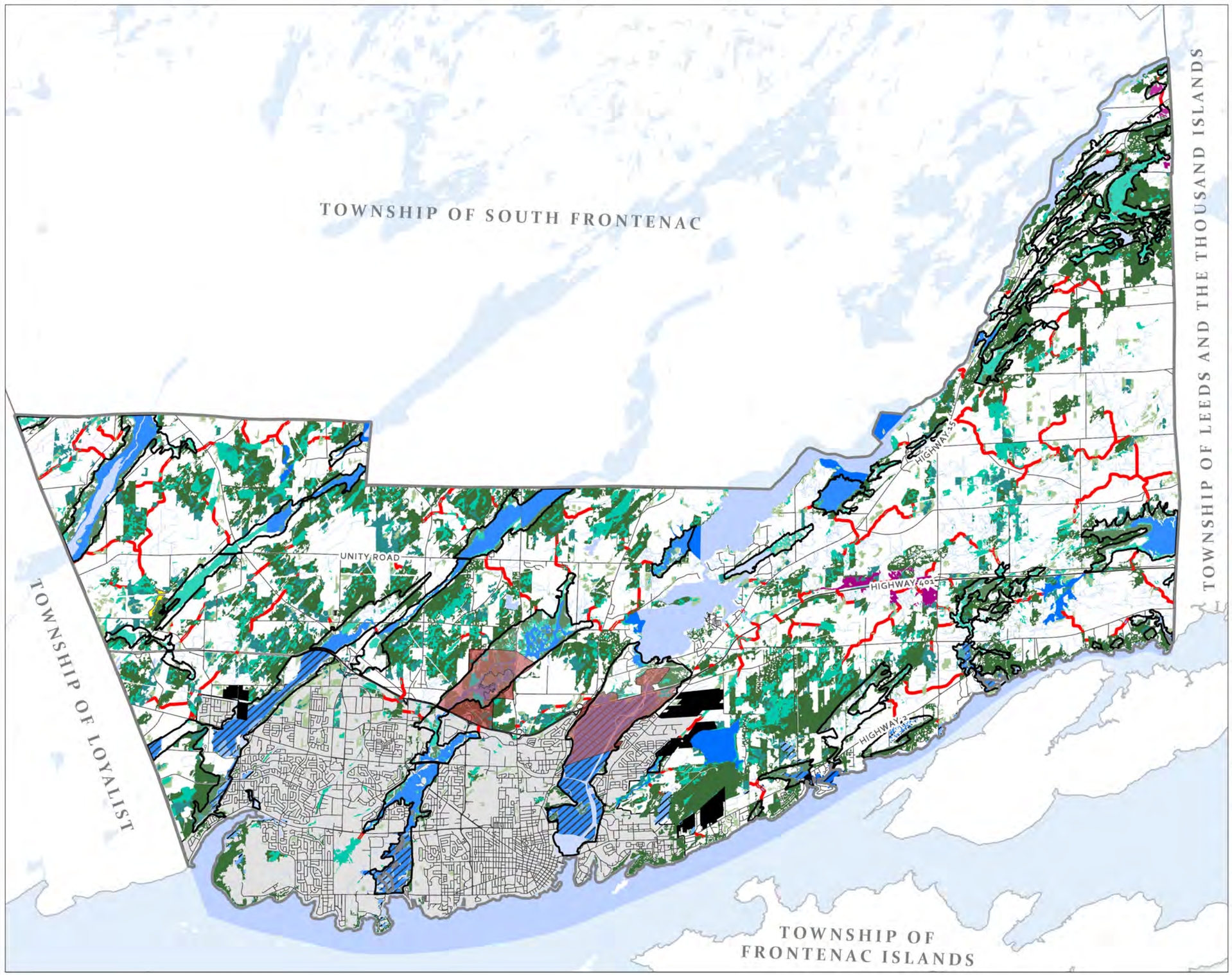

Figure 3 | City of Kingston
Draft Natural Heritage System Mapping

Legend

- City of Kingston
- Subject to an Urban Boundary Expansion Application. To Be Determined
- Urban Area Boundary
- Landscape-scale Linkages

Woodlands and Treed Areas

- Significant Woodland
- Contributory Woodland
- Other Treed Areas

Wetlands

- Significant Wetland
- Significant Coastal Wetland
- Coastal Wetland
- Locally Significant Wetland
- Unevaluated Wetland

Other NHS Features

- Area of Natural and Scientific Interest
- Significant Valleylands
- Waterbody
- Alvar

The mapping may be refined through an environmental impact study subject to acceptance by the City, at the development of a Planning Act applications

0 2 4 6 8 Kilometers

Project Number	Date:	N
24-1473	2025-06-20	

north-south ENVIRONMENTAL

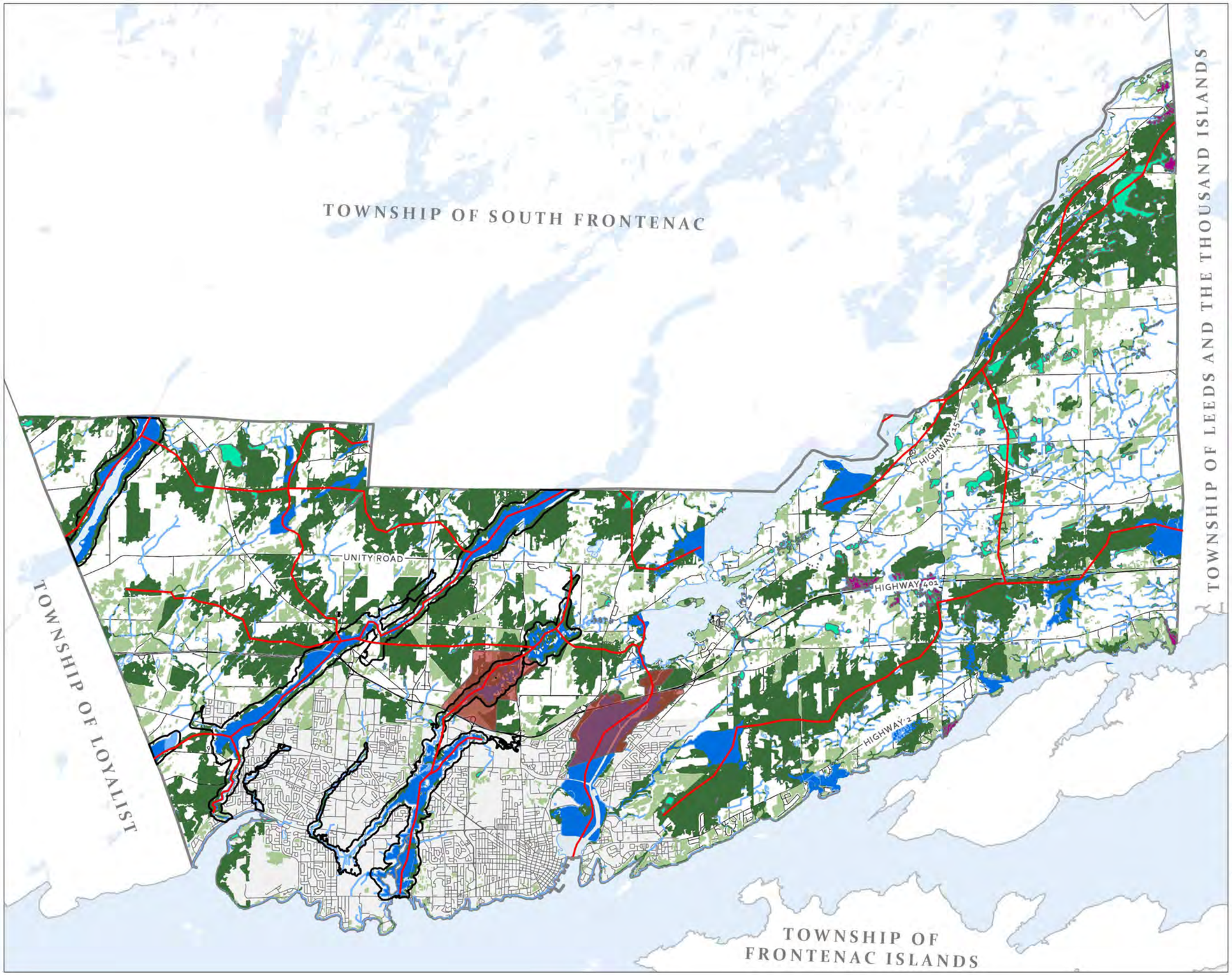

Figure 4 | City of Kingston

Current Natural Heritage System as mapped in the City's Official Plan

Legend

- City of Kingston
- Urban Area Boundary
- Linkage

Woodlands

- Significant Woodland
- Contributory Woodland

Wetlands

- Locally Significant Wetland
- Provincially Significant Wetland
- Unevaluated Wetland

Other NHS Features

- Area of Natural and Scientific Interest
- Valleyland
- Riparian Corridor

0 2 4 6 8 Kilometers

Project Number	Date:	N
24-1473	2025-07-02	

north-south ENVIRONMENTAL

Table 18 - City of Kingston. Comparison of the Current Natural Heritage System and the Draft Natural Heritage System

Area Calculation	CCRNHS 2006 / Current City's Natural Heritage System (2006) Schedules 7 and 8	Draft Natural Heritage System (2025)
Kingston	21,627 hectares	21,227 hectares

Table 19 - City of Kingston Comparison of Select Natural Heritage Features

	CCRNHS 2006 / Current City's Natural Heritage System (2006) Schedules 7 and 8	Draft Natural Heritage System (2025)
Significant Woodlands	11,994 hectares	10,820 hectares
Contributory Woodlands/Other Treed Areas	3,766 hectares	2,737 hectares
ANSI	899 hectares	894 hectares
Wetlands	3,107 hectares	5,605 hectares
Significant Valleylands	2,784 hectares	6,754 hectares

10.3.1. Woodlands

The difference in hectares for Significant Woodlands and Contributory Woodlands/Other Area Treed Areas from the current and draft Natural Heritage System mapping are identified in Table 19. This difference can be attributed to updated definition and mapping criteria for Woodlands (refer to Section 8.1.1 of the report) as well as more detailed mapping methodology for woodlands, created using LiDAR-derived products sourced from the Ontario Geohub (Eastern Ontario 2021-22 LiDAR Package) and refined with Nearmap's orthoimagery (leaf-on imagery from August 29, 2024, and leaf-off imagery from April 25, 2023). The high accuracy of the woodlands layer has facilitated greater precision in mapping all spatially adjacent or coincident features (e.g., waterbodies, watercourses), resulting in a more spatially accurate system.

The change in area for Significant Woodlands mapping, as described in Section 8.1.3, was a result of mapping criteria that was updated to be consistent to with NHRM based on current woodlands statistics provided in Table 19 as well as more accurate boundary delineation of woodland limits. There is also a difference in the area statistics for Contributory Woodlands and Other Treed Areas between the current and draft Natural Heritage Systems, due to several factors, including updated mapping criteria and methodology, the accuracy of the mapping, and new development since the CCRNHS 2006 report was completed.

10.3.2. ANSI

The difference in hectares for ANSI highlighted in Table 19 between the current and draft Natural Heritage System is a result of ANSI mapping updates in the Province's LIO database.

10.3.3. Wetlands

Table 19 highlights a difference in hectares for wetlands from the current and draft Natural Heritage System mapping. This difference can be contributed to wetlands mapping updates in the Province's LIO database, refinement of coastal wetlands, locally significant wetlands and unevaluated wetlands mapping to have more accurate mapping based on the methodology described in Section 8.2.4 and new development since the CCRNHS 2006 report was completed.

10.3.4. Significant Valleylands

The difference in hectares for Significant Valleylands is a result of updated mapping criteria consistent with the NHRM and revised mapping methodology revised to reflect a more accurate delineation Significant Valleylands in the City.

11. Overview of Next Steps

This Technical Report and the draft mapping of the Natural Heritage System has been made available for public consultation. The public consultation will include an Open House to allow an opportunity to view the materials and ask questions to City staff and the project team. Following the Open House, updates may be completed to the Natural Heritage System mapping based on feedback received through the public engagement.

The next phase of the project is the preparation of a Natural Heritage Study. The Natural Heritage Study will develop and summarize policy recommendations that will include clear and concise language relating to supporting the natural heritage objectives of the OP, including the protection and enhancement of natural heritage features. The Natural Heritage Study report will be made available for public consultation once completed.

12. Acronym Glossary

ANSI	Area of Natural and Scientific Interest
CCRNHS	Central Cataraqui Regional Natural Heritage Study
CWA	Clean Water Act (2006)
DTM	Digital Terrain Model
DSM	Digital Surface Model
EIS	Environmental Impact Study
ESA	Endangered Species Act (2007)
HDF	Headwater Drainage Feature
LIO	Land Information Ontario
NHIC	Natural Heritage Information Centre
NHRM	Natural Heritage Reference Manual (2010)
OLT	Ontario Land Tribunal
OMNRF	Ontario Ministry of Natural Resources and Forestry
OP	Official Plan
OWES	Ontario Wetland Evaluation System (2023)
PPS	Provincial Planning Statement (2024)
PSW	Provincially Significant Wetland
SAR	Species At Risk
SWH	Significant Wildlife Habitat
SWHTG	Significant Wildlife Habitat Technical Guide

13. Glossary of Terms

Natural heritage features and areas: Features and areas, including significant wetlands, significant coastal wetlands, other coastal wetlands in Ecoregions 5E, 6E and 7E, fish habitat, significant woodlands and significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River), habitat of endangered species and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest, which are important for their environmental and social values as a legacy of the natural landscapes of an area. (PPS 2024)

Natural Heritage System: 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. 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. The Province has a recommended approach for identifying natural heritage systems, but municipal approaches that achieve or exceed the same objective may also be used. (PPS 2024)

Settlement areas: Urban areas and rural settlement areas within municipalities (such as cities, towns, villages and hamlets). Ontario's *settlement areas* vary significantly in terms of size, density, population, economic activity, diversity and intensity of land uses, service levels, and types of infrastructure available.

Settlement areas are:

a) built-up areas where development is concentrated and which have a mix of land uses; and

b) lands which have been designated in an official plan for development over the long term. (PPS. 2024)

Watershed planning: Planning that provides a framework for establishing comprehensive and integrated goals, objectives, and direction for the protection, enhancement, or restoration of water resources, including the quality and quantity of water, within a watershed and for the assessment of cumulative, cross-jurisdictional, and cross-watershed impacts. Watershed planning evaluates and considers the impacts of a changing climate on water resource systems and is undertaken at many scales. It may inform the identification of water resource systems. (PPS 2024)

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APPENDIX A | Jurisdictional Scan of Municipal Official Plans

APPENDIX B | Review of City of Kingston's Criteria for Natural Heritage Features and Areas

APPENDIX C | Community Engagement Workshops Summary of Comments

Natural Heritage Study – Community Workshop Summaries

City staff and North-South Environmental facilitated three in-person and virtual Community Workshops to receive early thoughts from the community on natural heritage features and conservation. The workshops were targeted toward different audiences to capture a range of opinions. Each of the workshops started with the same presentation to share information about the project, scope of work, methodology and project timelines before transitioning into facilitated small-group discussions. The workshops were held:

- Development Community
    - February 19, 2025 1pm – 3 pm, virtually through Zoom
    - Approximately 10 participants
- Environmental, Rural and Agricultural Communities
    - February 19, 2025 6pm – 8pm at Glenburnie Firehall
    - Approximately 20 participants
- Indigenous Community
    - February 24, 2025 12pm – 2pm, virtually through Zoom
    - Approximately 25 participants

Comments received during the workshops have been consolidated and summarized into the following themes:

- **Environmental Protection and Conservation**
    - Existing woodlands mapping (Significant and Contributory) is inaccurate and based on outdated criteria and needs to be updated.
    - If the City wants areas conserved as part of a development application, the City should take ownership of the land rather than expecting future owners to protect the feature.
    - Through the new Official Plan project “YG200K”, the City can increase environmental protection and conservation through clear and measurable policies, supported by accurate mapping. The policies should clearly define when an Environmental Impact Statement would be required and what it should contain.
    - A range of opinions were received on the scope of protection the City should pursue within the Natural Heritage Study and the subsequent environmental policies within the new Official Plan. Some participants indicated the provincial minimums were sufficient, while other participants indicated the City should exceed provincial minimums and protect various additional features important within the local context.
    - Turtles need to be considered explicitly within the NHS, similar to how Fish Habitat is identified within the current list of natural heritage features within the Official Plan.
    - Trees and woodlands within the urban area, and the area considered for urban expansion, need greater protection from development activities.
- **Ecological Connectivity and Green Corridors**

- The existing corridors and linkages shown on Schedule 8 of the Official Plan are appropriately located. However, there should be a clear policy around when and how they are to be implemented.
- Corridors and linkages between natural features are more important than ever. There are opportunities to create more green corridors throughout the city (beyond what is currently shown on Schedule 8 of the Official Plan) by including them in development applications. For corridors to be effective, they need to be designed for the species that will use them. Some participants felt that land for future corridors should be considered as part of, rather than in addition to, parkland dedication.
- Wildlife connections have been incorporated into a few recent infrastructure projects and development applications, which is supported and should continue in the future.
- There is an opportunity to improve biodiversity within the urban area by redesigning outdoor residential spaces and eliminating the traditional lawn.

- **Human Connections and Use of Natural Spaces**
  - It is difficult to keep 'natural spaces' natural, as people often disturb these lands, especially those adjacent to development applications. However, there are opportunities to co-locate passive recreation uses within corridors and adjacent lands, provided they are well-designed and located sensitively.
  - The new Official Plan needs to balance human and natural elements together, with equal importance, as we need the natural ecosystems to survive.
  - It is difficult to re-establish natural features and landscapes as it is harder to add back than it is to remove. Natural features have a diversity that is very difficult to replicate.
  - Balancing growth with environmental protection is difficult. The additional height and density associated with infill and intensification projects is often beneficial, but these forms of development can also exacerbate the disconnection between people and the land. People need to have access to natural, unmanicured spaces to maintain a connection to the natural world.
- **Managing Growth**
  - Development pressure on natural heritage features within the urban boundary will increase without an expansion to the urban boundary.
  - An expansion to the urban boundary will increase development pressure on natural heritage features currently within the rural area, especially those in proximity to Butternut Creek, Collins Creek and along Hwy 2.
  - Developers are often asked to undertake restoration or enhancement of natural heritage features as part of development applications, which can add significant costs.
  - The current approach to development seeks to remove everything from the land so that the grade can be adjusted. A limited number of trees are replanted within the municipal road allowance, but typically in conditions that do not facilitate long-term growth. Moving forward, development should protect and conserve existing linkages and features (hedgerows, fence lines, small woodlands, etc.), rather than removing and trying to replace them afterwards.

    - Environmental Impact Statements submitted in support of development applications and the associated City-review, need to be more thorough. It is too easy to rationalize the removal of a natural feature from the landscape to support development applications. The City needs to be firmer in the review of these studies to offer greater protection for existing features.
    - The City should facilitate conversations between adjacent property owners interested in development so that broader connections and linkages can be planned and implemented.
    - The City should review the parkland dedication policies to accept natural heritage features in more situations, such as if there is an opportunity to include pathways. This may help conserve more natural areas from development.
- **Integrating Agriculture and Natural Heritage**
    - Corridors and protections along watercourses seem to be getting smaller and more relaxed for development applications. However, protection for those same features seems to be getting greater and more restrictive for agricultural and rural uses.
    - Rural and agricultural landowners often have a good sense of environmental protection and associated benefits. However, there need to be programs to incentivize and compensate property owners for their conservation actions.
    - There are different soil types and growing conditions in different parts of the city. Residential growth should be directed to the least arable soils in proximity to existing services that could be extended to preserve the higher capacity soils for agricultural uses and establishing linkages.
    - It is recognized that clearcutting woodlands to create or expand fields has long been a ‘normal farm practice’; however, there was concern among some participants that the activities are often related to future development interests rather than agricultural activities.
    - Farmers can be some of the best stewards of the land. However, compensation may be required to conserve certain natural features if the land could otherwise be more productive.
    - There are thought to be opportunities to incorporate restoration and enhancement of natural areas into agricultural practices, such as along watercourses by shifting the cultivated edge of a field back a few metres and allowing natural vegetation to regrow or allowing wet, unproductive portions of fields to form into wetland or grassland habitats. Some participants suggested this would be made stronger through by-law protection, other participants highlighted the existing level of regulation on agricultural activities.
    - The agricultural community should help reinforce the ecosystem services that natural heritage features provide to the community, as these services also benefit the agricultural community.
- **Cultural and Indigenous Perspectives**
    - Belle Island is a culturally important area and contains important habitat for birds, turtles, deer and significant woodlands. Similarly, the broader shoreline along Lake Ontario, including Lemoine’s Point, was also recognized as being culturally important.

- Wetlands and riparian areas along shorelines often contain culturally significant species and resources and should be protected from development and alteration.
- There is a need to consider the long-term implications of our actions – not just one generation, but seven generations from now.
- The land is a living entity and not just a resource for our use. Land should be respected by not taking more than you need and using everything that you take.
- With proper stewardship and time, the land will regenerate itself – but we need to be patient and protect space for that to occur.
- Ecosystems are complex, often more complex than we understand, and do not follow municipal or political boundaries