

Credit Valley Conservation
Natural Heritage System Strategy
Phase 4



Credit River Watershed Natural Heritage System
Recommendations for Implementation
Final Report, September 2015





Credit River Watershed Natural Heritage System Strategy

Phase 4: Recommendations for Implementation

**Credit Valley Conservation
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September 2015

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Resolution #59/15: Approval of CVC Natural Heritage System Strategy

Date: October 16, 2015

Moved by: Bob Inglis
Seconded by: Don MacIver

***THAT** the report entitled, "CVC Natural Heritage System Strategy – Phases 1-4" be received and appended to the minutes of this meeting as Schedule 'C'; and*

***THAT** the CVC Natural Heritage System Strategy (herein 'the strategy') be approved; and*

***THAT** staff make council presentations, develop materials, and offer conduct workshops or information sessions to inform provincial ministries, municipal staff and stakeholders about the strategy tools and science to assist in land use planning in an advisory capacity; and*

***THAT** staff be directed to promote the use of the science and tools in the strategy to local and regional municipalities as appropriate to assist them in developing, refining or defending systems to achieve local natural heritage protection and restoration goals in their official plans and to provide support as requested to interpret or apply the strategy in development review/official plans and site specific plans; and*

***THAT** staff use the strategy for CVC activities including watershed and subwatershed planning, land planning and securement, environmental management, restoration, stewardship and education; and further*

***THAT** staff monitor and periodically report on progress toward achieving the natural cover targets for the CRWNHS, and continue research and monitoring to provide leadership in advancing the science in sustainable ecosystem management.*

CARRIED

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Ministry of Natural Resources and Forestry
Ministry of Municipal Affairs and Housing
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Region of Peel
County of Dufferin
County of Wellington
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List of Acronyms

CRFMP	Credit River Fisheries Management Plan
CRWMSU	Credit River Water Management Strategy Update
CVC	Credit Valley Conservation
EIS	Environmental Impact Study
ESGRA	Ecologically Significant Groundwater Recharge Area
GIS	Geographic Information System
HGRA	High Groundwater Recharge Area
IWMP	Integrated Watershed Monitoring Program
IWRS	Integrated Watershed Restoration Strategy
LID	Low Impact Development
LOISS	Lake Ontario Integrated Shoreline Strategy
MGRA	Medium Groundwater Recharge Area
MMAH	Ontario Ministry of Municipal Affairs and Housing
MNRF	Ministry of Natural Resources and Forestry (formerly OMNR)
MOECC	Ministry of the Environment and Climate Change (formerly MOE)
NAI	Natural Areas Inventory
NHEMS	Natural Heritage and Environmental Management Strategy (Brampton)
NHS	Natural Heritage System
NHUFSS	Natural Heritage and Urban Forest Strategy (Mississauga)
OHT	Ontario Heritage Trust
PPS	Provincial Policy Statement
SGRA	Significant Groundwater Recharge Area
SWM	Stormwater Management Pond
TRCA	Toronto and Region Conservation Authority

Executive Summary

The Credit Valley Conservation (CVC) Natural Heritage System Strategy has four phases:

- **Phase 1:** Characterize and assess existing conditions for the watershed with a Landscape Scale Analysis based on existing terrestrial and hydrologic data. Use this analysis to assess and rank existing natural cover in terms of its watershed importance.
- **Phase 2:** Gather data and conduct research as needed to develop a natural heritage system that integrates aquatic and terrestrial functions. Consult with stakeholders on Phase 1 and 2.
- **Phase 3:** Develop methodology for identifying a Credit River Watershed Natural Heritage System (CRWNHS, abbreviated to NHS) integrating terrestrial and aquatic components. Prepare data layers for input into the NHS. Conduct quality assurance and quality control on data prior to mapping. Ensure that the NHS captures the best of CVC's existing natural cover and adds other lands strategically to improve connectivity and resilience. Incorporate climate change science where possible in the natural heritage system design. Consult with stakeholders and conduct technical peer review of NHS methodology.
- **Phase 4:** Develop recommendations for implementation of the NHS including consideration of stakeholder comments through consultation. Present the Strategy to the CVC Board of Directors for approval.
- **Ongoing after Phase 4:** Implement the NHS in official plans by engaging municipal partners, plan input and plan review. Use the NHS to highlight the watershed importance of existing natural heritage features being protected by municipalities. Provide information to assist in updating existing natural heritage system protection strategies within the context of watershed health. Implement the CVC Natural Heritage System Strategy through CVC watershed management programs such as the Greenlands Securement Strategy and the Integrated Watershed Restoration Strategy; through restoration, stewardship, and education activities with interested landowners; through continued inventory or monitoring of important watershed features and functions; and through CVC's advisory role in municipal natural heritage planning. Monitor and refine the NHS at appropriate time intervals, and update as required to integrate with provincial policies, official plans, and new science.

This report represents the completion of Phase 4 of the strategy and provides recommendations for implementing the NHS through CVC projects, programs and partnerships.

This report does not provide policies for implementation of the NHS but outlines actions to guide CVC in protection, enhancement and restoration of the NHS in the short to long term in the following areas:

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- Development of planning and policy tools and partnerships to guide CVC's plan input and plan review and to support municipal natural heritage systems and future systems planning;
- Integration with existing land and water management initiatives and future work to build NHS resilience;
- Inventory and monitoring to ensure accuracy and currency of data provided to partners and track system implementation;
- Applied research to address emerging issues and improve understanding of NHS functioning; and
- Restoration, stewardship and education to engage landowners and residents of the watershed and encourage actions to benefit the NHS.

The strategy is developed with the recognition that all of us ultimately share responsibility for implementing the CVC Natural Heritage System Strategy for the benefit of current and future generations.

1.0 INTRODUCTION

The Credit Valley Conservation (CVC) Natural Heritage System Strategy consists of four phases (following the Terms of Reference for the project outlined in CVC 2006):

- **Phase 1:** Review literature and relevant natural heritage models. Establish Technical and Municipal Advisory Committees. Characterize and assess existing conditions in the watershed in GIS, based on existing terrestrial and hydrologic data. Use this Landscape Scale Analysis to assess and rank existing natural cover in terms of its watershed importance in sustaining ecosystem function.
- **Phase 2:** Gather data and conduct research as needed to develop a natural heritage system that integrates aquatic and terrestrial functions. Communicate analysis of existing features and functions (results of Phase 1 and Phase 2) to stakeholders and invite stakeholder input. The results of Phase 1 and 2 are detailed in *Towards a Natural Heritage System for the Credit River Watershed. Phases 1 & 2: Watershed characterization and Landscape Scale Analysis* (CVC 2011).
- **Phase 3:** Develop methodology for identifying a Credit River Watershed Natural Heritage System (CRWNHS, abbreviated to NHS) integrating terrestrial and aquatic components. Prepare data layers for input into the NHS. Conduct quality assurance and quality control on data prior to mapping. Ensure that the NHS captures the best of CVC's existing natural cover and adds other lands strategically to improve connectivity and resilience. Incorporate climate change science where possible in the NHS design. Consult with stakeholders and conduct technical peer review of NHS methodology. The results of Phase 3 are detailed in *Credit Valley Conservation Natural Heritage System Strategy, Phase 3: Credit River Watershed Natural Heritage System. Final Technical Report, September 2015* (CVC 2015a).
- **Phase 4:** Develop recommendations for implementation of the NHS including consideration of stakeholder comments through consultation. Present the Strategy to the CVC Board of Directors for approval. This report represents Phase 4 of the Strategy.
- **Ongoing after Phase 4:** Implement the NHS in official plans by engaging municipal partners, plan input and plan review. Use the NHS to highlight the watershed importance of existing natural heritage features being protected by municipalities. Provide information to assist in updating existing natural heritage system protection strategies within the context of watershed health. Implement the CVC Natural Heritage System Strategy through CVC watershed management programs such as the Greenlands Securement Strategy and the Integrated Watershed Restoration Strategy; through restoration, stewardship, and education activities with interested landowners; through continued inventory or monitoring of important watershed features and functions; and through CVC's advisory role in municipal natural heritage planning. Monitor and refine the NHS at appropriate time intervals, and

update as required to integrate with provincial policies, official plans, and new science.

The following chapters of this report provide background on the rationale for development of the Natural Heritage System Strategy; a brief overview of the Credit River Watershed Natural Heritage System and its components; a brief overview of watershed stressors; and recommendations for management of the NHS through projects, programs and partnerships to enable its protection, enhancement and restoration for the long term.

2.0 RATIONALE FOR THE CVC NATURAL HERITAGE SYSTEM STRATEGY

Human health is tightly linked to the health of the natural environment. Healthy ecosystems are adaptable, resilient, self-sustaining, and support diverse native flora and fauna and associated ecological functions. Functions provided by ecosystems include provision of habitat for wildlife and regulation of water, climate, gases, nutrients and disturbance.

Ecosystems are also valued for the services or benefits they provide that are essential for human health and well-being such as flood moderation, water purification, waste and pollutant mitigation, temperature moderation, erosion prevention, soil formation, crop pollination, biological pest control, aesthetics and recreation. Ecosystems also provide goods such as water, food, raw materials, genetic resources, and models for design and engineering (biomimicry).

In 1998 CVC initiated the Natural Heritage Project, with a goal of defining and documenting natural features and functions in the watershed. This project also recognized the importance of systems based planning, in line with the emerging science in landscape ecology as well as direction from the Province indicating that *“the diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible”* (i.e. PPS 1996). In 2002, the Ontario Ministry of Natural Resources (OMNR) and Credit Valley Conservation (CVC) developed a comprehensive plan to protect and enhance the fisheries resource of the Credit River watershed (OMNR and CVC 2002). In 2007, CVC released the Credit River Water Management Strategy Update (CRWMSU) (CVC 2007); this strategy provided clear evidence that ‘business as usual’ development practices would result in continued declines in water quality and quantity across the watershed, and called for adoption of stormwater best management practices, low impact development, and an increase in watershed natural cover to slow or reverse these declines. Through these strategic directions CVC recognized the need to develop a watershed scale natural heritage system to determine the most efficient and effective location for the increased natural cover recommended by the CRWMSU. Together, these strategies are intended to sustain biodiversity and healthy ecological function, to maintain water quality and safeguard water quantity in the watershed, and to ensure continued provision of ecosystem benefits for present and future generations.

Consequently the CVC Board of Directors approved the Terms of Reference for developing a watershed scale Natural Heritage System Strategy through a project that was then termed the Terrestrial Ecosystem Enhancement Model or TEEM. This term has been replaced by more standard terminology and the project is now known as the CVC Natural Heritage System Strategy.

The objective of the Natural Heritage System Strategy is to protect biodiversity and ecosystem functions of the Credit River watershed in perpetuity (CVC 2006), through the development of a Credit River Watershed Natural Heritage System and recommendations for management and implementation of the NHS. The project, in

four phases as described above, builds on the detailed direction for fisheries, aquatic and terrestrial resources provided in previous studies and follows through on recommendations from those studies to increase terrestrial natural cover in strategic locations of the watershed. Through the project, CVC committed to the development of an integrated natural heritage system that would maintain, enhance, and restore both aquatic and terrestrial functions of the watershed.

The CVC Natural Heritage System Strategy implements multiple key goals of CVC's updated Strategic Plan (CVC 2014a) which sets the organization's direction for the next twenty years, namely:

- **Goal 1:** Plan for an environmentally sustainable future.
- **Goal 2:** Safeguard people, property and communities from hazards.
- **Goal 3:** Manage a healthy resilient environment through protection, restoration and enhancement.
- **Goal 6:** Promote land uses, development approaches and infrastructure that factor in the importance of the natural environment to society, the economy and the well-being of residents.

3.0 CONSULTATION PROCESS FOR THE NATURAL HERITAGE SYSTEM STRATEGY

Consultation with a wide range of stakeholders was important in the development of the CVC Natural Heritage System Strategy. The development of the CVC Natural Heritage System Strategy was guided by a core development team of CVC staff and an internal advisory committee of technical experts. A Steering Committee of senior management provided high level guidance. The Technical Advisory Committee consisted of representatives from neighbouring conservation authorities, the Niagara Escarpment Commission, MNRF, the Natural Heritage Information Centre (NHIC), Fisheries and Oceans Canada, Environment Canada, and CVC technical experts. The Municipal Advisory Committee consisted of representatives from each of CVC's member municipalities (upper tier and area municipalities), MNRF (Planning), Infrastructure Ontario, Ministry of Municipal Affairs and Housing (MMAH), and CVC planning staff.

An overview of the consultation process throughout the development of the Natural Heritage System Strategy is presented in Figure 3-1.

Highlights of the consultation process in developing the Credit River Watershed Natural Heritage System include:

- Contacted over 180 unique stakeholder groups and partner agencies, including the development community, agricultural producers, ratepayers groups and environmental organizations.
- Held 10 meetings with the Technical and Municipal Advisory Committees through the development of the Natural Heritage System Strategy.
- Consulted with stakeholders through five stakeholder workshops held in communities throughout the watershed, and one online webinar.
- Solicited independent technical peer review of the Natural Heritage System methodology by three reputable environmental consulting firms, Beacon Environmental Ltd., Dougan and Associates and North-South Environmental Inc.
- Conducted one-on-one meetings with individual stakeholders to seek targeted input and provide information as requested, including agricultural producers, BILD (GTA Building, Industry and Land Development Association), stewardship councils, and community groups.
- Posted natural heritage system methodology and implementation plan on CVC website for 45 day stakeholder consultation period.
- Received input from 70 individuals, representing 45 groups and partner agencies, which were reviewed and incorporated as appropriate in Phases 1-4 of the Natural Heritage System Strategy.

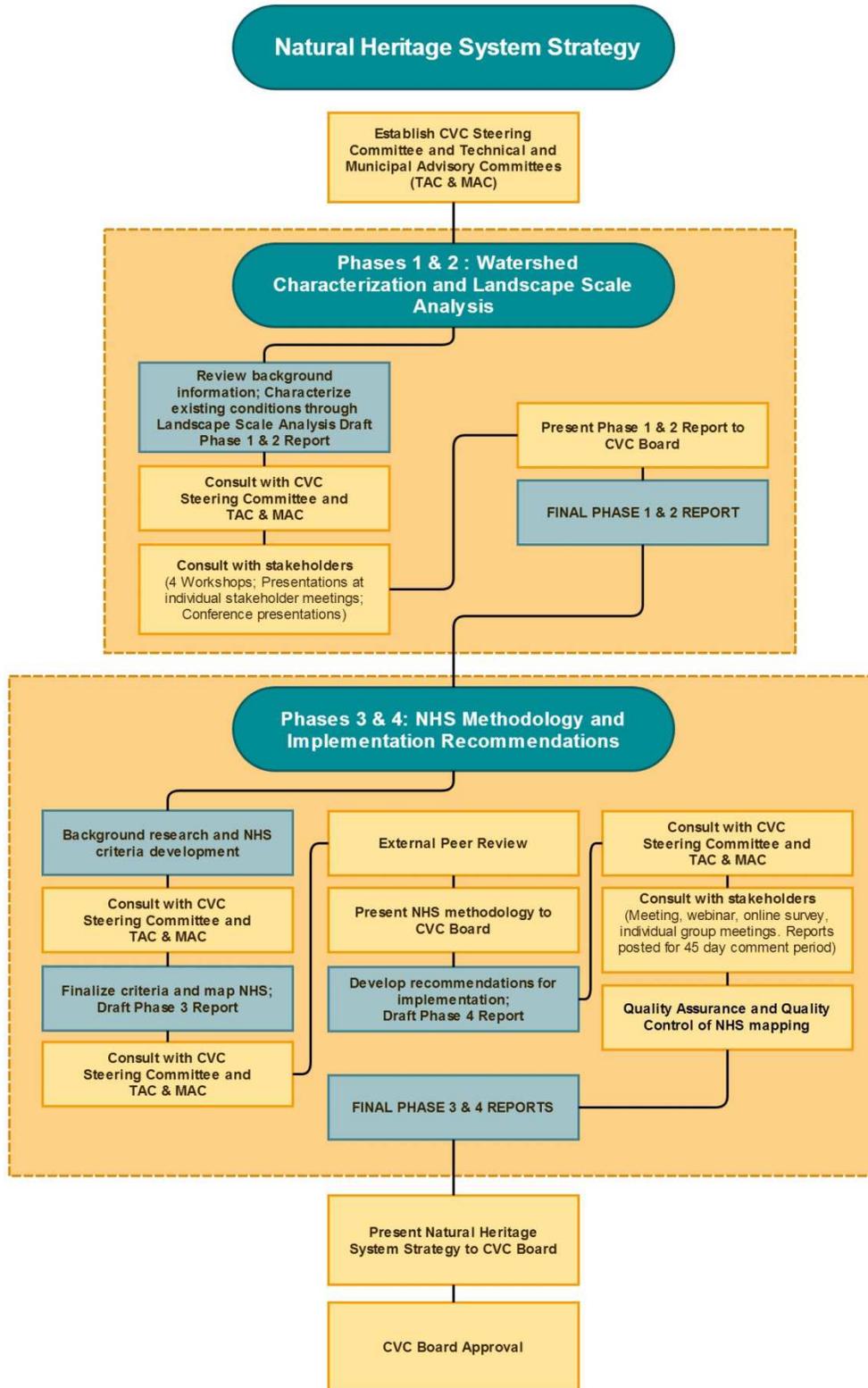


Figure 3-1 Overview of the consultation process undertaken to develop CVC’s Natural Heritage System Strategy

4.0 CREDIT RIVER WATERSHED NATURAL HERITAGE SYSTEM

4.1 What is a natural heritage system?

As defined under the Provincial Policy Statement (PPS), a natural heritage system 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*” (OMMAH 2014).

Lands “with the potential to be restored to a natural state” means lands that currently do not hold natural cover but have the capacity to be restored or rehabilitated to a natural state. Agricultural lands can be “working landscapes” within a natural heritage system that have no or limited natural cover but may provide supporting natural functions such as infiltration, groundwater recharge, and habitat for species movement, feeding, or migration.

A natural heritage system could also include specific urban areas, such as settlements within the floodplain. These typically include historic settlements, such as Glen Williams, Churchville or Huttonville, that fall within the NHS as they are located in a natural heritage feature (i.e. a valleyland). These locations would benefit from management practices to improve ecological function of the natural heritage system, and would also be important areas for enhancement under future redevelopment scenarios.

A watershed is recognized by the province of Ontario as the “*ecologically meaningful scale for integrated and long-term planning*” to protect, improve, or restore the quality and quantity of water; hence CVC has focused on the watershed as the scale for natural heritage system planning. This approach recognizes that the health of individual natural heritage features depends upon their placement within a functioning system.

In heavily human-modified environments such as the Credit River watershed, certain natural features are not large or diverse enough, or lack sufficient connectivity to meet the daily, seasonal and long-term life cycle requirements of species. When species survival is compromised, ecosystem functions within a feature may be impaired or lost. Land use change and climate change result in significant impacts to natural areas and increased human dependence on dwindling natural features and functions. To some extent, a natural heritage system that improves the functioning of natural features through improvements to their size, connectivity, and hydrological

functioning will help mitigate the impacts of current and future land uses within the watershed.

4.2 Use of the NHS

The NHS was developed to cover the CVC jurisdiction including the extent of Lake Ontario under CVC jurisdiction. The NHS is intended to serve multiple purposes:

- Provides an integrated system of terrestrial and aquatic features and functions to enable better management of the watershed's natural resources;
- Enables CVC to provide consistent and efficient plan input and plan review on provincial, regional, or area municipal initiatives as part of its technical advisory role, using a common NHS across the watershed;
- Supports CVC's Strategic Plan and existing watershed management programs such as the Greenlands Securement Strategy, the Credit River Fisheries Management Plan, the Credit River Water Management Strategy, the Lake Ontario Integrated Shoreline Strategy, and current and future programs, including subwatershed studies and a watershed plan; and
- Provides partners, including municipalities and the Province, with a science-based natural heritage system based on ecological and hydrological principles within a watershed ecosystem context, and extensive data. The resulting NHS can be used to help defend and refine existing municipal natural heritage systems, or can be adapted for development of municipal level natural heritage systems in municipalities that currently lack such systems.

The NHS may be used by planning authorities (e.g. regional and area municipalities) and other agencies to emphasize the watershed importance of existing municipally protected natural heritage features. The NHS can also provide information to assist in updating existing natural heritage system protection strategies within the context of watershed health. The NHS is not intended to limit the ability of municipalities to develop their own science-based natural heritage systems using systems approaches within their own land cover and land use context, in collaboration with CVC's watershed approach.

4.3 Components of the NHS

The NHS is a science-based, integrated system based on CVC's extensive natural heritage data and technical expertise (See CVC 2015a for a detailed description of the methodology). The NHS consists of natural heritage features and their buffers, and natural heritage areas (Table 4-1) that are connected and function together as an integrated, dynamic natural heritage system.

4.3.1 Natural Heritage Features

The natural heritage features component includes ecological features in the Credit River watershed that collectively are important for maintenance of biodiversity and ecological function in the watershed. Natural heritage features included in the NHS include valleylands, wetlands, woodlands, aquatic habitat and the Lake Ontario

shoreline, significant wildlife habitat and habitat of endangered species and threatened species. Natural heritage features are classified into three major categories to reflect relative differences in function at the watershed scale and to provide guidance for future implementation: High Functioning, Supporting, and Contributing.

Many natural heritage features have multiple roles and functions. For example, treed wetlands (i.e. swamps) meet the definition of both woodlands and wetlands; and wetlands may also function as aquatic habitat. A natural heritage feature may also fall under two different relative importance categories (for example, a treed swamp may classify as a Supporting woodland but also as a High Functioning wetland, based on ecological criteria for inclusion in the NHS). In such cases, it is recognized that the feature provides multiple functions and that management, restoration or protection should consider the feature in its entirety.

High Functioning features

High Functioning natural heritage features represent key features from a watershed and/or provincial perspective that are essential for maintaining biodiversity and ecological function within the watershed over the long term (Table 4-1). Collectively these features are essential for ensuring the integrity and resilience of the NHS. Cumulative impacts to these features are likely to have a significant impact on the resilience and self-sustainability of the NHS.

Supporting features

Supporting features enhance the quality and function of High Functioning features and collectively are highly likely to improve the resilience of the NHS (Table 4-1). These features contribute to meeting science-based and federal guidelines for overall natural cover within the watershed, help maintain the abundance of common species in the landscape, improve connectivity as stepping stone habitat or tableland linkages, and support species as they move across the landscape. The cumulative loss of these features will have some impact on overall levels of natural cover in the watershed and may locally impact High Functioning features.

Contributing features

Contributing features are those that play a contributing role within the watershed. These features may contribute to connectivity across the landscape. They are typically very small and may also be relatively isolated from other natural heritage features. In urban areas they may be especially valued for their social function, or may act as stepping stone habitat.

Contributing features are not generally included in the NHS, unless they are part of a more significant feature or area (for example, a small woodland located in the floodplain of the Credit River would be included, but is primarily classified as a valleyland natural heritage feature; or a small wetland located in a natural heritage area such as a Centre for Biodiversity would be primarily classified as a natural heritage area).

4.3.2 Buffers

Buffers represent areas around natural heritage features that protect or mitigate impacts on their functions from existing or future adjacent land uses.

Minimum buffer widths have been mapped in the NHS at the landscape scale around specific features, including valleylands, wetlands, woodlands and aquatic habitat (Table 4-1). All natural heritage features need to be further evaluated through the planning process on site. An evaluation should consider the function and sensitivity of the feature and the nature of the adjoining land use in order to evaluate appropriate buffer width and composition.

Existing CVC regulatory policies (CVC 2010) and applicable provincial or municipal direction on setbacks from natural heritage features continue to be applicable in all cases.

4.3.3 Natural heritage areas

Centres for Biodiversity

Centres for Biodiversity are defined for the purposes of the NHS as *“landscapes with a concentration of natural heritage features representative of physiographic regions in the watershed, which collectively represent important ecological features and functions capable of supporting native biodiversity over the long term”*.

Centres for Biodiversity contain the best representative aggregations of natural features such as valleylands, wetlands, woodlands and aquatic habitat. They may also contain other habitat that contributes to diversity or connectivity of ecosystems on the landscape, such as tableland successional areas, agriculture, open space, or urban land use.

In the Credit River watershed, there are a total of 11 Centres for Biodiversity, associated with the watershed's eight major physiographic regions, one inland lake and one estuarine area. Because these landscapes are large, each Centre for Biodiversity may cover more than one physiographic region. One large Centre for Biodiversity was divided into two due to its overall size, and to foster stewardship efforts within local communities (i.e. Inglewood and Forks of the Credit).

The intent of identifying Centres for Biodiversity is to guide their management, as these include some of the most valuable natural areas in the Credit River watershed. Retention and enhancement of these biodiversity hotspots will increase the likelihood of maintaining the watershed's existing biodiversity over the long term. It is hoped that communities neighbouring these Centres for Biodiversity could potentially become involved in stewardship of these areas.

4.3.4 Mapping the Natural Heritage System

All natural heritage features, their buffers and natural heritage areas are combined to form an integrated, connected natural heritage system (Table 4-1, Figure 4-1). The current mapping reflects the best available data. All components of the NHS have

not been mapped (i.e. significant wildlife habitat, habitat of endangered species and threatened species). Every effort has been made to ensure data quality and currency. Nevertheless, some minor mapping errors may exist and will be corrected as appropriate. In addition, features may change over time or ongoing field verification may result in refinement of the mapping. Therefore the intent is that the text of the criteria for identifying the NHS supersedes the mapping.

The total mapped area of the NHS is 37,113 ha (Figure 4-2), occupying 39% of watershed area (excluding the area of Lake Ontario under CVC’s jurisdiction). Approximately 75% of the NHS is occupied by natural or naturalizing cover, and the remaining 25% of the NHS is occupied by other land uses such as agriculture, open space, or urban.

The development of the NHS is consistent with provincial guidance (e.g. the Natural Heritage Reference Manual) and best available science (Table 4-1). Many of the components of the NHS are compatible with existing planning policies (e.g. *Provincial Policy Statement*). Although the NHS was developed using an ecological approach, comparative analyses showed that many of the features and areas are also already designated under provincial legislation (e.g. Greenbelt Plan) or in municipal official plans.

Table 4-1 Components of the Credit River Watershed Natural Heritage System with criteria, thresholds and categories

	NHS criteria and thresholds	Category
Natural heritage features		
1. Valleylands	1. Valleylands 1a) Credit River and its major tributaries, and major watercourses draining to Lake Ontario <i>Northern and Southern zone:</i> i) Valleylands of the Credit River and major tributaries, namely those having direct confluence with the Credit River; and ii) Valleylands of major watercourses (Sheridan Creek and Cooksville Creek) having direct drainage to Lake Ontario, from their outlet to the farthest upstream extent of their defined valley landform	High Functioning High Functioning
	1b) Valleylands supporting surface water functions (conveyance, attenuation, storage and release), productivity, and linkage functions <i>Northern zone and Southern zone:</i> All other valleylands associated with watercourses	Supporting

	NHS criteria and thresholds	Category
2. Wetlands	2. Wetlands 2a) Size <i>Northern and Southern zone:</i> i) All wetlands >2 ha ii) All wetlands >0.5 ha and <2 ha	High Functioning Supporting
	2b) Proximity <i>Northern and Southern zone:</i> All wetlands >0.5 ha and <2 ha within 30 m of a High Functioning woodland, High Functioning wetland, or High Functioning valleyland	Supporting
	2c) Surface water quality and quantity, multifunctional linkage <i>Northern and Southern zone:</i> All wetlands >0.1 ha and <2 ha located within or adjoining a valleyland	Supporting
	3. Woodlands	3. Woodlands 3a) Size i) <i>Northern zone:</i> All woodlands >16 ha ii) <i>Southern zone:</i> All woodlands >4 ha iii) <i>Northern zone:</i> All woodlands >4 ha and <16 ha iv) <i>Southern zone:</i> All woodlands >2 ha and <4 ha
	3b) Interior i) <i>Northern zone:</i> All woodlands <16 ha containing >0.5 ha interior habitat (100 m from woodland edge) ii) <i>Southern zone:</i> n/a (no woodlands <4 ha have interior)	Supporting
	3c) Proximity i) <i>Northern zone:</i> All woodlands >2 ha and <16 ha within 30 m of a High Functioning woodland, High Functioning wetland, or High Functioning valleyland ii) <i>Southern zone:</i> All woodlands >0.5 ha and <4 ha within 30 m of a High Functioning woodland, High Functioning wetland, or High Functioning	Supporting Supporting

	NHS criteria and thresholds	Category
	valleyland	
	3d) Surface water quality and quantity, multifunctional linkage <i>i) Northern zone: All woodlands >0.5 ha and <16 ha within or adjoining a valleyland</i>	Supporting
	<i>ii) Southern zone: All woodlands >0.5 ha and <4 ha within or adjoining a valleyland</i>	Supporting
4. Aquatic habitat and 5. Lake Ontario shoreline	4. Aquatic habitat 4a) Watercourses <i>Northern and Southern zone:</i> i) All watercourses containing or linking habitat for top predators associated with the following aquatic communities: a) Coldwater Brook Trout Fish Community; b) Coldwater Brown Trout/Rainbow Trout/Atlantic Salmon Fish Community; c) Large Warmwater and Migratory Coolwater Fish Community; and d) Estuarine Fish Community ii) All other watercourses	High Functioning Supporting
	4b) Water bodies <i>Northern and Southern zone:</i> i) Lake Ontario within CVC jurisdiction ii) All lakes that a) are not created and maintained by human infrastructure such as a dam; and b) are of aggregate origin whose aggregate license has been surrendered and show evidence of naturalization iii) All lakes that are created and maintained by human infrastructure such as a dam iv) All water bodies >2 ha of aggregate origin whose aggregate license has recently been surrendered (text criterion) ¹ v) All water bodies >0.5 ha and <2 ha within 30 m of a High Functioning valleyland, High Functioning wetland, or High Functioning woodland	High Functioning A High Functioning A High Functioning B Supporting Supporting

	NHS criteria and thresholds	Category
	5. Lake Ontario shoreline All areas within Lake Ontario shoreline defined by Lake Ontario Flood Hazard, Lake Ontario Erosion Hazard, and Lake Ontario Dynamic Beach Hazard	High Functioning
6. Significant wildlife habitat	6. Significant wildlife habitat <i>Northern and Southern zone:</i> All habitat identified as significant wildlife habitat (text criterion)	High Functioning
7. Habitat of endangered species and threatened species	7. Habitat of endangered species and threatened species <i>Northern and Southern zone:</i> All habitat identified for protection as habitat of endangered species and threatened species (text criterion)	High Functioning
Buffers		
8. Buffers on natural heritage features	8. Buffers High Functioning valleylands: Crest of slope or meander belt - minimum 30 m plus evaluation High Functioning wetlands: Minimum 30 m plus evaluation High Functioning woodlands: Minimum 30 m plus evaluation High Functioning aquatic habitat (water bodies): Minimum 30 m plus evaluation Supporting aquatic habitat (water bodies): Minimum 30 m if it adjoins a High Functioning wetland plus evaluation Supporting wetlands: Minimum 10 m plus evaluation Supporting woodlands: Minimum 10 m plus evaluation Supporting aquatic habitat (water bodies): Minimum 10 m unless it adjoins a High Functioning wetland plus evaluation All other natural heritage features: To be	n/a

	NHS criteria and thresholds	Category
	evaluated	
Natural heritage areas		
9. Centres for Biodiversity	9. Centres for Biodiversity Landscapes with a concentration of natural heritage features, encompassing the top 5% of habitat patches by area within Northern and Southern zones, representative of the eight major watershed physiographic regions, an inland lake and an estuarine area, that collectively represent important ecological features and functions capable of supporting native biodiversity in the long term	n/a

¹Text criterion: means the feature is not mapped as such but if it meets this criterion it is included in the NHS.

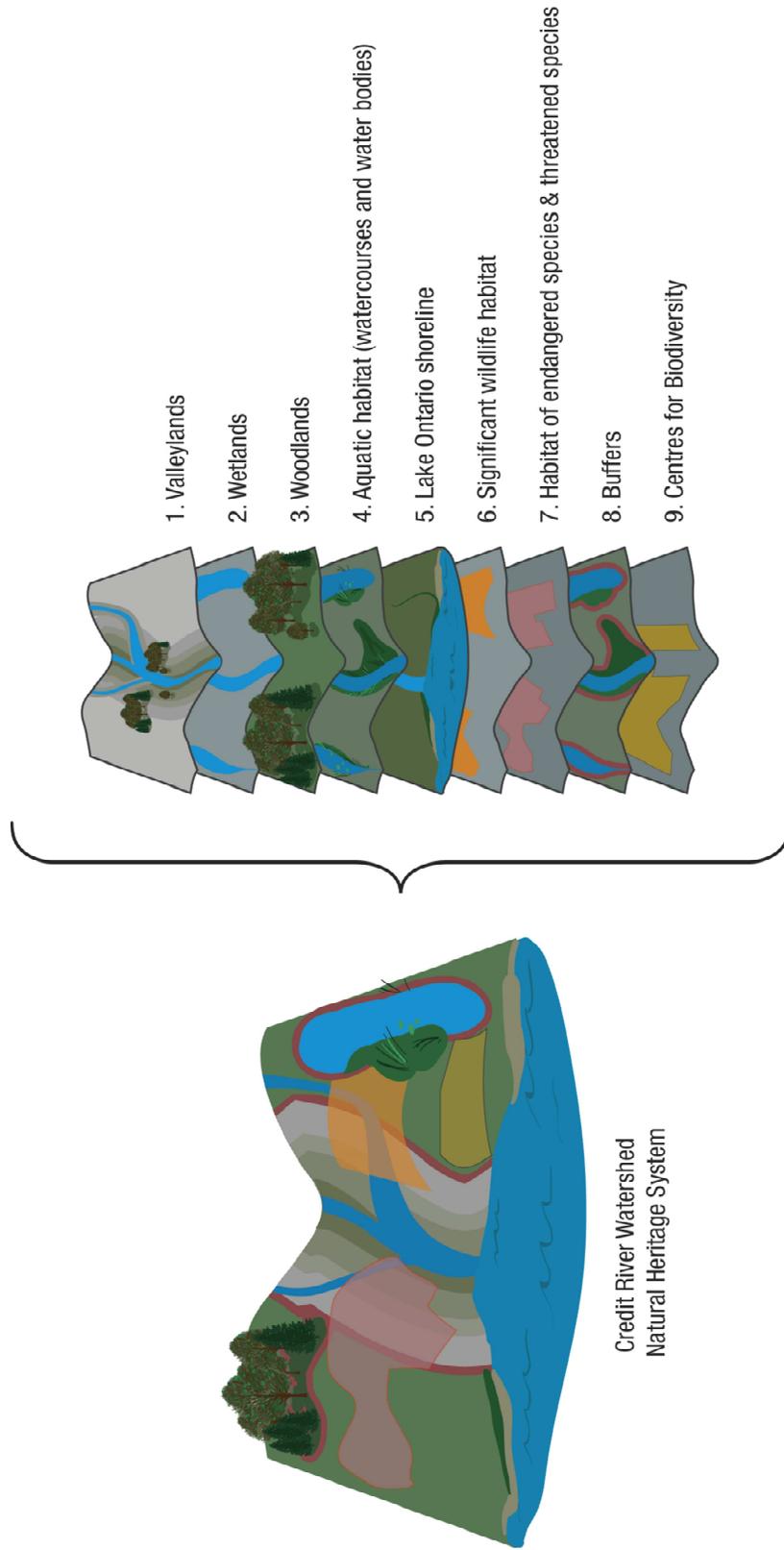


Figure 4-1 Schematic illustration of components of the Credit River Watershed Natural Heritage System

Credit Valley Conservation Natural Heritage System Strategy
Phase 4: Recommendations for Implementation

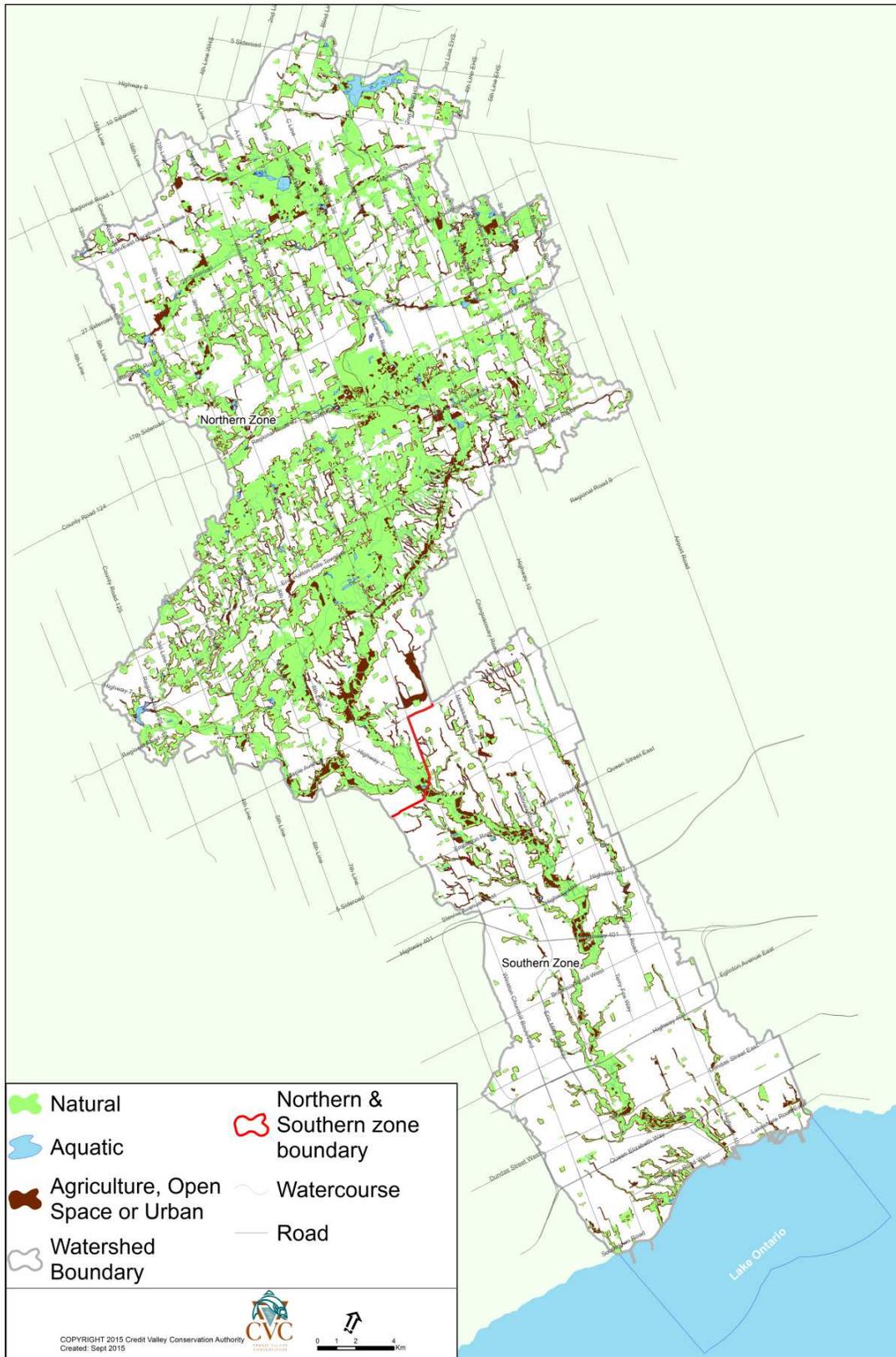


Figure 4-2 Mapped Credit River Watershed Natural Heritage System

5.0 NHS ROLE IN MITIGATING WATERSHED STRESSORS

There are a number of stressors that affect the watershed's ecosystems that provide critical ecosystem services to its inhabitants. Primary stressors, or root threats include the following:

- **Land use change** from natural to urban or rural residential (residential, commercial, industrial), recreational (e.g. golf courses, parks); agriculture, aggregate (pits and quarries); infrastructure (e.g. roads, utility corridors); and water management (e.g. dams, grading, water taking);
- **Pathogens, pests, and invasive species** (e.g. non-native invasive species, pests, diseases, modifications of the wild gene pool);
- **Anthropogenic disturbance** (e.g. unsustainable recreational use or encroachment);
- **Suppression of natural events** (e.g. fire, flooding, erosion);
- **Unsustainable harvesting of biological resources** (e.g. illegal harvesting of plants, unsustainable logging, hunting, fishing) – this is not currently a major threat in the Credit River watershed; and
- **Climate change.**

Primary stressors are frequently interlinked – for example, urbanization is associated with increased levels of water taking, recreation, and invasive species.

It is anticipated that the intensity of some stressors will increase in the watershed over the next few decades. For example, the Growth Plan for the Greater Golden Horseshoe calls for increased urbanization and densification (increased use of urban space both horizontally and vertically) with a projected population of 11.5 million by 2031 (MPIR 2006). Agriculture may also expand or intensify if pressure for agricultural land increases. With the watershed's increasing population, it is also anticipated that recreation activity will intensify.

Restoring and connecting the NHS can help lessen the impacts of these stressors on the watershed's ecosystems by guiding stresses away from sensitive ecological features and functions, by improving the resilience of ecosystems, and by retaining features that provide key ecological services to the watershed and its residents.

The area of the NHS is constrained due to regard for other watershed land uses and socioeconomic imperatives – therefore the implementation of the system alone will be insufficient to achieve watershed ecological integrity. A more holistic approach is necessary that includes both recognizing the importance of protecting a robust natural heritage system and managing the matrix (urban, agricultural) in which the system is embedded, to maintain long-term watershed health.

Recommended actions to alleviate stressors on the NHS have been included in 6.0 below. Continued efforts to alleviate pressures on the NHS should be pursued as feasible.

6.0 TOOLS FOR IMPLEMENTATION

The NHS is designed to protect the watershed, its natural features and its ecological and hydrologic function over the long term. The NHS can be implemented through several avenues, namely: protection, land and water management, restoration and stewardship, and through partnerships with the public and other agencies. Implementation of the NHS should follow the well-established principle of protection first, followed by restoration and enhancement. Protection of existing natural heritage features and areas, and their functions, is the most cost-effective and efficient way to maintain ecological and hydrological functions, while restoration and enhancement approaches are critical to achieving desired targets for natural cover and function.

The sections below are organized by implementation themes, and specific actions for implementation of the NHS are provided (marked with ● bullets). These actions incorporate recommendations and suggestions received from stakeholder consultation on the Natural Heritage System Strategy. Several implementation actions listed below are intended to occur or be initiated over the next five years while others are ongoing or longer term. The implementation actions are summarized in 10.0. A program review is recommended every 5-10 years to incorporate new science or tools for implementation of the NHS and to ensure that the NHS is integrated into new projects or programs.

6.1 Protection

6.1.1 Overview of CVC role in the planning process

Credit Valley Conservation has multiple roles through the planning and development process. The two main regulatory tools that CVC planning staff help implement include the *Conservation Authorities Act* and the *Planning Act*. In all capacities, there are opportunities for CVC staff to implement the NHS through protection and planning.

CVC's regulatory role

Under the *Conservation Authorities Act*, CVC regulates development and interference with wetlands, shorelines and watercourses, through Ontario Regulation 160/06. CVC's main objectives in this role are to ensure public health and safety and the protection of life and property with respect to natural hazards. In addition, CVC safeguards watershed health by preventing pollution and destruction of ecologically sensitive areas such as significant natural features and areas, wetlands, shorelines, valleylands and watercourses. Regulatory areas have been identified where development could be subject to flooding, erosion or dynamic beaches, or where interference with wetlands or alterations to watercourses might have an adverse effect.

Several regulated natural heritage features such as valleylands, wetlands, watercourses and shorelines are included in the NHS. Protection of these features

would be implemented through CVC's regulatory role via its planning policies (CVC 2010) and also through its advisory role (see below).

CVC role in planning matters

CVC provides input, review and technical advice to municipalities under the Planning Act or similar pieces of development related legislation. Advice is provided in several ways including: as a planning and technical advisor, as a watershed based resource management agency, as a regulatory body, and as a proponent or landowner. In this regard, CVC provides planning and technical advice to assist municipalities in fulfilling their responsibilities associated with natural heritage, water resources and natural hazard management pursuant to the relevant legislation. This role also allows CVC to assist with coordination of regulatory requirements including, but not limited to, Ontario Regulation 160/06, *Environmental Assessment Act*, *Clean Water Act*, *Niagara Escarpment Planning and Development Act* and the *Fisheries Act*.

The Provincial Policy Statement (PPS), issued under section 3 of the *Planning Act*, is a key tool that guides the planning process. The Provincial Policy Statement provides policy direction on matters of provincial interest related to land use planning and development, providing direction on use and management of natural resources, including: natural heritage, water, agriculture, minerals and petroleum, mineral aggregate resources and cultural heritage and archeology.

With respect to natural heritage systems planning, the PPS identifies that:

“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 and areas, surface water features and ground water features.” (Section 2.1.2)

In addition, Section 2.1.3 indicates that *“natural heritage systems shall be identified in Ecoregions 6E & 7E, recognizing that natural heritage systems will vary in size and form...”* Further, individual natural heritage features such as woodlands, wetlands and valleylands, are also offered protection through the PPS.

Natural heritage protection is also mentioned in section 2.2 of the Provincial Policy Statement on Water, particularly policies 2.2.1a, 2.2.1c and 2.2.1d:

- a) using the watershed as the ecologically meaningful scale for integrated and long-term planning, which can be a foundation for considering cumulative impacts of development;*
- c) identifying water resource systems consisting of ground water features, hydrologic functions, natural heritage features and areas, and surface water features including shoreline areas, which are necessary for the ecological and hydrological integrity of the watershed;*

d) maintaining linkages and related functions among ground water features, hydrologic functions, natural heritage features and areas, and surface water features including shoreline areas;

In addition, the PPS recognizes the need to protect farmland and agricultural uses through policies such as the following:

2.3.1 Prime agricultural areas shall be protected for long-term use for agriculture.

...

2.3.3.1 In prime agricultural areas, permitted uses and activities are: agricultural uses, agriculture-related uses and on-farm diversified uses.

...

2.3.3.2 In prime agricultural areas, all types, sizes and intensities of agricultural uses and normal farm practices shall be promoted and protected in accordance with provincial standards.
(OMNR 2010)

As noted in the Province's Natural Heritage Reference Manual, prime agriculture designations limit non-agricultural uses and thus benefit natural heritage protection and other interests (OMNR 2010). Protecting prime agricultural areas not only supports agriculture and farming (food, fibre and fuel), but also enables Ontario's farms to contribute societal benefits such as clean air, clean water, groundwater recharge, wildlife and wildlife habitats.

CVC's Natural Heritage System Strategy was developed to be consistent with the above policies in the PPS, and following well-established landscape ecology and conservation biology principles included in the scientific literature and the province's Natural Heritage Reference Manual (OMNR 2010).

In a land use planning context, CVC's planning and development services staff will continue to provide technical input and advice on municipal natural heritage systems planning consistent with existing Memorandums of Understanding and approved planning documents (e.g. Official Plans and supporting documents). It is anticipated that CVC's NHS may be used in an advisory capacity to support municipal scale NHSs, and for consideration to inform future municipal NHS updates to coordinate with adjacent municipality and agency efforts.

A detailed overview of CVC's mandate, roles and responsibilities with respect to planning can be found in CVC's *Watershed Planning and Regulation Policies* (CVC 2010).

6.1.2 Planning recommendations to implement the NHS

Effective policies are essential for ensuring long-term protection and management of the NHS. Credit Valley Conservation has developed recommended example planning policies with a goal of protecting the Credit River watershed's biodiversity

and ecological functions for present and future generations, and to ensure that any development permitted within the NHS achieves ecological gain.

The example policies, which include recommendations on permitted uses and boundary alterations of the NHS, will inform the revision of CVC's 2010 *Watershed Planning and Regulation Policies* (see 10.0 for timelines), which when initiated would include an extensive consultation process with all stakeholders.

Biodiversity offsetting could help ensure ecological gain is achieved when development is permitted in portions of the NHS, resulting in losses to ecological function. Restoration related to compensation should ensure that functions of the NHS and its features are addressed. To date, no formal comprehensive systems are in place to facilitate biodiversity offsetting in Ontario. Compensation is a tool that has been used in some contexts, such as for fish habitat under the *Fisheries Act*. *Compensation* for some individual Species at Risk (e.g. bobolink, eastern meadowlark, butternut) is also permitted under the Endangered Species Act. In addition, under the Ontario *Endangered Species Act 2007*, a Species at Risk Benefits Exchange is under development. CVC is in the process of developing principles for biodiversity offsetting as one of several planning tools to implement the NHS. Any such principles would be developed in consultation with municipalities, conservation authorities and agencies and would strive to achieve consistency in approach across jurisdictions.

The following actions are recommended to incorporate the NHS through CVC's internal planning initiatives:

- Incorporate the CVC Natural Heritage System Strategy into an update of CVC's 2010 Watershed Planning and Regulation Policies, in consultation with municipalities and other stakeholders.
- Update CVC's EIS guidelines to reflect the NHS, in consultation with municipalities and other stakeholders.
- Develop user friendly NHS tools for planning staff including mapping to facilitate official plan, planning study, and planning application review processes.
- Develop principles for biodiversity offsetting as a potential mechanism to assist in implementation of the NHS, to be used as appropriate in accordance with relevant existing policy requirements and/or future updates.

6.1.3 Incorporating the NHS into municipal natural heritage strategies

CVC recognizes that each municipal official plan often already identifies and protects much of CVC's NHS as well as additional natural features and areas as part of the municipal natural heritage system, to an extent that varies from one municipality to the next. To the extent that the official plan already does this, there is no need for repetition. To the extent that the official plan does not, CVC would recommend that the municipality consider modifying its official plan (mapping or policy) to become more consistent with the NHS. As is the case, municipal official plan mapping and policies provide direction for natural heritage systems planning within its area of

jurisdiction. However, through the municipal natural heritage system implementation process CVC staff will continue to work in partnership with municipalities and stakeholders to consider refinements to the NHS at local scales based on the unique characteristics of member municipalities (planning authorities).

Examples of NHS implementation

CVC has been a partner in the development of local municipal environmental strategies that were ongoing in parallel to development of the CVC *Natural Heritage System Strategy*. To aid the City of Mississauga in the development of their *Natural Heritage and Urban Forest Strategy* (NHUFS) (City of Mississauga 2014), CVC undertook an assessment of existing conditions of natural habitats in the City (CVC 2012). This study was undertaken in partnership with City staff, TRCA and the Ministry of Natural Resources and Forestry (MNRF). The analysis provided a baseline understanding of the relative importance of existing natural habitats in the City to incorporate into the NHUFS. CVC was also a Core Working Team member in the development of the City's strategy. Available draft mapping of the NHS was compared with proposed areas for expansion of Mississauga's Natural Heritage System and areas for further discussion were identified. Through this process, the NHS was analyzed in refining the natural heritage system for the City of Mississauga.

The City of Brampton is currently undertaking the development of a *Natural Heritage and Environmental Management Strategy* (NHEMS). As part of this study, municipal staff requested that conservation authorities under Brampton's jurisdiction (CVC and TRCA) provide the City with consistent natural heritage system mapping across the City. CVC and TRCA undertook an evaluation of available watershed scale natural heritage systems (CVC draft NHS mapping Nov 2012, TRCA 2007 and subsequent watershed plans) to develop a consistent mapping product for the City. The Conservation Authority Natural Heritage System for Brampton and associated recommendations for implementation will be used to inform the NHEMS and associated update to the City of Brampton Official Plan (CVC and TRCA 2014).

At Halton Region a Regional Natural Heritage System (RNHS) was developed through the Sustainable Halton planning exercise, in consultation with conservation authorities and other stakeholders. The Region's Natural Heritage System used a systems-based approach to protecting and enhancing natural features and functions, and is scientifically structured using key features, enhancement areas, linkages, and buffers. The description of and rationale for the RNHS is provided in the technical background reports to ROPA 38, in particular the Sustainable Halton Phase 3 report, *Natural Heritage System Definition and Implementation* (North-South Environmental Inc. 2009). CVC's existing data and mapping available at the time were used to provide comment and input relating to the RNHS methodology in general and specifically to areas of the RNHS located in and adjacent to the Credit River watershed. Following extensive public consultation and an adjudicative process the RNHS policies and associated mapping were approved on November 28, 2014.

These examples describe different potential methods to incorporate the NHS into municipal strategies. The method used will depend on the existing planning framework, whether or not the municipality has an existing natural heritage system, and the objectives of the municipality.

Municipalities are critically important partners in developing and protecting natural heritage systems and managing their natural resources for the health and wellbeing of current and future generations. Credit Valley Conservation is committed to working with municipal partners to support the development and implementation of local scale natural heritage systems.

The following actions are recommended to incorporate the NHS through CVC's advisory input to the municipal planning process:

- Collaborate with municipalities to incorporate the NHS into municipal official plans and policies. Work in partnership with municipalities and stakeholders to consider and refine the NHS at local scales based on the unique characteristics of member municipalities (planning authorities).
- Work with partners to develop transparent, accessible mapping of natural heritage systems available for review at the site scale. Ensure clarity on how the system and its component features and areas will be implemented at the site scale.

6.2 Conservation Lands

Credit Valley Conservation's conservation lands programs are responsible for undertaking long-range planning activities and coordinating land development, management, and operational initiatives and activities on CVC-owned and managed properties throughout the watershed.

6.2.1 Land Management

Land management covers a range of activities related to the ownership, administration, and operation of lands owned and/or managed by the Authority. The *Conservation Areas Strategy for the Credit River Watershed* outlines three key objectives that guide the management of our lands, in order of priority: protection, appreciation and recreation (CVC 1994). In essence, CVC cares for, protects, restores, or enhances ecologically important lands while ensuring some public access, safety and fostering appreciation and enjoyment of these lands by the public. As such, CVC has an obligation to use its human and material resources to manage these lands responsibly and efficiently while consistently upholding its organizational mandate.

CVC currently owns approximately 2500 ha of land that falls within the NHS (95% overlap with CVC's total land holdings). Detailed conservation area management plans are created for priority properties that are managed by CVC. The first stage of the management planning process involves generating background and characterization reports that thoroughly characterize the natural, cultural, social and economic resources and values associated with the property. The next step is to

develop strategic directions for the property in consultation with stakeholders and the broader community. Finally a management plan is developed that provides direction for long-term management of the conservation area. This process ensures that CVC properties are managed holistically for natural heritage, cultural heritage and recreational values. The process also incorporates infrastructure needs, existing resources, programming, policies, planning initiatives, and the role of the public.

The NHS provides natural heritage information at the landscape scale that can be used to inform the management of CVC's conservation lands. The NHS, when implemented through policies, also provides an additional layer of protection to ecologically important features and areas on CVC properties (i.e. in addition to existing policies such as the Greenbelt Plan). It is recommended that the NHS is incorporated into the land management process as follows:

- Incorporate the NHS during development or updating of conservation area management plans, and development of conservation area zoning recommendations. For properties that do not require a management plan, or do not have a current management plan, use the NHS to guide management, as appropriate.
- Incorporate the NHS into the development of recreational trail guidelines (Note: CVC may also use trail guidelines during the planning process through its advisory role to municipalities).
- Incorporate the NHS during the update of CVC's Conservation Areas Strategy.

6.2.2 Greenlands Securement

CVC's Greenlands Securement Strategy is a science-driven, criteria-based process that identifies properties of interest to further the protection of the land and water resources of the watershed. Greenlands are ranked to identify priority securement areas based on criteria that include terrestrial and aquatic features and their associated functions and connectivity across the landscape (CVC 2004). With the development of the NHS, the strategy will be updated to incorporate the natural heritage system as a high priority criterion in the ranking process for land securement. This will shift the securement methodology from a feature-based approach, towards a more holistic, system-based approach.

It is recommended that the NHS be incorporated into CVC's greenlands securement program as follows:

- Incorporate the NHS as an important criterion into an update of CVC's Greenlands Securement Strategy.
- Recommend incorporation of the NHS or its features and areas in municipal land acquisitions or land securement strategies.

6.3 Inventory and Monitoring

Protection and management of the NHS relies on sound and up-to-date data. The information collected by CVC's inventory and monitoring programs is critical to

assess and understand the significance and function of natural features and areas, to assess impacts and identify mitigation actions, to measure status and trends in watershed health, to capture or predict emerging environmental issues across the watershed, and ultimately to guide watershed management.

6.3.1 Inventory Programs

CVC has established a Natural Areas Inventory (NAI) program to inventory and assess natural areas in the watershed. This program classifies ecological communities in the field, and completes surveys of vegetation and fauna (e.g. birds, amphibians, odonates). CVC also undertakes inventories of other features and areas of interest such as wetlands, woodlands and aquatic habitat, with a focus on features and areas in the NHS (e.g. Centres for Biodiversity). In addition, wildlife habitat assessments provide municipal partners with scientific and relevant technical advice on features of provincial significance (e.g. significant wildlife habitat).

Accurate and up-to-date inventory data on the watershed's natural heritage features and areas is critical to understand their significance, function and impacts to their function, and thereby to protect the NHS over the long term.

Recommendations to inventory and assess the NHS to enable its management include the following:

- Target field inventories and research efforts within high priority areas, such as Centres for Biodiversity. Prepare master plans for these important natural heritage features and areas that identify restoration needs and enhancement opportunities.
- Work with landowners and partners to identify and ground truth natural heritage features and areas contained within the NHS to ensure accuracy and currency of the NHS.
- Identify and map components of the NHS such as candidate significant wildlife habitat to assist in municipal partner implementation of the NHS.
- Inventory areas that may be particularly vulnerable to future anthropogenic threats and pressures, such as development or resource extraction.
- Inventory and analyze connectivity barriers and pinch points in the NHS (e.g. valleyland crossings) and prioritize mitigation measures to improve terrestrial and aquatic connectivity.

6.3.2 Monitoring Programs

CVC established the Integrated Watershed Monitoring Program (IWMP) in 1999 to report on status and trends in ecosystem health. The program monitors a variety of biotic and abiotic indicators to assess the health of forest, wetland, groundwater and stream systems. At the landscape scale, the program also monitors patterns and trends in land cover and land use change over time. In addition, targeted monitoring programs (tier 2 monitoring; includes pre-post, impact, effectiveness, restoration or cause-and-effect monitoring) are also in place to better understand impacts of land

use change, address emerging issues, or to guide management of natural heritage features and functions.

Monitoring data provides important feedback for managing and maintaining the quality of the NHS and maintaining ecological and hydrologic function over the long term.

Recommendations to incorporate the NHS into CVC's inventory and monitoring work include:

- Consider the NHS when identifying new long-term (IWMP) and targeted monitoring sites.
- Monitor quality of the NHS at landscape and community scales to detect stresses and recommend actions for mitigation.

6.4 Strategies, Research and Tool Development

6.4.1 Watershed and Subwatershed Studies

Watershed and subwatershed planning provides a mechanism for identifying and evaluating the cumulative effects of land uses and practices on water resources and the environmental quality of the subwatershed. Watershed and subwatershed plans provide an environmentally sound framework within which those involved in planning and decision-making can evaluate the consequences of current and future development scenarios in the context of a subwatershed, or the entire watershed, in order to protect, maintain and/or enhance the resiliency and sustainability of the area.

In 2007, CVC completed the *Credit River Water Management Strategy Update* (CRWMSU). This watershed scale plan determined the actions needed to ensure that local residents have "abundant, clean and safe water" in the Credit River watershed now and into the future. The CRWMSU was developed through a consultation process in partnership with municipal partners, provincial agencies, educators and non-governmental organizations.

The CRWMSU determined the water balance and increase in natural cover needed to protect and enhance water quality and water quantity in the Credit River watershed. The NHS follows through on the plan recommendations by identifying where that natural cover needs to be located. Detailed subwatershed planning allows for incorporation of local scale data to refine the NHS. Recent subwatershed studies have been developed in coordination with the NHS.

The NHS will supersede subwatershed studies completed prior to January 1, 2012. Subwatershed studies completed after January 1, 2012 have already incorporated the NHS and conducted refinements based on detailed site specific information.

In 2016 CVC will be initiating a Watershed Plan. It will include a historical review of the watershed to determine lessons learned with respect to past failures and

successes. It is anticipated that new challenges such as climate change will also need to be integrated into all program areas of CVC in a more consistent manner. The plan will bring together existing watershed scale guidance documents, such as the *CRWMSU* and the *Natural Heritage System Strategy*, and targets for watershed health as developed in IWMP. Gaps identified through this integration process will then be addressed. The plan will also review the relationships with subwatershed plans and identify priorities for future updates.

Recommended actions to incorporate the NHS into watershed and subwatershed studies include:

- Unify the NHS with the Water Management Strategy and other guiding CVC documents through the Watershed Plan to provide recommendations for managing water in the NHS.
- Use the NHS to inform natural heritage planning in subwatershed studies.
- Continue to incorporate the NHS during the implementation of subwatershed studies.
- Continue to incorporate the NHS into CVC strategies and guidance documents, as appropriate (e.g. Invasive Species Strategy, Landowner Action Fund).

6.4.2 Credit River Fisheries Management Plan

In 2002 the *Credit River Fisheries Management Plan* (CRFMP) was formally endorsed by the Minister of Natural Resources, and outlines a plan to protect, enhance and rehabilitate the aquatic system in the Credit River watershed.

The Plan detailed a comprehensive list of approximately 90 issues, 140 strategies and 350 tactics to manage the aquatic system. Recommendations for implementation are detailed under the broad headings of:

- Habitat (Water Quality, Water Quantity and Physical Habitat);
- Education;
- Enforcement and Regulations;
- Species Mix and Partitioning;
- Rehabilitation;
- Public Access and Fishing Opportunities; and
- Other Issues.

One key recommendation was to identify and protect natural heritage features and systems, which was a key driver for the production of the CVC Natural Heritage System Strategy. As such the CRFMP should be considered a companion strategy to the NHS.

In 2013 CVC initiated a Brook Trout Recovery Strategy, consistent with the goals and objectives of the CRFMP. The strategy is in response to notable declines in brook trout, including the loss of individual populations, and increasing isolation between remaining populated areas. The species may also be particularly

susceptible to climate change. As brook trout is an indicator of high quality habitat, implementing the strategy will be critical to manage the health of the aquatic system in the Credit River watershed.

Recommended action to implement the NHS through the CRFMP includes the following:

- Continue to implement recommendations of the CRFMP using the NHS as the framework for terrestrial and aquatic protection in the watershed.

6.4.3 Integrated Watershed Restoration Strategy

CVC has completed an Integrated Watershed Restoration Strategy (IWRS) to guide CVC’s restoration and stewardship priorities (CVC 2015b). The IWRS determines high level priorities at a watershed scale based on four broad metrics, including:

- Natural Heritage: Terrestrial and Wetland;
- Natural Heritage: Aquatic;
- Water Quantity; and
- Water Quality.

Successful implementation of the NHS will be enhanced by incorporating the NHS into restoration and stewardship programs and priorities. To support multiple restoration and stewardship prioritization initiatives, priority rankings for NHS natural heritage features and areas were identified and mapped (

Table 6-1).

Table 6-1 Priority ranking for NHS natural heritage features and areas to inform priorities for restoration and stewardship

Priority 1	Centres for Biodiversity, High Functioning valleylands (including buffers on crest of slope and meander belt), High Functioning watercourses and water bodies, Lake Ontario shoreline, significant wildlife habitat, habitat of endangered species and threatened species, habitat for species of conservation concern.
Priority 2	High Functioning features outside those areas listed in Priority 1 and their buffers (e.g., High Functioning woodlands and wetlands outside Centres for Biodiversity).
Priority 3	Supporting features and any other areas in the NHS outside areas listed in Priority 1 and 2, and their buffers.
Priority 4	Lands within 120 m of the NHS.
Priority 5	Lands beyond 120 m of the NHS.

These criteria have been incorporated into terrestrial and wetland restoration priorities outlined in the IWRS. Local stream health data was used to refine Aquatic restoration priorities. Water Quantity priorities outlined in the IWRS focus on minimizing flood and erosion hazards (that pose a threat to public safety), and Water Quality priorities focus mitigating water quality impacts using land use and stormwater treatment areas as metrics.

It is important to note that the NHS mapping and priority ranking mapping do not prescribe which type of restoration or stewardship activity is suitable for a given site. Additional site level information is required to plan restoration projects, above and beyond what can be determined through mapping. A site level evaluation to plan for restoration projects would use additional information describing the physical site conditions, including soil condition, local ecology (e.g. natural communities and species present), site constraints and opportunities.

Recommended actions by CVC to incorporate the NHS into the strategic work to guide restoration include the following:

- Identify and where feasible map and quantify drivers and stressors on ecosystems in the watershed, and integrate the NHS and IWRS to guide management efforts.
- Develop tools that reduce pressures and enhance the ecological goods and services provided in the matrix, including tools relating to green infrastructure (e.g. Region of Peel Urban Forest Strategy and associated Priority Planting Tool).

6.4.4 Research and Tool Development

CVC has a variety of programs that undertake applied research and develop tools to manage the watershed's ecological features and functions. These include, but are not limited to, water science, natural heritage, landscape science, and ecological services. CVC will need to continue to track and interpret emerging science in a watershed context, to minimize pressures and stressors on the NHS, and to enhance ecological function within an adaptive management framework.

A variety of applied research areas have already been identified, including:

- Measurement of land use change in the watershed;
- Connectivity needs of various taxa;
- Requirements for species of conservation concern in grassland and open country habitat, forest, and wetland habitat;
- Impacts of climate change and vulnerability to the NHS;
- Ecosystem services tool development to guide management decisions; and
- Cumulative impacts to the NHS.

In addition, tools and guidelines will be needed based on emerging science and the results of inventory and monitoring to streamline implementation of the NHS.

Recommended research and associated implementation actions to manage the NHS include:

- Complete a mapping analysis of future land use scenarios in a subwatershed and watershed context to inform inventory, monitoring, and input to subwatershed and watershed plans.
- Pursue opportunities to study connectivity requirements for different taxa (e.g. amphibians), and incorporate results as appropriate into updates to the NHS mapping and/or local natural heritage system refinements.
- Develop ecological flow targets for watercourses in the NHS to maintain healthy aquatic systems. Undertake ecohydrology research in wetlands to understand the role of surface and ground water in protecting and maintaining these components of the NHS. Update relevant guidelines as appropriate (e.g. *CVC-TRCA Water Balance Guidelines*), and develop tools to inform decision makers.
- Develop a Grassland Strategy for the Credit River watershed that may be used to refine restoration objectives within the NHS.
- Assess ecosystem risk and vulnerability of natural ecosystems to climate change; validate recommendations from vulnerability analysis with field data and incorporate recommendations within an adaptive management framework.
- Test species suitability of climate appropriate genetic varieties and species in municipal and public open spaces (assisted migration).
- Consider ecosystem services valuation to assess the impacts of land use changes, and assess the value of the NHS in monetary or biophysical terms (e.g. www.creditvalleyca.ca/egs, specifically *Natural Credit: Estimating the Value of Natural Capital in the Credit River Watershed* (2009)). Promote the value of the NHS as green infrastructure.
- Develop an environmental benefits index to quantify environmental benefits gained by specific restoration actions at a site.
- Assess cumulative impacts to the NHS and recommend actions for mitigation.
- Continue to undertake targeted research projects that support building knowledge regarding landscape and ecosystem management in partnership with universities, agencies, conservation authorities, municipalities, or other organizations.

6.5 Environmental Management

CVC has a variety of programs that implement on the ground actions to manage the environment. A wide range of conservation actions are undertaken by CVC staff, including but not limited to (CVC 2015b):

- Low impact development;
- Restoration of aquatic, wetland, woodland and meadow ecosystems;
- Invasive species management;
- Application of best management practices in partnership with agricultural producers; and

- Plantings and naturalization in the urban landscape in partnership with corporations and private residents.

By using the NHS and IWRS to strategize conservation actions, CVC will be able to increase the effectiveness of limited conservation dollars. The following actions are recommended to implement the natural heritage system through the range of CVC's environmental management programs:

- Manage ecosystems to improve resilience through improvement of ecological integrity and function; protect and enhance genetic, species and ecosystem diversity with a focus on native species.
- Improve connectivity, functionality and permeability of the matrix, i.e. the land uses surrounding the natural heritage system.

6.5.1 Aquatic, Wetland and Terrestrial

Aquatic and Wetland Restoration

CVC has an aquatic and wetland ecosystem restoration program that provides assistance to private and public landowners. Staff partner with interested individuals to identify and to implement stream and wetland habitat creation and rehabilitation projects on properties found throughout CVC's jurisdiction.

Aquatic and wetland restoration projects at CVC are currently guided by the Credit River Fisheries Management Plan (OMNR and CVC 2002), as well as the Wetland Restoration Strategy (Dougan and Associates *et al.* 2009). In addition, the NHS has been used to inform aquatic and wetland restoration projects chosen to date. Currently, priority is given to those properties located in Priority 1 areas (

Table 6-1) identified by the Natural Heritage System Strategy, with over 80% of completed projects meeting this objective to date.

Recommended actions to integrate the NHS into aquatic and wetland restoration include the following:

- Implement stream and wetland buffer creation and dam removal in identified priority areas, as feasible.
- Implement the Brook Trout Strategy.

Terrestrial Restoration

The terrestrial restoration and management program is responsible for terrestrial restoration projects in the watershed, including forest and meadow habitat. The program is developing a strategic approach to focus efforts within its main business sectors, including nursery operations, forest management, naturalization and invasive species management, to determine where program priorities should be focused to achieve the greatest environmental benefit for effort expended.

Adopting the NHS as a key criterion into the analysis for refining efforts (e.g. through the IWRS) has the potential to enhance the NHS through targeting high priority areas (Priority Areas 1 and 2) to focus terrestrial restoration and management activities.

Recommended action to integrate the NHS into terrestrial restoration includes the following:

- Implement terrestrial restoration projects in priority areas, and incorporate the NHS into refined forest management and invasive species priorities.

6.5.2 Water Quality and Water Quantity

Stormwater Management

The practice of managing stormwater is continuing to evolve as the science of watershed management and understanding of our watershed functions grow, and the impacts of climate change, urbanization and infrastructure shortfalls are realized.

CVC has developed Stormwater Management Criteria to promote improved stormwater management (SWM) that more closely replicates predevelopment hydrology in areas undergoing development. Together the planning process and design criteria provide a procedure for the selection of the most appropriate approaches to SWM. The design criteria include guidance for flood protection, water quality, erosion control, and water balance (for both groundwater recharge and protection of natural features), and have been developed considering the interactions and cumulative effects which may be expected from urban growth and redevelopment.

Effective management of stormwater is important in managing the hydrology, water quality, and ecology of surrounding features. It is critical to the continued health of the watershed's streams, rivers, lakes, fisheries and terrestrial habitats, and ultimately of the NHS.

Recommendations to incorporate the NHS into stormwater management initiatives include the following:

- Apply mitigation measures to reduce impacts on the hydrological and ecological function of the NHS, using guidance from emerging environmental flow and ecohydrology research.

Low Impact Development

To support the improved management of stormwater in existing and new developments within urban areas, CVC has developed low impact development (LID) guidelines and resources.

LID manages rainfall at the source - where it lands – through site planning and physical installations that mimic the predevelopment hydrologic conditions. As a

result, these practices support improved water quality, erosion control, and maintenance of groundwater recharge and baseflow. LID is well suited for greenfield development as well as existing (older) developed areas where stormwater treatment is limited.

CVC has developed a number of technical guides and tools that can be used to implement LID (available online: <http://www.creditvalleyca.ca/low-impact-development/>), including:

- *Grey to Green Retrofit Guides* for existing developed areas, offering advice and support—both political and technical—for the adoption of low impact development within road, residential, public land and industrial-commercial properties, as well as through the Stormwater Master Planning process.
- *Low Impact Development Stormwater Management Planning and Design Guide* developed by CVC and TRCA is a tool for design guidance to help developers, consultants, municipalities and landowners understand and implement more sustainable stormwater management planning and design practices. This guide is complimented by CVC's *Low Impact Development Construction Guide*.

Low impact development supports the NHS through guidance for improved management of stormwater runoff at its source, which improves streamflow, water quality, and consequently stream ecology, and supports the functions of surrounding natural features.

Recommendations to use LID and other green infrastructure to manage the NHS include the following:

- Implement and promote green infrastructure in the urban matrix to manage water where it falls and to reduce impacts to the NHS. Share results and successes with multiple partners and stakeholders.

Water Sustainability Planning

With the increasing number of extreme weather events, attention is shifting to Canada's aging infrastructure, which is in need of rapid repair and replacement.

To meet the requirements of the *Water Opportunities Act*, CVC is developing Water Sustainability Planning Guidance through funding by the Ministry of Environment and Climate Change and in partnership with over 38 stakeholders. This document will provide guidance for developing municipal Water Sustainability Plans for small, medium and large municipalities. This guidance will tackle issues of collaborative planning for growth, aging infrastructure and climate change, using the watershed as the basis for integrating the management of water, wastewater and stormwater. This approach also applies risk management and vulnerability assessments to the management of municipal infrastructure. Following the development of the Provincial Water Sustainability Planning Guidance, CVC will be partnering with municipalities in the watershed to develop Water Sustainability Plans.

This integrated approach to managing all aspects of municipal water has the potential to improve water quality and quantity in the watershed, through managing human activities and natural resources in an area defined by watershed boundaries, thereby improving the ecological and hydrological function of the NHS. This approach recognizes and operates based on the interconnectedness of environment, economy and society. The aim is to ensure that adequate supplies of good quality water are maintained for the entire population while preserving the environment and adapting human activities within the capacity limits of nature.

Recommended action to incorporate the NHS into Water Sustainability Planning includes the following:

- Incorporate the NHS into water sustainability activities, as appropriate.

Floodplain mapping

Floodplains are the areas near watercourses that are included within the greater of the regional storm or 100-year flood line. A core mandate of CVC as a water management agency is to maintain and update floodplain mapping in support of Section 28 of the Conservation Authorities Act, specifically Ontario Regulation 160/06. Floodplain mapping informs planning processes and helps protect the public from hazards due to flooding.

CVC has established a number of real time water flow gauges throughout the watershed. Data from these gauges support CVC's flood modeling and enhance its flood prediction capacity.

Accurate mapping of floodplains supports the NHS as its valleylands are partly defined by floodplain boundaries. Natural hazards such as floodplains or shorelines are hazards due to the presence of human activity within areas where natural stream functions such as flooding occur. By identifying and protecting these areas within a natural heritage system, CVC can better manage them to achieve multiple benefits namely improvement of ecological and hydrologic function and protection of people and property from damage caused by flooding or erosion.

Recommended action to ensure floodplain mapping is integrated with valleylands mapping for the NHS includes the following:

- Update floodplain mapping as required and incorporate into NHS mapping at the appropriate scale.

Groundwater Recharge

The assessment of groundwater recharge allows for an enhanced understanding of the function of groundwater within the hydrologic and ecological systems of the watershed. Over the last decade, substantial research on groundwater resources in the Credit River watershed has occurred through water budget studies completed for the Province's source water protection program. These studies focused on water

balances and water quantity risk assessment associated with municipal sources. Groundwater recharge (and discharge) analysis formed an integral part of this effort.

At the watershed scale, CVC has assessed the natural water availability and the competing stresses associated with municipal groundwater-based systems, and also undertaken detailed analyses of recharge characteristics (AquaResources Inc. 2009). Using this mapping, important groundwater recharge areas have been mapped in association with the NHS, including Significant Groundwater Recharge Areas (SGRAs), High Volume Groundwater Recharge Areas (HGRAs), Medium Volume Groundwater Recharge Areas (MGRAs) and Ecologically Significant Groundwater Recharge Areas (ESGRAs) (Figure 6-1). These areas are particularly important to consider their functional linkages to the NHS, and may be used to develop targets for protection, restoration and acquisition.

It is recommended that the NHS be considered when undertaking water management as follows:

- Work with partners to protect, maintain or enhance groundwater recharge to natural heritage features and areas, to protect their function.

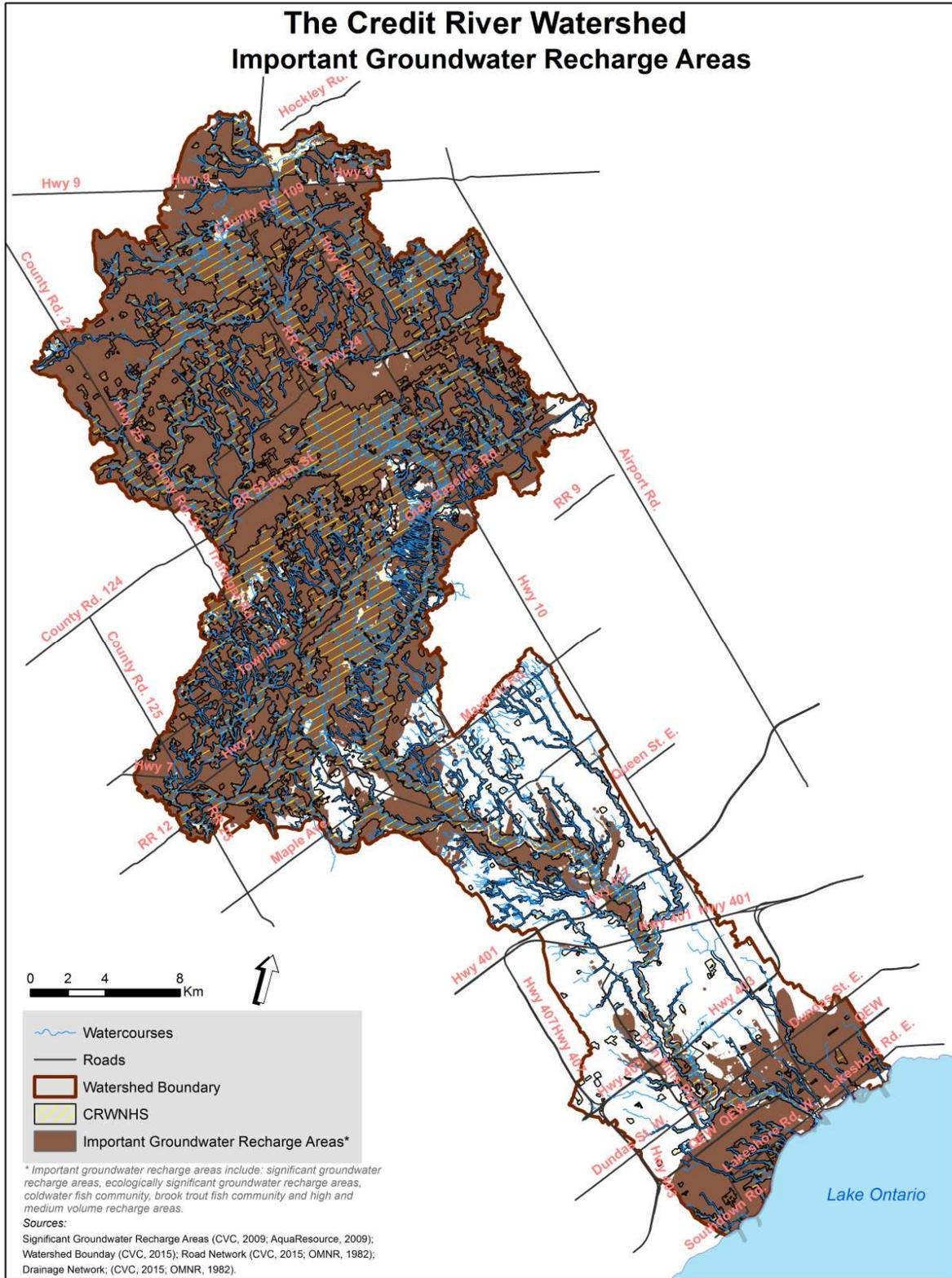


Figure 6-1 Credit River Watershed Natural Heritage System mapped in relation to Important Groundwater Recharge Areas

6.6 Outreach and Education

6.6.1 Community Outreach

CVC's community outreach program provides resources to the public, including education and support, to promote the goals and initiatives of CVC. This program works with corporate, community, and youth volunteers to implement projects throughout the watershed. Community Outreach encourages participation in projects developed by CVC and community partners; secures partnership funding to support restoration projects on private or public lands; implements restoration projects that increase natural cover and improve aquatic, terrestrial and wetland habitat and communities on public lands; and manages invasive species on public properties.

6.6.2 Landowner Outreach

Partnership with private landowners will be essential to implementing CVC's Natural Heritage System Strategy. The majority of the Natural Heritage System is in private ownership. Private landowners, including agricultural producers other rural landowners, as well as urban residents, are key stewards of natural areas. The majority of streams, forests and wetlands in the Credit River watershed exist and are healthy due to the protection and stewardship of private landowners.

CVC's landowner outreach program builds resilience to climate change and contributes to watershed health through the advancement and/or acceleration of private land stewardship. The program is focused on four target audiences: rural farm, rural non-farm, residential, and corporations and institutions. Mechanisms for engagement include workshops, technical assistance, and incentives, including the following programs:

- The *Landowner Action Fund* is an environmental incentive program for rural landowners providing financial and technical assistance for projects to protect water sources; build the resilience of natural systems to climate change; and improve habitat for fish and wildlife.
- The *Peel and Wellington Rural Water Quality Programs* provide technical assistance and cost-share grants to rural non-farm and equine landowners to undertake terrestrial, aquatic and groundwater Beneficial Management Practices (BMPs).
- CVC's *Bird-Friendly Certified Hay Program* values hay fields as breeding habitat for Bobolink and Eastern Meadowlark, two threatened grassland birds in Ontario. This program recognizes that the landscape is a working landscape and strives to assist landowners with voluntarily adopting environmental best management practices that improve the ecological function of both the working and natural landscape.
- The *Greening Corporate Grounds* program provides advice and landscape concept plans and organizes planting events for businesses and institutions.
- The *Your Green Yard* program provides workshops, presentations, resources and incentives for native plant gardening and ecological landscaping to local residents.

CVC's landowner outreach program provides opportunities to advance the implementation of the CVC Natural Heritage System Strategy through outreach, incentives, or engagement of landowners on priority lands to undertake restoration projects that support the NHS. Restoration or stewardship activities are flexible, dependent on landowner interest and voluntary participation and cover a range of conservation actions from beneficial farm management practices to naturalization of land (e.g. riparian zones).

6.6.3 Implementation through outreach programs

CVC's community and landowner outreach programs will use the NHS to guide priority restoration projects through the IWRS as described above. Additional recommended actions to build awareness of the NHS with watershed residents, the agricultural community, corporations, and institutions include the following:

- Improve public knowledge of NHS through education, communications and outreach.
- Engage watershed residents, corporations and institutions in NHS enhancement and restoration.
- Incorporate the NHS into landowner outreach materials and programs.
- Build trust with landowners to promote NHS implementation. Recognize and encourage existing efforts by public and private landowners and agricultural producers to protect and enhance the NHS.
- Continue to implement CVC landowner outreach programs, incorporating the Natural Heritage System Strategy to guide priorities, as appropriate.
- Develop new and/or expand existing stewardship incentives (e.g. innovative market based tools such as payment for ecosystem services) to accelerate uptake best land & water management practices by landowners, residents, corporations and institutions.
- Undertake targeted outreach and restoration campaigns within high priority areas such as Centres for Biodiversity to advance protection and enhancement by the community and landowners.

6.6.4 Environmental Education

CVC undertakes environmental education programming to enhance public awareness of climate change impacts and ecological functioning by providing education services that are "lifelong and lifewide," reaching adults, youth, and families. CVC also works with various partners, including municipalities, school boards, other conservation authorities, settlement agencies, and non-governmental organizations, to increase community awareness and engage citizens about climate change impacts and build widespread public ecological literacy.

CVC's environmental education program can be a vital tool for implementation of the NHS through providing the public and stakeholders with information regarding natural heritage features and systems in their vicinity; building community knowledge and understanding of the NHS; fostering appreciation of local natural heritage;

engaging non-traditional audiences in environmental activities; and creating widespread support for protecting and restoring the NHS.

Recommended action to inform and engage the public in NHS implementation includes the following:

- Develop or modify education program materials (e.g. maps, infographics) to engage the public in appreciation and implementation of the NHS.

While specific CVC strategies and programs may change and adapt to needs and circumstances over time, the above examples demonstrate the ways in which the NHS can be incorporated into ongoing initiatives.

7.0 SHARED ROLE IN IMPLEMENTATION OF THE NHS

The Natural Heritage System Strategy outlines a common vision and a plan for protecting, enhancing and restoring the NHS. This allows existing CVC resources and efforts to be refocused towards the abovementioned identified priorities as appropriate. The end result is improved organizational effectiveness and increased efficiency in the use of public funds.

Everyone has a role in implementing the natural heritage system to maintain and enhance its overall health.

Conservation Authorities may develop watershed scale natural heritage systems or identify important features and areas of subwatershed or watershed importance, provide technical and scientific advice to partners, undertake restoration, environmental education and stewardship initiatives and play a regulatory role.

Municipalities in the Credit River watershed contribute significantly to the protection, restoration and stewardship of the NHS in a number of ways – both directly and through their support for CVC projects and programs. Municipalities directly protect the NHS through natural heritage systems planning and implementation; land and water management; and their own forestry, restoration and stewardship programs. As natural heritage systems implemented through official plans frequently take a watershed approach in their design, their programs directly benefit the biodiversity, ecological function and hydrological function of the watershed and by extension the ecological benefits provided to watershed residents.

The NHS may also support a number of other municipal objectives, including planning for healthy and sustainable communities, infrastructure planning and transportation planning. Opportunities to connect and integrate programs should be pursued where possible.

Other agency partners contributing to the implementation of the NHS include Environment Canada, Fisheries and Oceans Canada, MNR, MMAH, the Ministry of the Environment and Climate Change (MOECC), Conservation Ontario, Ontario Nature, and the Ontario Heritage Trust (OHT). These partners support NHS implementation by providing guidance, tools and policies for the protection of watershed natural resources. In addition, they may contribute directly through land and water management; as owners of lands within the NHS; and through inventory and monitoring of important areas at the provincial scale. In addition, research projects with partner agencies and academic institutions can develop scientific knowledge about the watershed and create innovative approaches that lead to on-the-ground decision making.

Non-governmental organizations such as Ontario Streams, Sierra Club of Canada, Ducks Unlimited, Trout Unlimited, the Bruce Trail Conservancy and local naturalist clubs contribute significantly to the protection, maintenance and enhancement of the NHS through the passion and dedicated efforts of their members and volunteers.

Local residents, landowners and institutions or corporations also play a part. The majority of the watershed's land is privately owned, and individual actions by landowners play a role in providing ecological benefits to the watershed as a whole. Actions by individuals who live, work or play in the watershed cumulatively impact the watershed and can help protect watershed biodiversity and ecological function.

Continued efforts will be necessary to alleviate the impacts of existing and emerging threats such as climate change, habitat loss and degradation and pollution, and ensure the long term health and well-being of watershed residents.

Recommended actions to implement the NHS through partnerships include the following:

- Continue and build on existing partnerships with agencies, organizations, and landowners to pursue shared protection, restoration and management objectives.
- Collaborate with member and neighbouring regional and area municipalities and conservation authorities to connect natural heritage systems and to promote consistent protection for natural heritage systems across the watershed and southern Ontario.

8.0 NATURAL HERITAGE SYSTEM EVALUATION

At a watershed scale, the natural heritage system should be evaluated over time to ensure it is relevant and effective. Regular evaluation ensures that new information about natural heritage features and areas, policies, and programs are integrated to protect and restore the biodiversity and ecological function of the NHS over the long term.

The following are recommended actions to evaluate and refine the NHS:

- Complete quality assurance and quality control of the NHS mapping and correct errors as appropriate (e.g. through mapping updates or through the planning process).
- Develop a monitoring plan to evaluate the effectiveness of the NHS. Regularly evaluate the watershed targets identified in the Natural Heritage System Strategy. Incorporate new science on targets as appropriate.
- Incorporate and track performance measures for the NHS in the CVC watershed plan.
- Review NHS criteria and mapping at regular intervals, integrating with official plans as feasible to incorporate new science and counter existing or emergent threats (e.g. cumulative impacts).
- Review CVC policies relating to the NHS at regular intervals to incorporate federal, provincial and municipal direction and counter existing or emergent threats.

9.0 STAKEHOLDER FEEDBACK RELATING TO NHS IMPLEMENTATION

Stakeholder consultation occurred throughout the development of the CVC Natural Heritage System Strategy through facilitated workshops, presentations, outreach materials (CVC website and publications), meetings with individual stakeholders or groups of stakeholders, and email correspondence.

Stakeholder comments relating to NHS implementation are summarized below. These comments have been incorporated into the design of the NHS and in the implementation actions listed in this report.

Summary of stakeholder comments relating specifically to NHS implementation (CVC 2009, CVC 2014b, meetings, presentations, and correspondence) include the following (in no particular order of importance):

1. Stakeholder goals and objectives for the Natural Heritage System are that it needs to be sustainable, relevant, balanced (with other uses and users), fair, science-based, diverse and connected.
2. There is support for the use of a systems approach in NHS development. Community groups are concerned about the loss of natural heritage features and functions in the watershed.
3. Stakeholder buy-in and support is key. The NHS cannot be developed by CVC alone and a sense of shared ownership is needed. There is a need to 'cast a wide net' and engage a variety of stakeholders including government, industry and community. There is a real opportunity to strengthen existing traditional partnerships but also opportunities to foster new alliances with non-traditional partners.
4. The greatest opportunity for achieving the NHS rests with public education, outreach and increasing landowner awareness of the value of a natural heritage system. While the benefits are recognized by many, there is both an opportunity and a need to improve ecological literacy across the watershed.
5. The financial requirements to implement the Natural Heritage System Strategy should be made clear. The strategy is a valuable tool to refocus existing financial resources.
6. CVC has an important role to play as technical expert on the watershed and as information broker, relationship facilitator and educator for watershed-related information.
7. There is a need for accessible, transparent, mapping of the NHS at the site scale and a clear communication of the uses permitted in the various natural heritage features and areas comprising the NHS.

8. Mapping of the natural heritage system's features and functions needs to be accurate and verified or refined as appropriate when the NHS is being implemented at the site scale.
9. CVC should provide guidance on interpreting mapping at the site scale. Guidance is needed for feature evaluation, including the evaluation of buffers to the NHS.
10. To keep and restore green spaces, most of which are under private ownership, a voluntary approach is recommended with landowners and agricultural producers. Incentives should be explored. Ecological benefits from good farm practices should be recognized and compensated. The role of buffers in an agricultural context must be clarified and policies on buffers should not limit agricultural land uses.
11. The NHS should be managed and protected as a whole. Caution is needed to ensure that individual parts of the system (e.g. Centres for Biodiversity, High Functioning features) are not automatically viewed as more important than others. The entire system is necessary to maintain ecological function in the watershed.
12. CVC should provide clarity on how the Natural Heritage System Strategy relates to CVC's watershed planning and policies, and also how the Strategy will affect current development applications, approvals, and permits. Further, CVC should provide clarity on how its natural heritage system will be used in the context of municipal natural heritage systems planning and implementation.
13. It is important that forthcoming policies [relating to implementation of the NHS] allow flexibility in the development process to permit development to be responsive to local conditions and municipal requirements (e.g. buffer widths), and that the building and development industry is consulted before any policies are put forward.
14. Mapping and policies should be streamlined where feasible at the municipal scale to minimize red tape for municipalities and landowners.
15. The costs of maintaining municipal natural heritage systems in urban areas are high due to the increased stresses on the NHS in these areas. Existing partnerships to improve efficiency in protecting and restoring these systems are appreciated and should continue to be pursued. New partnerships to seek sustainable funding for municipalities to maintain this green infrastructure are required.

10.0 SUMMARY OF IMPLEMENTATION ACTIONS

Recommended short and medium to long term actions for implementation of the NHS are provided below. The actions are intended to guide integration of the system into CVC's projects, programs and partnerships.

KEY TO CVC PROGRAM ACRONYMS (AND DEPARTMENT)

AER = Aquatic Ecosystem Restoration (Watershed Transformation)

CO = Conservation Outreach (Watershed Transformation)

CL = Conservation Lands (Corporate Services)

ED = Education (Watershed Transformation)

ES = Ecosystem Services (Watershed Knowledge)

FHM = Flow/Hazard Management (Watershed Management)

GIS/IT = GIS & IT (Corporate Services)

LO = Landowner Outreach (Watershed Transformation)

MC = Marketing and Communications (Corporate Services)

NH = Natural Heritage (Watershed Management)

NS = Natural Science (Watershed Knowledge)

PDS = Planning and Development Services (Planning and Development Services)

SPG = Source Protection and Geoscience

IWM = Integrated Water Management (Watershed Management)

TRM = Terrestrial Restoration and Management (Watershed Transformation)

WS = Water Science (Watershed Knowledge)

Table 10-1 Recommended actions for implementation of the system. Timeframes are specified as short term (<5 years to complete), medium to long term (5-10 years to complete) and ongoing

#	Action	Timeframe	CVC Program															
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS
Protection and planning																		
1	Incorporate the CVC Natural Heritage System Strategy into an update of CVC's 2010 Watershed Planning and Regulation Policies, in consultation with municipalities and other stakeholders.	short term												X				
2	Update CVC's EIS guidelines to reflect the NHS, in consultation with municipalities and other stakeholders.	short term												X				
3	Develop user friendly NHS tools for planning staff including mapping to facilitate official plan, planning study, and planning application review processes.	short term								X		X	X	X				
4	Develop principles for biodiversity offsetting as a potential mechanism to assist in implementation of the NHS, to be used as appropriate in accordance with relevant existing policy requirements and/or future updates.	short term					X					X	X	X				
5	Collaborate with municipalities to incorporate the NHS into municipal official plans and policies. Work in partnership with municipalities and stakeholders to consider and refine the NHS at local scales based on the unique characteristics of member	ongoing										X	X	X				

#	Action	Timeframe	CVC Program															
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS
	municipalities (planning authorities).																	
6	Work with partners to develop transparent, accessible mapping of natural heritage systems available for review at the site scale. Ensure clarity on how the system and its component features and areas will be implemented at the site scale.	ongoing									X			X	X			
Land planning and management																		
7	Incorporate the NHS during development or updating of conservation area management plans, and development of conservation area zoning recommendations. For properties that do not require a management plan, or do not have a current management plan, use the NHS to guide management, as appropriate.	ongoing			X													
8	Incorporate the NHS into the development of recreational trail guidelines.	short term			X							X	X	X				
9	Incorporate the NHS during the update of CVC's Conservation Areas Strategy.	short term			X													
10	Incorporate the NHS as an important criterion into an update of CVC's Greenlands Securement Strategy.	short term			X					X								
11	Recommend incorporation of the NHS or its features and areas in municipal land acquisitions or land securement strategies.	ongoing			X													

#	Action	Timeframe	CVC Program																
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS	
Monitoring and Inventory																			
12	Target field inventories and research efforts within high priority areas, such as Centres for Biodiversity. Prepare master plans for these important natural heritage features and areas that identify restoration needs and enhancement opportunities.	medium to long term	X	X	X					X		X	X	X			X	X	X
13	Work with landowners and partners to identify and ground truth natural heritage features and areas contained within the NHS to ensure accuracy and currency of the NHS.	ongoing											X						
14	Identify and map components of the NHS such as candidate significant wildlife habitat to assist in municipal partner implementation of the NHS.	ongoing									X		X	X					
15	Inventory areas that may be particularly vulnerable to future threats and pressures, such as development or resource extraction.	ongoing											X						
16	Inventory and analyze connectivity barriers and pinch points in the NHS (e.g. valleyland crossings) and prioritize mitigation measures to improve terrestrial and aquatic connectivity.	medium to long term									X		X	X					
17	Consider the NHS when identifying new long term (IWMP) and targeted monitoring sites.	ongoing											X						
18	Monitor quality of the NHS at landscape and community scales to detect stresses and recommend actions for mitigation.	ongoing											X						

#	Action	Timeframe	CVC Program															
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS
	Strategies, Research and Tool Development																	
19	Unify the NHS with the Water Management Strategy and other guiding CVC documents through the Watershed Plan to provide recommendations for managing water in the NHS.	medium to long term										X	X			X		
20	Use the NHS to inform natural heritage planning in subwatershed studies.	ongoing								X			X			X		
21	Continue to incorporate the NHS during the implementation of subwatershed studies.	ongoing	X	X	X			X	X		X					X	X	
22	Continue to incorporate the NHS into CVC strategies and guidance documents, as appropriate (e.g. Invasive Species Strategy, Landowner Action Fund).	ongoing	X	X	X		X	X	X		X	X	X	X	X	X	X	X
23	Continue to implement recommendations of the CRFMP using the NHS as the framework for terrestrial and aquatic protection in the watershed.	ongoing	X	X	X				X		X	X	X	X		X	X	
24	Identify and where feasible map and quantify existing and future drivers and stressors on ecosystems in the watershed, and integrate the NHS and IWRS to guide management efforts.	short term								X		X				X		
25	Develop and implement tools that reduce pressures and enhance the ecosystem services provided in the urban matrix,	medium to long term						X	X			X	X			X		X

#	Action	Timeframe	CVC Program																
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS	
	including tools relating to green infrastructure (e.g. Region of Peel Urban Forest Strategy and associated Priority Planting Tool).																		
26	Complete a mapping analysis of future land use scenarios in a subwatershed and watershed context to inform inventory, monitoring, and input to subwatershed and watershed plans.	short term									X		X	X			X		
27	Pursue opportunities to study connectivity requirements for different taxa (e.g. amphibians), and incorporate results as appropriate into updates to the NHS mapping and/or local natural heritage system refinements.	ongoing									X			X					
28	Develop ecological flow targets for watercourses in the NHS to maintain healthy aquatic systems. Undertake ecohydrology research in wetlands to understand the role of surface and ground water in protecting and maintaining these components of the NHS. Update relevant guidelines as appropriate (e.g. CVC-TRCA Water Balance guidelines), and develop tools and priorities to inform decision makers.	medium to long term							X				X	X					X
29	Develop a Grassland Strategy for the Credit River watershed that may be used to refine restoration objectives within the NHS.	short term											X	X					X
30	Assess ecosystem risk and vulnerability of	ongoing	X	X	X					X			X	X					X

#	Action	Timeframe	CVC Program															
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS
	natural ecosystems to climate change; validate recommendations from vulnerability analysis with field data and incorporate recommendations within an adaptive management framework.																	
31	Test species suitability of climate appropriate genetic varieties and species in municipal and public open spaces (assisted migration).	medium to long term										X						X
32	Consider ecosystem services valuation to assess the impacts of land use changes, and assess the value of the NHS in monetary or biophysical terms. Promote the value of the NHS as green infrastructure.	medium to long term					X				X							
33	Develop an environmental benefits index to quantify environmental benefits gained by specific restoration actions at a site.	short term					X		X			X	X					
34	Assess cumulative impacts to the NHS and recommend actions for mitigation and restoration.	medium to long term											X					
35	Continue to undertake targeted research projects that support building knowledge regarding landscape and ecosystem management in partnership with universities, agencies, conservation authorities, municipalities or other organizations.	ongoing										X	X				X	X
Environmental Management																		
36	Manage ecosystems to improve resilience	ongoing	X		X				X			X						X

#	Action	Timeframe	CVC Program															
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS
	through improvement of ecological integrity and function; protect and enhance genetic, species and ecosystem diversity with a focus on native species.																	
37	Improve connectivity, functionality and permeability of the matrix, i.e. the land uses surrounding the natural heritage system.	ongoing	X		X					X			X				X	X
38	Implement stream and wetland buffer creation and dam removal in identified priority areas, as feasible.	ongoing	X	X						X			X				X	
39	Implement the Brook Trout Strategy.	ongoing	X	X	X					X		X	X	X			X	X
40	Implement terrestrial restoration projects in priority areas, and incorporate the NHS into refined forest management and invasive species priorities.	ongoing		X						X								X
41	Apply mitigation measures to reduce impacts on the hydrological and ecological function of the NHS, using guidance from emerging environmental flow and ecohydrology research.	ongoing							X			X	X				X	
42	Implement and promote green infrastructure in the urban matrix to manage water where it falls and to reduce impacts to the NHS. Share results and successes with multiple partners and stakeholders.	ongoing	X							X			X				X	
43	Incorporate the NHS into water sustainability activities, as appropriate.	medium to long term															X	
44	Update floodplain mapping as required and	ongoing							X									

#	Action	Timeframe	CVC Program															
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS
	incorporate into NHS mapping at the appropriate scale.																	
45	Work with partners to protect, maintain or enhance groundwater recharge to natural heritage features and areas, to protect their function.	ongoing													X	X		
Outreach and Education																		
46	Improve public knowledge of NHS through education, communications and outreach.	ongoing		X		X				X		X						
47	Engage watershed residents, corporations and institutions in NHS enhancement and restoration.	ongoing		X		X				X		X						
48	Incorporate the NHS into landowner outreach materials and programs.	ongoing								X		X						
49	Build trust with landowners to promote NHS implementation. Recognize and encourage existing efforts by public and private landowners and agricultural producers to protect and enhance the NHS.	ongoing				X				X		X						
50	Continue to implement CVC landowner outreach programs, incorporating the Natural Heritage System Strategy to guide priorities, as appropriate.	ongoing								X								
51	Develop new and/or expand existing stewardship incentives (e.g. innovative market based-tools such as payment for ecosystem services) to accelerate uptake best land &	medium to long term					X			X		X	X				X	

#	Action	Timeframe	CVC Program															
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS
	water management practices by landowners, residents, corporations and institutions.																	
52	Undertake targeted outreach and restoration campaigns within high priority areas such as Centres for Biodiversity to advance protection and enhancement by the community and landowners.	ongoing	X	X	X					X		X		X			X	X
53	Develop or modify education program materials (e.g. maps, infographics) to engage the public in appreciation and implementation of the NHS.	ongoing				X						X						
Partnerships																		
54	Continue and build on existing partnerships with agencies, organizations, and landowners to pursue shared protection, restoration and management objectives.	ongoing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
55	Collaborate with member and neighbouring regional and area municipalities and conservation authorities to connect natural heritage systems and promote consistent protection for natural heritage systems across the watershed and southern Ontario.	ongoing			X								X	X	X			
System evaluation																		
56	Complete quality assurance and quality control of the NHS mapping and correct errors as appropriate (e.g. through mapping updates	ongoing									X			X				

#	Action	Timeframe	CVC Program															
			AER	CO	CL	ED	ES	FHM	LO	GIS & IT	MC	NH	NS	PDS	SPG	IWM	TRM	WS
	or through the planning process).																	
57	Develop a monitoring plan to evaluate the effectiveness of the NHS. Regularly evaluate the watershed targets identified in the Natural Heritage System Strategy. Incorporate new science on targets as appropriate.	short term (evaluation ongoing)									X			X				
58	Incorporate and track performance measures for the NHS in the CVC watershed plan.	short term (tracking ongoing)												X				
59	Review NHS criteria and mapping at regular intervals, integrating with official plans as feasible to incorporate new science and counter existing or emergent threats (e.g. cumulative impacts).	ongoing									X			X				
60	Review CVC policies relating to the NHS at regular intervals to incorporate federal, provincial and municipal direction and counter existing or emergent threats.	ongoing											X	X	X			

11.0 GLOSSARY

Aquatic system: The aquatic system includes shallow or deep standing or flowing waters with little or no emergent vegetation (Lee *et al.* 1998). The aquatic system mapped in CVC includes watercourses, lakes and ponds (CVC 1998).

Biodiversity: Biodiversity (biological diversity) is the variability among living organisms from all sources including...terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems (Secretariat of the Convention on Biological Diversity 2003). It also includes functional diversity.

Buffer: A buffer is a vegetated area adjoining natural heritage features and areas in which only those land uses permitted within the feature or area itself are permitted. Buffers should be of sufficient size to protect the features and areas, including their functions, from potential impacts of development and site alteration that may occur before, during, and after, construction, and where possible, restore or enhance the features and areas, including their ecological functions and hydrological functions (CVC 2010).

Centres for Biodiversity: Landscapes with a concentration of natural heritage features representative of physiographic regions in the watershed that collectively represent important ecological features and functions capable of supporting native biodiversity over the long term.

Connectivity: Connectivity means the degree to which natural heritage features are connected across the landscape, by links such as plant and animal movement corridors, hydrological and nutrient cycling, genetic transfer, and energy flows through food webs (OMMAH 2002).

Contributing features: Contributing features are features that play a contributing role within the watershed. These features may contribute to connectivity within the system but are typically very small and may also be relatively isolated from other natural heritage features. In urban areas they may be especially valued for their social function. The function of these features may sometimes be more important than the dimensions of the feature. Contributing features may also be important at the subwatershed, catchment, or local scale and need to be assessed separately at those scales to determine if they warrant inclusion in local natural heritage systems.

Ecological functions: The natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes. These may include biological, physical and socio-economic interactions (OMNR 2010).

Ecological Restoration: Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (Society for Ecological Restoration 2004).

Ecosystem: An ecosystem consists of a dynamic set of living organisms (plants, animals, and microorganisms) together with the non-living components of their environment, related processes, and humans (OMNR 1999).

Green infrastructure: Natural and human-made elements that provide ecological and hydrological functions and processes. Green infrastructure can include components such as natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces, and green roofs (OMMAH 2014).

Groundwater discharge: Groundwater discharge is the process of upward movement of groundwater as a result of hydraulic pressures, which results in groundwater reaching the surface. Groundwater discharge is typically noted as seepage into wetlands and watercourses. Springs are the visible discharge points at the surface (CVC 1998).

Groundwater feature: Means water-related features in the earth's subsurface, including recharge/discharge areas, water tables, aquifers and unsaturated zones that can be defined by surface and subsurface hydrogeologic investigations (OMMAH 2014).

Groundwater recharge: Groundwater recharge is the process of water, usually from precipitation, moving downward through permeable soil and rock layers into an aquifer (i.e. a water bearing soil or rock formation). High recharge rates occur in areas of high permeable soils and rocks (e.g., sand and gravel and fractured bedrock) while low recharge rates may occur in low permeable soils (e.g., clays)(Gartner Lee 1997, CVC 1998).

Habitat of endangered species and threatened species: means

- a. with respect to a species listed on the Species at Risk in Ontario List as an endangered or threatened species for which a regulation made under clause 55(1)(a) of the Endangered Species Act, 2007 is in force, the area prescribed by that regulation as the habitat of the species; or
- b. with respect to any other species listed on the Species at Risk in Ontario List as an endangered or threatened species, an area on which the species depends, directly or indirectly, to carry on its life processes, including life processes such as reproduction, rearing, hibernation, migration or feeding, as approved by the Ontario Ministry of Natural Resources; and

places in the areas described in clause (a) or (b), whichever is applicable, that are used by members of the species as dens, nests, hibernacula or other residences. (OMMAH 2014)

Habitat patch: A habitat patch is defined as a contiguous area, boundaries delineated by another land use type or a 30 m gap on a 1:10,000 scale air photo (CVC 1998). It includes natural and semi-natural communities.

High Functioning features: High Functioning natural heritage features represent key natural heritage features from a watershed and/or provincial perspective that are essential for maintaining biodiversity and ecological function within the watershed over the long term. Collectively these features are essential for ensuring the integrity and resilience of the NHS. Some of these features are of provincial significance (e.g. are Provincially Significant Wetlands or Areas of Natural and Scientific Interest). Others may be deemed significant by planning authorities according to the Provincial Policy Statement (e.g. valleylands, woodlands, or significant wildlife habitat). Cumulative impacts to these features are likely to have a significant impact on the resilience and self-sustainability of the NHS.

Lake: An extensive body of water lying in a depression that is 2 ha in size or greater. A lake can be completely enclosed by land or can have either or both an in-flowing or out-flowing stream. A lake can also be created by interrupting the normal flow of a watercourse with a dam (CVC 1998).

Lake Ontario shoreline: All areas within Lake Ontario shoreline defined by Lake Ontario Flood Hazard, Lake Ontario Erosion Hazard, and Lake Ontario Dynamic Beach Hazard.

Landscape: A mosaic where the mix of local ecosystems or land uses is repeated in similar form over a kilometres-wide area (Forman 1995).

Landscape Scale Analysis: The characterization and analysis of ecosystem features and functions at the landscape scale, using GIS mapping, a systems approach, and well-established principles of landscape ecology and conservation biology, to ensure integration of the features and functions within the region of interest with those in the broader landscape.

Natural heritage system: 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 (OMMAH 2014).

Significant Wildlife Habitat: 'Wildlife Habitat' means areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter and

space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory or non-migratory species (OMMAH 2014).

'Significant' in terms of the PPS means "...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".

Successional area: Successional areas are defined as areas that have experienced human influence in the past and that are succeeding or have the potential to succeed to a natural state. These areas correspond to the Cultural Meadow (CUM), Cultural Savannah (CUS) and Cultural Thicket (CUT) ELC communities.

Supporting features: Supporting features represent features that play a supporting role within the watershed. These features enhance the quality and function of High Functioning features and collectively are highly likely to improve the resilience of the NHS. These features contribute to meeting science-based and federal guidelines for overall natural cover within the watershed, help maintain the abundance of common species and some less common species in the landscape, and provide stepping stone habitat or tableland linkages in the landscape, improving connectivity and supporting species as they move across the landscape. These features can in some cases (particularly in an urban context) help alleviate recreation pressure on High Functioning features. The cumulative loss of these features will have some impact on overall levels of natural cover in the watershed. Additionally, these features may be important at the subwatershed or local scale although separate analyses are required to determine their importance at these scales. In some cases, these features may require site level study to better determine the extent of the functions they provide.

Urban areas: Urban related uses including continuous ribbon development. Interpreted from air photos by number of roof tops, and groupings of 5 or more residential units equaling 2 or more hectares (i.e. the presence of pavement, buildings and structures). Single rural residential lots are not included as Urban Area unless part of a group of 5 or more units (OMAF 1982; CVC 1998). In CVC's Ecological Land Classification, "urban land use" includes commercial, industrial, institutional, or educational development; high, medium, or low density residential development; high rise or mixed residential development; rural development or residential estate; highways, collectors, regional roads, roads, railways, or major trails; construction, landfill, or active aggregate; general urban development; or small areas of manicured open space such as cemeteries, lawns, or parks.

Valleylands: Land that has depressional features associated with a river or stream, whether or not it contains a watercourse (CAA 1990).

Water body: For the purposes of the NHS, a water body is an area of open water classified through air photo interpretation using Ecological Land Classification as

Open Aquatic (OAO) or Shallow Water (SA, all types). A water body that is 2 ha or larger in size is termed a lake in CVC's NHP methodology, while one that is less than 2 ha is termed a pond (CVC 1998). Some areas (namely Open Aquatic or Shallow Water) classified under ELC as aquatic habitat or as a water body through air photo interpretation in CVC's ELC mapping may also be defined as wetland under the Ontario Wetland Evaluation System (OWES).

Watercourse: Means an identifiable depression in the ground in which a flow of water regularly or continuously occurs (CAA 1990).

Watershed: Means an area of land drained by a river and its tributaries (OMMAH 2014). For the purposes of this study, 'watershed' refers to the area under CVC jurisdiction.

Wetlands (as defined for the purposes of the NHS): Land that

- a. is seasonally or permanently covered by shallow water, or has a water table close to or at its surface,
- b. directly contributes to the hydrologic function of a watershed through connection with a surface watercourse,
- c. has hydric soils, the formation of which has been caused by the presence of abundant water, and
- d. has vegetation dominated by hydrophytic plants or water tolerant plants, the dominance of which has been favoured by the presence of abundant water,

but does not include periodically soaked or wet land that is used for agricultural purposes and no longer exhibits a wetland characteristic referred to in clause (c) or (d). (CAA 1990).

The PPS defines wetlands as follows:

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 plants or water tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens.

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. (OMMAH 2014).

Woodlands: 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." (OMNR 2010, OMMAH 2014).

For the purpose of defining woodlands for the NHS, the following definition was applied:

Woodlands:

- a. A tree crown cover of over 35% of the ground, determinable from aerial photography; or
- b. A tree crown cover of over 25% of the ground, determinable from aerial photography, together with on-ground stem estimates of:
 - 1,000 trees of any size per hectare, or
 - 750 trees measuring over five centimetres in diameter, per hectare, or
 - 500 trees measuring over 12 centimetres in diameter, per hectare, or
 - 250 trees measuring over 20 centimetres in diameter, per hectare but does not include a cultivated fruit or nut orchard or a plantation established for the purpose of producing Christmas trees (based on the Forestry Act of Ontario, R.S.O. 1990 http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90f26_e.htm)

For the purposes of a) and b), the tree amount is based on the average per hectare across the entire treed area.

Woodlands exclude nurseries, plantations that are managed for tree products with an average rotation of less than 20 years (e.g. hybrid willow or poplar) and plantations that are continuously managed for the sole purpose of complete removal at rotation without a reforestation objective, as demonstrated with appropriate documentation.

Woodlands that meet the above definition of woodlands but are altered by disturbance, pests, or disease (e.g. blowdown, fire, or invasive pest infestation) would still be considered as woodlands. The changes are considered temporary whereby the woodlands still retain their long-term ecological value, and still have the capacity to be restored to natural cover and eventually to woodland over time.

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