ATTACHMENT NO. 1

Phase 1 of the Natural Heritage Network Study for the City of Vaughan

FINAL REPORT

November, 2012

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City of Vaughan NHN Phase 1 Study Report

1.0 INTRODUCTION

Vaughan Vision 2020, the City of Vaughan's Strategic Plan, begins by acknowledging the rapid pace of change in the City.

green
directions
VAUGHAN

Vaughan is one of Canada's fastest growing cities, with a population of over 250,000. It is projected that the number of residents will increase to 430,000 by 2031.

The next 25 years will see Vaughan beginning the transition from a growing suburban municipality to a fully urban space. This type of transition will require long-term thinking about how best to accommodate and make the most of new opportunities.

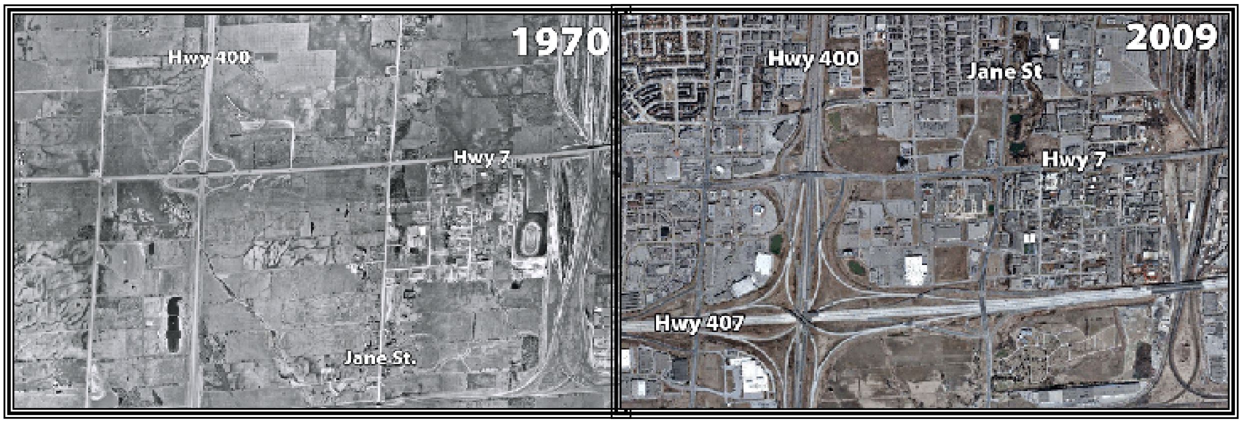
Vision 2020 includes a vision and strategic goal that acknowledges the need to value and manage the natural environment.

Vision: *A city of choice that promotes diversity, innovation and opportunity for all citizens, fostering a vibrant community life that is inclusive, progressive, environmentally responsible and sustainable*

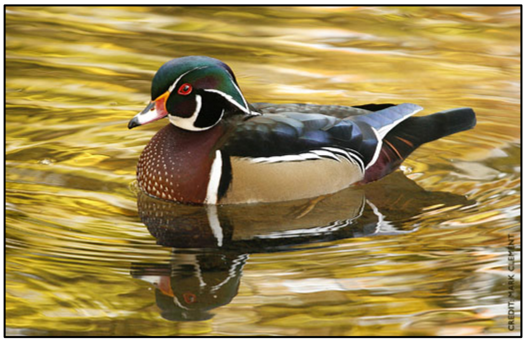
Goal: *Lead and Promote Environmental Sustainability*

Recognizing the pace of growth in urban areas, the Province of Ontario passed the Places to Grow Act (2005) and prepared the Growth Plan for the Greater Golden Horseshoe to provide direction and tools for municipalities to manage growth to optimize benefits and to minimize negative impacts. This includes planning for social, economic and environmental needs. Vaughan Tomorrow is the City's growth management program and comprises: Vaughan Vision 2020; Green Directions Vaughan, the City's first Community Sustainability and Environmental Master Plan; and the new Vaughan Official Plan 2010 (VOP 2010), adopted by Council on September 7, 2010 and subject to further modifications on September 27, 2011, March 20, 2012 and April 17, 2012, and approved with modifications by York Region council on June 28, 2012).

Over the past fifty years the extent and intensity of urban development has fundamentally changed the character of southern Ontario within an area extending from Oshawa to Hamilton and northward from Toronto to Newmarket. The change has occurred in large measure as urban development expanded into agricultural lands, which previously separated smaller towns and larger cities.

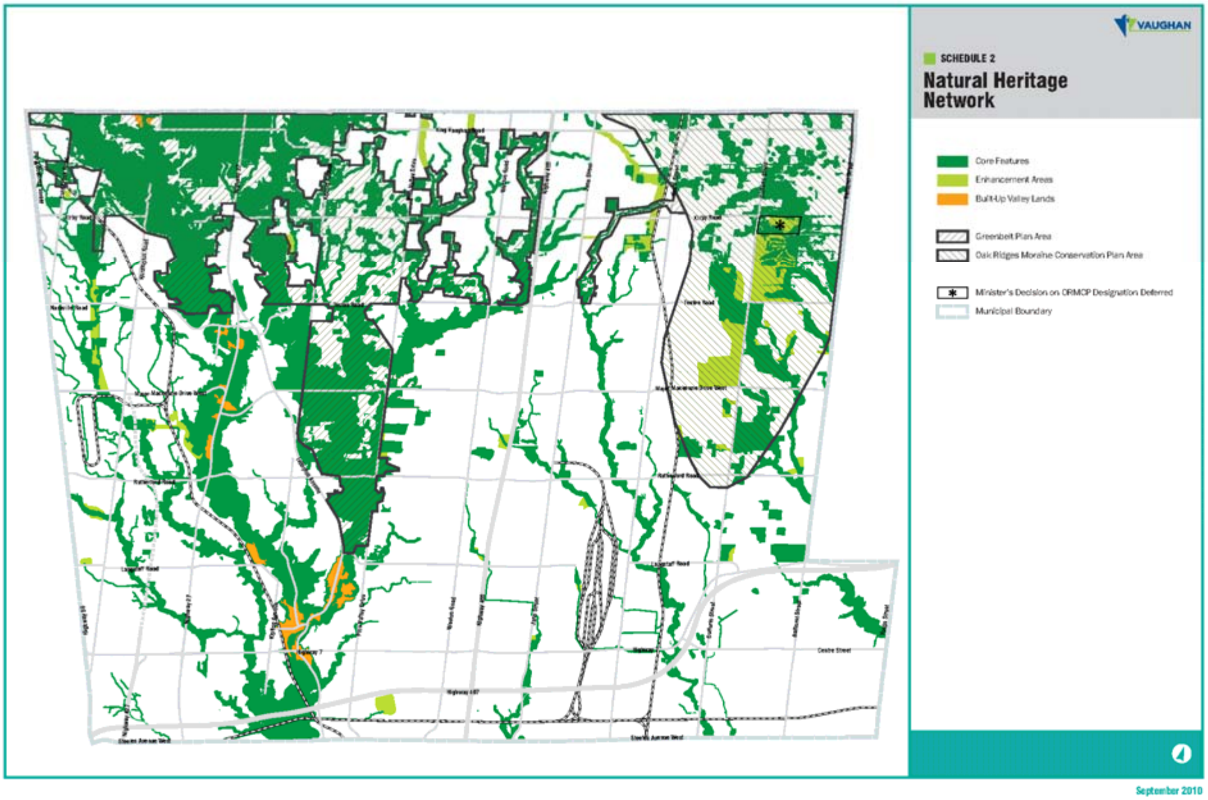


Over this same time period the approach to protecting natural areas within new areas of urban development has changed substantially. In the 1950's the approach was to maximize the area available for urban development by removing woodlands and wetlands and where possible putting watercourses in concrete channels that in some cases were buried. Through the 1960's and 70's greater effort was made to protect the most significant natural areas through Environmentally Significant/Sensitive Area programs, an approach described as protecting "islands of green". In the 1980's protecting natural areas began to take a "systems approach", considering the need for the protection of larger core protected areas and ecological corridors linking isolated natural areas; an approach requiring the protection of open fields and agricultural lands as "enhancement areas". Current approaches to environmental planning include strategies that integrate the "systems approach" with the planning and management of green infrastructure (on-site to end-of-pipe stormwater management facilities), open space (parks and active sports fields) and the urban forest (all trees on public and private property).


CREDIT: MARK CLEMENT

As part of the work in preparing the VOP (2010) the Province of Ontario and the Region of York require a "systems approach" be taken to the protection of terrestrial and aquatic features and functions. The environmental planning process for the VOP (2010) included broad-based input that lead to a Council adopted Natural Heritage Network (NHN) that represents an interconnected system of core natural features, enhancement areas and built-up valley lands to protect natural heritage features and their respective ecological functions. Based on a systems approach, the NHN core features protect the remaining habitat patches in Vaughan which together with interconnecting enhancement and linkage areas aim to establish a healthy and resilient area to provide long term protection and management of Vaughan's native biodiversity. The Natural Heritage Network as currently defined in the VOP 2010 is shown in the figure below (Figure 1).

Figure 1. City of Vaughan Natural Heritage Network (VOP 2010)


VAUGHAN
SCHEDULE 2
Natural Heritage Network
Core Features
Enhancement Areas
Built-Up Valley Lands
Greenbelt Plan Area
Oak Ridges Moraine Conservation Plan Area
Minister's Decision on ORMCP Designation Deferred
Municipal Boundary
September 2010

1.1 Purpose of Vaughan NHN Phase 1 Study

The NHN Phase 1 Study includes five key tasks with strong links between each of the tasks.

Task 1 ***Creation of a Comprehensive GIS database***. In consultation with the project coordinator and steering committee, assemble a digital data library that is accurately geo-referenced and contains attribute information that meets the current and future needs of Vaughan.

Task 2 ***Develop Ecosystem Targets.*** Develop policy-based and science-based measures of natural heritage features and functions that make up the NHN and protect native biodiversity in Vaughan over the long term, consistent with Provincial Policy Statement 2.1.2, York Region Official Plan (YROP) policies regarding Greenlands Systems and relevant environmental policies of VOP 2010.

Task 3 ***Undertake a Gap Analysis***. Utilize the comprehensive GIS database established in Task 1 to assess the level of protection afforded against the select ecosystem targets.

Task 4 ***Review the Environmental Management Guideline (EMG)***. Provide recommendations to revise the EMG in the context of: the environmental policies of Chapter 3 of the VOP 2010, with particular reference to the Natural Heritage Network policies; the available information within the GIS database; the ecosystem targets developed; and the results of the gap analysis.

Task 5 ***Recommend the Preliminary Methodology for Field Investigations.*** Identify priorities for the Phase 2 field work of the NHN Study focusing on headwater streams and significant wildlife habitat.

1.2 General Description of Natural Heritage Network Planning

An important contribution to the “health” of Vaughan comes from the combined elements of “nature” present in the city, including, individual trees, shrubs and gardens around homes, schools and businesses, green roofs and walls, urban parks, street trees and gardens, green infrastructure such as bioswales and stormwater ponds as well as the NHN. Each of these elements of nature contributes ecosystem services important to both human well-being and the long term protection of native plants and animals (*biodiversity*). These contributions include, for example:

- individual trees that provide shade to reduce household energy costs, increase property value, and provide habitat for urban wildlife; or
- green neighbourhoods that have continuous tree canopies along streets and interconnected urban parks and green infrastructure that calm traffic, clean air and provide local recreational opportunities; or
- healthy watersheds that have a robust and well-connected NHN consisting of forests, wetlands, watercourses and other natural cover that plays a role in reducing the urban heat island effect, managing urban stormwater flow and infiltration, improving air quality, promoting active lifestyles, while also providing the habitat needed to sustain native plants and animals.

The NHN performs the unique function of providing natural areas able to meet the demands of plant and animals that require high quality habitat for their long term survival. Many species (for example, Spring Peepers, Wood Thrush and Rose Twisted-stalk) cannot be found where there are high noise levels, vehicle exhaust, continuous light at night, poor water quality, barriers to movement, etc. that characterize more built-up urban areas.

The development of a NHN is therefore a long range environmental planning effort intended to protect the habitat necessary to sustain native plants and animals over the long term. The NHN is of particular importance in the context of ongoing urban development in Vaughan, particularly within new community areas.

The NHN is based on the Commitment to Environmental Stewardship as expressed in the VOP (2010):

> *The natural environment is among Vaughan's most important and cherished assets. The Humber and western Don Valley systems are prominent on the City's landscape and the overall health of those systems is reliant on the stewardship provided by Vaughan. The watercourses, woodlands, wetlands and related open spaces and agricultural lands each have an important function in maintaining ecological vitality and diversity in the City. Protecting flood prone areas from inappropriate development is critical to ensuring public safety. Ensuring the quality of our air, water and soil is fundamental to maintaining overall environmental health. We must also recognize the impacts of climate change on our environment and plan for both mitigation and adaptation.*

The NHN *provides for the long-term health of Vaughan's natural environment for the benefit of present and future generations* (VOP 2010). Achieving protection requires a "systems approach" that considers the importance of maintaining and protecting:

- ***ecological features*** in the environment such as woodlands, wetlands, meadowlands and watercourses, *etc.*;
- ***ecological functions*** of the environment such as water storage and water quality enhancement by wetlands, winter deer yards provided by dense cedar woodlands, amphibian breeding habitat in ephemeral forest ponds, *etc*.; and
- ***ecological interactions*** that occur over varying scales of time and space such as animal predation and herbivory, the daily, seasonal and long term movement patterns of plants and animals, and the ecological role of natural disturbance mechanisms such as fire, wind, water, and disease, *etc*.

2.0 TASK 1 - ASSEMBLING THE DIGITAL GIS DATABASE

In consultation with the project coordinator and steering committee, data layers from a variety of sources have been assembled to create a digital GIS database that is comprehensive and accurate for purpose of informing environmental planning in Vaughan.

Digital data was acquired from the following sources and include the following layers:

Provincial

- Area of Natural and Scientific Interest (Life Science and Earth Science)*
- Wetland#
- Water body#
- Watercourse#
- Greenbelt*
- Oak Ridges Moraine*

[asterisk (*)indicates data layers provided by the Region of York; hashtag (#) indicates data layers acquired from Land Inventory Ontario (LIO)]

Region of York

- York Region Greenlands
- Bioforest

Toronto and Region Conservation Authority (TRCA)

- Flora and fauna species locations
- Environmentally Sensitive Areas
- Habitat Plans
- Interior Forest
- Natural Cover (2007-2008)
- Regulation Limit (based on Ontario Regulation 166/06 of the Conservation Authorities Act)
- Soils
- Target Terrestrial Natural Heritage Systems Model
- TRCA property
- UFORE Landuse
- Vegetation Type
- Crest of Slope

City of Vaughan

- Conservation Areas
- Contours
- Detention Ponds
- Environmentally Sensitive Areas
- Forest
- Lots/Concession

- NHN – core features, enhancement areas, built-up valleylands
- Pits and Quarries
- Railway
- Regional Forest
- Roads
- Significant Forest
- Transmission Line
- Water bodies
- Watercourse – TRCA
- Watershed
- Wellhead Protection Area
- Water Reservoirs
- Zoning

2.1 Digital Data Layers in City of Vaughan GIS database

Below is a brief description of each of the digital data layers assembled. In cases where data was obtained from more than one source, multiple data sources were compared to provide an updated digital data layer that provides the most complete and current information based on 2011 orthoimagery. Appendix 1 provides further information on the source and description of digital data layers. Appendix 2 provides further information in regard to how digital data were reviewed during the NHN Phase 1 study and Appendix 4 provides samples of the metadata as provided in ESRI shapefiles.

Oak Ridges Moraine

The data layers for the Oak Ridges Moraine (ORM) include the ORM Plan Area, and internal designations of Natural Core Area, Natural Linkage Area, Countryside Area and Settlement Areas (see Figure 2). ORM Key Natural Heritage Features (KNHF) and Hydrologically Sensitive Features (HSF) are not provided in GIS data files; KNHF and HSF are described in the Oak Ridges Moraine Conservation Plan (ORMCP).

Source	Original File Name	Description
York Region	orm_bdry	Extent of the provincially designated Oak Ridges Moraine planning area within Vaughan.
York Region	landuse_region	Designations within the ORMCP include, Natural Core, Natural Linkage, Settlement Area and Countryside.

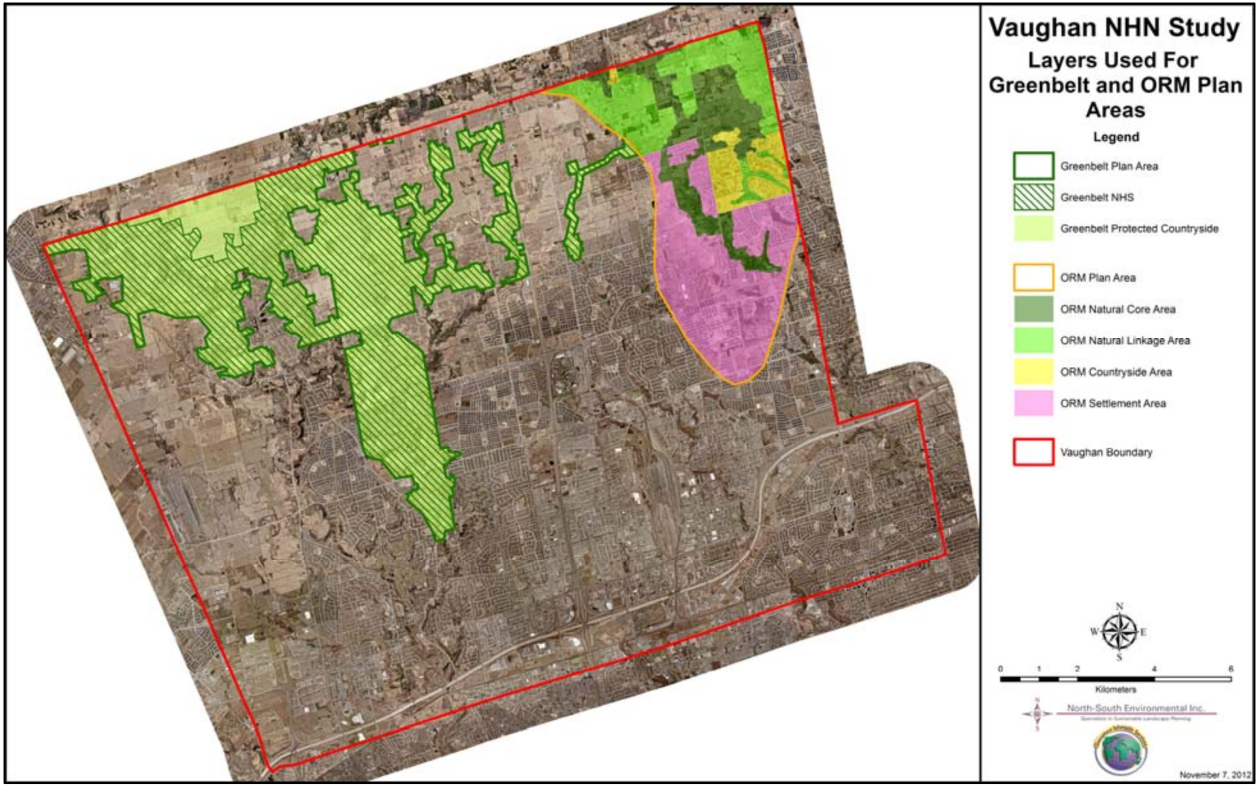
Greenbelt Plan

The data layers for the Greenbelt Plan include the boundary of the Greenbelt Plan area and the internal designation of Greenbelt Countryside and the overlay boundary of the Greenbelt NHS within the Plan area.

Source	Original File Name	Description
York Region	green_belt_bdry	Extent of the provincially designated Greenbelt planning area within the City of Vaughan.
York Region	ropgbnaturalheritagesystem	Natural Heritage System overlay within the Greenbelt Plan area.

The final digital layer, greenbelt_final, includes the boundary of the Greenbelt, Greenbelt NHS and Greenbelt Countryside (see Figure 2).

Figure 2. Example of ORM and Greenbelt data layers


Vaughan NHN Study
Layers Used For Greenbelt and ORM Plan Areas
Legend
Greenbelt Plan Area
Greenbelt NHS
Greenbelt Protected Countryside
ORM Plan Area
ORM Natural Core Area
ORM Natural Linkage Area
ORM Countryside Area
ORM Settlement Area
Vaughan Boundary
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Kilometers
North-South Environmental Inc.
November 7, 2012

York Regional Greenlands

The York Regional Greenlands System contains key natural heritage features and key hydrologic features and the adjacent lands necessary to maintain these features in a linked system. Policies to identify, protect and enhance the Regional Greenlands System are found in Section 2 of the York Region Official Plan.

Source	Original File Name	Description
York Region	Greenlands	Extent of the most recent Regional Greenlands System designated by York Region.

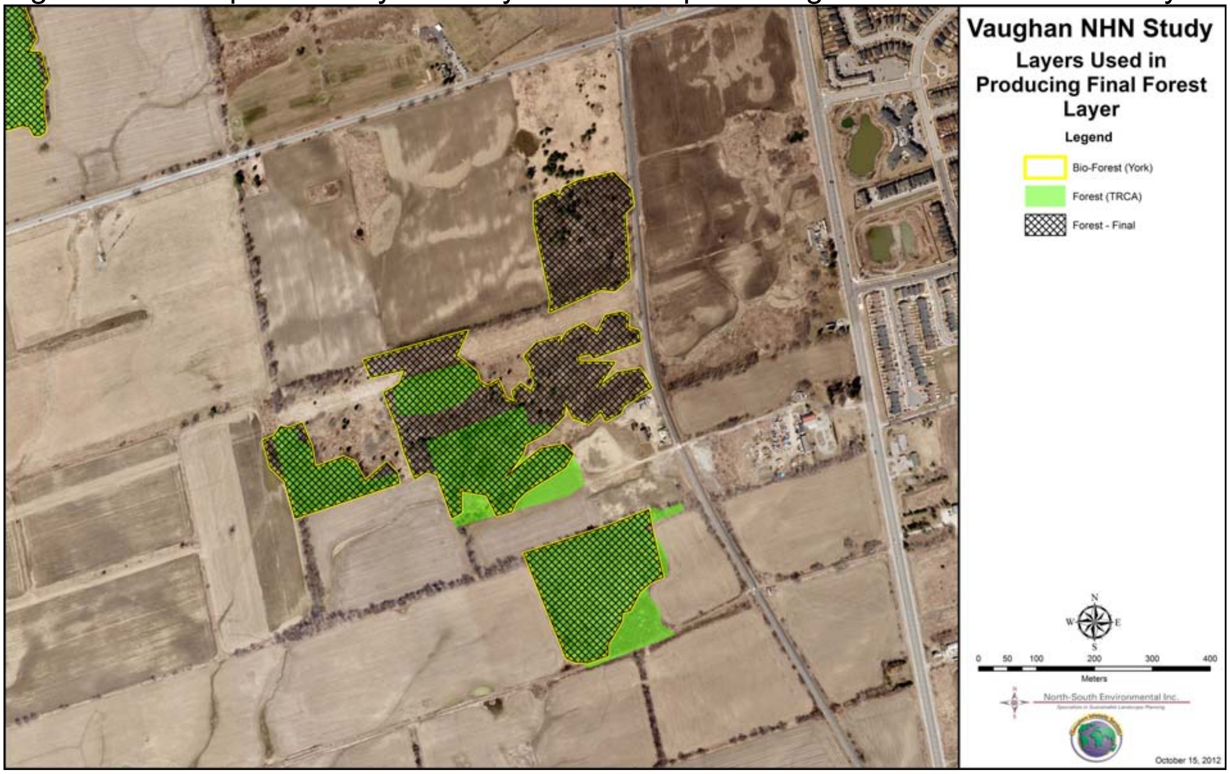
Forest/Woodlands
Digital GIS data for forest/woodlands was acquired from York Region and the TRCA. These data layers were analyzed as discussed below to produce a final woodlands data layer for Vaughan.

Source	Original File Name	Description
York Region	bioforest	Attributes include capture method, reason for a modification and an identification code.
TRCA	naturalcover20072008-_trca_clipVaughan	‘Forest’ is one four “natural cover” types (forest, meadow, successional, and wetland).

Refinement of Forest/Woodland Data Layer
The bioforest layer provided by York Region was the most current data layer and York Region indicated the layer was recently reviewed onscreen to ensure accuracy. The TRCA habitat data layer for forest is older. Upon review of both digital forest layers and the 2011 orthoimagery, inconsistencies were observed between the two data layers and woodland visible on the orthoimagery.

To produce a final digital forest layer the York Region data was compared with the TRCA data, and discrepancies >0.5 ha in size were reviewed onscreen using the orthoimagery to determine if forest was present (see figure 3). Where necessary narrow extensions and connections of polygons were evaluated for inclusion based on MNR criteria provided in Technical Paper 2 of the Greenbelt Plan (2005) and the ORMCP Technical Paper 7. The final Forest/Woodland layer named bioforest_final.

Figure 3. Example of analysis of layers used in producing the Forest/Woodland layer.


Vaughan NHN Study
Layers Used in Producing Final Forest Layer
Legend
Bio-Forest (York)
Forest (TRCA)
Forest - Final
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Meters
North-South Environmental Inc.
October 15, 2012

Meadowlands
While meadow habitat is not specifically noted in section 2 of the Provincial Policy Statement as a feature type, meadowlands may be identified as components of significant habitat of endangered and threatened species and significant wildlife habitat.

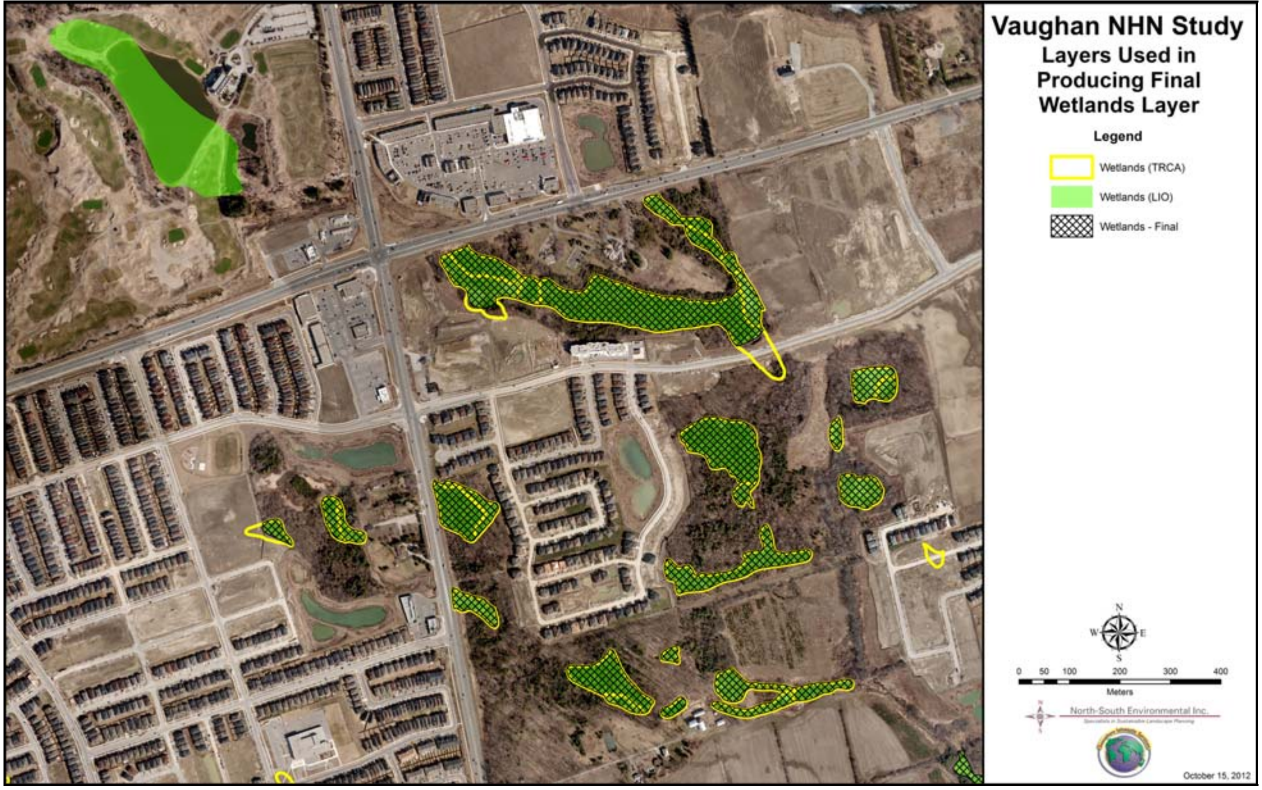
Source	Original File Name	Description
TRCA	naturalcover20072008-_trca_clipVaughan	'Meadow' is one of four "natural cover" types (forest, meadow, successional, and wetland)

Wetlands
Digital GIS data for wetlands was acquired from LIO and the TRCA. These data layers were analyzed as discussed below to produce a final wetlands data layer for Vaughan.

Source	Original File Name	Description
LIO	Wetlandu	Attributes associated with this data layer include: unit type (e.g swamp, marsh), evaluated, name of complex, significance - provincial, other, unknown
TRCA	naturalcover20072008-_trca_clipVaughan	'Wetland' is one of four "natural cover" types (forest, meadow, successional, and wetland)
TRCA	Vegtype_trca	Attributes associated with this data layer include ELC vegetation type classification that provides coverage for approximately 45% of Vaughan's natural areas.

Refinement of Final Wetland Data Layer for Vaughan
All available digital data for wetlands were merged to produce a final wetland data layer. Within areas of urban development wetland polygon units were examined overlaid on 2011 orthoimagery. Where it was obvious that wetland polygon units were no longer wetland areas due to development or disturbance they were removed from the final wetland data layer (see figure 4). The final wetland layer is named wetlands_final.

Figure 4. Example of analysis of layers used in producing the wetland layer.


Vaughan NHN Study
Layers Used in Producing Final Wetlands Layer
Legend
Wetlands (TRCA)
Wetlands (LIO)
Wetlands - Final
N
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0 50 100 200 300 400
Meters
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October 15, 2012

Watercourse

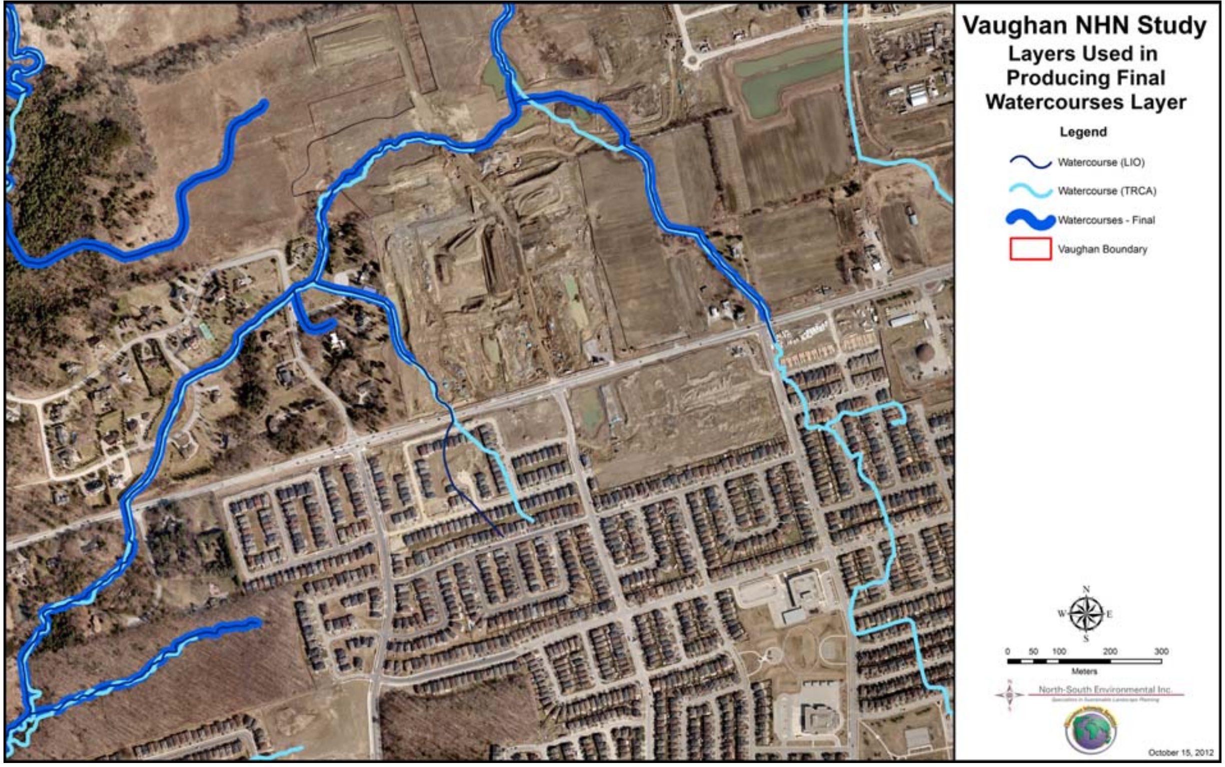
Digital GIS data for watercourses was acquired from LIO and the TRCA. These data layers were analyzed as discussed below to produce a final watercourse data layer for Vaughan.

Source	Original File Name	Description
LIO	ohnwcrs	Attributes for each watercourse line include official name, permanency, flow class, and EFFDATE (e.g. 2011-09-22).
TRCA	WatercoursesTRCA	Attributes relate to watershed and river name, but not for hydrological characteristics.

Refinement of Final Watercourse Data Layer for Vaughan

The LIO layer was used as the primary layer in creating the watercourse layer. The feature lines within the LIO layer were screened by examining the watercourse lines overlaid on 2011 orthoimagery. Watercourse lines that were no longer associated with open watercourses within developed areas were removed from this layer unless the watercourse was present as an open watercourse upstream and downstream of the area of development. In these latter cases it was assumed the watercourse is piped through the area of development. The TRCA layer was added and screened to add open watercourse lines that did not already exist in the LIO layer. A similar approach to screening watercourse within areas of development was used for these additional watercourses (see Figure 5). The final digital watercourse layer is named watercourse_final.

Figure 5. Example of analysis of layers used in producing the watercourse layer.


Vaughan NHN Study
Layers Used in Producing Final Watercourses Layer
Legend
Watercourse (LIO)
Watercourse (TRCA)
Watercourses - Final
Vaughan Boundary
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Meters
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TRCA Biotic Survey Information

TRCA provided point data of flora and fauna observations from field surveys.

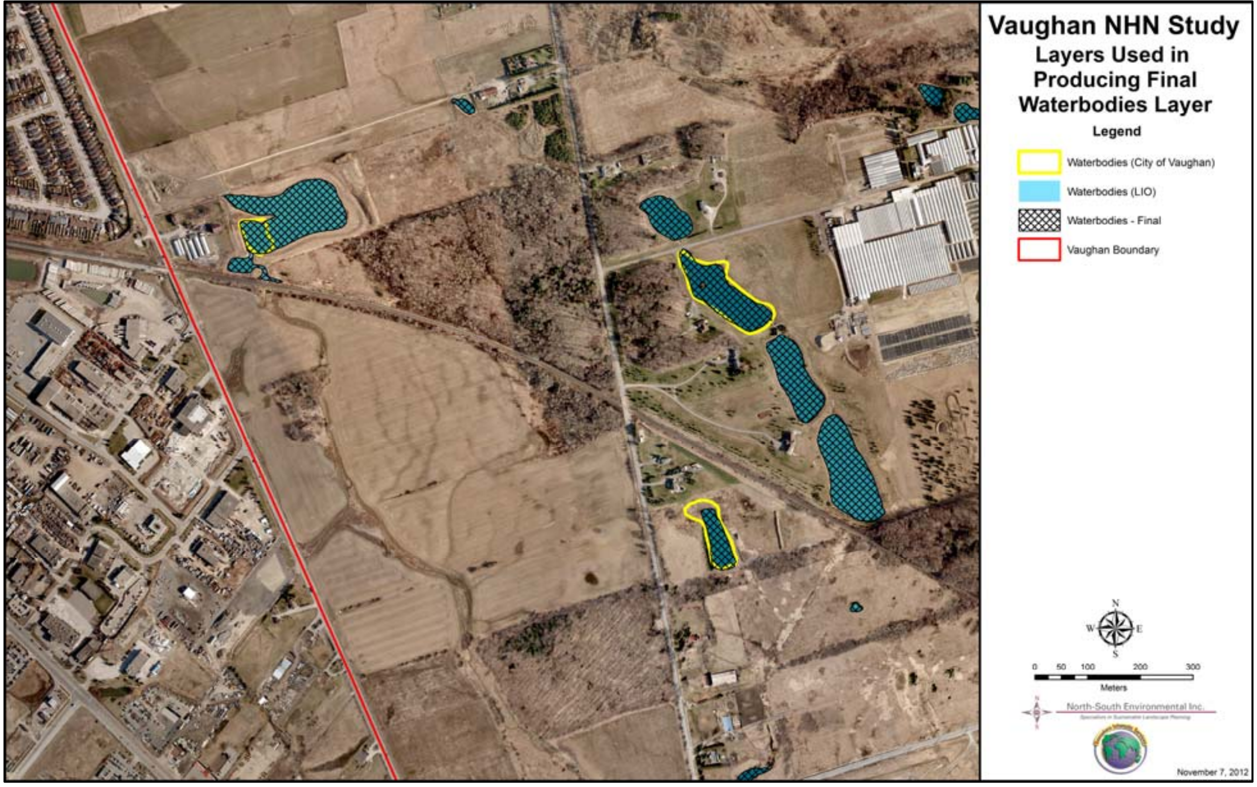
Source	Original File Name	Description
TRCA	flora_trca_vaughan_-250m_may17_2012	Point data for flora including the following attributes: common name, scientific name, L-rank, observer, date observed, population, and local distribution.
TRCA	fauna_trca_vaughan_-250m_may17_2012	Point data for fauna including the following attributes: common name, scientific name, L-rank, observed date, observer (source), abundance, and population.

Water Bodies
Digital GIS data for water bodies was acquired from LIO and Vaughan. These data layers were analyzed as discussed below to produce a final water bodies data layer.

Source	Original File Name	Description
LIO	ohnwbdy	Attribute data included information about types of water bodies (e.g.lake, river, reservoir).
Vaughan	WaterBody	Illustrates water bodies in Vaughan, but attribute data does not distinguish types of water bodies.
Vaughan	DETENPD	Illustrates the detention ponds (storm water management ponds) within the City of Vaughan

Refinement of Final Water Body Data Layer for Vaughan
The LIO digital data was used as the primary layer in creating the water body layer. The polygons within the LIO layer were screened by examining the polygons overlaid on the 2011 orthoimagery. Where development eliminated a water body it was removed from the digital data. Water bodies present as stormwater management ponds were retained in the digital data, and were given the attribute detention pond. All other water bodies have the attribute natural. It is recognized that some water bodies with the attribute natural may be dug ponds. The Vaughan water body layer was screened for additional water bodies not included in the LIO layer, additional water bodies were also tagged as natural or detention pond. The detention pond digital data was also screened on the orthoimagery to confirm the existence of these features and add them to the digital water body layer (see Figure 6). Additional effort is required to update information for detention ponds as this information becomes available. The final water body layer is named waterbodies_final.

Figure 6. Example of analysis of layers used in producing the water bodies layer.


Vaughan NHN Study
Layers Used in Producing Final Waterbodies Layer
Legend
Waterbodies (City of Vaughan)
Waterbodies (LIO)
Waterbodies - Final
Vaughan Boundary
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Meters
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TRCA Regulation Limit Base Data
Select base data used to define the TRCA Regulation Limit according to Ontario Regulation 166/06 are described below in relation to NHN features and areas.

Source	Original File Name	Description
TRCA	crestofslope_TRCA_-cliptoVaughan	Identification of crest of slope defining valley systems within Vaughan.
TRCA	Engineered_Floodline_TRCA_-CliptoVaughan	Extent of engineered flood line within Vaughan.
TRCA	Estimated_Floodline_TRCA_-CliptoVaughan	Extent of estimated flood line within Vaughan.

Designated Areas
The Ontario Ministry of Natural Resources (MNR) and the TRCA are external agencies that have identified natural areas in Vaughan. MNR is responsible for identifying and maintaining data regarding Areas of Natural and Scientific Interest (ANSIs) while TRCA previously identified Environmentally Significant Areas (ESAs).

Source	Original File Name	Description
LIO	ansi	All Earth Science and Life Science ANSIs within the City of Vaughan.
TRCA	esa_trca_slipvaughan	all ESA's within the City of Vaughan.

Vaughan Official Plan Natural Heritage Network

VOP 2010 designates a natural heritage system, the Natural Heritage Network (NHN), in Vaughan as delineated on Schedule 2 of VOP 2010. The NHN components include Core Features, Enhancements Areas, Built-Up Valleylands, and the Greenbelt Plan and ORMCP areas. Section 3.2.3 of VOP 2010 includes policies for the protection and enhancement of the NHN. It is recognized in policy 3.2.3.2 of VOP 2010 that the delineation of the NHN identified on Schedule 2 is based on the best available information at the time the background report (AECOM 2010) was prepared, but that further study is required to comprehensively identify a NHN that meets the test in Provincial Policy Statement (PPS) 2.1.2 of maintaining elements of biodiversity and ecological function for the long term. The NHN data layer is named natural_heritage_2_urban_strategies.

Source	Original File Name	Description
Urban Strategies	NaturalHeritage	This includes the area contained with the NHN created by Urban Strategies and includes the following attributes layer (core areas, enhancement areas, and built-up areas).

3.0 TASK 2 – DEVELOP NHN TARGETS

The overall NHN Study will assess the role of the existing NHN in maintaining elements of biodiversity and ecological function, consistent with PPS policy 2.1.2 and greenlands systems policies of the York Region Official Plan. At the completion of all phases of the NHN Study, additional NHN areas may be proposed to meet ecosystem targets of the natural heritage system related to biodiversity persistence and ecological function. Identification of appropriate ecosystem targets to complete the NHN is a critical task of Phase 1 of the NHN Study.

The establishment of NHN targets is intended to provide a measure of success towards achieving the role of the NHN to maintain elements of biodiversity and ecological function. In the establishment of targets, two primary objectives have been used:

- NHN targets based on relevant environmental policies and regulations; and
- NHN targets based on a “systems approach” to environmental planning.

3.1 Review of Background Reports

Several reports were reviewed in order to compile information for further consideration in the Natural Heritage Network. The literature review is important to ensure that all available data layers are identified for the compilation of the GIS database. Furthermore, observations regarding species occurrences and ecological functions are important to consider in developing the NHN targets. These reports include:

- AECOM. 2010. City of Vaughan Natural Heritage in the City.
- AGRA Earth and Environmental. 2001. Kleinburg – Nashville Community Plan: Natural Environment – Background Study Report.
- AMEC Earth and Environmental. 2002. Focus Rural Area Woodland Ecosystem Assessment.
- Toronto and Region Conservation Authority, 2012. City of Vaughan Urban Forest Study: Technical Report.
- City of Vaughan. 2001. Tableland Woodlot Protection Strategy. Prepared by J.H. Stevens, Planning and Development Consultants.
- Gartner Lee. 1993. City of Vaughan Subwatershed Study – Existing Environmental Conditions.
- Ontario Ministry of Natural Resources. 2012. Provincially Significant East Humber River Wetland Complex.
- Ontario Ministry of Natural Resources. 2000. Inventory of the Life Science Maple Uplands & Kettle Wetlands and Earth Science Oak Ridges Moraine Maple Spur Areas of Natural and Scientific Interest, City Of Vaughan, Ontario.
- Toronto and Region Conservation Authority, 2012. City of Vaughan Urban Forest Study: Technical Report.

AECOM. 2010. City of Vaughan Natural Heritage in the City

This report included a description of the natural heritage resources in the City, methodology for assessing the natural heritage network, and a proposed natural heritage network. Specifically, information that may be available for further consideration includes:

- locations for Redside Dace available on Figure 7 of the report;
- compilation of wildlife observations in section 4.3.2 of the report and species locations on Figure 12, including area-sensitive species.

AGRA Earth and Environmental. 2001. Kleinburg – Nashville Community Plan: Natural Environment – Background Study Report

This report provides descriptions of vegetation communities including ELC of the Kleinburg – Nashville study area. The locations of cultural plantations (CUP) shown on figures 6-2 and 6-3 were used to update the final forest data layer created for Vaughan in the Phase 1 NHN study.

AMEC Earth and Environmental. 2002. Focus Rural Area Woodland Ecosystem Assessment.

This study identifies woodlands classified as low, moderate, or high ecological function based on methodologies developed by AGRA Earth and Environmental in the Kleinburg – Nashville report (2001). The classification of these woodlands may be considered in applying the policies of the Official Plan Amendments 450 and 600 (Section 5.11) respecting the protection of those areas which provide high and moderate forest ecosystem function. Flora and fauna inventory information described in the report can be used to determine candidate or confirmed significant wildlife habitat.

City of Vaughan. 2004. Regional Road 27 Valley Corridor Study - Valley Corridor Management Plan.

The purpose of this management plan is to detail the natural features within the valley corridor associated with the main branch of the Humber River between Rutherford Road and Nashville Road. Additionally, this management plan proposes the protection of natural features, restoration of natural features and functions, and to preserve and establish linkages within and adjacent to the valley system.

The description of natural features relies on the natural environmental information detailed in the AGRA Earth and Environmental report titled, OPA 160 Official Plan Review Kleinburg–Nashville Community Plan Natural Environment – Background Study Report. A general description of the natural heritage features includes:

- Humber River watershed;
- Fisheries;
- Regional storm floodplain;
- Erosion hazards;

- Woodlands;
- Wetlands and ponds; and
- Cultural heritage resources.

Toronto and Region Conservation Authority, 2012. City of Vaughan Urban Forest Study: Technical Report.

This report includes a very high level assessment of tree cover and tree types within the City of Vaughan. The report assesses the distribution, structure and function of the urban forest, and provides management recommendations for enhancing the sustainability of both the urban forest resource and the community as a whole. The study also provides a baseline for future research and monitoring.

City of Vaughan. 2001. Tableland Woodlot Protection Strategy. Prepared by J.H. Stevens, Planning and Development Consultants.

This report includes an inventory of forests designated as “Woodlots” within the City of Vaughan. The inventory includes a summary of relevant municipal policies and a brief summary of:

- the woodlot characteristics;
- the ownership and acquisition status;
- its current policy/regulatory context;
- assessment of current issues associated with its protection; and
- an aerial photo of each woodlot to provide a greater understanding of its existing land use context.

Gartner Lee. 1993. City of Vaughan Subwatershed Study – Existing Environmental Conditions.

This background report describes the City’s environmental resources for the purpose of providing the framework for developing a linkage plan that integrates the various resource features and informs the completion of Environmental Management Plans for three development areas assessed in this report.

The background review of existing information and analysis of aerial photography was focused on geologic/hydrogeologic features (e.g. hydrogeologically sensitive areas) the extent and type of forest cover, significant natural areas (e.g. ANSIs, ESAs, and wetlands), valley lands, and hydrology and hydraulic characteristics.

Fieldwork included:

- Water quality sampling (13 sampling stations)
- Fisheries sampling (13 locations)
- Benthic sampling (19 sites)
- Instream habitat assessment (180 roadside surveys)
- Flow measurements (13 sampling stations)
- And confirmatory field checks of geologic and forest conditions.

The results of the field work were used to assess the ecological integrity of streams.

Ontario Ministry of Natural Resources. 2012. Provincially Significant East Humber River Wetland Complex.

This wetland evaluation report provides additional information with respect to upland habitat that might be considered critical habitat for amphibians and where potential linkages or enhancement areas might exist between wetland features. Flora and fauna inventory information described in the report can be used to determine candidate or confirmed significant wildlife habitat.

Ontario Ministry of Natural Resources. 2000. Inventory of the Life Science Maple Uplands & Kettle Wetlands and Earth Science Oak Ridges Moraine Maple Spur Areas of Natural and Scientific Interest, City Of Vaughan, Ontario.

This report includes a detailed description of the Life Science and Earth Science ANSIs and how and why these features present were included within the areas identified as ANSI. Included within this report are the regionally and provincially rare flora and fauna species as well as uncommon and rare community types that are present.

3.2 NHN Targets based on Policy and Regulation

The policies and regulations considered in the development of NHN target include:

- Species at Risk Policy (2008) and the Endangered Species Act (2007);
- Oak Ridges Moraine Conservation Plan (2002);
- Greenbelt Plan (2005);
- York Region Greenlands (2012);
- Provincial Policy Statement (2005); and
- Toronto and Region Conservation Authority Regulations, O.R. 166/06 (2006).

Table 1 identifies NHN targets based on official policies and regulations.

Table 1: NHN Targets based on Policy and Regulation

VAUGHAN NATURAL HERITAGE NETWORK TARGETS
1. Species at Risk
Species Listed under the Endangered Species Act • requires comprehensive field studies to identify significant habitat • Red Side Dace is a regulated species present in Vaughan for which significant habitat information is available • policy can stipulate that the habitat of Endangered and Threatened species is incorporated into the NHN where identified • some of the species listed by COSSARO that have been observed in Vaughan include: Butternut; Jefferson X Blue Spotted Salamander; Bobolink; Eastern Meadowlark; Peregrine Falcon; Acadian Flycatcher; Loggerhead Shrike; Henslow's Sparrow; Northern Brook Lamprey.
2. ORM Core Areas & Linkage Areas
Key Natural Heritage Features (KNHF) • Wetlands; • Significant portions of the Habitat of Endangered, Rare and Threatened Species; • Fish Habit; • Areas of Natural and Scientific Interest – Life Science (ANSI); • Significant Valleylands; • Significant Woodlands; • Significant Wildlife Habitat; and • Sand Barrens, Savannahs, and Tallgrass Prairies. ***Hydrologically Sensitive Features (HSF)*** • Permanent and Intermittent Streams; • Wetlands; • Kettle Lakes; and • Seepage Areas and Springs.
***3.* Greenbelt Natural Heritage System**
Key Natural Heritage Features (KNHF) • Significant Habitat of Endangered, Threatened and Special Concern Species; • Fish Habit; • Wetlands; • Areas of Natural and Scientific Interest – Life Science (ANSI); • Significant Valleylands; • Significant Woodlands; • Significant Wildlife Habitat; • Sand barrens, Savannahs, and Tallgrass Prairies; and • Alvars. ***Key Hydrologic Features (KHF)*** • Permanent and Intermittent Streams; • Lakes (and their littoral zones); • Seepage Areas and Springs; and • Wetlands.

VAUGHAN NATURAL HERITAGE NETWORK TARGETS

4. York Region Greenlands

Key Natural Heritage Features (KNHF) & Key Hydrologic Features (KHF)

- Significant Habitat of Endangered and Threatened Species;
- Fish Habitat;
- Wetlands;
- Life Science Areas and Earth Science Areas of Natural and Scientific Interest;
- Environmentally Significant Areas
- Significant Valleylands;
- Significant Woodlands;
- Significant Wildlife Habitat;
- Sand Barrens, Savannahs and Tallgrass Prairies;
- Lakes and their Littoral Zones;
- Permanent and Intermittent Streams;
- Kettle Lakes; and
- Seepage Areas and Springs deemed Vulnerable or Sensitive Surface Water Features.

5. Provincial Policy Statement

Significant Habitat of Endangered and Threatened Species

- based on species listed under the Endangered Species Act
- requires comprehensive field studies to identify significant habitat
- red side dace is a regulated species for which significant habitat information is available

Significant Wetlands

- wetlands are evaluated using the Ontario Wetland Evaluation System

Significant Woodlands

- woodland significance may be evaluated using the MNR Natural Heritage Reference Manual, York Region criteria and where appropriate ORM and Greenbelt criteria
- in addition criteria for locally significant woodlands may be used

Significant Valleylands

- significant valleylands include natural features located below the crest of slope
- significant valleylands may be evaluated using the MNR Natural Heritage Reference Manual

Significant Wildlife Habitat

- based on the MNR Significant Wildlife Habitat Technical Guidelines and Ecoregion schedules for designation of Significant Wildlife Habitat
- comprehensive field studies are generally required to delineate and confirm areas of significant wildlife habitat

Significant Areas of Natural and Scientific Interest

- based on MNR mapping and reports of ANSIs
- includes Life Science and Earth Science ANSIs that may be Provincially or Regionally significant

Fish Habitat

- based on provincial and federal requirements

VAUGHAN NATURAL HERITAGE NETWORK TARGETS
• includes direct habitat of permanent water bodies and watercourses where fish present • may include direct and indirect habitat associated with intermittent headwater streams ***Adjacent Lands*** • protection of areas adjacent to features to prevent negative impact to features • adjacent lands may be evaluated using the MNR Natural Heritage Reference Manual
6. Toronto Region Conservation Regulations
Steep Slopes • valleylands as defined by crest of slope and/or stable top of bank plus setback ***Wetlands*** • wetlands plus setback ***Watercourses*** • watercourse plus setback • flood plain plus setback • meander belt plus setback

3.3 NHN Targets based on a *Systems Approach*

NHN targets based on a *systems approach* will include targets aimed at the protection of ecological features based on policy and regulation. It will also include targets aimed at the protection of important ecological functions and interactions critical to the long term survival of plants and animals (i.e. native biodiversity) that inhabit ecological features including woodlands, wetlands, open habitat, and aquatic ecosystems.

Ecological functions and interactions may be associated with readily identifiable ecological features, such as:

- interior habitat conditions provided by larger habitat patches;
- wetlands that provide seasonal water storage and improve water quality;
- dense cedar woodlands that provide winter deer yards;
- riparian vegetation providing shade and food to watercourses; and
- ephemeral ponds that provide amphibian breeding habitat in spring.

In other cases ecological functions and interactions may be not be associated with readily identifiable features, such as:

- agricultural lands which are the surface water catchment for a wetland;
- headwater drainage features that may contribute up to 90% of the water to rivers;
- meadows that provide foraging areas for raptors;
- agricultural fields that facilitate the daily, seasonal and long term movement patterns of animals and plants among ecological features; and

- fields and meadows that separate (buffer) ecological features from the negative impacts (noise, light, domestic cats and dogs, invasive species, etc.) of adjacent lands.

3.3.1 Ecological Considerations of the Landscape Matrix

The systems approach is important because it includes consideration of lands surrounding features, lands which may be referred to as the "landscape matrix". The landscape matrix around natural heritage features may consist of a variety of other land uses; land uses that will have varied impacts on natural features. Generally speaking, agricultural land use imposes fewer impacts on the natural environment than urban land use and is, therefore, more compatible with the protection of natural heritage features in most cases.

In addition, an agricultural landscape matrix may be improved to protect natural features through the implementation of Best Management Practices (BMPs) and/or an Environmental Farm Plan (EFP). Compared to an urban landscape matrix, an agricultural landscape matrix will include a more natural distribution of surface water, minimized impacts to infiltration and ground water, and better opportunities for the movement, migration and dispersal of plants and animals utilizing agricultural fields, hedgerows and/or protected riparian corridors.

An urban land use matrix includes impacts that go well beyond an agricultural matrix and which are very largely irreversible. Challenges posed by an urban land use matrix include:

- impervious surfaces that alter the timing, quantity and quality of surface and ground water flows;
- physical barriers to the movement of plants and animals and habitat conditions unsuitable for wildlife that may attempt to move among isolated natural heritage features;
- increased introduction of non-native plants from urban landscaping;
- cats and dogs that harass and kill native wildlife;
- increased human use resulting in soil compaction and erosion from trampling, motorized recreational vehicles and mountain bikes;
- refuse and garden waste dumped in natural areas;
- increased noise and light pollution from roads and parking areas; and
- contamination of surface water, *etc.*

Where a transition from an agricultural matrix to an urban matrix is contemplated, a systems approach will consider what areas outside natural heritage features may be required to create and protect a NHN within an urban landscape matrix that is capable of maintaining important ecological functions critical to the long term integrity of natural heritage features. This will include the identification of enhancement areas, ecological linkages and buffers that mitigate the effects of more intensive urban land uses.

Table 2 identifies NHN targets based on a systems approach.

Table 2: NHN Targets based on Systems Approach

VAUGHAN NATURAL HERITAGE NETWORK TARGETS
1. Enhancement Areas
• enhancement to create woodland interior • enhancement to create core habitat clusters consisting of habitat mosaics of woodlands, wetlands, open habitat, watercourses, and water bodies • enhancement to create regional centres for biodiversity
2. Ecological Linkage
• regional ecological linkages within and beyond the City of Vaughan • local ecological linkages associated with woodlands, wetlands, open habitat and watercourses • linkage providing connectivity between aquatic and terrestrial habitat • linkage providing connectivity among watersheds • multiple linkages providing redundancy of connectivity among features • ecopassages where the NHN encounters barriers to wildlife movement (e.g. roads, railines)
3. Buffers
• provide protection of NHN features from impacts associated with adjacent land uses • implement ORM, Greenbelt and York Region Greenlands criteria regarding vegetation protection zones • implement TRCA setbacks for wetlands, stable top of bank, floodplain, or meander belt

4.0 TASK 3 - GAP ANALYSIS OF NHN TARGETS

An assessment of the degree to which select NHN targets for woodlands, wetlands and watercourses are protected has been completed by applying guidelines from the Canadian Wildlife Service (CWS) publication “How much habitat is enough? Second Edition” (Environment Canada 2004). Of the 18 ecological guidelines described in the CWS publication, seven have been selected for a preliminary analysis that relate to the NHN targets based on a systems approach, such as woodland interior habitat and aquatic-terrestrial habitat mosaics. This will help to inform the approach to meet NHN targets.

As more detailed work is completed in Phases 2 to 4 of the Vaughan NHN study additional gap analysis may be undertaken by examining targets for York Region Greenlands System, the TRCA Terrestrial NHS Strategy, Humber River Terrestrial and Aquatic State of the Watershed Report and the Don River Watershed Plan.

4.1 Forest Habitat

Select Canadian Wildlife Service (2004) guidelines for woodlands and their respective values in Vaughan are as follows:

CWS Forest Habitat Guideline	Forest Habitat in Vaughan
At least 30% forest cover	11 %
At least 10% of forest cover should be interior forest >100 m from edge	0.5 %
At least one large contiguous forest within each watershed (>200 ha)	Humber Watershed largest forest – 152 ha Don Watershed largest forest – 88 ha

The NHN study will identify enhancement areas within areas not currently forested, and in many cases these areas will develop forest vegetation over time contributing to the total forest cover of Vaughan. To increase the amount of interior forest, enhancement areas will be strategically identified to reduce the edge to interior ratio of forests, particularly where forest patch size is at the threshold of achieving interior forest. In addition, delineation of enhancement areas may be based on the extent of closely spaced clusters of smaller forest patches, that collectively can provide much larger forest patches with substantial interior forest and, where possible, a large contiguous forest >200 ha in size.

Further analysis will need to consider the fragmentation impact of the proposed GTA West Transportation Corridor on forest habitat.

4.2 Wetland Habitat

Select Canadian Wildlife Service (2004) guidelines for wetlands and their respective values in Vaughan are as follows:

CWS Wetland Habitat Guideline	Wetland Habitat in Vaughan
At least 10% wetland habitat	1.9%
Protection of a Critical Function Zone (CFZ) of 100 m from edge of wetland	42 % of 100m CFZ protected by other natural heritage features[1]

[1] other natural heritage features include, woodlands, adjacent wetlands, or floodplain

The loss of wetland habitat is difficult to restore due to the altered hydrology of urban and agriculture lands. Nonetheless the NHN may prioritize the restoration and management of hydrologic conditions that sustain wetland vegetation where possible. The protection of wetlands within the NHN will include the protection of an appropriate buffer and include recommendations for the protection of surface water catchments within the Critical Function Zone (CFZ) and linkage to adjacent upland habitat which collectively can contribute to increased protection of the CFZ. Identification of priority wetlands for buffers beyond a 30 metre minimum vegetation protection zone may be based on criteria such as hydrological linkage to Redside Dace habitat and/or importance for downstream flood control.

4.3 Riparian Habitat

Select Canadian Wildlife Service (2004) guidelines for riparian habitat and their respective values in Vaughan are as follows:

CWS Riparian Habitat Guideline	Riparian Habitat in Vaughan
75 % cover along streams	30 % of stream length in Vaughan have forest cover within 3 m of stream banks
30 m buffer along streams	47 % of stream length has some forest cover within a 30 m buffer along stream banks

The inclusion of streams within the NHN will include a buffer which may over time be managed to restore native vegetation to achieve greater cover along streams and within buffer areas adjacent to streams. Criteria for increasing the dimensions of stream buffers and identifying restoration opportunities may relate to the location of important fish-bearing streams and provision of local ecological linkages. Modelling the potential restoration of streams in the Greenbelt Plan area and ORMCP area will be an important consideration in delineating enhancement areas.

5.0 TASK 4 - REVIEW OF THE ENVIRONMENTAL MANAGEMENT GUIDELINE

The Environmental Management Guideline (EMG) was originally written in 1994 as a companion document to Official Plan Amendment (OPA) 400. The 1994 EMG identified criteria and approaches for the implementation of the environmental policies of OPA 400 addressing nine resource features and categorized into two scales of development: block plan; and draft plan of subdivision/site plan.

The EMG was revised in 2010 to support the environmental policies of the VOP 2010. The revised EMG is based on the Natural Heritage Reference Manual and reflects the protection of natural heritage features, ecological functions and adjacent lands according to the PPS 2005. The EMG identifies the range of studies that may be required and provides guidance regarding the level of detail of submittal information to prepare environmental reports in support of development applications according to the environmental policies in Chapter 3 of the VOP 2010.

The RFP for Phase 1 of the NHN Study specified that the EMG should be reviewed, and recommendations be provided to address ecosystem targets and gaps in the NHN and provide the attribute information developed to describe the NHN. The most important goal was to revise the EMG to reflect the need for information on Significant Wildlife Habitat (SWH) and headwater streams, two of the most significant gaps in the NHN.

The EMG was revised throughout to ensure that information on habitat functions gathered during environmental studies is submitted to the City's database, such that recommendations can be incorporated into the NHN. In addition, portions of the EMG were changed to ensure the guidelines were easier to follow. The following paragraphs provide a summary of the changes made to the EMG.

All recommendations for revision of the EMG were made using the MS Word "Track Changes" function, either through changing wording within the document or providing comments that provided a rationale for changes made within the document.

Section B: Environmental Reporting Process

The section on the environmental reporting process was revised to provide more detail and a more logical flow to the process of preparing a Terms of Reference, obtaining review comments from agencies and subsequently devising a work plan and conducting an environmental impact assessment (i.e. Master Environmental Servicing Plan or Environmental Impact Study) based on the approved Terms of Reference. This required reorganization of text to separate elements that would go into a Terms of Reference from elements that would go into a report at the end of the information gathering process.

Other changes to this section included:

- a clearer indication that incorporation of data transfer into the reporting process was required;

- more emphasis on monitoring requirements; and
- more emphasis on assessment of cumulative impacts.

Section C: Attributes of the Natural Heritage Network, Natural Features and Ecosystem Functions

Several revisions applied throughout this section. All sections were revised to incorporate the requirement for more information on significant wildlife habitat and significant headwater areas, where applicable. The text throughout this section was revised to emphasize the need to transfer any relevant new data to the City to ensure it informs the delineation of the NHN. Additional information sources were added to each section to reflect the availability of information on the Environmental Registry and on the Ontario Ministry of Natural Resources website. Minor changes were made throughout the document to improve clarity.

The most significant changes were made to the section on Significant Wildlife Habitat (SWH). This section was revised to provide more guidance on how to assess SWH. The need for an assessment to determine if a feature may have overlapping designations, such as features that may meet the criteria for Significant Woodland and Significant Wildlife Habitat, was described.

Tables were prepared (see Appendix 3) to provide guidance on criteria used to designate Significant Wildlife Habitat. Two sources of guidance are currently used to help determine criteria that qualify an area as SWH: the Significant Wildlife Habitat Technical Guide (SWHTG) (OMNR 2000) and Ecoregion schedules for designation of Significant Wildlife Habitat (OMNR Draft 2012b). The SWHTG and the draft MNR Ecoregion schedules provide guidance as to criteria and thresholds for the above categories that can be used to define SWH. The ecoregion schedules (for Vaughan, the schedule for Ecoregion 6E is applicable) were put on the Environmental Registry (EBR #011-4750) for comment in January 2012. They are more explicit concerning thresholds and guidance than is the SWHTG. However, it must be pointed out that the Ecoregion schedules are still in draft form, and have not been accepted as the supporting document for designation of SWH, though they are currently used in projects where OMNR approval is required, such as Renewable Energy applications. The SWHTG is still considered the accepted guidance document for designation of SWH, though the Ecoregion schedules provide useful reference and guidance. The tables developed for this section provide examples of the most likely categories of SWH to be found in Vaughan, providing a comparison of criteria used by the Ecoregion Schedules and the SWHTG.

Designation of SWH is complicated by the fact that the original intent of the SWHTG was to provide guidance for evaluation of SWH on a municipality-wide basis. For example, for amphibian breeding habitat, it was intended that information on amphibian breeding habitat would be compared throughout the municipality, after which specific criteria could be developed for the municipality that would allow mapping of the most significant habitat. However, municipalities have generally not had resources to evaluate SWH on a municipality-wide basis. Guidance in the 2010 NHRM updates this process, providing a protocol by which studies would indicate the potential for individual features to qualify as SWH, on the basis of site-specific studies. Thresholds provided by the Ecoregion criteria help in this regard.

6.0 TASK 5 - PRIORITIES FOR FIELD WORK

The GIS database has been prepared based on the available information. Much of the digital data assembled has been derived from interpretation of aerial imagery. Field ecological studies ground-truth, update and refine the available digital data, and field studies may identify important additional areas that cannot be determined through the interpretation of aerial imagery. The GIS database together with field studies collectively provide the information needed to refine the boundary of the NHN.

Priorities for future field studies are suggested to focus on two areas considered most important and most frequently at issue in urbanizing agricultural landscapes within the GTA: Headwater Drainage Features; and Significant Wildlife Habitat. Criteria that may be used to assist in the selection of priority areas for field study are provided below.

6.1 Headwater Drainage Features

The following text from the Credit Valley Conservation and Toronto and Region Conservation Interim Guidelines for the Evaluation, Classification and Management of Headwater Drainage Features (HDF) (2009) provides a useful summary of the importance and vulnerability of HDF.

The spatial extent of headwater drainage features can account for 70-80% of the total catchment area within a watershed. Furthermore, 90% of a river's flow may be derived from catchment headwaters. Headwater systems are considered important sources of food, sediment, water, nutrients, and organic matter for downstream reaches. However, due to their small size and because these functions are poorly understood and typically underestimated, headwater drainage features can be vulnerable to impacts resulting from agricultural and urban land uses, such as tile drainage, channel lowering, relocation, and enclosure (i.e. piping).

The GIS database assembled may be used to select priority HDF for field study that meet one or more of the following criteria:

- HDF in an agricultural landscape that has an upstream connection to a natural area such as woodland, wetland, or groundwater discharge/spring;
- HDF with natural cover present located outside the engineered or estimated floodline;
- HDF with a catchment > 30ha;
- HDF consisting of both first and second order or higher watercourses;
- HDF with a defined meander belt;
- HDF associated with a known cold/cool water system; or
- HDF contributing flow to downstream habitat of known fish species as risk.

More recent subwatershed studies in parts of southern Ontario have considered a cumulative assessment approach to the evaluation of stream reaches and HDF. Hence, while a preliminary categorization of HDF based on the criteria above is useful, representative sampling should also be considered. To ensure representative sampling, HDF selection may also include a range of HDF from smaller catchments, e.g < 10 ha, 10-20 ha, and 20-30 ha. An evaluation of possible HDF sample sites should also consider existing data, such as that managed by TRCA and/or the Southern Ontario Stream Monitoring Research Team (SOSMART). The TRCA is also preparing a revised draft for HDF evaluation, classification and management for release in 2013; when available this guideline document should also be referenced.

Field surveys should be conducted during the spring freshet to assess flow conditions and amphibian habitat and during the growing season to assess vegetation. Field surveys should follow the methodology for the assessment of HDF provided in the Interim Guidelines for the Evaluation, Classification and Management of Headwater Drainage Features (CVC/TRCA 2009).

6.2 Significant Wildlife Habitat

The protection of Significant Wildlife Habitat (SWH) is critical to the long term protection of native biodiversity and the identification of SWH requires comprehensive field studies, conducted by qualified ecologists, following accepted methodologies and applying accepted evaluation criteria. Priority SWH for evaluation in Vaughan is outlined below. Selecting SWH field study sites may be accomplished using queries of the GIS database based on the habitat conditions outlined below.

Habitat for Species of Conservation Concern

- Colonial bird nesting habitats: this would include banks, bluffs, cliffs and other steep slopes that could harbour swallow species that nest in cavities in banks or on ledges (not including man-made habitat such as gravel pits or bridges) – would require surveys in May to July.
- Raptor winter feeding and roosting areas: this would include large cultural meadows (over 15 ha) with adjacent woodlands that are not intensively used such as lightly grazed pastures and lightly used hayfields; would require surveys in winter.
- Bullfrog concentration areas: see descriptions for Rare Vegetation Communities or Specialized Habitats for Wildlife below.

Rare Vegetation Communities or Specialized Habitats for Wildlife

- Rare vegetation communities that may not be included in the GIS database as woodlands or wetlands, particularly areas with sandy soils that may provide conditions suitable for the development of sand barrens, prairie, or savannah.
- Habitat for open-country area-sensitive breeding bird species: this would include large grassland areas (includes natural and cultural fields and meadows) >30 ha, that are not used for intensive farming (i.e. row cropping within the past 5 years).

- Habitat for shrub/early successional breeding bird habitat: this would include shrub and thicket habitats > 10 ha; would require surveys from May to July.
- Amphibian breeding habitat not protected within woodland: this would include ponds within 120 m of woodlands; would require surveys from May to July.
- Amphibian breeding habitat (wetlands): this would include wetlands and pools over 500 m^2, that are isolated from woodlands (>120 m); would require surveys from May to July.
- Bald Eagle and Osprey nesting habitat: this could include habitat that was probably already within the NHN (for example the Maple ANSI) but would require evaluation of additional functions and additional areas that may need to be protected if development were proposed in adjacent areas; would require surveys in late March and April.
- Habitat for woodland area-sensitive species: this would include woodlands > 30 ha, habitat that is probably already within the NHN, but for which additional functions should be identified in order to provide effective protection if development were proposed that could exacerbate fragmentation; would require surveys in May to July.
- Seeps and springs: would include areas with multiple groundwater discharge points that are active year-round; would likely include habitat that is already within the NHN but which may need additional protection of local groundwater recharge in adjacent areas; would require multiple surveys throughout the year.

To assist the field survey in the identification of SWH, three tables are provided in Appendix 3 that provide the criteria used to identify SWH of Seasonal Concentrations of Animals, Rare Vegetation Communities, and Specialized Habitat for Wildlife.

7.0 NEXT PHASES IN NHN STUDY

The NHN Study includes four phases; this report provides the results of Phase 1 including the development of the GIS database, NHN targets, gap analysis, review of EMG and priorities for field work. Future phases of the NHN Study will include:

- Phase 2 - field investigations based on priorities outlined in Phase 1;
- Phase 3 - analysis and summary of the outcomes from Phases 1 and 2 including the refinement of NHN targets and NHN gaps; and
- Phase 4 - consideration of approaches to land securement for the NHN and environmental management of the NHN.

8.0 REFERENCES

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APPENDIX 1: SOURCES AND DESCRIPTIONS OF DIGITAL DATA LAYERS

Appendix 1: Sources and Descriptions of Digital Data Layers Interpreted for the City of Vaughan GIS Database

Oak Ridges Moraine

Source 1: York Region
Original File Name: orm_bdry
Date: 2012-06-27
Description: This layer was added to illustrate the extent of the provincially designated Oak Ridges Moraine planning area within Vaughan.

Source 2: York Region
Original File Name: landuse_region
Date: unknown
Description: Internal boundaries within the ORM include, Natural Core, Natural Linkage, Settlement Area and Countryside.

Greenbelt

Source 1: York Region
Original File Name: green_belt_bdry
Date: 2012-06-27
Description: This layer was added to illustrate the extent of the provincially designated Greenbelt planning area within the City of Vaughan.

Source 2: York Region
Original File Name: ropgbnaturalheritagesystem
Date: 2012-06-27
Description: This layer includes the boundary of the area defined as Natural Heritage System within the Greenbelt.

York Regional Greenlands

Source: York Region
File Name: Greenlands
Date: 2012-03-01
Description: This layer illustrates the extent of the most recent Regional Greenlands System designated by York Region. There are no internal boundaries or features identified within the digital files of the Regional Greenlands System that may be used in developing the NHN for Vaughan. Attributes included within this layer include: capture method and source (whom the layer was produced by).

Forest/Woodlands

Source 1: York Region
Original File Name: bioforest
Date: 2010-09-24
Description: Attributes associated with this layer include: creation date, created by, modified date, capture method, modification reason, and forest id number.

Source 2: TRCA
Original File Name: naturalcover20072008_trca_clipVaughan
Date: 2006-04-10
Description: Attributes associated with this layer include: habitat type (forest, meadow, successional, and wetland). The forest habitat type was used in the data refinement outlined below.

Meadowlands

Source: TRCA
Original File Name: naturalcover20072008_clipVaughan
Date: 2006-04-10
Final File Name: natural cover_meadowlands
Description: This layer included a 'habitat type' attribute that includes the following types: forest, meadow, successional, and wetland from which the meadow layer was produced.

Wetlands

Source 1: LIO
Original File Name: wetlandu
Date: unknown
Description: This layer includes the following attributes: unit type (e.g swamp, marsh), evaluated, name of complex, and significance (provincial, other, or unknown).

Source 2: TRCA
Original File Name: naturalcover20072008_clipVaughan
Date: 2006-04-10
Description: Attributes associated with this layer includes habitat type (forest, meadow, successional, and wetland). The habitat type wetland was used in the data refinement outlined below. Note that only open wetland types (MAM, MAS) are included in the habitat type wetland data layer.

Source 3: TRCA
Original File Name: vegtype_trca
Date: 2006
Description: Attributes associated with this data layer include ELC vegetation type classification that provides coverage for approximately 45% of Vaughan's natural areas.

The ELC vegetation classifications for wetlands (SWD, SWC, SWM, SWT, MAM, MAS) were used in the data refinement outlined below.

Crest of Slope

Source: TRCA
Original File Name: crestofslope_TRCA_cliptoVaughan
Date: 2006-05-15
***Final File* Name**: crest_of_slope
Description: The crest of slope line was identified digitally by TRCA using a Digital Elevation Model (DEM). This layer was added to assist in the identification of crest of slope defining valley systems within Vaughan. There are no additional attributes associated with this layer

Engineered Flood Line

Source: TRCA
File Name: Engineered_Floodline_TRCA_CliptoVaughan
Date: 2006-05-15
Final File Name: engineered_floodline
Description: This layer was added to illustrate the extent of engineered flood line within Vaughan. There are no additional attributes associated with this layer include.

Estimated Floodplain

Source: TRCA
File Name: Estimated_Floodline_TRCA_CliptoVaughan
Date: 2006-05-15
Final File Name: estimated_floodline
Description: This layer was added to illustrate the extent of estimated flood line within Vaughan. Attributes associated with this layer include: basin and source.

Watercourse

Source 1: LIO
Original File Name: ohnwcrs
Date: 2001-09-22
Description: This layer included attributes for each watercourse line including official name, permanency, flow class, and EFFDATE (e.g. 2011-09-22).

Source 2: TRCA
Original File Name: WatercoursesTRCA
Date: 2012-05-02
Description: Attributes associated with this layer include: watershed, subwatershed, river name, and update source (e.g. year of orthoimage used to identify watercourses).

Water Bodies

Source 1: LIO
Original File Name: ohnwbdy
Date: 2012-01-25
Description: This layer included attributes for each watercourse segment including: waterbody type (e.g. lake, river, reservoir), and permanency.

Source 2: Vaughan
Original File Name: WaterBody
Date: 2012-04-30
Description: This layer illustrated the water bodies found within the City of Vaughan. Attributes associated with this layer include: created by, date created, date modified, name, and class (e.g. lake and island).

Source 3: Vaughan
Original File Name: DETENPD
Date: 2012-04-30
Description: This layer illustrated the detention ponds (storm water management ponds) found within the City of Vaughan. Attributes associated with this layer include: block, ward, purpose, detention pond name, depth, general description, and location description.

Flora

Source: TRCA
File Name: flora_trca_vaughan_250m_may17_2012
Date: 2012-05-17
Description: This layer includes point data for flora including the following attributes: common name, scientific name, L-rank, observer, date observed, population, and local distribution.

Fauna

Source: TRCA
File Name: fauna_trca_vaughan_250m_may17_2012
Date: 2012-05-17
Description: This layer includes point data for fauna including the following attributes: common name, scientific name, L-rank, observed date, observer (source), abundance, and population.

Areas of Natural and Scientific Interest (ANSI) – Life Science and Earth Science

Source: LIO
Original File Name: ansi
Date: 2011-11-17

Final File Name 1: ansi_clip_earth_vaughan
Final File Name 2: ansi_clip_life_vaughan
Description: This layer includes all Earth Science and Life Science ANSIs within the City of Vaughan. These two types of ANSIs were selected from the original ANSI layer to create an Earth Science ANSI layer (named ansi_clip_earth_vaughan) and a Life Science ANSI layer (named ansi_clip_life_vaughan). Additional attributes associated with the original layer and included within the final Life Science and Earth Science layer includes: the name of the ANSI, significance designation (Provincial or Regional), candidate ANSIs, management plan (y/n), and general comments about the ANSI.

Environmentally Significant Areas (ESA)

Source: TRCA
File Name: esa_trca_slipvaughan
Date: 2005-02-07
Final File Name: esa_final
Description: This layer includes all ESA's within the City of Vaughan. The attributes of this layer includes: ESA name, ESA number, and the watershed where the ESA is located.

Vaughan Official Plan Natural Heritage Network

Source: Urban Strategies
File Name: NaturalHeritage
Date: 2010
Final File Name: natural_heritage_2_urban_strategies
Description: This includes the area contained with the NHN created by Urban Strategies and includes the following attributes: layer (core areas, enhancement areas, and built-up areas).

APPENDIX 2: REVIEW OF AVAILABLE DIGITAL DATA

Appendix 2. Review of Available Digital Data

TRCA DATA				
Data Name	Description of Data	NHN Analysis	Update (Sept 11th, 2012)	NHN Target
Species Locations	• point • plant and animal species lists with L1-4 ranks (and rank breakdowns) • coverage across Vaughan	• may work with subset of L1-4 ranks as was done for Toronto ESA study • will cross-reference TRCA species list with Provincial rarity and NHIC S-ranks • will analyse against ELC data • location of indicator species, based on rarity status (TRCA, SAR, NHIC) and/or sensitive (area demanding, amphibians) • assess protected habitat meets indicator species needs (e.g. area demanding/size, amphibians/connected wetland-terrestrial habitat)	• Most species locations within NHN, but, open habitat species outside woodlands • butternut (end) – mostly within NHN • barn swallow (thr) – in/out of NHN • bobolink (thr) – in/out of NHN • eastern meadowlark (thr) – in/out of NHN	• yes (note: an assessement of habitat requirements for individual species is required to identify target)
ESA	• polygon • ESA name & number	• check status of ESAs in regard to TRCA, Region & Vaughan policies	• ESAs identified by TRCA • Vaughan OP protects ESAs • Most areas of ESAs within NHN • Some ESA slivers within areas of new development • ESA requires careful edit to update boundaries	• yes

TRCA DATA				
Data Name	Description of Data	NHN Analysis	Update (Sept 11th, 2012)	NHN Target
Habitat Plans	- polygon - "cover opportunities" include: agriculture, forest, meadow, naturalization, riparian, tree/shrub, wetland	- determine basis for delineation - analyse against ELC data	- follow up with TRCA - may be used to include areas in NHN that do not have other identified features or functions - most areas within NHN - may help to identify opportunities to expand NHN along utility corridors	- Possible
Interior Forest	- polygon - 100m & 300m buffer	- check against ELC "forest" layer - check against other forest data layers - analyse against interior demanding species - note: this data layer points to the need to create a similar "interior meadow" data layer	- need to regenerate layer using York algorithm applied to final forest layer - will be captured in NHN by forest layer - can manually improve forest patch shape and link forest patches to increase interior forest	- yes

Natural Cover 2007-2008	- polygon
	- includes forest, meadow, successional, wetland
	- no wetland classification
		- total cover assessment as percent of land base (land base may be subdivided based on ecological or social-political boundaries)
		- inaccuracies in data noted,
		  - forest data replaced by York Region data
		  - wetland data replaced by LIO data
		  - successional areas need to be checked when used
			- Forest
			- layer checked against York Region "bioforest" considered more accurate forest cover layer
			- 275 polygons >0.5 ha not included in bioforest
			- Wetland
			- layer checked against LIO, MNR wetland data considered more accurate
			- if used to add polygons field
				- yes
				(note: successional and meadow habitats may require further assessment of ecological features and functions related to the

TRCA DATA				
Data Name	Description of Data	NHN Analysis	Update (Sept 11th, 2012)	NHN Target
		to define NHN - meadow areas need to be checked when used to define NHN	ground truthing required • Successional - layer identifies non-forest/non-wetland areas in NHN - may be used to identify areas to assess potential contribution to NHN in terms of linkage function and shape/size contribution to adjacent forest patch, protection on slopes, etc. - some overlap with bioforest • Meadow - layer identifies non-forest/non-wetland areas in NHN - may be used to identify areas for contribution to NHN in terms of linkage function and large open habitat patches (e.g. >16 ha)	habitat requirements for individual species, ecological linkage or enhancement functions to identify target)
Regulation Limit	• line • TRCA		• not applicable given set-backs included in defining Regulation line	• no
Soils	• polygon • categories based series/unit	• lump categories & run analysis of representation	• no analysis completed to date	• possible

TRCA DATA				
Data Name	Description of Data	NHN Analysis	Update (Sept 11th, 2012)	NHN Target
Target Model	• polygon • see TRCA Terrestrial NHS for description • includes sub-categories existing and potential	• check against other data and orthoimagery to assess what is in and what is out • cross-reference to ELC	• cross-reference to NHN • meeting was held with TRCA to understand definition • target system provides excellent science based rationale for inclusion of areas without features to provide long term integrity of NHN based on future development of adjacent lands • will be used to identify additional NHN areas	• possible
TRCA Property	• polygon • publicly owned	• other publicly owned lands (Province, Region, Vaughan) could be analyzed	• may be used in future analysis	• no
UFORE Landuse	• polygon	• categories include agriculture, commercial/industrial, institutional, natural cover, open space, other, residential low, residential med/high, and utilities/transportation	• unsure how generated and how up to date this data layer is • not a priority for analysis	• no

TRCA DATA				
Data Name	Description of Data	NHN Analysis	Update (Sept 11th, 2012)	NHN Target
Vegetation type	• polygon • ELC veg type classification • provides approximately 45% coverage for Vaughan's natural areas	• NHIC rare communities (e.g. sand barrens) • gap analysis and representation of vegetation communities may be undertaken	• check listed communities within NHN - FOD7-4 Fresh-Moist Black Walnut Lowland Deciduous Forest – S2S3 - SWD1-2 Bur Oak Mineral Deciduous – S3 - FOD6-2 Fresh-Moist Sugar Maple - Black Maple Deciduous Forest – S3? • data used to confirm final wetland data layer • identify as priority for Vaughan/TRCA to initiate field studies	• yes
Crest of Slope	• line • data available from TRCA	• assessment of natural areas within valleylands versus tablelands	• digital data provided	• possible

VAUGHAN DATA				
Data Name	Description of Data	NHN Analysis	Update (Sept 11th , 2012)	NHN Target
Conservation area/ TRCA	• polygon • subset of TRCA Property data layer	• percent natural • areas available for active management	•	• no
Contours	• line • full coverage 1m	• run slope analysis 0-5%, 5-15%, 15-25%, >25% • tableland, slope, bottomland • slope aspect may be determined and used for analysis	• steep slopes without other natural features or functions may be used to define NHN	• possible
Detenpd	• polygon • SWM ponds • does not appear current	• use to classify “water bodies” layer • consider potential for inclusion as part of NHN options	• water bodies classified • data layers requires significant update to refine boundaries, delete areas and include new areas	• no
ESA/ TRCA	• polygon • matches TRCA ESA layer	• check status of ESAs in regard to TRCA, Region & Vaughan policies	• ESAs identified by TRCA • Vaughan OP protects ESAs • Most areas of ESAs within NHN • Some ESA slivers within areas of new development • ESA layer requires update	• yes
Forest	• polygon • coverage includes all of TRCA watershed • no sub-categories are identified	• check against TRCA forest layer • check against TRCA ELC	• TRCA forest data is older and is updated by York Region “bioforest” layer • TRCA forest cover used to confirm/update forest layer from Vaughan	• yes

VAUGHAN DATA				
Data Name	Description of Data	NHN Analysis	Update (Sept 11th , 2012)	NHN Target
Lots/ Concession	• polygon • full coverage	• none required	•	• no
Municipal Boundary	• polygon • full coverage	• none required	•	• no
NHN Cat1v2	• polygon • Core features	• does not follow OP Schedule 2	• final digital NHN file provided by Urban Strategies • unknown internal boundaries to be resolved	• yes (Note: this is VOP 2010 adopted NHN proposed for amendment through the NHN Study)
NHN Cat2v2	• polygon • Enhancement areas	• does not follow OP Schedule 2	• final digital NHN file provided by Urban Strategies • unknown internal boundaries to be resolved	• yes (Note: this is VOP 2010 adopted NHN proposed for amendment through the NHN Study)

VAUGHAN DATA

Data Name	Description of Data	NHN Analysis	Update (Sept 11th , 2012)	NHN Target
NHN Cat3v2	• polygon • Built-up valleylands	• does not follow OP Schedule 2	• final digital NHN file provided by Urban Strategies • unknown internal boundaries to be resolved	• yes (Note: this is VOP 2010 adopted NHN proposed for amendment through the NHN Study)
NHN Cat4v2	• polygon • Unknown category	• fills in areas corresponding to Greenbelt Protection Plan • fills in areas corresponding to ORM Natural Linkage • includes other areas – need to determine basis for inclusion	• final digital NHN file provided by Urban Strategies • unknown internal boundaries to be resolved	• yes (Note: this is VOP 2010 adopted NHN proposed for amendment through the NHN Study)
Pits & Quarries	• polygon • active & inactive categories	• match to ELC • consider potential restoration for inclusion as part of NHN options	• in and out of NHN • areas outside may be used to define NHN additions • data layer requires regular updating as new pits develop and old pits are restored	• possible
Property_ SP_SDE	• polygon • property Pin # ID	• no proposed analysis	•	• no

VAUGHAN DATA

Data Name	Description of Data	NHN Analysis	Update (Sept 11th , 2012)	NHN Target
Railway	• line data	• check against ELC data • consider potential for inclusion as part of NHN options	•	•
Regional Forest	• polygon	• check against other forest layers	• in NHN	• yes
Regional Forest Boundary	• polygon	• check why there is small difference from "Regional Forest"	• mostly in NHN • includes small area of meadow/successional vegetation in northwest corner	• yes
Roads	• line	• assess impact of larger transportation corridors	• need to identify priority ecopassage areas	• yes
Significant Forest	• polygon • draft application of York SW criteria	• checked against other forest layers	• there is a need to reapply York Region SW criteria to updated forest layer to identify SW	• yes
Transmission Line	• line	• check against ELC data • consider potential restoration for inclusion as part of NHN options	•	•
Water-bodies	• polygon • includes SWM ponds	• categorize based on presence of SWM pond	• water bodies now categorized to "natural" and "detention pond" • LIO data is more accurate	• yes
Water-course TRCA	• line	• use ELC/Forest to assess linear coverage	• watercourse now updated to eliminate lines in built up areas • LIO data was most accurate • future analysis to assess riparian cover targets	• yes

VAUGHAN DATA				
Data Name	Description of Data	NHN Analysis	Update (Sept 11th , 2012)	NHN Target
Watershed	- polygon - four sub-watershed	- use to assess protection targets by watershed	•	•
Wellhead Protection Area	- polygon - sub-categories based on year zones	- assess percent natural cover - assess compatible land uses	•	•
Watresv	- point - water towers - reservoirs	- may check to classify water bodies if necessary	- use to categorize water bodies	•
Zoning	- polygon	- check against NHN	- check against NHN	(Note: assessment of NHN targets will include a review Open Space zones)

PROVINCIAL DATA				
Data Name	Description of Data	NHN Analysis	Update (Aug 17, 2012)	NHN Target
ANSI	• polygon	• check for inclusion within NHN	• all within NHN	• yes
Wetland	• includes breakdown of PSW, other and unknown	• check for inclusion within NHN	• majority wetlands in NHN • LIO wetland data appears more accurate than TRCA data • wetland polygons to be added will require field ground truthing	• yes
Water body	• source LIO	• check against TRCA data	• majority natural water bodies in NHN • LIO water body data appears more accurate than TRCA data	• yes
Water course	• source LIO	• check against TRCA data	• majority watercourses in NHN • appears to be more up-to-date than TRCA digital data • create updated watercourse layer for City of Vaughan	• yes
Greenbelt	• includes protected countryside and NHS	• check for inclusion of NHS within NHN	• GB NHS all within NHN • NHN goes beyond GB NHS in some areas	• yes
ORM	• includes settlement area, natural core, natural linkage and countryside	• check for inclusion of natural core and natural linkage within NHN	• ORM natural core and natural linkage areas within NHN • NHN goes beyond ORM in some areas	• yes
SAR species	• point data • NHIC 1km grid data only available	• data not available at a scale to permit analysis	• checking further with MNR to obtain point data	• yes

		YORK REGION DATA		
Data Name	Description of Data	NHN Analysis	Update (Aug 17, 2012)	NHN Target
York Green-lands	• polygon	• check for inclusion within NHN	• majority in NHN, generally NHN is larger • numerous slivers inside/outside NHN but “intent” similar • portion of golf course in York Greenlands not in NHN	• yes
Bioforest	• updated forest layer • 2009 orthoimagery	• appears to be most up-to-date forest layer	• checked against TRCA natural cover “forest” and York Region “bioforest” considered more accurate forest cover layer • 275 polygons >0.5 ha in TRCA forest data not included in bioforest • use to create new forest layer for City of Vaughan • run algorithm to identify SW	• yes

APPENDIX 3: SIGNIFICANT WILDLIFE HABITAT CRITERIA

Appendix 3. Significant Wildlife Habitat Criteria (Note: Only examples of areas most likely to have potential significance in Vaughan and may be currently outside the NHN are provided)

Table 1: Examples of criteria for SWH provided by the SWHTG (Section 8.3 & Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: seasonal concentrations of animals. (For details see Draft Ecoregion Schedule 6E and SWHTG)

Seasonal Concentration Areas	Wildlife Species (Draft Ecoregion Schedule 6E)	CANDIDATE SWH (DRAFT Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
Waterfowl Stopover and Staging Areas (Terrestrial) Rationale; Habitat important to migrating waterfowl.	American Black Duck Wood Duck Green-winged Teal Blue-winged Teal Mallard Northern Pintail Northern Shoveler American Wigeon Gadwall	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these Ecosites.	Fields with sheet water during Spring (mid March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH.	Studies carried out and verified presence of an annual concentration of any listed species • Any mixed species aggregations of 100Í or more individuals required. • The area of the flooded field ecosite habitat plus a 100-300m radius buffer dependant on local site conditions and adjacent land use is the significant wildlife habitat. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates).	• Criteria for terrestrial sites not described by SWHTG
Waterfowl Nesting Areas	please see Table 3: specialized habitat for wildlife				
Raptor Wintering Area Rationale; Sites used by multiple species, a high number of individuals and used annually are most significant	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl Special Concern: Short-eared Owl	Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC. Upland: CUM; CUT; CUS; CUW.	The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Raptor wintering sites need to be > 20 ha with a combination of forest and upland. Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands	Studies confirm the use of these habitats by: • One or more Short-eared Owls or; • At least 10 individuals and two listed spp. • To be significant a site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birdsÍ.	• Significant sites are generally the only known sites in the planning area; significant sites may be one of only a few in the area. • Most significant sites support several species of concern; significant sites support one species. • Sites with the greatest number of species are more significant. • Sites with the highest number of individuals are more significant. • Large sites (e.g., at least 20 ha) are more significant than smaller sites. • Least disturbed sites may be more significant. • Sites located near other open field areas,

Table 1: Examples of criteria for SWH provided by the SWHTG (Section 8.3 & Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: seasonal concentrations of animals. (For details see Draft Ecoregion Schedule 6E and SWHTG)

Seasonal Concentration Areas	Wildlife Species (Draft Ecoregion Schedule 6E)	CANDIDATE SWH (DRAFT Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
					with adjacent woods are more significant. • Sites with better habitat (e.g., abundant prey and perches; a tendency toward less snow accumulation due to exposure to strong prevailing winds) are probably more significant. • Significant sites may have been used for several years and/or at least 60% of winters.
Reptile Hibernaculum Rationale; Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	Snakes: Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake Special Concern: Milksnake Eastern Ribbonsnake Lizard: Special Concern (Southern Shield population): Five-lined Skink	For all snakes, habitat may be found in any ecosite in central Ontario other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats. Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator. The existence of rock piles or slopes, stone fences, and crumbling foundations assist in identifying candidate SWH. For Five-lined Skink, ELC	For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations. Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line. Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. Five-lined skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct). • Note: If there are Special Concern Species present, then site is SWH	• All sites of locally rare or uncommon species should be considered significant • representative hibernacula for common species should be protected • Most significant sites support two or more species of concern; significant sites may support one species. • Sites with the greatest number of species are more significant. • Sites with the highest number of individuals are more significant. • the least disturbed and most diverse habitats are likely more significant

Table 1: Examples of criteria for SWH provided by the SWHTG (Section 8.3 & Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: seasonal concentrations of animals. (For details see Draft Ecoregion Schedule 6E and SWHTG)

Seasonal Concentration Areas	Wildlife Species (Draft Ecoregion Schedule 6E)	CANDIDATE SWH (DRAFT Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
		Community Series of FOD and FOM and Ecosites: FOC1 FOC3			
Bullfrog Concentration Areas	Please see table 3 in this appendix: specialized habitat for wildlife		•		
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff) Rationale; Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	Bank Swallow Cliff Swallow Northern Rough-winged Swallow	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles (Bank Swallow and N. Rough-winged Swallow). Cliff faces, bridge abutments, silos, barns (Cliff Swallows). Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation.	Studies confirming: • Presence of 1 or more nesting sites with 8 or more cliff swallow pairs or 50[Í] bank swallow and rough-winged swallow pairs during the breeding season.	• Sites that have been used the longest are important; • The number of nests is important; • Sites that support provincially rare species are more important than those that support regionally rare species • Suggested number of nests that should be considered significant: Cliff Swallow, 8; Bank Swallow, 100; Northern Rough-winged Swallow, 10
Migratory Butterfly Stopover Areas Rationale: Butterfly	Painted Lady White Admiral Special Concern Monarch	Combination of ELC Community Series; need to have present one Community Series from each	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario. • The habitat is typically a	Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct). MUD is based on the number of days a site is used by Monarchs,	• Large sites are usually the most significant because they contain the greatest diversity of plant species • Significant sites are generally the only known sites in the planning area; significant sites may be one of only a few

Table 1: Examples of criteria for SWH provided by the SWHTG (Section 8.3 & Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: seasonal concentrations of animals. (For details see Draft Ecoregion Schedule 6E and SWHTG)

Seasonal Concentration Areas	Wildlife Species (Draft Ecoregion Schedule 6E)	CANDIDATE SWH (DRAFT Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.		land class: Field: CUM CUT CUS Forest: FOC FOD FOM CUP Anecdotally, a candidate sight for butterfly stopover will have a history of butterflies being observed.	combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes	multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day; significant variation can occur between years and multiple years of sampling should occur. • MUD of >5000 **or** >3000 with the presence of Painted Ladies or White Admirals is to be considered significant.[Í]	in the area. • Most significant sites support two or more species of concern; significant sites may support one species. • Sites with the greatest number of species are more significant. • Sites with the highest number of individuals are more significant. • Large sites are more significant than smaller sites. • Sites with a variety of habitat types (e.g., forest, grassland) are often more significant than sites with homogeneous habitat. • Sites within 5 km of Lake Ontario and Lake Erie shoreline are most significant. • Least disturbed sites may be more significant. • Sites that have been traditionally used for at least 10 years are more significant.

Table 2. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Rare Vegetation Communities.(For detail see Draft Ecoregion Schedule 6E and SWHTG)

Rare Vegetation Community	CANDIDATE SWH (Ecoregion Schedule 6E)			CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
	ELC Ecosite Code	Habitat Description	Detailed Information	Defining Criteria	
Sand Barren Rationale; Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always ≤ 60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. They have little or no soil and the underlying rock protrudes through the surface. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered but less than 60%.	Any sand barren area, no minimum size.	• Confirm any ELC Vegetation Type for Sand Barrens • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics)[Í].	• All provincially rare vegetation communities (S1 to S3 as listed by NHIC) should be considered significant
Savannah Rationale: Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%.	No minimum size to site Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH.	Field studies confirm one or more of the Savannah indicator species listed in Appendix N should be present. Note: Savannah plant spp. list from Ecoregion 6E should be used. • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics).	• All provincially rare vegetation communities (S1 to S3 as listed by NHIC) should be considered significant
Tallgrass Prairie Rationale: Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover.	No minimum size to site [Í]. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH.	Field studies confirm one or more of the Prairie indicator species listed in Appendix N should be present Note: Prairie plant spp. list from Ecoregion 6E should be used • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics).	• All provincially rare vegetation communities (S1 to S3 as listed by NHIC) should be considered significant

Table 2. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Rare Vegetation Communities.(For detail see Draft Ecoregion Schedule 6E and SWHTG)

Rare Vegetation Community	CANDIDATE SWH (Ecoregion Schedule 6E)			CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
	ELC Ecosite Code	Habitat Description	Detailed Information	Defining Criteria	
Other Rare Vegetation Communities Rationale: Plant communities that often contain rare species which depend on the habitat for survival.	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG . Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in appendix M The OMNR/NHIC will have up to date listing for rare vegetation communities.	Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG. • Area of the ELC Vegetation Type polygon is the SWH.	• All provincially rare vegetation communities (S1 to S3 as listed by NHIC) should be considered significant • Communities that represent < 3% of remaining natural area and/or are found in only five or fewer locations within the municipality might be considered locally significant communities.

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
Waterfowl Nesting Area Rationale; Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 Note: includes adjacency to Provincially Significant Wetlands	A waterfowl nesting area extends 120 m from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur. • Upland areas should be at least 120 m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites.	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards, or; • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects	• This category falls under Habitat of Seasonal Concentrations of Animals in the SWHTG • Most significant sites are the only known sites in the planning area; significant sites may be one of only a few in the area. • Most significant sites support several species of concern; significant sites support one species. • Sites with the greatest number of species are more significant. • Sites with nesting and brood habitat for American Black Ducks should be considered significant • All nesting areas for Gadwall, Green-winged Teal, Northern Pintail, Northern Shoveler, and American Wigeon should be considered significant • Sites with the highest number of individuals are more significant. • Larger sites of suitable habitat (e.g., grasslands adjacent to wetlands, ponds, lakes for many species) are more significant. • Most significant sites have better habitat (e.g., optimal vegetation structure, stable water levels, abundant cover, and a wetland/water body within 150 m). • Sites providing safe movement of broods from nest to wetland/water body (i.e., no roads) are more significant. • Sites with lower rates of nest predation are more significant. • Sites with little disturbance (e.g., haying, cattle grazing) are more significant.
Turtle Nesting Areas Rationale; These habitats are rare and when identified will often be the only breeding site for local populations of turtles.	Midland Painted Turtle Special Concern Species Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100m) or within the following ELC Ecosites: MAM2 MAM3 MAM4 MAM5 MAM6 MAM1 MAM2 MAM3	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road	Studies confirm: • Presence of 5 or more nesting Midland Painted TurtlesÍ • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependant on slope, riparian vegetation and adjacent land use is the SWH	• Larger sites are most significant because fewer nests are likely to be lost to predation and larger areas are more likely to be important to larger numbers of turtles. • Nesting areas adjacent to permanent water bodies and large wetlands, and removed from roads are more significant because of increased likelihood of nesting success and hatchlings reaching the water; as well as reduced road mortality. • Higher, well-drained sites are more important than poorly drained, low-lying areas at risk of inundation by water. • Sites with good exposure to sunlight are more significant. • Generally nesting areas of preferred substrate (e.g., sands and gravels) are preferred to sites over other substrates. • Presence of several nests or adult females observed during the nesting season, within a single area indicates a significant habitat. • Sites with evidence of use by several species are more significant.

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
		SAS1 SAM1 SAF1 BOO1 FEO1	embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used.	• Travel routes from wetland to nesting area are to be considered within the SWH.	• Sites with traditional use are more significant. • Nesting habitats used by rare species are more significant. • More significant sites are less prone to nest predation (e.g., they are not located in highly active wildlife corridors). • Most significant nesting habitats are connected to other turtle habitats (e.g., wetland) by corridors permitting relatively safe movement of these reptiles.
Amphibian Breeding Habitat (Woodland). Rationale: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians	• Presence of a wetland, lake, or pond within or adjacent (within 120m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat	Studies confirm; • Presence of breeding population of 1 or more of the listed species with at least 20 individuals (adults, juveniles, eggs/larval masses).	• Greatest significance is ascribed to ponds that support a high diversity of species, species of conservation concern, and high numbers of amphibians; but there is little discussion of ponds that support woodland amphibian breeding that are located outside woodlands • Ponds supporting high species diversity are more significant. • Ponds supporting rare amphibian species are more significant than ponds supporting only common species. • Ponds with a good diversity of emergent and submergent aquatic vegetation are most significant. • Presence of shrubs and logs increase significance of pond for some amphibian species because of increased structure for calling, foraging, and escape and concealment from predators. • More significant areas will have closed canopy forest providing shaded, moist understorey and abundance of downed woody debris for cover habitat. • Breeding ponds with shortest distance to forest habitat are more significant because of reduced risk to moving amphibians and are more likely to be used. • Prefer unpolluted waters.
Amphibian Breeding Habitat (Wetlands) Rationale; Wetlands supporting breeding for	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard	ELC Community Classes SW, MA, FE, BO, OA and SA.	• Wetlands and pools (including vernal pools) >500m^2 (about 25m diameter) isolated from woodlands (>120m), supporting high species diversity are significant; some small or ephemeral habitats may not be	Studies confirm: • Presence of breeding population of 1or more of the listed salamander species or 3 or more of the listed frog or toad species and with at least 20 breeding individuals (adults, juveniles, eggs/larval masses) **or;**	• The SWHTG included only Bullfrog concentration areas, which are discussed under Habitat for Seasonal Concentrations of Animals • in areas where bullfrogs have declined and there is potential for population recovery, even small concentrations of bullfrogs may be significant. • Sites supporting low densities of bullfrogs may be significant if they are near the limits of the species' range • Sites that have supported bullfrogs for at least 10 years are significant

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	Frog Pickerel Frog Green Frog Mink Frog Bullfrog		identified on MNR mapping and could be important amphibian breeding habitats. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation.	• Wetland with confirmed breeding Bullfrogs are significant.	
Open Country Bird Breeding Habitat (noted under Species of Conservation Concern in Ecoregion Schedules) Rationale; This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow Special Concern Short-eared Owl	CUM1 CUM2	Large grassland areas (includes natural and cultural fields and meadows) >30 ha. Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years). Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species.	Field Studies confirm: • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owls is to be considered SWH.	• Sites supporting area-sensitive species of birds that are rare or uncommon, and/or exhibiting population declines provincially are most significant. • Largest grasslands in the municipality are likely most significant with those >30 ha most likely to support and sustain diversity of these species. • Grasslands with a variety of different layers of vegetation at different heights likely provide more habitats and support more bird species and are consequently more significant. • Roadless, relatively undisturbed sites with no history of disturbance from grazing, forestry operations during the last 20 years are most significant. • In general, early successional grasslands that are not being used for agricultural production are more significant that similar grasslands that are used for agriculture (e.g., crops, cattle grazing). • Sites with the least amount of adjacent residential development are more significant. • Sites that could be lost or severely degraded and cannot be replaced by similar sites in the planning area, are highly significant. • Specialized habitats with the poorest current representation within the planning area are significant. • Sites providing several identified significant wildlife habitats (e.g., raptor nest sites, rare vegetation community, habitat for species of conservation concern) are most significant.

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
Shrub/Early Successional Bird Breeding Habitat (noted under Species of Conservation Concern in Ecoregion Schedules) Rationale; This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records	Indicator Spp: Brown Thrasher Clay-coloured Sparrow Common Spp. Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species	Large field areas succeeding to shrub and thicket habitats>10ha in size. Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years). Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species. Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands. •	Field Studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. • A field with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat.	• shrub-nesting, area-sensitive species not noted in SWHTG but they were not specifically ruled out as criteria for SWH • Sites supporting area-sensitive species of birds that are rare or uncommon, and/or exhibiting population declines provincially are most significant.
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat Rationale; Nest sites are fairly uncommon in Eco-region 6E and are used annually by these species Many suitable nesting locations may be lost due	Osprey Special Concern Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH, maintaining	• Most significant nesting habitats are adjacent or close to relatively clear and shallow (< 1 m) water bodies with productive fish populations. • Presence of large, sturdy trees near shoreline • Most significant nesting habitats have numerous large conifer and/or deciduous trees in good condition along the shoreline providing birds with good visibility and clear flight line to the nest. • More significant sites will have no disturbance from human activities within 200 m of the nest during the nesting season. • Some Ospreys may tolerate some disturbance but more significant sites and sites of more sensitive birds should not be disturbed after onset of nesting. • Most significant habitat contains several nests within a single area (e.g., within 1 square km) • Sites with current evidence of use are most significant. • Sites with traditional use are most significant (many nests are used for

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
to increasing shoreline development pressures and scarcity of habitat. Possible occurrences have been noted in the Maple ANSI area and additional functions (e.g. foraging habitat) should be considered if development is proposed adjacent to this part of the NHN.			platforms).	undisturbed shorelines with large trees within this area is important. • For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area of the habitat from 400-800m is dependant on site lines from the nest to the development and inclusion of perching and foraging habitat • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for > 3 years or suspected of not being used for >5 years before being considered not significant.	several consecutive years). • Potential nesting habitats that could be lost or severely degraded and cannot be replaced by similar sites in the planning area, are significant. • Sites threatened with degradation or loss are more significant than similar, but currently unthreatened sites.
Woodland Area-Sensitive Bird Breeding Habitat (Classified as Habitat for Species of Conservation Concern in Draft Ecoregion Schedules) Rationale: Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Special Concern: Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha. Interior forest habitat is at least 200 m from forest edge habitat.	Studies confirm: • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH.	• Sites supporting area-sensitive species of birds that are rare or uncommon, and/or exhibiting population declines provincially are most significant. • Largest natural forest stands in the municipality are likely most significant with those >30 ha being most likely to support and sustain a diversity of these birds. • Most significant forest stands should contain at least 10 ha of forest interior excluding at least a 200m buffer around the forest interior. • Smaller interior habitats may still be significant where no larger examples exist. • Sites with an abundance of large (e.g., >40 cm DBH, >25 m tall), mature trees are more significant for certain nesting raptor species as well a number of songbird species. • Forests and grasslands with a variety of different layers of vegetation at different heights likely provide more habitats and support more bird species and are consequently more significant. • Uneven-aged forests are generally more significant than even-aged forests because they provide more forest structure. • Sites with largest contiguous canopy cover and fewest gaps in the canopy are likely most significant. Natural gaps (e.g., windthrown trees, woodland ponds) are preferred to man-made gaps (e.g., roads).

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
forest song birds. Though these areas would almost certainly be incorporated into the NHN, additional function should be considered if development is proposed adjacent to this part of the NHN.					• Gaps should be < 20 m including roads and rights-of-way. • Roadless, relatively undisturbed sites with no history of disturbance from grazing, forestry operations during the last 20 years are most significant. • Sites with history of only light grazing and/or forestry operations over the last 20 years are potentially significant if properly managed. • Uneven-aged forest stands are often more significant than even-aged forest stands because they may be less intensively managed, and generally contain a natural representation of species. • Forest stands with a history of little or no forest management may be most significant. • Sites with the least amount of adjacent residential development are more significant. • Sites that could be lost or severely degraded and cannot be replaced by similar sites in the planning area, are highly significant. • Specialized habitats with the poorest current representation within the planning area are significant. • Sites providing several identified significant wildlife habitats (e.g., raptor nest sites, rare vegetation community, habitat for species of conservation concern) are most significant.
Special Concern and Rare Wildlife Species Rationale: These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre.	All plant and animal element occurrences (EO) within a 1 or 10km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites	Studies Confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • Habitat form and function needs to be assessed from the assessment of vegetation types and an area of significant habitat that protects the rare or special concern species identified.	• called habitat for species of conservation concern in the SWHTG • habitats that support large populations of a species of concern (in the broad sense) should be considered significant • Habitats of the rarest species are more significant than those of less rare species. For example, habitats for species ranked S1and S2 should be considered more significant than habitats for species ranked S3. • Species ranked as vulnerable by the OMNR should also be considered significant. • Less rare species and their habitats in the planning area may be deemed species of conservation concern by the municipality based on such factors as the number of known occurrences, total extent of remaining habitat, degree of threat or risk to habitat, and/or local interest in a particular species. • The habitat for species experiencing the greatest declines is most significant. • The habitat for declining species that has the lowest representation in the planning area is more significant. • Those habitats that provide the best opportunity for the long-term sustainability of the declining species are most significant (e.g., large well-protected sites; sites that best meet the species' habitat requirements; sites with good connections to other similar habitats).

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
					• Habitat for those species with the poorest representation within the • planning area is more significant. • These species and their habitats are significant even if well represented in the planning area, due to high provincial responsibility for their protection. • Those habitats that provide the best opportunities for the long-term sustainability of the target species are most significant (e.g., large well protected sites; sites that best meet the species' habitat requirements; sites with good connections to other similar habitats). • Sites that provide habitat that best meets the survival requirements of the target species and that also include a natural buffer zone are most significant (i.e. most likely to sustain species/population over the long term). • Sites that contain the fewest non-native species of potential threat to the target species are significant. • Undisturbed or least-disturbed habitats (e.g., no/few deleterious impacts from roads, human activities) are significant. • Sites capable of producing a large number of individuals of a single species of conservation concern are significant. • Highly diverse sites that support one or more species of conservation concern are most significant. • Habitats supporting large populations of a several species of conservation concern are most significant. • Habitat supporting large populations of a single species is significant. • Large sites supporting large populations of several species of conservation concern are most significant. • Large sites are generally more significant than most comparable but smaller sites. • Sites large enough to ensure long-term support and viability of species of conservation concern are significant. • Sites with large areas of suitable habitat that are also connected to other potentially suitable habitat and/or natural areas are most significant. • Habitats that provide the best opportunity for long-term protection are usually more significant than similar habitats with little opportunity for protection or facing an uncertain future due to potential threats (e.g., habitat found in a large natural area vs. an isolated site close to an expanding residential development). • Habitats threatened with degradation or loss are more significant than similar, but currently unthreatend habitats, if they can be protected. • Habitats of species currently experiencing severe population declines in

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
					Ontario (e.g., grassland bird species) due to habitat loss are most significant. • Habitats of species currently experiencing significant population declines in the municipality are significant. • Poorly represented habitats for species of conservation concern are significant. • Habitats that could be lost or severely degraded and cannot be replaced by similar habitats in the planning area, are highly significant. • Sites with documented traditional use by species are most significant. • Species of particular interest to the planning authority (e.g., the CAC may recommend certain species such as indicator species) may be considered significant • Sites providing the best examples of habitat that will ensure the longterm • sustainability of the species are significant.
Seeps and Springs Rationale; Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams. Although these features are likely within the NHN, a feature-based water balance approach may be required to maintain these functions.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system. Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species	Field Studies confirm: • Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of a ELC forest ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat	• Sites with several seeps/springs (e.g., >5) are most significant. • Most significant seeps/springs are present even during very dry summers. • Most significant sites support diversity of native vegetation. • Sites supporting rare or uncommon species (e.g., plants, salamanders), or species that are unique to the area (e.g., Wild Turkey) are more significant than those that support only common species. • Seeps/springs located on south-facing slopes are probably more significant than seeps with other aspects because of their winter value to some wildlife species. • Seeps/springs in forest stands and/or headwater areas are generally more significant than those found in other areas. • Seeps/spring found in relatively undisturbed areas are generally more significant than those found in areas disturbed by human activities (e.g., off-road vehicle travel).

APPENDIX 4: GIS METADATA

Appendix 4: GIS Metadata – as displayed for ESRI Arcview shapefiles

Bioforest Final
Shapefile
Tags

Forest, Forest Cover, Woodlands, City of Vaughan, York Region

SummaryThe bioforest shapefile illustrates the forest polygons within the City of Vaughan. It is primarily comprised of the York Region bioforest layer with some additional forest patches from the TRCA natural covers shapefile.

Description

Using the bioforest shapefile received from York Region as the primary source of the woodland patches found in the City of Vaughan. The York Region forest layer was based on 2009 orthoimagery interpretation. Using 2011 orthoimagery the bioforest layer was updated based on the existence or non-existence of woodland patches. The boundary of the spatial forest layer was not altered to reflect the changes found in the 2011 orthoimagery.

In addition to the forest polygons from York, we looked at the forest polygons found in the TRCA shapefile. The TRCA forest component was pulled from the natural covers shapefile (naturalcovers20072008_trca_clipVaughan.shp) Each of the TRCA polygons were analyzed to see if they could be added to the York Region's bioforest layer. The possible additions would need to be greater than 0.5 ha and do not already exist in York Region's forest layer. The TRCA forest polygons that met the criteria were imported into the bioforest_final layer.

Credits

North-South Environmental and Geosphere Infomatic Services, 2012

Access and use limitations

There are no access and use limitations for this item.

Wetlands Final

Shapefile

Tags

Wetlands, Swamps, Marshes, Fens, Bogs, City of Vaughan, York Region

Summary

The wetlands shapefile illustrates the location of swamps, marshes, fens and bogs within the City of Vaughan. It is primarily comprised of the Land Information Ontario (LIO) wetlands layer with the addition of wetland polygons from TRCA.

Description

Using the wetlands layer form LIO as the primary spatial source of wetlands in the City of Vaughan. This layer was compared to the 2011 orthoimagery to edit out any wetlands that have been drained or have been taken out by development.

Additional wetlands were added to the layer above from information obtained from TRCA. These additions comprised of wetland polygon that did not exist in the LIO layer above and were present on the orthoimagery. No boundary modifications were carried out on this final layer.

Credits

North-South Environmental and Geosphere Infomatic Services, 2012

Access and use limitations

There are no access and use limitations for this item.

Watercourses Final
Shapefile
Tags
Rivers, Creeks, Streams, City of Vaughan, York Region

Summary

The watercourses shapefile illustrates the location of rivers, creeks and streams within the City of Vaughan. It is primarily comprised of the Land Information Ontario (LIO) watercourses layer with the addition of watercourses from TRCA.

Description

Using the watercourses layer form LIO as the primary spatial source of watercourses found in the City of Vaughan. This layer was compared to the 2011 orthoimagery to edit out any watercourses that have been taken out by development.

Additional watercourses were added to the layer above from information obtained from TRCA. These additions comprised of rivers, streams and creeks lines that did not exist in the LIO layer above and were present on the orthoimagery.

Credits

North-South Environmental and Geosphere Infomatic Services, 2012

Access and use limitations

There are no access and use limitations for this item.

Waterbodies Final
Shapefile
Tags
Water, Lakes Ponds, Detention Ponds, City of Vaughan, York Region

Summary
The waterbodies shapefile illustrates the lakes, ponds and detention ponds and storm water management ponds within the City of Vaughan. It is primarily comprised of the Land Information Ontario (LIO) waterbodies layer with the addition of waterbodies and detention ponds from the City of Vaughan.

Description
Using the waterbodies layer form LIO as the primary spatial source of waterbodies found in the City of Vaughan. This layer was compared to the 2011 orthoimagery to edit out any waterbodies that have been drained or have been taken out by development.

Additional waterbodies and detention were added to the layer above from information obtained from the City of Vaughan. These additions comprised of water polygons that did not exist in the LIO layer above and were present on the orthoimagery. No boundary modifications were carried out on this final layer.

Credits
North-South Environmental and Geosphere Infomatic Services, 2012

Access and use limitations
There are no access and use limitations for this item.

Environmentally Significant Areas
Shapefile
Tags
ESA, Environmentally Significant Areas, City of Vaughan, York Region

Summary
The ESA layer indicates environmentally significant areas within the City of Vaughan. the layer was sent to North-South Environmental by the Toronto Regional Conservation Authority (TRCA).

Description
The ESA shapefile was produced by the TRCA. No other information is available

Credits
There are no credits for this item.

Access and use limitations
There are no access and use limitations for this item.