Draft Natural Heritage Features Mapping Report

Section 1: Introduction

The Friends of the Greenbelt Foundation undertook this study to understand the process by which natural heritage features are mapped and communicated to the public by municipalities in Ontario. This was in response to issues raised by Greenbelt stakeholders, mainly within the agricultural sector, who were affected by inaccuracies in municipal Official Plan mapping schedules for natural heritage features. The Foundation was concerned that a perception of inaccuracy in natural heritage feature maps and a lack of clarity in communicating what Official Plan maps represent was eroding stakeholder confidence and affecting delivery of natural heritage and agricultural policy goals.

In late 2014, the Friends of the Greenbelt Foundation commissioned a researcher to review mapping guidance materials and to interview 19 municipalities and one conservation authority in the Greater Toronto and Hamilton area. The goal was to develop a more in-depth understanding of the mapping process and its communication to the public, in order to identify challenges and good practice to inform discussion between key stakeholders.

The following report is based on the information provided by the 20 interviews and may not reflect the complete picture of the mapping process from all perspectives.

Section 2: Policy Context

Overview

Official Plans (OPs) are created by upper, lower and single-tier municipalities to regulate development, planning activities and future growth plans within a municipality's boundaries. The policies in an OP are required to be consistent with all relevant provincial plans and policies e.g. Provincial Policy Statement (PPS), Greenbelt Plan (GBP), Oak Ridges Moraine Conservation Plan (ORMCP), Niagara Escarpment Plan (NEP), and Growth Plan (GP) for the Greater Golden Horseshoe. All of these include requirements for natural heritage protection and those requirements differ between the Plans.

Municipalities are required to have maps available showing known natural heritage features (NHF) and hydrologic features (HF) and any associated minimum protection zones under the PPS, GBP, ORMCP and NEP. These maps are part of the process for coordinated, integrated and comprehensive management of natural heritage systems. The maps are displayed as schedules within OPs to guide local development.

The Greenbelt contains a Natural System that provides a continuous and permanent land base necessary to support human and ecological health in the Greenbelt and beyond. The Natural System policies of the Greenbelt Plan protect areas of natural heritage, hydrologic and/or landform features, which are often functionally inter-related and which collectively support biodiversity and overall ecological integrity. The implementation of these policies requires natural heritage features to be identified and accurately located at a local level.

The process of identifying and locating natural features (used interchangeably to describe NHF and or HF) for OPs involves the provincial government, upper-single-lower tier municipalities, conservation authorities, not for profit organizations and the public. It also involved a multitude of experts including planners, GIS technicians, foresters, biologists, hydrologists and consultants.

The provincial Natural Heritage Reference Manual sets out the following process:
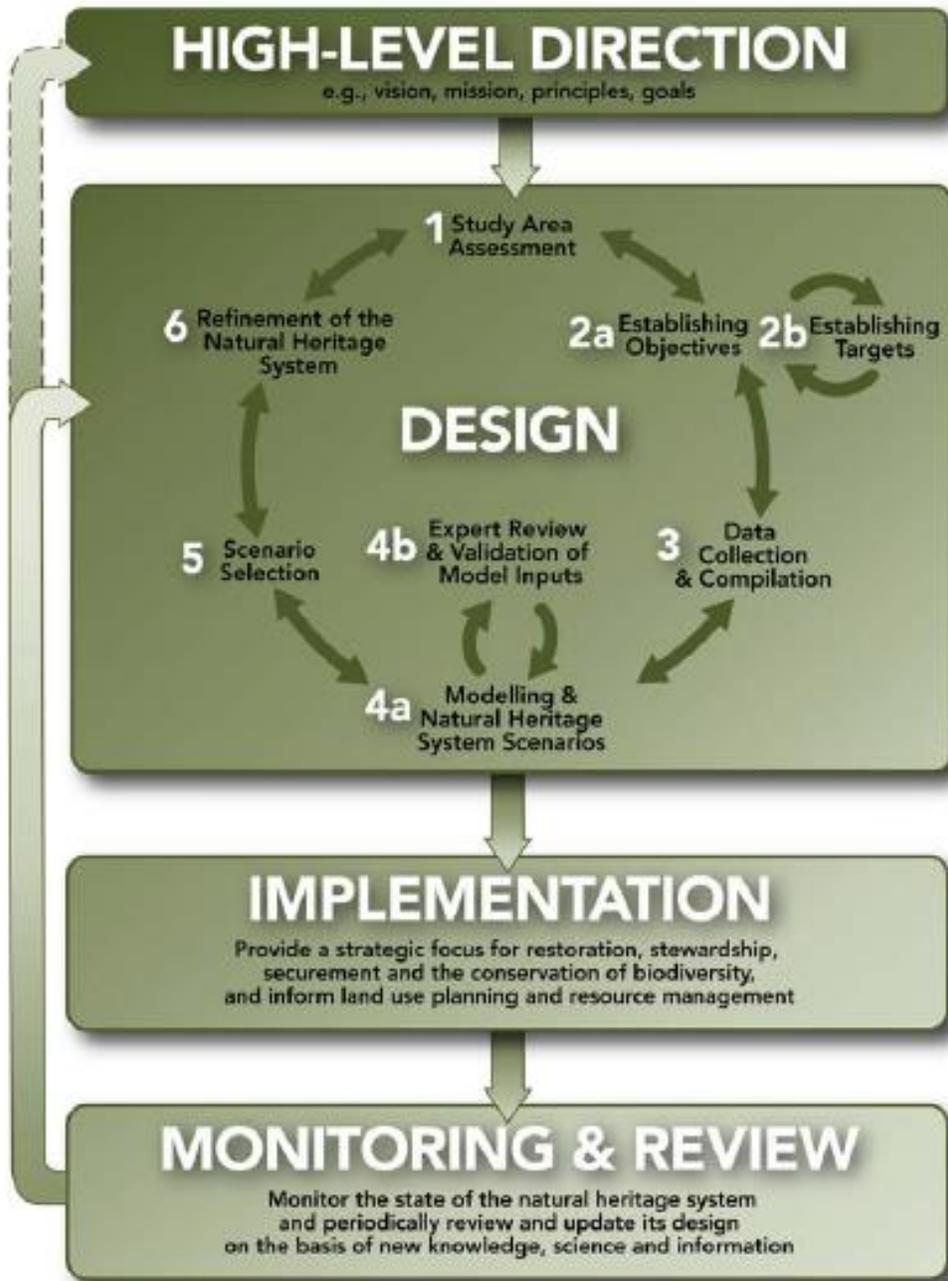
This report is focused on Stage 3, "Data Collection and Compilation and Stage" and Stage 6, "Refinement of the Natural Heritage System".

Defining Natural Features

For this report, staff from 19 municipalities and one conservation authority within the Greenbelt was interviewed. The GBP contains policies for protecting a Natural System that provides a continuous and permanent land base necessary to support human and ecological health in the

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Greenbelt and beyond. The Natural System's policies protect areas of natural heritage, hydrologic and /or landform features, which are often functionally inter-related and which collectively support biodiversity and overall ecological integrity. The Natural System is made up of a Natural Heritage System (NHS) and a Water Resource System (WRS) that often coincide given ecological linkages between terrestrial and water based functions.

The policy regimes for the Natural Heritage Features and Water Resource Features are slightly different. The GBP policies for Key NHFs **only apply** within the Natural Heritage System identified within the schedule of the GBP. Outside of the Natural Heritage System but within the Protected Countryside the policies of the PPS apply. In contrast, the Water Resource System is not mapped in the GBP and all Key Hydrologic Features within the Greenbelt **are defined by and subject to** the natural features policies of the GBP.

The following table details the features that are set out in the GBP and Provincial Policy Statement (PPS).

Table 1: Comparison of Greenbelt Plan and PPS natural heritage features

Greenbelt Plan	Provincial Policy Statement
(Key)* Natural Heritage Features	
Significant habitat of endangered species	Habitat of endangered and threatened species
Fish Habitat	Fish Habitat
Wetlands	Significant Wetlands and significant coastal wetlands
Life Science Areas of Natural and Scientific Interest	Areas of Natural and Scientific Interest
Significant valleylands	Significant valleylands
Significant woodlands	Significant woodlands
Significant wildlife habitat	Significant wildlife habitat
Sand barrens, savannahs and tall grass prairies	NA
Alvars	NA
(Key) Hydrologic Features	
Permanent and intermittent streams	NA
Lakes (and their littoral zones)	NA
Seepage areas and springs	NA
Wetlands	NA

*The GBP refers to 'Key' features whereas the PPS does not
Sources: Greenbelt Plan 2005, Provincial Policy Statement 2014

It must be noted that the PPS and GBP set out the minimum requirements for NHS feature identification. Municipalities may choose to extend these in response to local demand or need. Some features are identified at the provincial level while others are identified at the municipal level using criteria provided by the province or federal legislation (see table 2 below).

Table 2: Responsibility for identifying natural heritage features

Feature	Who establishes and how
Significant habitat of endangered species and threatened species	MNRF identifies such habitat by delineating/describing, reviewing and approving the work of others or establishing methods such as training and standards that ensure that the work of others will be acceptable.
Significant wetlands and significant coastal wetlands	MNRF identifies such wetlands by delineating them or reviewing the work of others in accordance with the Ontario Wetland Evaluation System.
Significant woodlands planning	Planning authorities identify such woodlands or approve the work of others using criteria recommended in the manual or municipal approaches that achieve or exceed the same objective as the provincial criteria.
Significant valleylands	Planning authorities identify such valleylands or approve the work of others using criteria recommended in the manual or municipal approaches that achieve or exceed the same objective as the provincial criteria.
Significant wildlife habitat	Planning authorities identify such habitat or approve the work of others using criteria and processes recommended in the Significant Wildlife Habitat Technical Guide (see section 9.3.1) and the manual or municipal approaches that achieve or exceed the same objective as the provincial processes and criteria.
Areas of natural and scientific interest	MNRF identifies such areas in accordance with the ANSI confirmation process.

Displaying Natural Heritage Information on Maps

Provincial policy requires municipalities to map and implement policies for the protection of natural heritage features. The province provides broad scale mapping at a regional or landscape level (the exception being PSW's and ANSIs) as well as technical guidance and criteria such as the Natural Heritage Reference Manual, significant wildlife habitat criteria, ESA general habitat descriptions, and recovery strategies. In the Natural Heritage Reference Manual there is a clear acknowledgement of the limitations of regional scale mapping for NH boundary delineation and accuracy; site specific studies of some form are required to achieve accuracy at that level.

Various approaches in how features are identified in written policies and mapping have been taken by the municipalities interviewed. The majority have combined all environmentally protected areas (including NHF and HF) into a single "Greenlands" or "Natural Heritage

System". The approach and mapping schedules are available to be commented on when the final draft goes through the consultation process at the time of an OP update, with municipal council making the final decision on what approach is taken. Appendix 1 "Approach to Mapping Natural Heritage Features" describes the approaches taken by various municipalities. Designations set out the land uses that are permitted on those lands, while overlays identify plans and features separately for reference and identification purposes. Overlays act as a screening tool (in terms of NHFs) in that they flag the presence of a feature but that more information is needed before policies are applied to that feature. The designations are generally referred to on the municipality's main "Land Use" schedule and incorporate natural heritage features and provincial plans such as the GBP, ORMCP and NEP. This is discussed further in best practices.

Development Restrictions

The written polices of an OP describe the permitted and non-permitted land uses within Natural Features and their associated buffers. The Greenbelt Plan does not allow development or site alterations within NHF / KHF or their associated buffer. Exceptions to this are for existing on-farm buildings, infrastructure and aggregate projects, and low impact uses such as trails. The PPS does not allow for development within a NHF or KHF unless it can be shown (through a study) that the development will have no negative impact on the form or function of the feature.

Environmental Impact Statement (EIS) Requirements

Under the Greenbelt Plan, development applications for land within 120 metres of a NHF require an EIS (the exception being valleylands). Under the PPS an EIS is required for development applications for land within a Natural Feature or its buffer. Some Features have additional requirements e.g. an EIS is recommended for applications within 1km of habitat of endangered species.

> "*An Environmental Impact Statement (EIS) is a study that assesses the potential impact of a development proposal within, or adjacent to, a Core Area by a qualified expert, usually an environmental consultant, ecologist, or hydrogeologist. An EIS provides an objective technical assessment of a development proposal that explains if and to what extent the proposed development might reasonably be expected to impact the biological and physical characteristics and functions of an area. The EIS identifies potential adverse impacts of a proposal and recommends ways to avoid or minimize these impacts and, if possible, enhance the natural area.*"- **City Of Hamilton**, Environmental Impact Statement Guidelines Revised November 2013[7]

Some OP's written policies describe general requirements of approval, criteria or guidelines for EIS preparations such as peer review or protocol. Conservation Authorities and members of the public can provide input on EIS findings during a consultation phase.

"*Where planning applications to establish or expand a permitted use are not subject to the Environmental Assessment Act, an environmental impact statement (EIS) shall be required, <u>to the satisfaction of the Town</u>, to establish that the use will not negatively impact the natural*

features or ecological functions contained within the Natural Area designation." - **Town of Oakville**, OP 2009[8]

"*Where the preparation of an Environmental Impact Statement is required, the report shall be prepared to the satisfaction of the Town in consultation with the relevant agencies. The Town may determine that a peer review should be conducted of the Environmental Impact Statement. The Town shall select and retain a qualified environmental consultant, at the expense of the proponent, to conduct the peer review in accordance with the provision of Section 6.4"* - **Town of Georgina**, OP Office Consolidation, October 2010[9]

The planning proponent generally bears the costs of the EIS study. Some municipalities have provided funding to certain proponents, such as rural land owners, to help offset cost incurred for environmental studies.

Buffers

Buffers are lands that are adjacent to a natural heritage feature with restricted land uses. They act to reduce or remove the potential impact of development on the feature. The 'buffer' requirements are different between the PPS and GBP. The GBP adopts a fixed minimum buffer policy, which means all KNHF and KHFs require a minimum 30 metre buffer. Certain features require an EIS if development is occurring within 120 metres their boundary. That EIS may recommend a buffer distance of greater, but no less than, than 30m.

For features outside the scope of the GBP policies and therefore covered by the PPS, the Natural Heritage Reference Manual 2005 describes how buffers should be applied (table C-2, pp 204) but the recommendations are not always followed. In general, the only permitted uses within the buffer of a feature are low impact, such as trails, passive recreation and conservation activities such as forestry, fisheries management and erosion control. Legally existing uses and land use proposals that have undertaken an EIS that has determined the proposal will not impact the feature are also permitted. Municipalities provide written policies in the OP to protect and minimize disturbance to vegetation within buffer areas; these areas are described as "Vegetation Protection Zones."

"*Vegetation Protection Zone means a vegetated buffer area surrounding a natural heritage feature or hydrologic feature within which only those land uses permitted within the feature itself are permitted.*"- City of Markham- OP-Region Approved-2014[14]

The variability of policies relating to buffers is captured in table 3, *Buffer distances and permitted land uses.* The table shows the process by which buffer distances are determined by each municipality interviewed, land uses permitted within them, whether buffers include a requirement for vegetation protection zones, and how buffers are displayed on OP schedules.

Table 3 - Buffer Distances and Permitted Land Uses

Municipality	Buffer Distance Determined by	General Permitted Land Uses	Vegetation Protection Zones	Inclusion of Buffers on OP Schedules
Ajax	Buffers are determined through site-specific studies or site walks as part of the development approval process	i) conservation and resource management; ii) forest, fish and wildlife management; iii) conservation and flood erosion control projects iv) infrastructure, subject to the policies of the Greenbelt Plan and this Plan; v) archaeological conservation activities including archaeological field work vi) passive recreational vii) expansions and alterations to existing agricultural buildings and structures, with satisfactory EIS	Yes	Included as a part of the feature
Clarington	In rural areas, the buffer distances recommended in the Natural Heritage Reference Manual are used, generally a 30 metre buffer. Urban areas are subject to an EIS, which determine appropriate buffer. Buffers are subject to Environmental Protection designation	Low impact land uses are only permitted, EIS required to determine impact, generally no structures or intensive land uses. Agriculture permitted if existing, subject to Tree Cutting Bylaw if not existing but In general, no EIS required	Yes	Included as part of the feature in rural areas, not included in urban areas
Durham	Within Urban Areas and Rural Settlements, the vegetative protection zone shall be determined through an environmental impact study Outside of Urban Areas and Rural Settlements, an environmental impact study shall be required for any development or site alteration within 120 metres of a key natural heritage or hydrologic feature to identify a vegetation protection zone. In addition, there are numerous policies within the ROP which state that the vegetation protection zone for various features shall be a minimum of 30 metres wide (measured from the outside boundary of the feature), or an appropriate width as determined on a case by case basis in consultation with the appropriate conservation authority	The vegetation protection zone surrounding a key natural heritage feature or a key hydrologic feature permits only those land uses permitted within the feature itself.	Yes	Not Included
East Gwillimbury	Consultant suggestions or legislative requirements	Existing uses and conservation	Yes	Included as a part of the feature
Georgina	Buffer distances described In Provincial Plan, Lake Simcoe Protection Plan, Greenbelt Plan and Natural Heritage Reference Manual	Not very many activities permitted: Low impact land uses only permitted, Legally existing land uses and conservation projects are examples of permitted uses and EIS determines if proposed land use will have impact on feature	Yes	Not included

Halton	Background implementation document describes protocol, Guideline document describes minimum thresholds/buffers, EIA/EIS process documents refinement process and buffers, Detailed investigation required upon proposal to determine value & function of features on site and in the context of the broader natural heritage system, likely impacts resulting from the proposed development, mitigation measures (of which buffers are one example) and enhancement opportunities. With the Greenbelt Plan Area, minimum vegetation protection zone policies of 30m apply for select Key Natural Heritage and Key Hydrologic Features.	Buffer is generally a "No Touch" zone, Detailed investigation by developer may reduce width of buffer to allow more developable land, if EIS/EA determines no impact will be had on the feature	Yes	Included as a part of the feature
Halton Hills	Some features have default buffers that are outlined In the written policies, EIS upon a development proposal generally determines buffer distances or refines mapping, buffers are conservative in width	Typically allows for agricultural operations, conservation uses, EIS is required and determines if proposed use is low impact	Yes	Included as a part of the feature
Hamilton	Subwatershed studies, Environmental impact studies, Minimum distances of buffers described in written policies of the OP	Low impact land uses, Vegetation restoration, Trails and boardwalks are examples of permitted land uses, Generally no development permitted within buffer areas	Yes	Rural OP includes buffers as a part of the feature Urban mapping does not include buffers on the maps
Markham	The City's OP 2014 (not yet in force) provides the minimum requirements for vegetation protection zones based on the feature to be protected. The current OP generally requires 10 metres from all features.	Buffers are part of the feature and land use is restricted to that permitted in the feature which is generally very limited to conservation uses.	Yes	Included as a part of the feature
Newmarket	**Woodlands** Adjacent lands: 50 m Buffer: Min. 10 m (3 m in a natural state and remaining 7 m no building or structure and no grading within 3 m of the dripline) Greater buffer may be established through EIS. **Meadows** Adjacent lands: 50 m Buffer: Meadow 1 - No development or site alteration. Meadow 2 - Limited development and site alteration may be permitted unless EIS demonstrates there would be no negative impact on the feature or no loss of function. All Development subject to EIS. Wetland Adjacent lands: 50 m Buffer: Min. 15 m. Greater buffer may be established through EIS. **Watercourses** Adjacent lands: Not defined. Buffer: Min 15 m for warm water stream. Min 30 m for cold water stream. Different setbacks may be required by LSRCA.**ANSI's and significant habitat of endangered and threatened species** to be identified by MNRF.	No development permitted on identified lands	Yes	Not included
Niagara	Based on Provincial regulations, Regional guidelines, Natural Heritage Reference Manual, Greenbelt Plan and depends on feature	Varies, Low impact uses, please refer to EIS guidelines which identify what can and cannot be placed In a buffer (and under what circumstances)	Yes	Not included
Oakville	Depends on feature, Depends on regulator, Town conforms to regulatory limits of features	Depends on the proposal, Municipality reviews studies submitted by proponents and consults to verify information	Yes	North Oakville mapping includes buffers as part of the feature South Oakville is feature based, does not include buffers

Peel	Conservation authorities and municipalities determine the buffer distances. The lay of the land and proposals are taken into account.	This Depends on the proposal. the proposal must conform to Regional policies that give a guide line of permitted uses In a buffer of a core greenland area	Yes	Not included
Pelham	Conservation authority determines buffer distances	Activities relating to conservation or protection of the Natural Environment, Development not supported, unless EIS determines no impact will be had on the natural heritage feature	Yes	Not included
Thorold	Conservation Authorities generally determine buffer widths, Provincial policy does not identify buffer widths, Typically, buffers are 30 meters from the feature	Environment 1 designations: Nothing but natural or very low impact proposals permitted within, no buildings. Environment 2 designations: EIS process is used to determine if proposed land use will have negative effect on feature, mitigation required	Yes	Not included
Vaughan	Relied on Provincial and Regional policy. Utilized conservation authority guidelines and policy For certain features such as Valley and Stream corridors, Vegetation Protection Zones (VPZ) have been established as buffers and are strictly protected. All wetlands have at least a 30 metre VPZ on Schedule 2, but only Provincially Significant Wetlands and Provincial Plan wetlands are required to have a minimum 30 m VPZ. If a minimum vegetation buffer has been established, the area is strictly protected	Feature specific policies for wetlands and woodlands in Section 3.3 of the Vaughan Official Plan are intended to allow for modification of features that are not determined to be significant, subject to compensation measures. All Core Features determined to be significant are strictly protected.	Yes	Included
York	Buffers are determined through EIS, Minimum buffers for features, at minimum those outlined by province are required, Follows direction of Greenbelt Plan and Oak Ridges Moraine Plan	Low impact uses such as storm water management, recreation, trails, and community gardens – subject to an EIS, Legally existing land uses such as agriculture, agricultural buildings, May allow for public infrastructure subject to Environmental Assessment	Yes	Not Included

Linkages and External Connections

Linkages, enhancement areas and external connections are areas that are identified for connecting natural heritage features and enhancing the ecological quality of features. Both the PPS and GBP have policies that state municipalities 'should' promote and undertake planning and design to ensure that these linkages or connections are maintained or enhanced.

"Enhancements to the Key Features means, ecologically supporting areas adjacent to Key Features and/or measures internal to the Key Features that increase the ecological resilience and function of individual Key Features or groups of Key Features." - Halton Region Official Plan, December 16, 2009

During this study it was found that linkages and enhancement areas are not included in the OP mapping by every municipality, with 55% of the study sample included in this category (see Table 6, *Approaches to Mapping NHF)*.

OP Consultation

Draft policies and mapping of NF conducted by municipal staff are subject to a consultation process. Stakeholders such as the public, lower tier municipalities, conservation authorities, not for profit organizations, developers, public agencies and planners may submit comments or speak at the public meeting about the draft OP (including NH mapping schedules).

Changing Natural Features OP Schedules

NF mapping, as an approximate illustration of the written policies, is continuously being updated as new data and mapping become available to provide greater accuracy. The need for refinements is also commonly identified at the point at which a natural heritage feature is assessed on site. OPs generally provide mapping at a regional scale, and only a significant refinement of a feature would affect the mapping. The maps within an OP can be changed in two ways; through an OP refinement or through an OP amendment.

OP Refinement
Upon the creation or update of an OP, refinements are identified for different reasons, including by a municipality undertaking studies at its own expense, through comments received in the consultation process, or from studies prepared by a proponent relating to their planning application.

Town of Ajax: "*Maps are usually ground truthed through aerial photography, site-specific studies and site walks in relation to development/redevelopment proposals, and may be examined during Municipal Watershed and Subwatershed planning exercises. If discrepancies are discovered through the development approvals process, they may be addressed 1) in the context of a site-specific OPA (OP Amendment), 2) during an OP Consolidation process if it is a minor housekeeping matter, or 3) as part of a 5-year Comprehensive OP Review. As mentioned above, changes may be made through the ensuing planning process. Most often, we rely on conservation authority input (the proponent bears the cost through CA plan review fees). Town and CA staff participate in site walks, and CA staff attend meetings as part of the Town's formal pre-consultation process (pre-consultation is required prior to a development application being deemed "complete"). Sometimes, the Town requires developers to have background reports for site-specific development proposals peer reviewed (by an expert peer reviewer jointly identified with Town staff, but paid for by the developer). In both cases, the developer would bear costs associated with verifying a potential error.*"

Region of Durham - *Changes and refinements to Schedule 'B' – Map 'B1', Key Natural Heritage and Hydrologic Features, based on updated information from the Province or as a result of a Natural Heritage evaluation and/or hydrological evaluation will be formally incorporated into this Plan through a comprehensive review. Planning Staff undertake site visits on an application by application basis. Site visits often include a number of stakeholders and commenting agents. Where key natural heritage and/or hydrologic features are known or suspected, site visits would also be conducted in consultation with the appropriate conservation authority. In addition to the above noted site visits, any proposal for development or site alteration in proximity to key natural heritage or hydrologic features shall be required to include an Environmental Impact Study (EIS) as part of a complete application. The EIS would be conducted by an external professional(s) and necessitate additional site visits. The Region, in consultation with the respective area Municipality, conservation authority and applicant, may select and retain a qualified environmental consultant to peer review the study – at the proponent's expense. Technical changes to the base information on Schedules 'A', 'B', and 'C' can be made without amendment to the ROP. These errors would be formalized and consolidated on an on-going basis. During ROP reviews, the public has the opportunity to examine and comment on what is being proposed, which includes mapping schedules. Entire maps are not ground-truthed; however, specific areas of a map may be investigated by a planner through routine site visits. Information collected by staff is then fed back to the GIS group within the Planning & Economic Development Department. Orthophotography is used to decipher natural features from other features within a particular area. We would also contact the*

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data stewards for verification on features that they publish/maintain, such as the district MNRF office for wetland units. ROP map updates coincide with the 5 year review cycle of the ROP document. Any relevant datasets that are available are acquired to update existing datasets within the current ROP GIS dataset. These updates are then processed and built into the next consolidation of the ROP (within the 5 year cycle). This is completed by the department's GIS staff in close consultation with the policy planners. Information related to mapping is provided to the GIS staff and incorporated into the ROP GIS dataset as part of the ROP consolidation process. Mapping errors are identified during the process of reviewing Planning Applications and implementing the policies and guidelines found within the current ROP. For example, errors may be identified through a site visit. Additionally, when the data is shared with external partners (e.g. Lower Tiers, Conservation Authorities) errors may be identified in our datasets which are communicated back to the department's staff. The mapping errors are confirmed and updated as necessary for the next ROP consolidation"

"*It is an objective of this Plan to ensure that lands surrounding the boundary of woodlands are developed in a manner sensitive to maintaining the integrity and health of the woodlot. Therefore, development proposals on lands within approximately 35 metres of a woodland area shall be accompanied by an Environmental Impact Study (EIS) which demonstrates how the above objective can be accomplished. The EIS should address potential impacts including drainage and groundwater changes. <u>Based upon an EIS, modifications may be made to the Environmental Conservation designation without Plan amendment</u>*"

(**Source**: City of Thorold – OP- Woodlands)[6]

OP Amendment

When a significant change is made in OP mapping, and where no written policies allow for refinements, an OP Amendment is required. An OP Amendment is a formal document that changes a municipality's OP. Council, a person or public body may request that an OP be amended by submitting an application. Council may refuse to accept an application that fails to provide sufficient information.

Section 3: The Process of Producing Natural Heritage Maps for OPs

Overview

In order for natural heritage features to be mapped for Official Plan purposes, the municipality must collect data on features within its boundaries.

The basic steps in natural heritage features mapping for inclusion in an OP are:
1. Collect and review all known sources of information
2. Verify data for accuracy and quality
3. Combine data from different sources with mapping layers
4. Consult with stakeholders and public
5. Review and approval by Council

Information Collection

Information from a wide range of sources is collected by Geographic Information System (GIS) staff in consultation with planning and/or environmental staff, or by a contracted external professional. The information will be collected either as data (e.g. coordinates and descriptors) or as digital map layers for integration into municipal GIS. Typically there will be several sources of information for each type of feature within an area. The year and protocol for how the data was collected is different with each source. The map layers display combined information, but information such as the date collected would be available from the source agency, e.g. a CA or the MNRF. Even though a mapping layer may give a single date for the source, in practice as the information is often from a combination of studies, it may have been collected over several years to create that layer.

The main resources for natural heritage information used by municipalities are conservation authorities and the MNRF (through the Natural Heritage Information Centre and Land Information Ontario). The NHS reference manual provides the following guidance on the main sources of data available for municipalities:

Table 4: Natural Heritage Information Sources (Table B-1 of the NH Reference Manual)

PPS NATURAL HERITAGE POLICY AREA RELEVANCY

INFORMATION SOURCE (see appendix B.1.2 for descriptions of individual information sources)		Natural Heritage Systems	Significant Habitat of Endangered and Threatened Species	Significant Wetlands and Significant Coastal Wetlands	Significant Woodlands	Significant Valleylands	Significant Wildlife Habitat	Significant Areas of Natural and Scientific Interest	Fish Habitat
Provincial Government Offices/ Programs	Land Information Ontario	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	MNR District Offices	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Natural Heritage Information Centre	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Conservation Organizations	Conservation Authorities	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes
Manuals/ Guidelines	Adaptive Management of Stream Corridors in Ontario	N/A	N/A	N/A	N/A	Yes	N/A	N/A	Yes
	Ecological Land Classification Manuals	Yes	N/A	Yes	Yes	Yes	Yes	N/A	N/A
	Ontario Wetland Evaluation System Manuals	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A
	Significant Wildlife Habitat Technical Guide with Draft Ecoregion Criteria Schedules Addendum	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A
	Significant Wildlife Habitat Decision Support System	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A

PPS NATURAL HERITAGE POLICY AREA RELEVANCY

INFORMATION SOURCE (see appendix B.1.2 for descriptions of individual information sources)		Natural Heritage Systems	Significant Habitat of Endangered and Threatened Species	Significant Wetlands and Significant Coastal Wetlands	Significant Woodlands	Significant Valleylands	Significant Wildlife Habitat	Significant Areas of Natural and Scientific Interest	Fish Habitat
Internet	Municipal Planning in Ontario MNR Webpages	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Ontario's Species at Risk MNR Webpages	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A
	Species at Risk Public Registry Government of Canada Website	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Data Layers	ANSI Data Layer	Yes	N/A	N/A	N/A	N/A	Yes	Yes	N/A
	Aquatic Resource Area Summary and Survey Point Data Layers	Yes	N/A	N/A	N/A	N/A	N/A	N/A	Yes
	Carolinian Canada's Big Picture	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Digital Elevation Model – Version 2.0.0 – Provincial Tiled Data Layer	Yes	N/A	N/A	Yes	Yes	N/A	N/A	N/A
	Forest Cover – Forest Resources Inventory Unit	Yes	N/A	N/A	N/A	N/A	Yes	N/A	N/A
	Great Lakes Conservation Blueprint for Biodiversity	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Southern Ontario Land Resource Information System	Yes	N/A	Yes	Yes	Yes	Yes	N/A	Yes
	Various Wildlife Land Information Ontario Data Layers	Yes	N/A	N/A	N/A	N/A	Yes	N/A	N/A
	Water Line Segment Data Layer	Yes	N/A	N/A	Yes	Yes	N/A	N/A	Yes

INFORMATION SOURCE (see appendix B.1.2 for descriptions of individual information sources)		PPS NATURAL HERITAGE POLICY AREA RELEVANCY							
		Natural Heritage Systems	Significant Habitat of Endangered and Threatened Species	Significant Wetlands and Significant Coastal Wetlands	Significant Woodlands	Significant Valleylands	Significant Wildlife Habitat	Significant Areas of Natural and Scientific Interest	Fish Habitat
Data Layers	Water Poly Segment Data Layer	Yes	N/A	N/A	Yes	Yes	N/A	N/A	Yes
	Water Virtual Flow – Seamless Provincial Data Layer	Yes	N/A	N/A	Yes	Yes	N/A	N/A	Yes
	Wetland Unit Data Layer	Yes	N/A	Yes	Yes	N/A	Yes	N/A	Yes
	Wooded Area Data Layer	N/A	Yes	N/A	N/A	Yes	Yes	Yes	N/A

In addition to the MNRF and CAs, data is also gathered from previous environmental studies (Environmental Impact Statements (EIS) and Subwatershed Studies), environmental advisory committees, Natural Resources Canada, Environment Canada, the community/public at large, studies commissioned by the Municipality, Information from other Municipalities, Internal data from previous OPs, not for profit organizations, citizen science programs, and Fisheries Management Plans.

Interestingly, some of the interviewees did not make a distinction between policy and data when asked to detail the sources used to depict natural heritage features. This points to the complicated nature of natural features mapping. Below is the list of manuals and reference materials cited by municipal planners as being used to depict a natural heritage feature:

- Natural Heritage Reference Manual for the Natural Heritage Policies, 2005 PPS
- 2005 Provincial Policy Statement
- 2006 Growth Plan for the Greater Golden Horseshoe
- Canada Land Inventory soil classifications to find the location of Classes 1, 2 and 3 or prime agricultural soils
- Land Information Ontario (LIO) Data (e.g. wetland unit, wooded area, significant ecological area, pit/quarry, ANSI, Landform Conservation Area, NHS Area, etc.)
- Natural Heritage Information Centre (NHIC)
- Watershed Plans
- Fisheries Management Plans
- Local natural heritage studies, scientific studies and data
- Urban Heat Island Mapping sourced from Natural Resources Canada
- Site Specific Environmental Assessments and Environmental Impact Statements submitted by development proponents and peer reviewed on the municipalities behalf
- Environmental studies commissioned by municipality
- Conservation authority manuals, mapping, regulations and definitions
- Oak Ridges Moraine Conservation Plan, Ministry of Municipal Affairs and Housing, 2002
- Greenbelt Plan, Ministry of Municipal Affairs and Housing, 2005
- Natural heritage features mapping and technical papers, MNRF
- In-house mapping (e.g. woodland coverage) developed in consultation with our Data, Mapping and Graphics Division (DMG)
- Environment Canada "How Much is Enough" (Third Edition 2013)
- Niagara Escarpment Plan (2005)

- Shared information between upper and lower tier municipalities
- Technical definitions and criteria for key natural heritage features in the Natural Heritage System of the Protected Countryside area (Greenbelt 2005)
- Nature Count and citizen science projects
- Official Plan written policies
- Significant Wildlife Habitat Ecoregion Schedules
- Municipal Criteria for Mapping (e.g. *Natural Heritage Policy Review -* Peel Region Official Plan Review - *Discussion Paper)*

The following example shows the source and description of the digital wetlands data layers for the City of Vaughan:

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: LIO – Original File Name: Wetland – Description: Attributes associated with this data layer include: unit type (e.g. swamp, marsh), evaluated, name of complex, significance - provincial, other, unknown

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

Source: TRCA – Original File Name: Vegtype_trca Description: 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. The final wetland layer is named wetlands_final*"

Source: Natural Heritage Network Study for the City of Vaughan[5]

Methods of Locating and Identifying Natural Heritage Features

On site investigation, historical environmental data, aerial photo interpretation, and previous environmental studies are sources of data used by conservation authorities, the province, consultants and municipalities that feed into the mapping process. The scale and level of information provided in Watershed Studies, subwatershed studies and site specific studies (EIS) gets more refined and detailed as the area of study decreases. For instance, a subwatershed study is often a requirement of a comprehensive planning study like a secondary plan, MESP, neighbourhood plan or comprehensive planning initiative. An EIS is conducted for a specific development proposal on a specific site. Methods of data collection are discussed in more detail below.

Aerial Photography

Aerial photography interpretation is one of the main methods of locating and identifying types of natural features. GIS, environmental and planning staff work together to identify and verify features based on aerial photography. Aerial photography is important for reducing costs from site visits and providing information about features in sites that are difficult to access or that are in private properties. Interpreting aerial photography produces less accurate data because of successional or physical changes on the ground, misinterpretation of a feature, spatial errors and the course scales of the photos. However, annual aerial photography is becoming higher quality and increasingly affordable as technology develops and improves.

Environmental Impact Statements

Another prominent source of information is Environmental Impact Statements (EIS). An EIS is required when a land use or development proposal is made within the buffer or within the natural heritage feature itself. An EIS is a detailed environmental report performed by an environmental consultant to determine what impact (if any) a land use proposal will have on a feature and how those impacts can be avoided, minimized, and/or mitigated. The findings of the EIS detail the location and description of the feature which can be used to further refine or clarify OP/ZBL maps. In general, and where the CA has capacity or a technical service agreement with a municipality, the local conservation authority will be on site at time of staking distances and buffers and review the EIS to verify the consultant's findings and recommendations.

EIS findings that are approved by municipal staff are high quality, provide on-site documentation of current conditions, and an expert assessment of the feature. Municipalities that have the capacity and technology to save EIS data are able to use the data for future reference, and create a patch work of individual properties with features that have been verified. As more studies are completed, the municipality gains more accurate data and mapping of natural heritage features on individual properties.

Subwatershed Studies and Comprehensive Planning Initiatives

Subwatershed studies and comprehensive planning initiatives are performed and funded by municipalities or conservation authorities under certain circumstances. The studies are initiated because of public interest and/or funding availability. Subwatershed studies evaluate a specific subwatershed's environmental features in greater detail. Subwatershed reports detail inventory and management recommendations. Typically, watershed plans are prepared to help advance the preparation of an OP or comprehensive OP amendment. These studies are restricted by funding availability, but often provide the most accurate data because of the detail and reliability in their assessments, findings and recommendations.

> "*The data we collected will help us to characterize the current condition of the subwatershed, consider the impact of various land uses on the environmental and water-related features of the subwatershed, and prepare a plan with recommendations for the appropriate management and stewardship of this subwatershed for future generations*" - **Credit Valley Conservation authority** Black Creek - Subwatershed 2009 Study[11]

Routine Planning Site Inspections

Planning staff undertake routine site visits during development applications. During site visits for other matters they may take pictures or notes of a specific area of a natural heritage feature. This information is then fed back to the GIS department. This form of ground truthing supplies

limited information and detail for the overall confirmation of natural heritage feature mapping, but is good practice for monitoring and documenting small portions of features.

Citizen Science

Nature Counts and citizen science programs provide the opportunity for the public to contribute to Natural Heritage Mapping. The programs are effective for engaging citizens and collecting mapping data about specific features. The data must be verified, but the additional volume of data is useful for confirming features, monitoring changes over time, improving community education, and flagging the presence of important species or areas. Individual land owners can also contribute important information about features on their property.

> "*Nature Counts is a Natural Areas Inventory (NAI), a complete inventory of natural areas in Hamilton, created so that current information on plant and wildlife species, vegetation communities, and site boundaries is available for agencies which are responsible for protecting and enhancing natural features. It was first carried out in 1991 by the Hamilton Naturalists' Club and partners and again in 2001-2002 with an inventory published in 2003. Partners are now planning an update to the NAI for publication in the summer of 2014. This project is a collaborative effort between the Hamilton Conservation authority, the Hamilton Naturalists' Club, the City of Hamilton and other partners…This information tells us whether a particular natural area is especially deserving of environmental protection in the city's Official Plan based on its features and functions in the environment, and helps us make better decisions on how to protect these natural areas in a developing urban centre*" Hamilton Conservation authority, Natural Areas Inventory (NAI)[13]*

TechnologyTechnology plays an increasingly important role in natural heritage mapping. The following table describes the key elements involved.

Table 5: Technology for Mapping and Monitoring Natural Heritage Features

Technology	Use
Updated Aerial Photography	Annual air photo updates are essential for planning and GIS staff to verify and monitor features, this simplifies accessing private lands, makes data more available and makes verifying features more economical than performing ground studies
Environmental Survey Equipment	Access to environmental surveying equipment provides the ability to confirm study details, delineate mapping in areas of dispute and mark boundaries
Unmanned Aerial Vehicles (UAV) or "Drones"	Drones are not yet extensively used for this purpose, but planners have noted that they will become a useful and strategic tool for verifying, in great detail, the current conditions of natural heritage features on private and difficult to access lands
Data Storage & Formatting Software	A valuable tool for providing accurate Official Plan mapping is the ability to store data from all approved EIS studies, so that the data can be easily referred to and incorporated into the mapping and data sets. This involves utilizing current data management software, professional expertise, and standardizing the formatting requirements for EIS studies

Data Limitations

The NH Reference Manual acknowledges the limitations of mapping data (provided by the Province?) and states that where possible, field investigations should be done to refine the location and extent of natural heritage features. In addition, planning authorities should, wherever possible, improve the fitness (e.g., accuracy, currency) of the available data on the basis of information they obtain through various sources. (e.g., upload information to provincial databases and enhance ELC base layers). The Greenbelt technical paper also recognizes that the delineation of some natural features in municipal plans and zoning by-laws may be based on the best available information at the time. Planning and development applications for sites within 120 metres of a KNHF within the NHS will trigger the need for a natural heritage evaluation. This could lead to a refinement in the boundaries of the KNHF (and possibly the identification of additional KNHFs). It is expected, therefore, that municipal OPs and zoning by-laws will be amended over time to provide greater precision in the mapping of KNHFs, in a manner consistent with the policies of the Greenbelt Plan.

<u>Dealing with Inaccuracies and Gaps in Data</u>
From the interviews conducted with municipal planners and from the provincial technical guidance, it is broadly understood that natural heritage mapping is often an approximation because of gaps in data, changing ground conditions and the different scales of the existing maps.

In areas where existing data is not sufficient or adequate for the purposes of NF identification, planning authorities may have to look at additional ways of identifying those features and other areas for potential inclusion in a natural heritage system. Sometimes criteria can be used to identify potentially significant natural heritage features or areas until more site-specific information is available to verify their precise location. For example, woodlands of a certain size and type can be identified, even if their precise boundaries are unknown, in which case planning authorities may wish to define the boundaries broadly and provide for more specific delineation as part of the development application review process.

Another common resolution is to include a policy that states written policies prevail over the mapping schedules if there is a discrepancy between the two. So if a feature is inaccurately mapped or further information comes to light, written policies are still implemented. An example of this wording can be found in the City of Vaughn's Official Plan.

Policy 3.2.3.2 states "*the policy text prevails over the mapping shown on Schedule 2 in determining the Natural Heritage Network. That identification of elements comprising the Natural Heritage Network is an ongoing process and as such the Natural Heritage Network identified on Schedule 2 is based on the best information available. Schedule 2 may not identify all the natural heritage features in Vaughan. The precise limits of mapped natural heritage features, and any additions to the mapped network, will be determined through appropriate study undertaken in consultation with the Toronto and Region Conservation authority and the Province. This may occur on a site-by-site basis through the development process or through studies carried out by the City, Region, Toronto and Region Conservation authority or other government agencies*".

In situations where a previously unknown feature is discovered (e.g. through a site study), or where a municipality does not have sufficient data to include a feature in the OP schedule but has clear indication it exists, written policies can be included in the OP to allow for that feature to still be protected.

Data Verification

Producing maps of natural heritage features relies on having access to detailed and accurate data. Having collected data from the various sources, planning authorities must confirm the information acquired is fit for purpose; that is, to verify the accuracy, compatibility and quality of the information. This verification process can be undertaken by GIS staff in consultation with planners or by a qualified external consultant. This is a high level verification process intended to review whether a feature is in the location indicated (on a map layer or coordinates), and to ensure the source of the data is robust enough for the planning authority to have confidence in it.

The process and extent of verification varies between municipalities. It depends on the quality and confidence in the data collected (i.e. is it from a trusted source or one that is known to be outdated or containing errors), the specific geographic challenges of the area, local development pressures, local priorities and availability of resources. Ground truthing is an important component of verifying mapping data for natural heritage features on Official Plan schedules. It can involve site inspections or interpretation of aerial photography. Ground truthing provides documentation and detailed, verifiable information about the features biological components and makeup, successional changes that have occurred, and delineation of boundaries/buffers. Having environmental experts do ground truthing, or verifying ground truthed data, is vital for successful quality interpretation of the natural heritage feature. Municipalities have higher confidence in the precision and quality of information contained within Official Plan schedules that have been ground truthed data by environmental experts.

During the interviews it was reported that natural heritage features data available to municipalities can be limited, and often requires detailed verification to confirm accuracy. Conservation Authorities and the MNRF may (CAs have no formal obligation to provide mapping data but in practice there is a general expectation that they will do so) provide natural heritage information and mapping but quality varies as constraints in funding and capacity can result in a lower quality of data. This can create different outcomes for planning applicants in different areas of the Province. For example, if a suspected feature does not have enough data to confirm its location and or composition, the municipality may not have the confidence to include the feature as a part of its Official Plan mapping. However, it was also reported in the interviews that natural heritage features are not often ground-truthed prior to a planning application. Planning applications or development proposals result in ground truthing of features by assessing for natural heritage features on a specific site.

Combining Sources of Data and Mapping Layers

Once data has been verified and accepted for inclusion, it is combined to create a proposed mapping schedule. The proposed mapping undergoes an official consultation process and is ultimately finalized by municipal council.

The mapping scale at which the natural heritage system is being planned often determines the required level of accuracy. Broad regional scale studies are often based on very general natural heritage information. Planning authorities generally use 1:50,000 to 1:10,000 scale mapping for these regional studies. These would generally not be accurate enough to determine feature and buffer boundaries for site planning purposes. According to the NHF reference manual a more detailed delineation of natural features and areas, based on a mapping scale of 1:2,000 can be deferred to a more detailed planning stage. As there is no standardized process for producing feature maps, municipalities are left with the challenge of combining different mapping layers at different scales, for different geographies into a single OP schedule.

The following table summarizes the municipal approaches to the policy and mapping topics discussed in sections two and three of this report

Table 6 - Approaches to Mapping Natural Heritage Features

Region	Natural Heritage Approach	Interactive Mapping Availability	Problematic Features for Mapping and Data Collection	Linkages/ Enhancement ID on OP Schedule	Treatment and Unmapped Features	Responsibility for OP Schedule Mapping
Ajax	Greenlands System	Staff and Public (Public can access In Office)	Not particularly	No	Subject to written policies	GIS staff in consultation with staff and stakeholders
Clarington	Natural Heritage System	Planning and GIS staff	Significant Wildlife Habitat, Significant Habitat of Endangered And Threatened Species, Valleylands, Thickets	No	Subject to written policies	GIS staff in consultation with staff and stakeholders
Durham	Key Natural Heritage and/or Hydrologic Features	Planning and GIS Staff	No dataset is 100% accurate, however the data provided /acquired are sufficient in identifying natural heritage features.	No	Subject to written policies	GIS staff in consultation with staff and stakeholders
East Gwillimbury	Natural Heritage System	Town staff	No particular features present difficulty in mapping	Yes	Generally no, but if new data becomes available they could be subject to applicable OP policies	Town staff and external staff
Georgina	Greenlands System	OP features maps are to be blown up to allow for easier determination on whether there are features on properties	Significant Woodlands Significant Wildlife habitat	No	Subject to written policies	Consultant, in consultation with staff and stakeholders
Halton	Key Features within the Greenbelt and Regional Natural Heritage Systems	Planning and GIS Staff	Habitat of endangered species, significant wild life habitat, and valley lands	Yes	Subject to written policies	GIS staff in consultation with staff and stakeholders
Halton Hills	Natural Heritage System	Planning and GIS Staff	Habitat of Threatened and Endangered species	No	Subject to written policies	GIS staff in consultation with staff and stakeholders
Hamilton	Natural Heritage System	Planning and GIS Staff	Watercourse layer, particularly intermittent streams	Yes	Subject to written policies	GIS staff in consultation with planning staff and stakeholders
Markham	Greenway System	City staff	No	Yes	Subject to written policies	Site specific refinements through the development approvals process are done by consultants and confirmed by the City, TRCA and MNRF where applicable
Newmarket	Regional Greenlands System	Town staff	Significant wildlife habitat, habitat of endangered and threatened species	No	Should be mapped as part of EIS in response to planning application.	Refinements made currently the applicant's Ecological consultant and subject to Town peer review. Town is due for a comprehensive analysis of the natural heritage mapping and policy
Niagara	Core Natural Heritage	Planning and GIS Staff	Ephemeral streams, Wetlands	Yes	Subject to written policies	GIS staff in consultation with planning staff and stakeholders
Oakville	Natural Areas	Staff and Public Access	No	No	Subject to written policies	Halton Region
Oshawa	Key Natural Heritage and Hydrologically Sensitive Features	City Staff	No	Yes	Subject to written policies	Final product mapped by City GIS staff, based on conservation authority subwatershed studies

Peel	Core Areas of the Greenlands System	Planning and GIS staff	Wetlands, Woodlands, Small watercourses -	No	Not a Regional level, but at Municipal Level	GIS staff in consultation with staff and stakeholders
Pelham	Environmental Features	Planning, GIS staff and some public through Niagara Navigator	Not sure, referred to conservation authority	No	Yes	Town hires consultant to do mapping, Communicates with Region throughout process
Thorold	Natural Environment	Planning and GIS staff	Not in planners experience	No	Subject to written policies	Consultant, in consultation with staff and stakeholders
Vaughan	Natural Heritage Network	GIS Staff	Waterbodies, small streams, headwaters, dug ponds and wetlands	Yes	Subject to written policies	Consultant, in consultation with staff and stakeholders
York	Regional Greenlands System	GIS and Planning Staff, Some public	Watercourses, Valleylands, Fish Habitat, Habitat of Threatened and Endangered Species, Significant Wildlife Habitat	Yes	Subject to written policies	GIS staff in consultation with staff and stakeholders

Section 4: Challenges in Natural Features Mapping

Municipal planners face a complex challenge of managing the requirements of provincial legislation and plans, interests of the public and developers, and the actual process of collecting and combining data into maps. The process for mapping natural heritage features for OPs involves the contribution of many parties, stakeholders and agencies. Provincial protocols and guidelines provide a detailed framework for managing the process but the challenges of managing the process, the various actors and the geography is unique to each municipality. Municipal staff identified numerous challenges faced in producing NHF maps for OP schedules which are discussed in the following section.

Inconsistent language

Public agencies such as the MNRF and CAs play a lead role in providing on the ground data sources and mapping layers. Municipalities often have multiple CA watersheds and MNRF districts within their boundaries. Municipal staff has noted varying definitions, data collection methods, amount captured and interpretations of features not only between the conservation authority and the MNRF, but also internally between the geographic offices of the CA watersheds and MNRF districts. Since practices and definitions have not yet become standardized, some municipalities have difficulty identifying certain features with confidence.

Standardization of data

Standardization is a key challenge for municipalities. Organizations often have varying survey techniques, descriptions of the data collected and different ways of combining data into mapping layers, which can lead to discrepancies in the mapping.

Inaccuracy and data gaps

Features that have not had sufficient studies performed are mapped approximately. Municipalities realize that data must be accurate and well sourced to substantiate mapping should the maps be appealed. A municipality therefore may not include a feature that does not have sufficient quality data available.

Funding

Funding is a major challenge for the key agencies who map natural heritage features for OPs (municipalities, the MNRF and CAs). Interest of the public, politicians and municipal stakeholders has influence in determining the capacity and funding of these organizations. An environmental impact study can cost in the order of $1,500-$3,000 per site, or $100,000 for a large site (e.g. 400 acres). The expensive studies can limit the ability of individual proponents to understand what specific land use proposals would be permitted by the municipality. The current system of having the proponent bear the cost of EIS studies works better for established developers and can be problematic for small land owners, such as farmers, and small businesses who do not have the economic ability to invest in completing studies.

Maintaining up to date information

Ecosystems are dynamic and physical features can change over time. A challenge for municipalities is providing updated mapping that reflects on the ground conditions. Monitoring of NFs is necessary to document successional changes, update feature boundaries and to ensure restrictive Official Plan policies are being met. Municipalities also are challenged to create a protocol that allows for updates as they happen but also incorporates landowner and public consultation.

Data verification

As development pressures intensify in southern Ontario, there will be more development applications that will impact or be in close proximity to natural features. This in turn is likely to result in more site studies and EIS that will need thorough verification, meaning municipalities will need capacity to respond appropriately.

Stakeholder interests

The province lays out the minimal requirements for which natural heritage features are to be protected, but exceeding (or not) these requirements are driven by local interests. The MNRF, Conservation Authorities, not for profit organizations and the public, often have conflicting interests from developers and landowners. Developers and other land owners are directly impacted by OP designations and mapping. It is interesting that the interviewees reported that the municipality must balance the interests of stakeholders involved with the OP; a "battle of interests" between private and public interests has been described. This suggests that the mapping process is not a purely 'evidence' driven process.

This issue may also be a reflection of the fact that some stakeholders understand that OP mapping must be verified either through field investigations or other more detailed studies. Yet other stakeholders desire that the policy and the mapping be definitive and determinative which is not always appropriate at the OP scale Zoning maps and overlays provide greater clarity over the accuracy of mapped features but are often misunderstood by stakeholders.

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Challenges relating to specific features

Thirteen of the municipalities interviewed reported having some difficulty mapping certain features. The following table shows the number of problem features for municipalities that reported mapping difficulties.

Table 7: Frequency of problem features

Number of problem features	Number of municipalities
0	7
1	2
2	3
3	5
4	2
5	1

The table below shows the breakdown of features where municipalities reported difficulties. The results indicate a variety of experiences with 38% reporting no problematic features. Of the specific features identified, the results suggest that water related features are the most problematic as a combined total of 11 municipalities mentioned a type of hydrologic feature (4 watercourse, 3 wetlands, 1 ephemeral stream, 1 small stream, 1 dug pond, 1 fish habitat), followed by wildlife and endangered species habitats.

Table 8: Problem Features

Feature	# of municipalities
No specific features	7
Significant wildlife habitat **"..***became inadvertent by protecting other features*".	5
Significant habitat of endangered species *Not enough data, data is not always current, areas are difficult to identify, often in dispute*".	5
Watercourse layer *Watercourses, Waterbodies, Small streams, Headwaters, Dug ponds)* "The degree of difficulty in interpreting the features through aerial photos and lack of verified and current data"	4
Wetlands *Sometimes conservation authority and Ministry of Natural Resource data does not reflect current conditions or wetland data labelling is inconsistent or not perfectly aligned to policy language (e.g. identified, unevaluated, evaluated non-significant, significant, etc.)."*	3
Valleylands "..*most difficult to identify because Conservation Authorities have different definitions and identification protocols*".	3
Woodlands "*Provincial SOLRIS woodland datasets are dated and tend to map woodland elements that are typically excluded from policy protection requirements (e.g. narrow hedgerows, etc.) or have woodland boundaries that do not accurately reflect on the ground or current air photo conditions*	2
Thickets	1
Ephemeral streams	1
Small streams "*Small headwater watercourses, farm drains and municipal drains data also typically encounter data accuracy issues"*	1
Dug ponds	1
Fish habitat	1

Technology and expertise

The interviews noted technology and expertise are an expensive luxury for most municipalities. Having sufficient expert internal staff representing the interests of the municipality by verifying and carrying out studies to confirm mapping, as well as commenting on development proposals, is a challenge for many municipalities.

Best Practice and Recommendations

Best Practice

Best practice was identified during this study by comparing mapping practices between the municipalities and by asking what aspects have been most effective. The responses are outlined below.

<u>Data Availability and Quality</u>
Interviewees described subwatershed studies as the most reliable and well sourced information available for identifying and locating natural heritage features. The process is inclusive, and allows for all relevant stakeholders to be included during the study. The results provide comprehensive data and accurate mapping of features that have been ground truthed by professional environmental staff. By prioritizing completion of sub-watershed studies, municipalities can map natural heritage features with accuracy.

The ability to save and easily refer to previous EIS studies should also be prioritized. An EIS is often the only source of data that details a feature on a specific site. The ability for staff to refer to this data when creating maps or considering a new development proposal is key. An EIS provides historical details, accurate location and identification of features and could avoid the need for additional costly study. This information may be crucial when mapping an area of dispute or when verifying a study completed by a private consultant. By creating data storage systems and standardizing reporting requirements, municipal planning staff can readily access the results of previous EIS.

A similar mechanism for collecting and storing "Citizen Science" or "Natural Areas Inventory" data would also assist the mapping process. The objective would not be to use the data for direct mapping, but instead to act as a flagging system for municipal staff. If a citizen records the presence of an undetected feature or threatened species is reported in a previously unknown area, that can be noted for further investigation and verification. This is a valuable resource for building on previous data of local natural heritage features and providing up to date changes on the ground.

<u>Appropriate Technology and Expertise</u>
There are new technologies available that can support municipal staff to verify data, monitor changes or succession in natural heritage features, and delineate mapping boundaries. The interviews noted technology and expertise are an expensive luxury for most municipalities so these would need resourcing.

Experienced professionals (internal or external) contribute significantly to the efficiency of the mapping process and quality of data produced. GIS, planning and environmental staff are a vital component to ensuring accurate and reliable mapping. Experienced GIS staff with the capability to combine layers, acquire datasets, create layers, interpret aerial imagery, provide reasoning, display mapping, and establish/follow protocols provide the technical experience needed to conduct mapping for schedule(s) in an Official Plan.

Environmental planners, biologists, and foresters can greatly improve the process of verifying and carrying out studies to confirm mapping provided by third parties. Private consultants who are hired by developers may face pressure to provide findings that are consistent with the

development application. Environmental staff are able to review EIS in detail, ensure quality standards are met, and defend decisions during any subsequent appeal.

Managing the Mapping Process
Establishing a transparent protocol is best practice for the mapping process and directing engagement between municipal staff and development applicants. Relying on staff discretion may create an inconsistent approach and result in varying degrees of quality. Some municipalities have already developed such protocols for these situations. The typical steps are as follows:

1. Decide which features to incorporate
2. Identify which agencies need to be involved and what resources are required to be referred to when collecting data about a specific natural heritage feature
3. Determine how to map specific features of the NHRM
4. Combine data and mapping layers
5. Identify reliable data, and how to verify environmental studies
6. Decide the specific features that require ground truthing
7. Determine the significance of a mapping refinement and how to implement the change (e.g. waiting for next OP update, OPA or in house update)

Official Plan Maps
Communicating the differences between overlays and land use designations clearly on the OP schedules, and using the appropriate option for features in those schedules, is a best practice for transparency and helping to ensure a strong understanding by the public, non-profit organizations and public agencies. Although the Official Plan text clearly describes land use designations and the associated restrictions, a land owner or reader may easily misinterpret this information. If a feature is not defined, but mapped as an overlay, such as an enhancement or linkages, the mapping may create a backlash from land owners who feel it may greatly impact their property. The reality is that the impact will be minimal and the overlay acts more as a screening tool. In a similar vein, if a landowner interprets the feature as an overlay rather than a designation, the understanding of the restrictions associated with that feature may be skewed and lead to backlash upon a development application. It is also not clearly defined if the land use designations include the whole overlay layer or only confirmed sections of the mapping. It is important to define and communicate these differences to help the public's understanding of restricted features and identified features.

The ability for staff and the public to access mapping that illustrates land use overlays and designations provides many benefits. Layers allow the public and developers to understand the boundaries of a restricted area more easily when preparing a land use proposal. It is important for planners to have direct access to interactive mapping so they can quickly flag areas of concern, refer to sites and mapping through aerial photography, monitor sites, and identify mapping refinements. Interactive mapping provides public transparency and allows the reader to view the mapping at different scales.

Linkages and Enhancement Areas are areas that are identified for connecting natural heritage features and enhancing the ecological quality of the feature. Linkages and Enhancement Areas are not included on the OP mapping by every municipality. The reasons for this vary, including resistance from local landowners who misinterpret the mapping as a designation. Including linkages and enhancement areas should be considered best practice because identifying them allows for stakeholders to plan accordingly and municipalities to focus their restoration and efforts.

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Providing Support to meet EIS Requirements
Providing support for the completion of EIS by planning proponents is an opportunity to create a relationship between the municipalities and applicants with land use proposals that align with local priorities. A municipality could make funding available to applicants required to undertake an EIS if the proposal was in line with local priorities, e.g. agricultural uses, low impact recreation, green energy, etc.

Recommendations

During the interviews, planners were asked to provide recommendations for improving the process of NF mapping. Their responses are summarized below.

Table 8: Summary Recommendations

Recommendation	# of interviewees
1. Standardization of conservation authority (and other relevant agencies) data collection methods and feature definitions.	6
2. Better coordination between mapping agencies	6
3. Greater accuracy in provincial maps, in particular through greater use of field work	5
4. Provide municipalities with additional resources (funding and guidance)	4
5. Provide improved process for involving the public in features mapping	3
6. Identify a simple process for correcting maps	1

1. Standardize language and data collection methodologies

Consistent language and a standardized process for collecting data would provide clarity and limit discrepancies between planning agencies. It will also make the process of combining multiple sources of data much more efficient. A challenge will be standardizing the process across the province, yet allowing for local flexibility. A conversation between planning agencies on standardizing the process, or parts of it, would have the potential to develop a consistent and fair understanding of natural heritage features and mapping protocols across the province.

2. Better coordination between mapping agencies

This recommendation overlaps with standardization of language and providing sufficient resources. Once language and methodologies are standardized, some of the need for coordination would be removed. Similarly, if conservation authorities had additional capacity it would be easier for them to undertake comprehensive mapping, perhaps on a subwatershed basis, involving coordination across jurisdictional boundaries.

3. Greater accuracy in provincial maps, in particular through greater use of field work

Provincial policy requires municipalities to map and implement policies for the protection of natural heritage features. The province provides direct support through providing information. In the technical manuals for NHF mapping there is a clear acknowledgement of the limitations of regional scale mapping for NH boundary delineation and accuracy – site specific studies of some form are required to achieve accuracy at that level. However, regional scale information provided by the province is an important component of municipal OP mapping products and should therefore be as accurate as possible. A greater use of field work would contribute to improved accuracy.

4. Provide municipalities with additional resources: allocating funding and guidance

In order for mapping to be accurate and up-to-date, municipalities need sufficient resources (staff expertise, technology, sub-watershed and site studies etc.) to dedicate to that purpose.

Allocating funding that allows for greater capacity can provide quality studies to be prepared by experts, rigorous review of studies, strict and effective regulation, improved communication and technical competence. Additional funding that focuses on initiating on-site studies of unconfirmed natural heritage features will allow for the capacity to create a more accurate Official Plan schedule. Providing adequate resources to the various stakeholders will also help to remove many of the inconsistencies that currently exist across jurisdictions.

Interviewees reported that sub-watershed plans have been successful in providing more reliable up to date information, and accuracy. Sub-watershed studies are considered by some to be the most reliable and well sourced studies available for describing local natural heritage features. The process is inclusive, and allows for stakeholders to be at the table during the implementation of the studies. The studies also provide specific data and mapping of the features that have been ground-truthed by professional environmental staff. By prioritizing sub-watershed studies, municipalities can map natural heritage features with confidence and accuracy.

Providing resources to municipalities and CAs also has the potential to remove the cost burden for EIS that typically fall on the planning proponent, which can create inequality in the development process. This is especially true in agricultural settings where farmers may find the requirement to undertake an EIS a barrier to making on-farm investments / building upgrades.

5. Provide improved process for involving the public in features mapping

The public, whether a land owner or participants in citizen-science projects, can be a valuable source of information. Developing a stream-lined process for feeding this information into NH mapping could improve accuracy, lead to improved delivery of policy goals, and reduce costs. This is especially true in areas that have less in-house capacity and resources to undertake mapping themselves.

6. Identify a simple process for correcting maps

As NHFs are ground-truthed at the local or site level, it is important that information can be fed back into the mapping process in order to correct mistakes as they are identified. As the main source of public information, Official Plans need to be kept up to date but feedback to regional data providers (the province and conservation authorities) will also improve efficiency. There should be a straightforward process, in particular for Official Plan schedules, that allows for on-going updates.

Conclusion

Natural heritage features mapping for Official Plans is guided by provincial policies. Municipalities create the most accurate Official Plan mapping product they can at any given time based upon their own funding and capacity, as well as the quality of information provided to them. Conservation authorities and the MNRF are the main providers of data on natural heritage features. The MNRF has several sources of information that are in need of updating. The quality and quantity of the data provided by conservation authorities can vary between different localities due to inconsistent levels of funding and capacity.

While there have been instances of inaccuracies and data gaps in OP schedules, the amount and quality of available information are generally improving. Municipalities face some challenges in producing NHF maps but best practices can be implemented to improve the accuracy of those maps. Perhaps equally as important, municipalities can improve the way the mapping product is interpreted, displayed and communicated to local stakeholders, via OP overlays and designations, in order to make the development application process easier to understand and navigate. Possible limitations to maps need to be recognized and communicated so that landowners are not unnecessarily impacted by them.