

Natural Heritage Features Mapping: Challenges and Best Practice

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Possibility grows here.

A Report on Challenges and Best Practice for Natural Heritage Features Mapping in Ontario

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Table of Contents

1. Executive Summary	4
2. Introduction.....	7
3. Policy Context	8
4. The Process of Producing Natural Heritage Maps for Official Plans	21
5. Challenges in Natural Features Mapping	31
6. Best Practices and Recommendations.....	36
7. References.....	43

1. Executive Summary

Natural Heritage Features Mapping: Challenges and Best Practice

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 are affected by inaccuracies in Official Plan mapping schedules for natural heritage features. The Foundation is concerned that a perception of inaccuracy in natural heritage feature (NHF) maps and a lack of clarity in communicating what Official Plan maps represent are eroding stakeholder confidence and affecting delivery of natural heritage and agricultural policy goals.

The study was completed in three stages: policy and literature review, interviews with municipal planners and staff of a conservation authority, and a workshop to discuss the results of the interviews with a wider range of stakeholders. This report offers an understanding of:

- Implementation of NHF mapping from the perspective of municipal planners and other stakeholders in the process;
- The variation in the way municipalities are implementing policies;
- Issues that impact the ability of municipalities to efficiently and cost effectively identify NHF;
- Challenges for municipalities associated with combining data from different sources with mapping layers, and communicating them to the public; and,
- Issues that impact the implementation of NHF protection policies.

The report documents the complexity of NHF mapping and shows there are a number of challenges with data collection, mapping, and documenting NHF. These challenges affect the development of NHF maps, in turn affecting implementation of policies to protect NHF. The experience of development applicants and other stakeholders in the planning process is also impacted by these challenges. The issues include:

- **Data Accuracy, Integrity and Availability:** lack of standardization of data, inconsistent language, data misalignment between mapping agencies, inaccuracies in older mapping products, and data gaps.
- **Maintaining Up-to-Date Information:** features are dynamic, meaning it is challenging to make updates on an ongoing basis that also incorporates landowner and public

consultation. This is compounded by an inefficient system for two-way flow of information between the province and municipalities.

- Capacity and Resourcing: technology and expertise are an expensive luxury for many municipalities but are critical to the quality and quantity of mapping products. The quality and quantity of the data provided by conservation authorities can vary between different localities due to inconsistent levels of funding and capacity.
- Communication, Education and Awareness: Municipalities face challenges in managing competing interests, communicating the limitations of mapping, and engaging landowners and the public.
- Other Challenges: Some features, such as water features and habitats of endangered species, create specific challenges for mapping. This is largely due to inherent uncertainties with those features.

Many of these issues can be addressed by the recommendations set out in this report. Including:

- Standardizing language and data collection methodologies
- Ensuring use of appropriate technology and expertise
- Better coordination between mapping agencies
- Providing municipalities and conservation authorities with additional resources (funding and guidance)
- Providing an improved process for involving the public in NHF mapping
- Establishing simple processes for correcting maps

The report concludes that municipalities endeavor to create the most accurate Official Plan (OP) mapping product they are able to given their available funding and capacity. The final result is linked directly to the quality of information provided to the municipalities. While there have been instances of inaccuracies and data gaps in OP schedules, the amount and quality of available information are generally improving and will continue to do so over time, which will lead to improvements in OP mapping.

Municipalities face some challenges in producing NHF maps, but the implementation of best practices across the region will 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. Possible uncertainties and limitations to maps must be recognized and communicated so landowners are not unnecessarily impacted.

Addressing the challenges identified in this report is important for several reasons. It will improve the development application process, in particular for agricultural stakeholders which will in turn increase confidence in NH protection policies. Given the interconnectedness of the NHS and agricultural system this is critical in the long-term.

Addressing the challenges will also increase the efficiency of delivering NHF mapping policies and result in more comprehensive and quality data to support planning decision-making processes. Ultimately this will better support the achievement of NH protection policies.

2. 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 are affected by inaccuracies in Official Plan mapping schedules for natural heritage features. The Foundation is concerned that a perception of inaccuracy in natural heritage feature maps, as well as a lack of clarity in communicating what Official Plan maps represent, are 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 research developed a more in-depth understanding of both the mapping process and communication of the process to the public, identifying challenges and best practices to inform a discussion about NHS mapping among key stakeholders. A draft report of the study was completed in September 2015.

The Foundation convened a workshop in March 2016 to discuss the draft report's findings with a wider range of stakeholder and to refine understanding of the issues and their solutions. The outcomes of the workshop have been incorporated into this report.

This report offers an understanding of:

- Implementation of NHF mapping from the perspective of municipal planners and other stakeholders in the process;
- The variation in the way municipalities are implementing policies;
- Issues that impact the ability of municipalities to efficiently and cost effectively identify NHF;
- Challenges for municipalities associated with combining data from different sources with mapping layers, and communicating them to the public; and,
- Issues that impact the implementation of NHF protection policies

The report provides recommendations and priorities to address these issues.

3. 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 somewhat between the Plans.

Municipalities are required to have maps available showing known natural heritage features (NHF) and hydrologic features (HF), as well as 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 GBP 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 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, and lower tier municipalities, conservation authorities, not-for-profit organizations and the public. It also involves a multitude of experts including planners, GIS technicians, foresters, biologists, hydrologists, and consultants.

The provincial Natural Heritage Reference Manual sets out the following process:

Figure A-1: Process for a Coordinated, Integrated and Comprehensive Approach for Natural Heritage Systems



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

The Natural System outlined in the GBP 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 (KHF) 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

* The GBP refers to 'Key' features whereas the PPS does not

Seepage areas and springs	NA
Wetlands	NA

It must be noted that the PPS and GBP set out only 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 governments (see Table 2 below).

Table 2: Responsibility for Identifying Natural Heritage Features

Feature	Who	How
Significant habitat of endangered species and threatened species	Ministry of Natural Resources and Forestry (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 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 site level.

Various approaches have been taken by the municipalities interviewed in determining how features are identified in written policies and mapping. The majority of municipalities 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 for comment when the final draft goes through statutory public consultations at the time of an OP update, with municipal councils making the final decision. Appendix 1 "Approach to Mapping Natural Heritage Features" describes the approaches taken by various municipalities. Designations set out the permitted land uses, 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; however 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 policies describe the permitted and prohibited land uses within Natural Features and their associated buffers. The Greenbelt Plan does not allow development or site alterations within NHF and 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 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 Environmental Impact Statement (EIS) (the exception being valleylands). Under the PPS an EIS is required for development applications for land within a NF or its buffer. Some features have additional requirements e.g. an EIS is recommended for applications within 1km of the 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 2013⁷*

Some OP's written policies describe general requirements for approval, criteria or other guidelines for EIS preparations such as peer review but there are no standardized criteria to ensure quality control. Municipalities require in-house expertise to ensure the quality of EIS they receive. 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, to the satisfaction of the Town, 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 2009⁸*

*"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 2010⁹*

The planning proponent generally bears the costs of the EIS study. Some municipalities provide 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 NHF 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 require a minimum 30 metre buffer. Certain features require an EIS if development is proposed within 120 metres of their boundary. That EIS may recommend a buffer distance of greater, but no less than, than 30 metres.

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 2014¹⁴

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 LSRC.A. 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, 2009¹⁵

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

OP Consultation

Draft policies and mapping of NF for Official Plans are subject to a consultation process. The public, lower tier municipalities, conservation authorities, not-for-profit organizations, developers, public agencies, and planners may submit comments or speak at public meetings 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 updated as new data and mapping become available to provide greater accuracy. The need for refinements is also commonly identified when a NHF 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

Following the creation, or during the 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.

*"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." - **Town of Ajax***

"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. Based upon an EIS, modifications may be made to the Environmental Conservation designation without Plan amendment"
(Source: **City of Thorold-OP-Woodlands**)⁶

*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 ongoing 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 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" - **Region of Durham***

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 approve an application that fails to provide sufficient information.

The next section outlines in some detail the process data collect methods used by municipalities to produce NH maps for their OPs.

4. The Process of Producing Natural Heritage Maps for Official Plans

Overview

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

The basic steps of NHF mapping 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 data, but specific information such as date collected would only 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 it may have been collected over several years to create that layer as the information is often drawn from a combination of sources. Consequently, it may be difficult to identify how current a specific data point is.

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 Natural Heritage Reference Manual provides the following guidance for municipalities:

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

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
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

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
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 environmental studies (EIS and Subwatershed Studies), environmental advisory committees, Natural Resources Canada, Environment Canada, the community/public at large, other 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 highlights the complicated nature of NF mapping.

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 to produce a final wetlands 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.”*

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.

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 (e.g. EIS) gets more refined and detailed as the area of study decreases. 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 natural features. Aerial photography is important for reducing costs from site visits and providing information about features on sites that are difficult to access or that are on private properties. However, aerial photography requires human interpretation and therefore produces less accurate data due to successional or physical changes on the ground, misinterpretation of a feature, spatial errors, and the coarse scales of the photos. However, as aerial photography is becoming of higher quality (reducing the likelihood of error) and increasing affordable technology improves.

Environmental Impact Statements

Another prominent source of information is the (EIS). An EIS is required when a land use or development proposal is made within the buffer of a natural heritage feature or within the 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 capacity or a technical service agreement with a municipality exists, the local conservation authority will be on site at the time of staking distances and buffers, and reviews the EIS to verify the consultant's findings and recommendations.

EIS findings approved by municipal staff are of high quality, providing 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. For instance, a subwatershed study is often a requirement of a secondary plan, MESP, neighbourhood plan, or comprehensive planning initiative. Subwatershed studies evaluate a specific subwatershed's environmental features in greater detail. Subwatershed reports detail inventory and management recommendations. Typically, watershed plans are prepared for 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 Study¹¹

Routine Planning Site Inspections

Planning staff undertake routine site visits during development applications. During site visits; 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 NHF mapping. The programs can be 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

Technology 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 storage of 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 Natural Heritage Reference Manual acknowledges the limitations of mapping data 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 GBP 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 GBP.

Dealing with Inaccuracies and Gaps in Data

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 for the purposes of feature 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 certain 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 solution is to include a clause in the OP 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"*. - **City of Vaughan**, Official Plan

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 NHF maps is reliant upon 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, verify the accuracy, compatibility and quality of the information. This verification process is usually undertaken by GIS staff in consultation with planners or by a qualified external consultant.

It 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 OP 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. Not surprisingly, municipalities have higher confidence in the precision and quality of information contained within OP schedules that have been ground truthed by environmental experts.

Conservation Authorities, though under no formal obligation to provide mapping data to municipalities, are generally expected to do so. The MNRF may also provide natural heritage information and mapping, but quality varies as constraints in funding and capacity can result in a lower quality data. This can create different outcomes for planning applicants in different areas of the Province depending upon the cooperation of CAs, and the quality of data available. For example, if there is not have enough data to confirm the location and or composition of a potential feature, the municipality may not have the confidence to include the feature as a part of its OP mapping.

It was also reported in the interviews that NH features are not often ground-truthed prior to a planning application, potentially undermining confidence in the mapping data among land owners.

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 Natural

Heritage 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

5. Challenges in Natural Features Mapping

Municipal planners face the complex challenge of meeting the requirements of provincial legislation and plans, ensuring a robust process of collecting and combining data into maps, and managing the interests of the public and development applicants.

While some specific challenges are unique to each municipality, there is a lot of commonality between them.

Data Accuracy, Integrity and Availability

Inconsistent data standards, language and jurisdictional boundaries

Interviewees and workshop participants noted varying definitions, data collection methods, level of detail captured and interpretations of features not only between CAs and the MNRF, but also internally between the different offices of the CA watersheds and MNRF district offices. Organizations also take different approaches to combining data into mapping layers that is then passed on to municipalities.

These inconsistencies must be resolved by individual municipalities and, in the absence of further guidance; it is possible that, though unintentionally, provincial policy goals may not be followed.

Municipalities often have multiple CA watersheds and MNRF districts within their boundaries. NHS and their component NHFs do not line up between CAs and municipalities. Municipalities must integrate available data to fit within their jurisdictional boundaries.

Inaccuracy and data gaps

When features have not had sufficient studies performed, they are initially approximated on the map. However, 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.

Various stakeholders reported that some landowners are reluctant to provide access to private lands for site inspections and data collection, which can cause delays and lead to gaps in information. Features often cross property boundaries and having access to some properties and not others is problematic.

Site scale data including NHF boundary refinement is often generated when an EIS is required. An EIS can cost in the order of \$1,500-\$3,000 per site, or \$100,000 for a large site

(e.g. 400 acres). The cost of these studies can limit the ability of individual proponents to properly review if a specific land use proposals would be permitted by the municipality.

The current system requiring the proponent to bear the cost of an EIS works better for larger and established but can be problematic for small land owners, such as farmers and small businesses who do not have the same financial ability to invest in studies.

In addition, workshop participants reported that EIS can vary greatly in quality. As the planning proponent pays for the study, there is built in bias for the studies not to find 'issues' that could delay, prevent or incur additional project costs. Municipalities require access to qualified professionals to assess the quality of EIS and the resources to challenge any inadequate studies.

Maintaining up to date information

It was reported that the province can be unresponsive to proposed data changes based on features verification at the local level. Due to the nature of NHF mapping it is important that information flows in both directions between agencies involved.

A challenge for municipalities is providing updated mapping that reflects on the ground conditions. Ecosystems are dynamic and physical features can change over time, so monitoring of NFs is necessary to document successional changes, update feature boundaries and ensure OP policies are being met.

Municipalities should create a protocol that allows for updates as they happen while incorporating landowner input and public consultation.

Capacity and Resourcing

Funding

As noted throughout this report, resourcing levels differ across municipalities, CAs and provincial ministries. The result is different capacity levels to gather data and, consequently, some data and maps are much more accurate than others.

Technology and expertise

The interviews noted that having the technology and expertise available to collect quality data are expensive luxuries for most municipalities, but are critical to the quality and quantity of mapping products. Many municipalities do not have sufficient expert internal staff verify and carry out studies to confirm mapping, as well as evaluate and comment on development proposals.

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, requiring municipalities to have the necessary capacity to respond appropriately.

Communication, Education and Awareness

Managing competing interests

Municipalities, like all governments, must manage competing interests. The MNRF, Conservation Authorities, not for profit organizations and the public, often have interests that conflict with those of landowners and development applicants. Some of 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 is how it was described. This suggests that the mapping process may not always be a purely ‘evidence’ driven process.

Communicating the limitations of mapping

Data continues to evolve as more information becomes available, as well as to reflect changes in features as the landscape evolves. The public does not always appreciate that landscapes change over time, and that subsequently the data must reflect these changes.

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. Data may be accurate but is at different scales so the public often confuse accuracy with precision. This can create confusion about the evidence base for implementing environmental protection policies.

Engaging the public

The public can add significant value to NHF mapping through citizen science projects, participating in consultations, providing information through EIS and other site studies, and by helping set local priorities. Engaging effectively with the public can be challenging as it requires significant resourcing and NHF mapping is not always an issue with much public interest. It can also be a challenge to ensure that citizen science projects are informed by strong science principles and do not become solely advocate/activist endeavors.

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: Types of Problem Feature

Feature	Number of municipalities
No specific features	7
Significant wildlife habitat <i>"..became inadvertent by protecting other features".</i>	5
Significant habitat of endangered species <i>Not enough data, data is not always current, areas are difficult to identify, often in dispute".</i>	5
Watercourse layer <i>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"</i>	4
Wetlands <i>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.)."</i>	3

Valleylands <i>"..most difficult to identify because Conservation Authorities have different definitions and identification protocols".</i>	3
Woodlands <i>"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"</i>	2
Thickets	1
Ephemeral streams	1
Small streams <i>"Small headwater watercourses, farm drains and municipal drains data also typically encounter data accuracy issues"</i>	1
Dug ponds	1
Fish habitat	1

Impact of Challenges

The challenges identified in this chapter result in information gaps (errors, omissions, less informed decision making). This study did not seek to assess the impact of those gaps in relation to provincial goals for natural heritage protection or the effective operation of the planning system. It is clear, however, that there are instances where some of the challenges compromise the ability of municipalities to conform to both the word and intent of those policies.

Some of the challenges identified, such as inconsistent terminology and reconciling out dated maps with more recent information, create inefficiencies in the mapping process (duplication, delays, and interpretation disputes) while others point to more systemic issues (lack of consistency in features' definition and data collection standards) that directly impact policy goals.

6. Best Practices and Recommendations

Best practice and priorities for action were identified by interviewees and workshop participants in response to the challenges identified in the previous section.

Data Accuracy, Integrity and Availability

Standardizing data and addressing inconsistent language

Sub-watershed studies were described as the most reliable and well sourced information available for identifying and locating natural heritage features. The study 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.

Given the limited resources at their disposal, municipalities can map natural heritage features with accuracy by prioritizing completion of sub-watershed studies which capture extensive data.

Making access to previous EIS easy

The ability to save and easily refer to previous EIS is key. An EIS is often the only source of data that details a feature on a specific site and 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 investing in data storage systems and standardizing reporting requirements, municipal planning staff can readily access the results of previous EIS.

Using citizen science

A mechanism for collecting and storing “Citizen Science” or “Natural Areas Inventory” data is a valuable resource. The objective would not be to use the data for direct mapping, but rather to act as a flagging system for municipal staff. If a citizen records the presence of an undetected feature or if a threatened species is reported in a previously unknown area, the information can be noted for future investigation and verification.

Ensuring appropriate technology and expertise

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. 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 all vital to ensuring accurate and reliable mapping. Experienced GIS staff, with the capability to combine layers, acquires datasets, create layers, interpret aerial imagery, provide reasoning, display mapping, and establish/follow protocols provide the technical experience needed to conduct mapping for schedules in an Official Plan.

Environmental planners, biologists, and foresters can greatly improve the process of verifying and carrying out studies, and to confirm mapping provided by third parties. Private consultants hired by developers may face pressure to provide findings that are consistent with the development application. Employing environmental staff who are able to review EIS in detail, ensure quality standards are met, and defend decisions during any subsequent appeal, is best practice.

Addressing inaccuracies and data gaps

Providing support for the completion of EIS by planning proponents both fills data gaps and creates 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.

Communication, Education and Awareness

Managing competing interests

Establishing a transparent protocol is best practice for the mapping process and 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 must be referred to when collecting data about a specific natural heritage feature
3. Determine how to map specific features identified in the Natural Heritage Reference Manual
4. Combine data and mapping layers
5. Identify reliable data, and 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)

Communicating the limitations of mapping

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 of NHF mapping by the public, non-profit organizations and public agencies.

The OP text describes land use designations and the associated restrictions, but the language may be technical and 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 lead to a misunderstanding by of what it means for landowners 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.

Interactive mapping

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

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.

Engaging the public

Building understanding among the farming community of the value of natural heritage systems was identified as good practice. There is a perception that the priority is being placed on the 'natural heritage system' and not on the interests of landowners and the farming community, when in fact, the natural heritage system supports their interests. This is not about agriculture versus the protection of natural heritage; the two are integrated and aligned.

Demonstrating the value of the NHS to the general public is also good practice. There is an element of natural hazard management that is connected to natural features mapping. Making this connection is important. The public needs to understand 'what's in it for me.' Drawing a visual connection between hazards and heritage is an effective way to support this.

Recommendations

During the interviews, planners were asked to provide recommendations for improving the process of NF mapping. These were discussed at the workshop and generally agreed with.

Table 9: Summary Recommendations

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

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, while allowing for local flexibility. A conversation between planning departments on standardizing the process, or parts of it, would have the potential to develop a consistent and conservation authorities understanding of natural heritage features and mapping protocols across the province.

2. Better coordination between mapping agencies

This recommendation accompanies the standardization of language and provision of sufficient resources in all municipalities. Once language and methodologies are standardized, some of the need for coordination would be removed. Additionally, if conservation authorities had additional capacity, they would be able to undertake more comprehensive mapping projects, perhaps on a subwatershed basis, involving coordination across jurisdictional boundaries.

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

Given that provincial policy requires municipalities to map and implement policies for the protection of natural heritage features, the province provides direct support to municipalities in the form of maps, data, guidance and other information. However, 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.

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 improving its accuracy.

4. Provide municipalities with additional resources: funding and guidance

In order for mapping to be accurate and up-to-date, municipalities need sufficient resources (e.g. staff expertise, funding and technology) to dedicate to that purpose.

Allocating funding to build capacity will allow for 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 result in more accurate OP schedules. 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, accurate and up-to-date information. Sub-watershed studies are considered by many to be the most reliable and well sourced studies available for describing local NHF. By prioritizing sub-watershed studies, municipalities can map NHF with confidence and accuracy.

Some stakeholders also thought there is a need for a new and improved Natural Heritage Manual and a procedural guide to implement a natural heritage systems approach.

Providing resources to municipalities and CAs 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.

By providing additional funding to municipalities to secure the necessary technology and expertise, the quality of NHF mapping will improve significantly which will, in turn, inspire more confidence in the accuracy and value of NHF maps. Similarly, more comprehensive guidelines and resources from the Province will establish a more consistent, objective process across municipalities.

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

The public; whether landowners or participants in citizen-science projects; can be a valuable source of information. Developing a streamlined 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 inaccuracies as they are identified. As the main source of public information, OPs need to be kept up to date but ensuring feedback to data providers (i.e. the province and conservation authorities) will also improve efficiency. There should be a straightforward process, in particular for OP schedules, that allows for on-going updates.

Conclusion

Natural heritage features mapping for Official Plans is of critical importance in ensuring these features are properly protected, in keeping with provincial policy goals. While farmers and other landowners are necessary partners in properly identifying and protecting natural heritage features, many of these stakeholders are wary of the accuracy of NHF mapping and report significant obstacles in correcting inaccuracies in mapping. This undermines confidence in the systems set up to protect NHF and must be addressed.

NHF mapping is guided by provincial policies. Municipalities create the most accurate Official Plan mapping product they can at any given time based upon their respective 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, and 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 do 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.

Addressing the challenges identified in this report is important for several reasons. It will improve the development application process, in particular for agricultural stakeholders which will in turn increase confidence in NH protection policies. Given the interconnectedness of the NHS and agricultural system this is critical in the long-term. Addressing the challenges will also increase the efficiency of delivering NHF mapping policies and result in more comprehensive and quality data to support planning decision-making processes. Ultimately this will better support the achievement of NH protection policies. As the provincial government continues to extend NHS mapping across the GGH the importance of resolving these challenges becomes ever more important.

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