

Submitted to the
City of Guelph

City of Guelph Natural Heritage Strategy

Phase I: Terrestrial Inventory Design & Defining Locally Significant Natural Areas



Tree preservation on Grange Hill



Torrance Creek PSW from Bathgate Drive



Hanlon Creek Swamp PSW



Homes backing onto Preservation Park

FINAL REPORT
March 2005



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- Drew Cherry – Planner (Wellington County Stewardship Council)
- Astrid Clos – Planner (Guelph Development Association / Guelph and Area Homebuilder’s Association)
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- Glynis Logue – Local Environmentalist (Green Plan Steering Committee/Guelph Environmental Leadership)
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- Helen White – Park Planner (City of Guelph)
- Val Wyatt – Local Naturalist/Consulting Ecologist (Guelph Field Naturalists)
- Tony Zammit – Ecologist or Fred Natolochny – Senior Planner (Grand River Conservation Authority – GRCA)

In addition to their input through the TSC, the GRCA and OMNR (Guelph District) have provided base natural heritage data for this study.

We would also like to thank the key stakeholders and community members who took the time to attend the Workshop and/or Community Forum and provide feedback, as well as all those who completed and submitted surveys for Phase 1 of the NHS.

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Executive Summary

In February of 2004, the ecological consulting team of Dougan & Associates was retained to undertake Phase 1 of a 3-Phase study outlined by the City to complete a number of initiatives related to identification and protection of locally significant terrestrial natural heritage resources in the City of Guelph. This report contains the methods, results and recommendations coming out of Phase 1 of this study, and provides some tools and information required to move forward with Phase 2.

This study recognizes that the City of Guelph is an urban area that has already been developed to a great extent, and that development will continue. However, this study also recognizes the desire of many residents, and the City itself, to have a sustainable greenspace network in the City.

The City has provided a solid foundation for a strong natural heritage system through the Greenlands System set out in its Official Plan (June 2002 consolidation), and over the past decade has effectively protected a number of significant natural areas in the City. However, there are ongoing issues related to the lack of natural heritage data on a City-wide level, and the lack of consistent environmental planning policies and guidelines across the City, particularly as they apply to terrestrial resources. Furthermore, given the rapid urbanization of the City over the past decade, there is a recognized need to identify potential naturalization/restoration areas, particularly on public lands, that could improve the existing Greenlands System.

Over the course of the 3 phases of this project, the Natural Heritage Strategy (NHS) intends to address these issues by:

- 1) developing a scientifically-defensible, criteria-based system for identifying Locally Significant Natural Areas (LSNAs);
- 2) providing a City-wide natural heritage resource database/mapping system to facilitate environmental planning, policy implementation and monitoring;
- 3) identifying areas that do not qualify for LSNA status but that could potentially be naturalized and restored to support the overall Greenlands System; and
- 4) providing recommendations for City-wide environmental policies and guidelines that recognize the need to accommodate development while still protecting the features and functions that make LSNAs locally significant.

Notably, the original Terms of Reference (see [Appendix A](#)) called this study a “Terrestrial Inventory”. However, once Phase 1 was underway the consulting team and the City decided to place the 3 phases of this work under the broader context of a “Natural Heritage Strategy” (NHS). This was done primarily because, while the focus of the inventory work is to remain on terrestrial features (i.e., woodlands, shrublands, and meadows), many of the products (e.g., natural area mapping and database creation, monitoring approaches) and recommendations coming out of this work would include and be applicable to terrestrial as well as aquatic systems (i.e., wetlands, streams and rivers). From the perspective of community consultations, it was felt that seeking

input on *all* natural areas in the City would make the most efficient and effective use of funding and participants' time. Within the context of a NHS we have been able to take a more comprehensive and integrated approach that focuses on terrestrial but still includes aquatic features, and focuses on priority areas (i.e., LSNAs) while also addressing issues related to the protection and potential restoration of some undesignated natural areas.

This report for Phase 1 of the NHS contains the following components:

- An overview of existing natural heritage resources in the City (including mapping).
- An overview of the existing natural heritage planning policies in the City and mapping of what is currently encompassed in the City's Greenlands System.
- A review of comparable initiatives from other municipalities in southern Ontario (focusing on criteria-based systems for identifying locally significant natural areas).
- A summary of the Phase 1 community consultation* process and results.
- A working definition and working criteria for Locally Significant Natural Areas (LSNAs).
- Landowner contact program tools and strategies.
- Inventory methods for assessment of LSNA in the City.
- A monitoring approach for LSNA in the City.
- Recommendations related to Phase 1 of the study as well as the broader NHS.

Notably, text for a landowner contact package (graphic design to be completed by the City) has also been provided to the City under separate cover for use in subsequent phases of the NHS.

Phase 2 will use the background data collected and new site inventory data along with the working LSNA criteria to develop recommendations for a network of LSNAs in the City. Phase 3 will focus on developing policies to: support the LSNA system, initiate monitoring systems, encourage land stewardship, and secure partnerships and funding for ongoing initiatives in support of the NHS.

The 8 working LSNA criteria were drawn from a comprehensive list of criteria prepared for this study and refined based on:

- the study Team's knowledge of existing planning protection;
- defensible ecological or landscape ecology theory and concepts;
- the type and quality of data available;
- the ability of the criteria to be applied equitably to natural areas of varying size and composition;
- the ability of the criteria to be easily understood and applied;
- useful elements from comparable studies elsewhere in southern Ontario;
- input from the City and Technical Steering Committee; and
- input from the key stakeholders and the community.

These criteria will be subject to refinement and possible modification during Phase 2 of the NHS once more current and detailed data is collected and analyzed. Notably, at present, Criterion #1 is considered Primary (i.e., any Natural Area fulfilling this criterion will automatically be considered an LSNA), and the remaining criteria are considered Secondary and equally weighted. However,

* For this component of the study, "community consultations" consisted primarily of a workshop (attended by more than 20 key stakeholders) and a community forum open to all (attended by more than 50 individuals), as well as a survey posted on the City's website.

how many Secondary Criteria will be required to fulfill LSNA status has been left open at this time and will be determined as part of Phase 2.

The 8 **working criteria** developed for identification of LSNA are:

1. Provincially and Nationally Designated Natural Heritage Features
2. Hydrological Significance
3. Landform Conservation Value
4. Habitat Diversity
5. Habitat Size
6. Uncommon or Representative Habitats
7. Presence of Significant Species
8. Supportive Ecological Functions

Specific measures and rationales for each of these are provided in the report.

The recommended **working definition for LSNA** in Guelph, based directly on the working criteria, is “LSNAs are intended to capture natural areas in the City of Guelph that make a significant contribution to the City’s Greenlands System by:

- (a) *providing important hydrological functions, habitat diversity, habitat for area-sensitive species, or supportive ecological functions, or*
- (b) *encompassing landforms, ecological communities or habitats, or species considered significant at the local level”.*

Land ownership, current municipal zoning, and municipal plans related to growth have not been specifically examined at this preliminary stage of the study, however it is recognized that these will all be important considerations in actually implementing the proposed NHS. It is also understood that the LSNA criteria put forward for the NHS are intended for the purposes of identifying LSNA within the City, but will need to be modified in order to be incorporated into planning policy. Furthermore, it is recognized that publicly owned lands within or adjacent to natural areas represent excellent opportunities for natural area protection and/or enhancement. Issues and opportunities related to land ownership will be explored more fully in subsequent phases of the NHS.

A total of 16 **recommendations** have evolved out of Phase 1 of the NHS. Notably, while recommendations #1 through #4, and #5 through #8 are more short-term and relate more directly to the products of Phases 1 and 2 of this project, recommendations #9 through #16 are more long-term and provide some direction for ongoing implementation of the NHS as a whole. While recommendations #1 through #8 are intended to provide direction for the subsequent phases of the NHS, recommendations #9 through #16 are intended to provide some preliminary and general policy direction based on the findings of Phase 1 of this project, and should be revisited at the conclusion of Phases 2 and 3 of the project.

The specific recommendations have been broken down into ‘immediate’, short-term’ and ‘long-term’ categories and are as follows:

Immediate (Winter 2005)

- 1) The general tone and intent of this report should be endorsed by the Technical Steering Committee as a basis for moving forward with the NHS.
- 2) With respect to the working LSNA criteria for the City of Guelph, we recommend that:
 - a) the LSNA criteria presented in this report are endorsed by the Technical Steering Committee as working criteria for LSNA identification for Phase 2 of the NHS;
 - b) the recommended criteria be refined after more detailed analysis of the City's existing Natural Areas is completed as part of Phase 2 of the NHS, as required; and
 - c) the finalized criteria and mapping/database be used as the basis for designating LSNA in the City.
- 3) All LSNA maps should be labeled as "Draft" and noted as being "subject to revision" until landowners and City Staff have been notified and given the opportunity to provide their input.
- 4) City personnel and the Technical Committee should develop guidelines for internal protocol and a strategic plan for both technical and process-related short and long-term steps, so as to move forward in a unified and systematic manner, and maximize the value of future phases.

Short-term (Spring – Fall 2005)

- 5) The City should obtain current digital ortho-imagery for the City of Guelph.
- 6) The preliminary Landowner Contact package should be distributed as part of Phase 2 and the Landowner Contact Program and support mechanisms should be further developed (as per the recommendations in this report).
- 7) The City should engage in further discussion and negotiations with landowners and developers, as well as other key stakeholders, to develop mutually agreeable solutions whereby development needs and natural heritage objectives can both be met to a reasonable degree.
- 8) Workable targets for the City of Guelph's overall natural area coverage, as well as coverage by different vegetation types (e.g., woodlands, meadows) should be developed as part of Phase 2 of the NHS.

Longer Term (2006 – ongoing)

- 9) Phase 1 community consultation results should be taken into consideration when developing and/or revising policies, by-laws, site-level guidelines, and other support mechanisms in relation to the City’s natural heritage resources. Along with further consultations with landowners and developers, additional targeted consultations should be undertaken to review draft final criteria, maps and policies. In future phases, the facilitator of community consultations should be included in Technical Committee meetings and discussions of key decisions.

- 10) With respect to integration of the LSNA system into the City of Guelph’s Official Plan and subsequent application of the LSNA system, we recommend, as part of the next Official Plan amendment, that:
 - a) identified LSNAs be integrated into the existing “Core” and Non-Core” Greenlands categories as appropriate (e.g., Provincially Significant Wetlands within LSNAs will continue to be “Core” Greenlands, while Significant Woodlands within LSNAs will continue to be “Non-Core” Greenlands);
 - b) that the current Official Plan category of “Other Natural Heritage Features” be replaced with specific land classification categories, as based on the findings of Phase 2 of this study, and that appropriate policy be developed for each of these new categories;
 - c) if the LSNA includes “Core Greenlands” no development be permitted within these features, as is consistent with the current policy and practice;
 - d) development in identified LSNA features outside the “Core Greenlands” be contingent upon approval of an Environmental Impact Study (EIS) , as is consistent with the current policy and practice;
 - e) every EIS for an LSNA establishes no net impact to each of the criteria for which the LSNA has been designated, and outlines the mitigation required for any impacts identified;
 - f) LSNA not be accepted towards fulfillment of the required parkland dedication, but that other natural or potential restoration areas identified outside LSNA be treated more flexibly from a planning perspective; and
 - g) a detailed Restoration Plan (i.e., with a Tree Preservation and Planting Plan) using site-appropriate native species be required wherever restoration or creation of a natural feature is approved as part of an EIS.

- 11) With respect to integration of natural features outside the LSNA system into the City of Guelph's Official Plan we recommend, as part of the next Official Plan amendment, that:
 - a) the City should incorporate linkages, potential restoration areas and other undesignated natural areas that are the subject of voluntary initiatives into Greenlands System mapping as a separate category from LSNAs ; and
 - b) policy be developed to define and support identified linkages, potential restoration areas and undesignated natural areas subject to voluntary initiatives.
- 12) The City should develop land management/stewardship guidelines and plans for publicly held LSNAs.
- 13) The City should provide land management/stewardship guidelines and, where possible, in-kind support and financial incentives for encouraging protection of privately held LSNAs and other natural areas.
- 14) The City should engage in on-going education and communication to inform residents about LSNA protection and encourage stewardship of *all* natural areas.
- 15) The City, in consultation with relevant stakeholders, should develop a fund raising and land securement strategy in support of the NHS, which could involve the GRCA, the Speed River Land Trust and/or other conservation NGOs (e.g., Wellington County Stewardship Council, Guelph Field Naturalists, Federation of Ontario Naturalists, Nature Conservancy of Canada). This strategy should explore options regarding public acquisition priorities, appropriate compensation, and donor incentives for lands that are identified as part of the NHS.
- 16) In terms of general environmental policies and practices that will support the effective implementation of the NHS, the City should work towards encouraging smart growth and accommodating alternative development standards, as well as implementing and enforcing effective buffers between developed/ developing and natural areas. More specific recommendations addressing these two approaches should be provided as part of Phase 3 of the NHS.

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City of Guelph Natural Heritage Strategy
Phase 1: Terrestrial Inventory Design & Defining Locally Significant Natural Areas

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I Introduction

I.1 Study Phasing

In February of 2004, the ecological consulting team of Dougan & Associates (with Ecological Outlook) was retained to undertake Phase 1 of a 3-Phase study outlined by the City (see [Appendix A](#)) to complete a number of initiatives related to identification and protection of locally significant terrestrial natural heritage resources in the City of Guelph. The 3 Phases of the study have been set out as follows:

Phase 1: Assembly and Review of Background Information; Definition and Preliminary Identification of **Locally Significant Natural Areas (LSNAs)**; Community Consultation and Education; Development of an Inventory Methodology and Monitoring Approach for LSNA assessment; Development of Landowner Contact Program

Phase 2: Landowner Contact; City-wide Natural Heritage Mapping and Database Creation; Inventory and Assessment of Priority Natural Areas; Revision of LSNA Criteria and Mapping Based on Field Results

Phase 3: Development of City-wide Monitoring and Management Systems; Provide Recommendations to Policies and Guidelines as Required; Secure Funding for Long-term Monitoring and Outstanding Inventory Work; Identify Additional Next Steps

Notably, due to budgetary and timing constraints, Phase 2 has been divided into Phase 2a and Phase 2b. **Phase 2a** is currently underway and will provide a City-wide natural heritage database and mapping system along with a draft LSNA network. **Phase 2b**, which will be initiated in the spring of 2005, will focus on actual field assessments of the terrestrial components of LSNA. (The methods for Phase 2 are laid out in detail in [Section 7.1](#)).

I.2 Study Context & Rationale

This study represents an important step in implementing initiatives outlined in Guelph's Environmental Action Plan (2003) and SmartGuelph Principles (2003)¹, as well as aspects of the City's Official Plan (2001/consolidated June 2002) (as described in [Section 3](#) of this report), the City's Green Plan (1994), and natural heritage components of the Provincial Policy Statement (1997). Moving forward with a City-wide NHS also speaks to the City's ongoing commitment to supporting sustainable growth that integrates natural heritage within the City to the greatest extent possible.

Notably, the original Terms of Reference (see [Appendix A](#)) called this study a 'Terrestrial Inventory'. However, once Phase 1 was underway the consulting team and the City decided to

¹ These policy documents are available for downloading from the City's website at www.city.guelph.on.ca

place the 3 phases of this work under the broader context of a ‘Natural Heritage Strategy’ (NHS) even though the focus of the study was to remain on terrestrial features (i.e., woodlands, shrublands, and meadows). This shift in context was implemented for several reasons. Firstly, the approach adopted for identification of LSNAs in this study is ecosystem-based, which means that in order to determine which natural areas are locally significant, the first step is to delineate *all* natural areas (i.e., terrestrial *and* aquatic features) regardless of existing designations or land ownership, and then screen the natural areas through the established criteria. This approach is ecologically sound and has been used for the identification and designation of ESA (Environmentally Sensitive Areas) in the City of Hamilton, ESPAs (Environmentally Sensitive Policy Areas) in the Region of Waterloo, and Significant Natural Sites in the City of Mississauga, LSNAs (Locally Significant Natural Areas) in the City of Cambridge and the Town of Fort Erie, and elsewhere. This approach is also validated in the current scientific literature of landscape and conservation ecology which presents the multiple benefits of taking a ‘landscape’ or ‘systems’ approach to natural heritage planning as opposed to a more simplistic ‘features-based’ approach (e.g., With 1999; Austen et al. 2001; Joyal 2001; Fahrig et al. 2002; Haila 2002; Lee et al. 2002; Fischer et al. 2004).

Secondly, it was agreed that the term ‘NHS’ would be more appropriate for the study since: (a) many of the products (e.g., natural area mapping and database creation) and recommendations coming out of this work would include and be applicable to terrestrial as well as aquatic systems; (b) from the perspective of community consultations, it was felt that seeking input on *all* natural areas in the City would make more efficient and effective use of public funds and participants’ time; and (c) it would provide a context for a more comprehensive and integrated approach focusing on terrestrial but still including aquatic features, and also focusing on priority areas (i.e., LSNAs) while also addressing some issues related to the protection of undesignated natural areas.

This study recognizes that the City of Guelph is an urban area that has already been developed to a great extent, and that development will continue. However, this study also recognizes the need to ensure a sustainable greenspace network throughout the City. This commitment is described succinctly in the 1st of 5 Operating Principles in the City’s current Official Plan, as follows:

Environmental Sustainability: “Recognition that the quality of life is directly related to the integrity of natural systems (air, water, soil, wildlife, plants) and that there is a responsibility on the part of the community to maintain and improve the integrity of natural systems so as to not compromise the ability of future generations to meet their needs”.

– City of Guelph Official Plan (June 2002 consolidation), Section 2.2

The City has provided the foundation for a strong natural heritage system through the Greenlands System set out in its Official Plan (June 2002 consolidation), and over the past decade has effectively protected a number of significant natural features in the City. However, there are ongoing issues related to:

- the City’s data on natural areas being contained in multiple reports and hardcopy maps rather than centralized in a digital format, making it difficult for City staff (and others) to access and interpret;
- data being outdated or absent for many terrestrial features in the City;
- the lack of a clear and consistent mechanism for assessing and ranking locally significant, and especially terrestrial, features on a City-wide basis; and

- the lack of consistent environmental planning policies and guidelines across the City, particularly as they apply to terrestrial resources.

Furthermore, given the rapid urbanization of the City over the past decade there is a recognized need to ensure protection of the remaining locally significant natural features and identify potential restoration / enhancement areas, particularly on public lands, that could improve the City's natural heritage system.

The City has already protected all Nationally and Provincially designated natural heritage features under the Core Greenlands designation in the City's Official Plan, and has also designated many Regionally and locally significant natural heritage features under the category of Non-Core Greenlands in its most current Official Plan. The crux of *this* study is to re-examine the terrestrial components of the Non-Core Greenlands using more accurate and comprehensive data, establish a criteria-based system for determining which areas are locally significant in a consistent and defensible manner, and provide recommendations for the short and long-term protection of the areas ultimately confirmed as candidate LSNAs.

Land ownership, current municipal zoning, and municipal plans related to growth have not been specifically examined at this preliminary stage of the study, however it is recognized that these will all be important considerations in actually implementing the proposed NHS. It is also understood that the LSNA criteria put forward for the NHS are intended for the purposes of identifying LSNA within the City, but will need to be modified in order to be incorporated into planning policy. Furthermore, it is recognized that publicly owned lands within or adjacent to natural areas represent excellent opportunities for natural area protection and/or enhancement. Issues and opportunities related to land ownership will be explored more fully in subsequent phases of the NHS.

1.3 Study Goals & Objectives

The following goals and objectives have been revised from the original ones provided in the project Terms of Reference (see [Appendix A](#)) and have been changed to better reflect the intent and direction of the study as it has evolved.

Overall Study Goals of the NHS:

1. To identify and assess candidate Locally Significant Natural Areas (LSNAs) using a consistent and transparent methodology.
2. To identify existing or potential ecological linkages between LSNAs.
3. To identify potential restoration lands (outside the LSNAs) that could contribute to the overall sustainability of the City's natural heritage system or, in the case of City-owned lands, provide some planning flexibility.

4. To provide recommendations for City-wide environmental policies and guidelines that recognize the need to accommodate social and cultural needs, as well as ongoing development in the City while still protecting the features and functions that make LSNAs significant.
5. To promote the protection of candidate LSNAs, and the City's entire Greenlands System by providing tools for and initiating and sustaining increased community awareness and landowner buy-in.

Specific Study Objectives of the NHS:

1. To define and identify LSNAs using a scientifically-defensible, criteria-based system that captures areas having ecological features or functions recognized as having significance at the local level.
2. To create updated mapping (using the Ecological Land Classification [ELC] system) and a related database of the City's Natural Areas (using GIS) that will;
 - a. allow for application of the established LSNA criteria,
 - b. make terrestrial natural heritage information more accessible and useful to City staff, EAC (the Environmental Advisory Committee) and the public,
 - c. facilitate information sharing with the OMNR and GRCA, and
 - d. provide baseline mapping and data for future inventories and monitoring studies.
3. To develop inventory methodologies for assessing candidate LSNAs, and monitoring approaches and methods for protecting LSNAs.
4. To identify existing or potential ecological linkages between LSNAs.
5. To identify potential restoration areas (primarily on public lands) outside of LSNAs that could either be naturalized and restored to support the overall Greenlands System or, in the case of City-owned lands, provide some planning flexibility.
6. To provide recommendations for making relevant environmental policies, guidelines and by-laws consistent with appropriate protection for LSNAs as well as natural areas and potential restoration areas identified outside of LSNAs.
7. To provide tools for building/expanding partnerships with various key stakeholder organizations, landowners and citizens to share the responsibility of environmental protection.
8. To initiate contact with various key stakeholder organizations, landowners and citizens regarding the NHS and provide tools, materials and recommendations for follow-up with different interest groups and stakeholders.

2 Overview of Existing Natural Areas in Guelph

2.1 Sources Reviewed

Existing information on Guelph's natural heritage features was assembled from digital and hardcopy sources provided by the City, **Grand River Conservation Authority (GRCA)** and **Natural Heritage Information Center (NHIC)** as follows:

Digital Sources

- Orthorectified air photos for the City of Guelph, spring 2000, provided by the GRCA.
- GRCA wetland and floodplain mapping, including Provincially Significant Wetlands (PSWs), Locally Significant Wetlands (LSWs), unevaluated wetlands, and subwatershed boundaries.
- NHIC records for provincially rare vegetation and wildlife species (historical and current records), and for Regionally and Provincially Significant Areas of Natural and Scientific Interest (ANSIs).
- GIS layers (shapefiles) of relevant mapping from the City's Official Plan (consolidated June 2002) (i.e., City boundary, roads, railways, rivers, streams, lakes, floodlines, designated wetlands – provincially and locally significant, significant woodlands [≥ 1 ha], other natural areas, ANSIs), provided by the City.

Hardcopy Sources

- City of Guelph Official Plan 2001 (with Schedule 2), June 2002 consolidation.
- South Wellington Environmentally Sensitive Areas Study, 1976.
- Eramosa-Blue Springs Subwatershed Study, Part I and II, 1999.
- Mill Creek Subwatershed Plan, 1996.
- River Systems Management Study, Final Report, 1993.
- River Systems Management Study, Technical Report #1, Inventory and Analysis of Heritage Resources, 1992.
- Torrance Creek Subwatershed Study Management Strategy, Executive Summary and Recommendations, 1999.
- Torrance Creek Subwatershed Study Management Strategy Technical Appendix, 1998.
- Hanlon Creek Watershed Plan, Final Report, 1993.
- Hanlon Creek Watershed Plan, Interim Report, Volumes 1 - 4, 1992.
- Hanlon State-of-the-Watershed Study Final Report, 2004.

Secondary planning studies, environmental impact studies (EIS) and environmental assessments (EA) conducted within the City were also made available, but the information contained in these is too detailed for the purposes of Phase 1. These documents will however provide useful data for Phase 2 of the study. Similarly, species-specific data from sources such as the Ontario Breeding Bird Atlas and Ontario Herpetological Atlas will also be collected as part of Phase 2 of this study.

2.2 General Characterization of Guelph's Natural Heritage System

The City of Guelph is largely urbanized, but still contains a fairly diverse natural heritage system comprised primarily of small and mid-sized woodlands, large wetland complexes and ravines associated with the City's extensive river systems. Based on information derived from the various hardcopy and digital sources reviewed it was determined that the City of Guelph, which is about 82 km², encompasses the following (as shown in Figures 1 through 5 and Maps 1 & 2):

- 5 Subwatershed/Watershed Areas (in whole or in part),
- 4 Environmentally Sensitive Areas (ESAs),
- 2 Areas of Natural and Scientific Interest (ANSIs),
- 8 Provincially Significant Wetland (PSW) Complexes (in whole or in part),
- 3 Locally Significant Wetlands (LSW),
- approximately 30 Locally Significant Woodland Areas (i.e., of 1 ha or greater),
- and large areas of what are currently identified as ecological corridors, buffers and linkages (i.e., 'Other Natural Heritage Features' in the Official Plan, June 2002 consolidation).

The City of Guelph's predominant natural areas are comprised of rivers, streams and wetlands (primarily marsh and swamp wetlands) with some associated wooded valleys and uplands. However, there are also a number of isolated upland woodlots scattered throughout the City, as well as some upland areas that were once being actively managed for human use (e.g., gravel pits, plantations, agricultural fields) but have been abandoned and become naturalized.

As is shown in Table 1, total coverage by currently recognized natural heritage features in the City is 18% with the most dominant features being 'Other Natural Heritage Features' (for a full definition see Section 3 of this report) and Provincially Significant Wetlands comprising 15% jointly. Notably, there is approximately another 600 ha (6%) of "greenspace" in the City that consists of manicured parks, sports fields and other open space areas that for the purposes of this study have not been considered as natural.

Table 1. Approximate area coverage by currently recognized natural heritage features in the City of Guelph.

Natural Heritage Feature*	Area (ha)	Percent of the City covered
Locally Significant Wetlands	21.429	0.24%
Provincially Significant Wetland	610.742	6.95%
Other Wetlands	105.641	1.20%
Significant Woodlands (≥ 1 ha)	132.886	1.51%
Other Natural Heritage (NH) Features**	738.961	8.41%
TOTAL COVERAGE BY NH FEATURES	1609.659	18.33%

*Based on desktop analysis of digital mapping layers provided by the City and GRCA.

**Currently defined in the City's Official Plan as "lands that primarily comprise environmental corridors, ecological linkages and buffers to natural heritage features".

An overview of the City's remaining natural heritage features is provided in the following sections based on information drawn from existing sources. More accurate information on overall natural cover and the relative representation of various natural heritage features in the City will be provided as part of Phase 2 of the NHS.

2.2.1 Watershed/ Subwatershed Areas

The 5 watershed/ subwatershed areas that fall within Guelph's City limits are the (1) Eramosa River – Speed River Watershed (to the northwest), (2) Clythe Creek Subwatershed (to the northeast), (3) Hanlon Creek Watershed, including the Hall's Pond Subwatershed Area (to the southwest), (4) Torrance Creek Subwatershed (to the southeast), and (5) Mill Creek Subwatershed (to the south). All of these subwatershed/watershed areas have been studied in whole or in part over the last decade or so, and extend beyond the City's boundaries to varying extents.

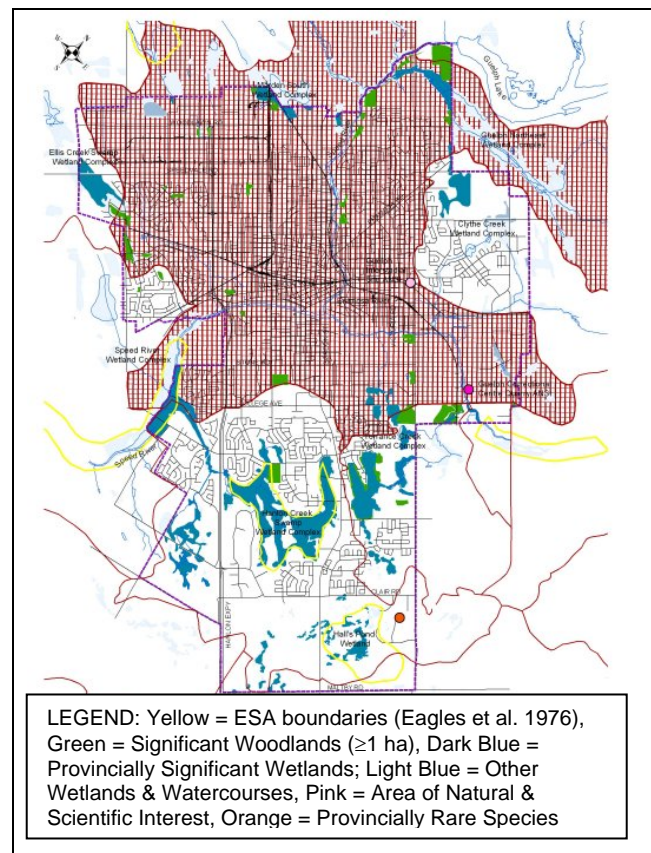
Notably, some of the natural features already recognized as significant within the City are closely associated with larger natural features extending outside the City's limits. While the focus of this study is on terrestrial natural features within the City's boundaries, in taking a landscape ecology approach to planning it is important to identify and recognize natural linkages to areas outside the City, and try to protect these linkages as well as those within the City.

1. Eramosa River – Speed River Watershed

This watershed is by far the largest in the City, as shown in [Figure 1](#), and also includes a large area in the northwest quadrant of the City that has never been studied. Parts of the watershed have been examined from a natural heritage perspective in 2 studies; the [Eramosa River – Blue Springs Watershed Study](#) (Beak International Inc. et al. 1999) and the [River System Management Study](#) (Weinstein Leeming + Associates et al. 1992) which focused on the Eramosa and Speed River corridors within the City.

The [Eramosa River – Blue Springs Watershed Study](#) (Beak International Inc. et al. 1999) covers a very large area of which only a small component includes a portion of the City of Guelph. The study area encompasses a mosaic of landforms, with the watershed component found in the City's boundaries falling into the physiographic region known as the Guelph Drumlin Field and including a few smaller esker, kame and end moraine features at the southeastern end of the City. The watershed was historically dominated by upland deciduous forests but this is now one of the most poorly represented vegetation communities in the area, as can be seen by the number of woodlands of 1 ha or more shown in [Figure 1](#) (in green) within the watershed.

Figure 1. Eramosa River – Speed River Watershed area (based on subwatershed boundary information provided by the GRCA for 2003).



The dominant natural communities are now wetlands, meadows/old field, and floodplain forests. The watershed includes more than 1500 ha of Class 1 wetland complexes and extensive deeryards. The study reports a total of 405 plant species with a relatively high component of native species (79%), including 23 regionally and 4 provincially rare species. A total of 171 wildlife species were also recorded, including 41 mammals, 120 birds and 10 reptiles and amphibians.

The *River Systems Management Study* (Weinstein Leeming + Associates et al. 1992) was focused almost entirely within Guelph along the City's 2 dominant rivers and involved an inventory of 200 vegetation units. The study identified several areas of significant natural woodland and sections of continuous natural cover along the Eramosa River including escarpments and wetlands. These 2 rivers also provide linkages between several of the City's wetland complexes/ESAs (e.g., Speed River Valley, Eramosa Valley, Hanlon Creek Wetland). In general, urban areas adjacent to the rivers are dominated by sugar maple, basswood and elm used in ornamental settings during the latter half of the 1800's, although in the 1970's and 1980's replacement trees consisted largely of Norway and Manitoba maples. With respect to wildlife, the study characterizes the Speed River valley south of Hanlon Expressway and Eramosa River between Victoria Road and the City limits as areas of high habitat quality.

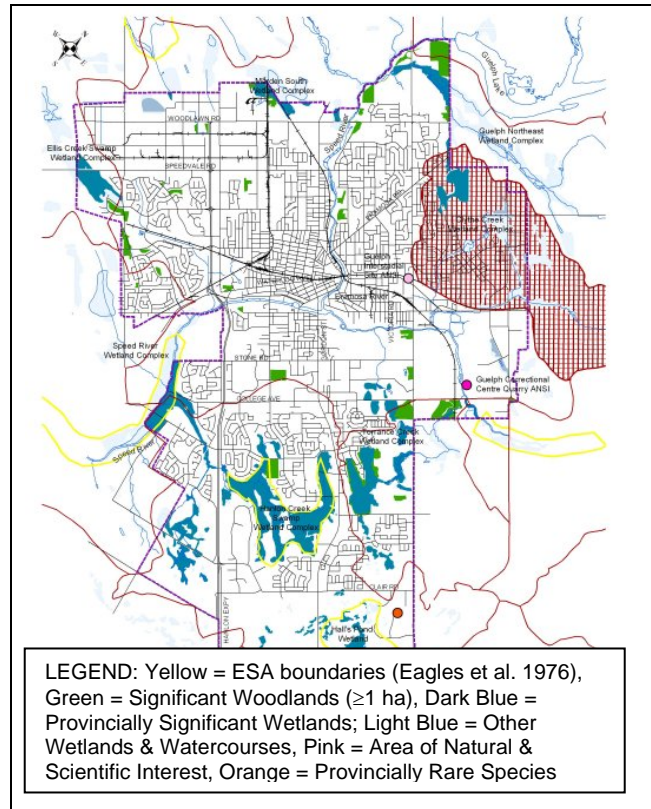
2. Clythe Creek Subwatershed

The Clythe Creek Subwatershed was studied in its entirety, although not in depth, in the *Clythe Creek Subwatershed Overview* (Ecologistics and Blackport and Associates 1998). The study defined 15 vegetation community types (10 wetland and 5 upland communities) and characterized the area as being largely idle or active agricultural lands with wooded areas and hedgerows interspersed.

At the time of the study, the subwatershed contained 10% upland vegetation, including 28.7 ha of mixed deciduous woods (mostly small and isolated woodlots ranging from 0.8 to 7.2 ha) and 156 ha of wetland (mainly bands of vegetation along watercourses).

The *Clythe Creek Subwatershed Overview* (Ecologistics and Blackport and Associates 1998) also recorded a total of 274 plant species (although none with nationally or provincially rare status) including many (29%) non-native species. The 89 wildlife species recorded for the subwatershed included 59 bird species (including 1 provincially threatened species), 9 mammals, and 21 reptiles and amphibians.

Figure 2. Clythe Creek Subwatershed area (based on Subwatershed boundary information provided by the GRCA for 2003).



3. Hanlon Creek Watershed (incl. Hall's Pond Subwatershed)

This watershed is almost entirely contained within the City, as shown in [Figure 3](#), and includes the largest contiguous areas of greenspace within the City. The watershed was first studied in the [Hanlon Creek Watershed Study](#) (MMM & LGL 1993) and has recently been re-examined for the [Hanlon Creek State-of-the-Watershed Report](#) (Planning & Engineering Initiatives Ltd. et al. 2004). The [Hanlon Creek Watershed Study](#) (MMM & LGL 1993) and related technical reports (MMM & LGL 1992a,b,c,d) characterized the watershed as having a high diversity of biological habitat types and identified 500 discrete vegetation units representing 40 community types. The study also described the watershed as being predominantly agricultural (60%) and 30% forested with a mixture of upland and wetland deciduous and coniferous forests. The species recorded included 2 nationally threatened species and an additional 40 plant and 20 bird species of 'management concern' (i.e., having provincial, regional or local status).

The [Hanlon Creek State-of-the-Watershed Report](#) (Planning & Engineering Initiatives Ltd. et al. 2004) updated the original vegetation community mapping to current standards for Ecological Land Classification (ELC) (Lee et al. 1998) and found that between 1991 and 2000 there was a 10% decline in overall "greenspace" primarily related to development of abandoned and active agricultural lands and hedgerows surrounding the Hanlon Creek Swamp / Preservation Park conservation area. Nonetheless, the watershed was still quite "green" as of 2000, with 41% of the total watershed area consisting of natural or naturalized habitats, and much of the remaining natural habitats in the watershed being of relatively high quality with 71% native vascular plant species and more than 60 ha of forest interior habitat.

As of 2000, 423 plant species (including 31 significant or rare species) and 191 breeding bird species (including 78 species considered to be regionally and locally significant, and 6 provincially rare) had been recorded in the Hanlon Creek Watershed. Between 1991 and 2000, the largest changes in the watershed consisted of agricultural lands (148 ha), cultural meadows (161 ha), plantations (63 ha) and deciduous forest (42 ha) surrounding the core wetland areas being converted to urban lands (i.e., residential, commercial, and industrial developments and associated infrastructure).

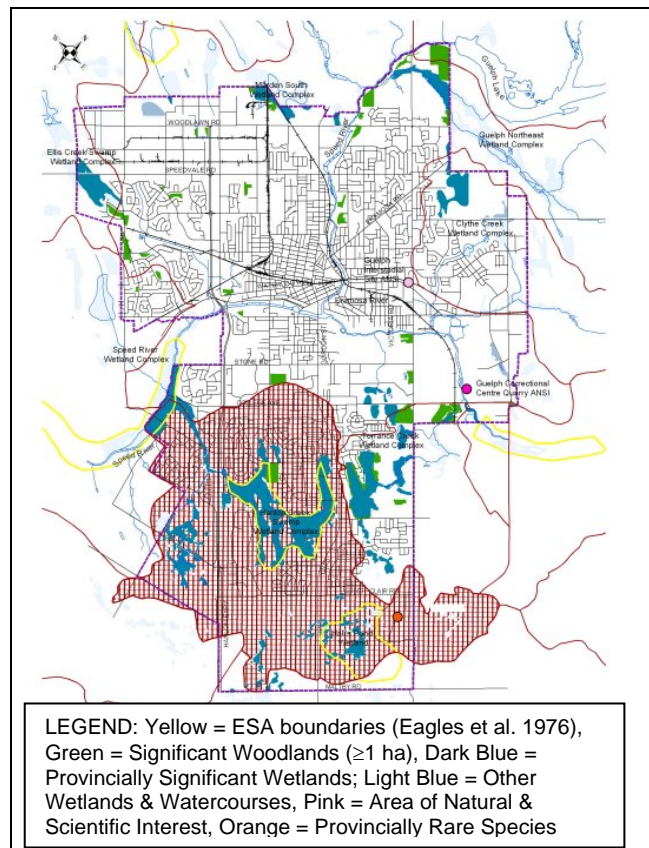


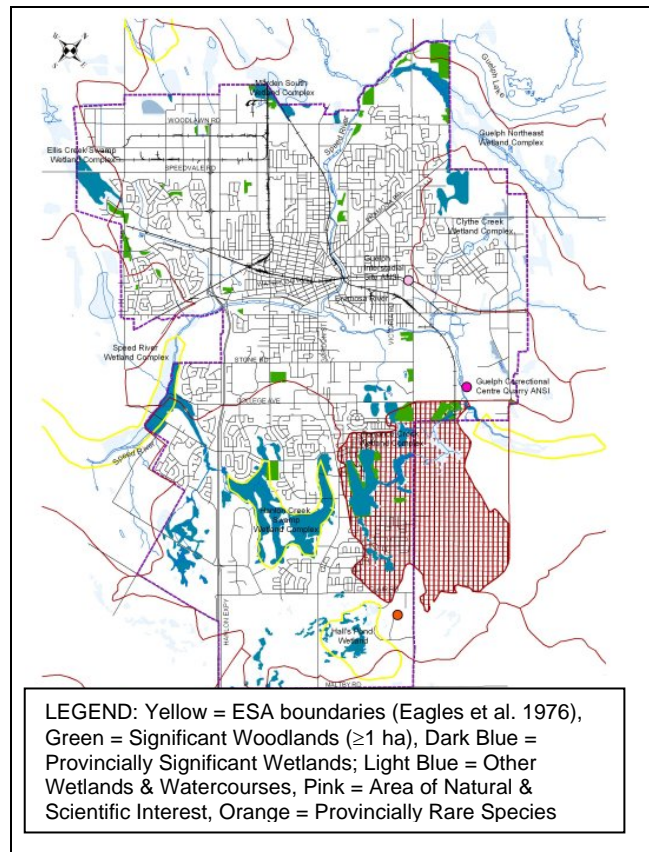
Figure 3. Hanlon Creek Watershed area, including Hall's Pond Subwatershed area (based on subwatershed boundary information provided by the GRCA for 2003).

4. Torrance Creek Subwatershed

This subwatershed is located in the City's eastern corner, as shown in [Figure 4](#), and was described in the *Torrance Creek Subwatershed Study Management Strategy, Executive Summary and Recommendations* (Totten Sims Hubicki et al. 1999) and associated reports (Totten Sims Hubicki et al. 1997a,b; 1998a,b). The subwatershed covers 10.6 km², with about half falling within the City limits, and has been divided into 24 vegetation communities (2 aquatic, 8 wetland, 8 woodland, 3 plantation, and 3 successional).

In terms of natural heritage, the subwatershed is dominated by swamp and marsh wetlands, many in kettle depressions, as well as treed swamps and a few upland forests (mostly deciduous).

Figure 4. Torrance Creek Subwatershed area (based on subwatershed boundary information provided by the GRCA for 2003).



Although this Subwatershed does not contain interior or old growth forest, it does have some areas with forest interior species and old growth forest characteristics. In terms of species, no provincially significant plant species have been recorded in the subwatershed, but a number of regionally significant plants (mostly in wetland habitats) have been documented. The subwatershed also has a fairly high diversity of wildlife with 145 wildlife species recorded (101 birds, 25 mammals, 10 amphibians, and 9 reptiles).

5. Mill Creek Subwatershed

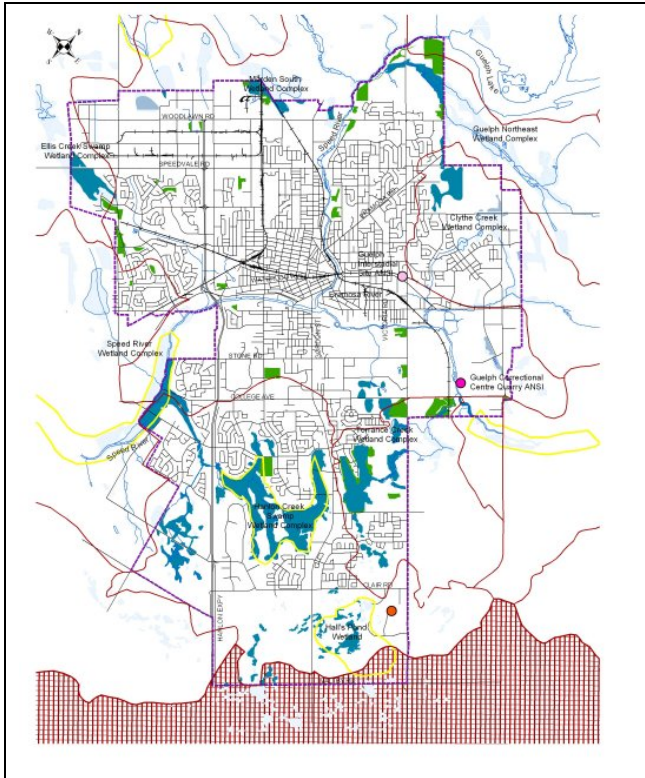
This subwatershed is at the extreme southeast of the City, as shown in [Figure 5](#), and was described in the *Mill Creek Subwatershed Plan* (CH2M Gore & Storrie Ltd. et al. 1996). Although the subwatershed is barely within the City, it does contain a number of important natural heritage links with the remaining natural areas in the Hall's Pond Subwatershed area and adjacent lands within the City.

In 1996 the subwatershed had predominantly agricultural land cover but was still 30% forested with mostly lowland communities and scattered upland deciduous forests. Kettle lakes occur throughout study area and the wetlands consist of mostly forested swamps.

In the 1996 study, 13 vegetation types were identified in the subwatershed and 140 bird species (including 125 confirmed breeders, 8 provincially rare and 11 regionally rare species), 15 amphibians, 9 reptiles, and 37 mammals were recorded.

Figure 5. Mill Creek Subwatershed area (based on subwatershed boundary information provided by the GRCA for 2003).

LEGEND: Yellow = ESA boundaries (Eagles et al. 1976), Green = Significant Woodlands (≥ 1 ha), Dark Blue = Provincially Significant Wetlands; Light Blue = Other Wetlands & Watercourses, Pink = Area of Natural & Scientific Interest, Orange = Provincially Rare Species



2.2.2 Environmentally Sensitive Areas (ESA)

The only ESA study that encompasses the City of Guelph is the dated *South Wellington Environmentally Sensitive Areas Study* (Eagles et al. 1976). This study identified ESA throughout the County based on fulfillment of any of the 9 established criteria (as listed in *Table 4*).

The 5 ESAs within or close to the City of Guelph are outlined on *Map 1* and *Figures 1 through 5*. The 4 ESAs within the City boundaries, in whole or in part, are the Speed River Valley (ESA#13 - 347 ha), Hanlon Creek Subwatershed (ESA#14 - 272 ha), Hall's Pond (ESA#15 - 133 ha), and Eramosa River Valley (ESA#17- 2038 ha) on the southeast side and mostly outside the City. Ariss Woods (ESA#16 - 139 ha) is in the northwest corner just outside the City's boundaries.

Although this study was never officially adopted by the City, these ESA have, to a large extent, been integrated into and protected under the City's existing Greenlands System (see *Maps 1 & 2*).

2.2.3 Areas of Natural & Scientific Interest (ANSI)

There are 2 ANSI in the City of Guelph, as shown in *Map 2*; the Guelph Interstadial Site, which is Regionally Significant, and the Guelph Correctional Centre Quarry (1.6 ha), which is Provincially Significant. According to current NHIC records, they are both considered Earth Science (rather than Life Science) ANSI (www.mnr.gov.on.ca/MNR/nhic/areas/) and therefore have limited value in terms of this study. The significance of the Correctional Centre site resides in the fact that it is an abandoned quarry showing contact of the Guelph and Amabel (Eramosa) formations, as well as representative lithology and excellent exposure of bedrock. The Guelph Interstadial Site's

significance is that it shows a paleosol dated at the Port Talbot Interstadial or older (rare in southern Ontario) that was revealed during excavation for the Victoria Street railway.

2.2.4 Provincially Significant Wetland (PSW) Complexes

The 8 Provincially Significant Wetland (PSW) complexes within the City are shown on Map 1 and are located at all ends of the City. Although these wetlands are not the focus of this study and will not be re-examined as part of this study, it is important to note that these wetlands, along with the 2 rivers, form the backbone of the City's Greenlands System and, in many cases, have other terrestrial features closely associated with them.

2.2.5 Locally Significant Wetlands (LSW)

There are currently 3 Locally Significant Wetlands (LSW) in the City that have been designated by the Ontario Ministry of Natural Resources (OMNR) because although they do not meet the criteria for PSW they have been recognized as making a significant ecological and hydrological contribution on a local level. Two of these are located in the Speed-Eramosa River Watershed, and one is located within the Clythe Creek Subwatershed (as shown on Map 2).

These wetlands will not be re-examined in the field as part of this study, have already been designated as locally significant by the GRCA, and will automatically retain this status for the purposes of LSNA identification.

2.2.6 Locally Significant Woodland Areas

Currently, Significant Woodlands in the City of Guelph are defined as “a forested area, of at least 1 ha in size, that contains trees in a natural setting” (City of Guelph, 2002). There are approximately 30 such areas identified throughout the City in the current Official Plan (2002), as shown on Map 2, although their coverage relative to other recognized natural heritage features in the City is quite small (as shown in Table 1).

Unlike LSW, these woodlands will be subject to desktop investigation, field studies and analysis, along with other smaller woodlands, to re-examine if the current definition for Significant Woodlands is appropriate for the City of Guelph.

3 Overview of Existing Natural Heritage Designations & Policy in Guelph

Given that the crux of this study is to re-examine the terrestrial components of existing Non-Core Greenlands and provide recommendations related to the City's designations and policy related to locally significant natural features, it is important to have a good understanding of the existing natural heritage designations and policies, and how they have been implemented at the Official Plan level. The purpose of the following sections is to provide such an understanding.

The City's Official Plan (2001/June 2002 consolidation) represents the most current synthesis of environmental planning information in the City based on data provided by the **Ontario Ministry of Natural Resources (OMNR)**, GRCA and other environmental studies, as well as input from key stakeholders and the community. It is the source for most of the following information.

3.1 Designated Natural Heritage Features

The City's Official Plan broadly defines natural heritage features as “*areas containing wetlands, forested areas, wildlife habitats for terrestrial and aquatic species (including endangered and threatened species), valleylands, areas of natural and scientific interest, environmental corridors and ecological linkages*”. More specifically, these features consist of the following:

1. Provincially Significant Wetlands (PSW)
2. Areas of Natural and Scientific Interest (ANSI) – only Provincially significant
3. Locally Significant Wetlands (LSW)
4. Other Natural Heritage Features (i.e., “*lands that primarily comprise environmental corridors², ecological linkages³ and buffers to natural heritage features*”); and
5. Significant Woodlands (i.e., “*a forested area, of at least 1 ha in size, that contains trees in a natural setting*”).

PSW, LSW and ANSI may be identified and are mapped and confirmed by the OMNR. The OMNR and GRCA have also had input into the mapping of Other Natural Heritage Features and Significant Woodlands, however ultimately it is the City that is responsible for the designation of all these features through their Official Plan.

² “environmental corridors” include all rivers, streams and creeks and are defined as: “A linear biophysical feature usually associated with natural topographic, surface water and vegetation features such as wetlands, rivers and creeks, valleylands and wooded areas. These corridors serve as essential passageways for native plant and animal species and communities including: migratory routes; passage between different types of habitat for animals requiring a variety of habitats to survive and; pathways for movement and reproductive interchange between different populations of the same plant or animal species. In addition, where these corridors are associated with streams, these natural corridors also serve as essential buffers to protecting the integrity of the stream's ecosystem”.

³ “ecological linkages” are defined as “*landscape links/connections between remnant natural areas that promote the transfer of genetic material to maintain and enhance genetic viability, health and biological diversity*”.

Currently, for PSW and ANSI no development is permitted within the boundaries of the feature itself, and any proposed development in “adjacent lands” (as presented in [Table 2](#)) is contingent upon provision and approval of an Environmental Impact Study (EIS) demonstrating no net impacts to the PSW or ANSI. For LSW, Other Natural Heritage Features, and Significant Woodlands, development within the feature or in adjacent lands (as presented in [Table 2](#)) is contingent upon provision and approval of an Environmental Impact Study (EIS) demonstrating no net impacts to the feature.

Table 2. Minimum width of adjacent lands* in the City of Guelph.

Natural Feature	Adjacent Lands*	Source
Provincially Significant Wetland	120 m	PPS**
Locally Significant Wetland	30 m	GRCA***
Habitat for Threatened + Endangered Species	50 m	PPS**
Fish Habitat****	30 m	PPS**
Significant Woodlands	50 m	PPS**
Environmental Corridors & Ecological Linkages*****	50 m	PPS**
Significant Wildlife Habitat	50 m	PPS**
Areas of Natural & Scientific Interest (Provincially Significant)	50 m	PPS**

* Adapted from Section 10 (Glossary) in the City of Guelph’s Official Plan 2001, June 2002 consolidation.

** Based on the recommendations of the Natural Heritage Reference Manual (1999) prepared in support of Policy Section 2.3 of the Provincial Policy Statement (1997).

*** Based on the recommendations of the GRCA’s Wetland Policy (2003).

**** Includes any lakes, rivers, and streams that contain fisheries.

***** Included in “Other Natural Heritage Features” in the City’s Official Plan.

Notably, although policy for “Habitat for Threatened and Endangered Species” is described in the Official Plan, no such habitat has been identified by the OMNR in Guelph and as a result none is identified in the current Official Plan. Research for this study uncovered 2 records for such species within the City boundaries, a Grey Fox (*Urocyon cinereoargenteus*) and a Loggerhead Shrike (*Lanius ludovicianus*), however both of them are historical dating back to 1963 and 1980 respectively and are no longer considered current. Field work to be conducted for this project in 2005 should help confirm the presence or absence of these and other Threatened or Endangered species.

The City also provides special policy considerations for “Forestry Resources” and the Official Plan not only states that: “*The City places a high priority on protecting existing trees, hedgerows and wooded areas*”, but goes on to say that it will “*give consideration to developing a comprehensive ecological definition of woodland significance in the Municipality by conducting an assessment study of wooded areas within Guelph*” which will be undertaken as part of Phase 2 of this study.

Policy for “Significant Wildlife Habitat” is also provided in the Official Plan and defined as “(a) *critical habitat areas that provide for seasonal concentrations of animals; (b) wildlife movement corridors; (c) rare vegetation communities or specialized habitats for wildlife; or (d) habitats for species of conservation concern including provincially and federally vulnerable species*”. As with Habitat for Threatened and Endangered Species, this type of habitat needs to be identified by OMNR mapping, confirmed by comprehensive and scoped EIS findings, and designated by the City. Although none has been specifically identified in the City to date, some natural areas in the existing Greenlands System may contain this type of habitat.

3.2 The Greenlands System

The City’s current Official Plan includes a Greenlands System that divides natural heritage features into 2 categories (i.e., “Core” Greenlands and “Non-Core” Greenlands) based on the different planning policies that apply to them (as shown in [Table 3](#) below). Core Greenlands are comprised of natural areas considered to have greater ecological “sensitivity or significance”, and are essentially lands protected at the provincial level in which development is not permitted. Non-Core Greenlands are comprised of natural areas that, based on information and recommendations from a variety of regional and local sources, are considered locally significant and have been afforded protection at the municipal level.

Table 3. Core and Non-Core Greenlands designated under the City of Guelph’s Official Plan.

Core Greenlands*	Non-Core Greenlands**
<ul style="list-style-type: none"> ✓ Provincially Significant Wetlands (PSW) ✓ Provincially Significant Areas of Natural and Scientific Interest (ANSI) ✓ Provincially Significant Habitat for Threatened and Endangered Species ✓ Floodplains and some Natural Hazard Lands 	<ul style="list-style-type: none"> ✓ Fish Habitat ✓ Locally Significant Wetlands (LSW) ✓ Significant Woodlands (≥ 1.0 hectare) ✓ Other Natural Heritage Features (Significant Environmental Corridors, Ecological Linkages + Buffers to natural areas) ✓ Significant Wildlife Habitat

*No development is permitted in these lands; development in adjacent lands is contingent upon an approved Environmental Impact Study that demonstrates no negative impacts to the natural feature or its ecological functions.

** Development is permitted within these features or adjacent lands but is contingent upon an approved Environmental Impact Study that demonstrates no negative impacts to the natural feature or its ecological functions.

Based on an analysis of the digital mapping provided by the City and the GRCA, the entire Greenlands System covers just over 24% of the City (2119 ha) with slightly more area dedicated to Non-Core Greenlands (1195 ha covering 13.6% of the City) than Core Greenlands (924 ha covering 10.5% of the City) (as shown in [Figure 6](#) below). Compared to other municipalities of comparable size in southern Ontario, this level of greenspace coverage is probably above average, although the frequently cited guidelines established by Environment Canada – CWS et al. (1998) for the Great Lakes Areas of Concern recommend targets of 30% forest cover for subwatersheds. To provide some more appropriate context, this study also reported that the County of Wellington had 18.2% forest cover and 75% of the forest interior species within its range in 1997.

Preliminary analyses also showed that Other Natural Heritage Features (as defined in [Section 3.1](#) above) account for 35% of the total Greenlands System and PSW account for 29% of the system, while Significant Woodlands account for only 6%, and Locally Significant Wetlands account for 1% of the area. Notably, part of the PSW consist of forested swamps and so there is more forest cover in the City than 6%, especially if smaller woodlots, hedgerows and street/park trees are also taken into consideration.

After the mapping is updated and revised for Phase 2 of the NHS, it will be possible to generate more accurate numbers on overall natural cover and the relative representation of various natural heritage features in the City. This will provide a basis for setting realistic and workable targets with respect to natural area protection and/or restoration.

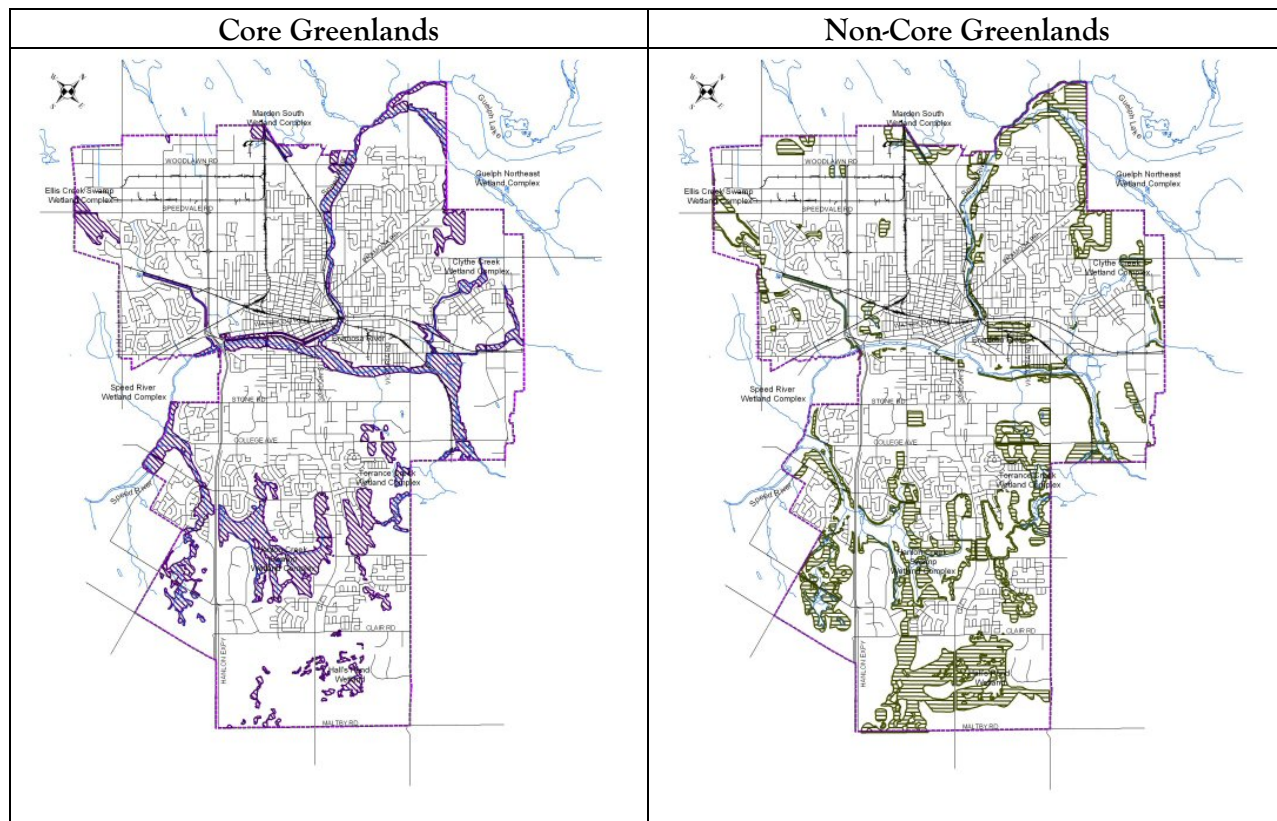


Figure 6. Coverage of Core (purple) versus Non-Core Greenlands (green) in the City of Guelph (based on digital layers provided by the City from its Official Plan, June 2002 consolidation).

4 Phase I Community Consultations & Communications

"In order to achieve a high quality of life, residents should be actively involved in decisions that affect their community."

City of Guelph Official Plan Operating Principle #4, Citizen Involvement

Guelph is known to many, both within and beyond the community, as an environmentally progressive municipality with many environmentally aware citizens. In fact, during the recent Smart Guelph community consultations, a greener, non-polluted environment with connected natural areas was identified as the highest priority in the community's vision for Guelph.

The City recognized that this study presented an opportunity to involve its many knowledgeable citizens, as well as relevant agencies, in identifying areas of local significance from a natural heritage perspective. Consequently, a significant component of the Phase 1 work consisted of an intensive community consultation process. The goals of the community consultations were to provide information, garner input into the criteria for LSNAs and high priority areas, and increase awareness of the NHS. The community consultations also provided opportunities to identify potential partners in natural heritage protection and restoration, and for participants to hear and consider various perspectives.

It was recognized from the outset that the timeline and budget for Phase 1 of the NHS would limit communication and participation somewhat, but the process was still deemed worthwhile. The City intends to undertake further community consultations and communications at various stages in the development of the NHS to be determined as the study proceeds.

Key communication and community consultation tools for Phase 1 of the NHS included:

- information posted on the City's website;
- a Key Stakeholder Workshop (see [Appendix B-1](#));
- a Community Forum (see [Appendix B-2](#));
- a Community Survey (see [Appendix B-3](#)); and,
- a Power Point presentation for the Workshop and Forum (provided digitally to the City);
- and, a preliminary Landowner Contact Program (see [Section 6](#)).

Specific items provided by the Consultants included:

- advice on Phase 1 community consultation and communication tools;
- guidance on specific tasks throughout the process;
- input on a Key Stakeholder list and a targeted mailing list for the Community Forum;
- a Project Summary that was posted on the City's website and mailed in invitation packages;
- a Community Survey that was posted on the website, mailed to a targeted list, and made available at the meetings and at the Planning Department;
- agendas and invitations for the Key Stakeholder Workshop and the Community Forum;
- circulating the invitation/support materials for the Key Stakeholder Workshop via email;
- a newspaper notice for the Community Forum;

- two versions (one more detailed and the other simplified) of a Power Point presentation on the background of the study, existing natural areas and current designations;
- facilitation and documentation of the discussion at the Key Stakeholder Workshop and the Community Forum;
- poster-sized and 11x17 in. maps to allow for participant input on specific sites of interest within the City;
- and, guidelines and preliminary materials for the Landowner Contact Program.

City staff provided feedback on materials and agendas, synthesized contact lists, posted materials to the website, circulated materials via targeted mailing, and assisted with preparation for the public meetings. The Technical Steering Committee provided input into the maps, the Power Point presentation, the Community Survey, the selected working criteria, and the Phase 1 report.

4.1 Results of Community Consultations

Detailed documentation of the discussion at the 2 meetings and the results of the Community Survey are provided in [Appendix B](#) and summarized below. Although participants were interested in identifying and prioritizing terrestrial features, they also expressed considerable interest in both the overall NHS and the practical results on the ground. The facilitator anticipated and allowed for discussion of all of these issues. While the community consultations resulted in useful input for the terrestrial inventory, the broader discussions confirmed the need for and provided insights into additional steps beyond the inventory.

4.1.1 Input into the Overall Natural Heritage Strategy

Participants were generally very supportive of the initiative and some offered their on-going assistance to City staff. A few concerns about the NHS were noted, as follows:

- The NHS process and resulting policies may not lead to increased protection of natural areas on the ground. Adequate resources will be needed for implementation.
- Some of the remaining natural areas in the City are contained within lands that are presently the subject of development applications. Existing mechanisms to protect these areas must be applied now before the overall NHS is finalized.
- Officially designated LSNAs should not become a barrier to voluntary initiatives related to natural heritage protection outside of the designated areas.

Participants made some suggestions for addressing these issues, some of which have been incorporated into the recommendations of this report.

The developers that participated in the process stated that they support protecting natural heritage while still meeting development needs. They noted that protection of all remaining natural areas and linkages/buffers is not possible, as it would result in considerably less development than is currently planned for the City. At the same time, some developers agreed that more natural areas and features could be protected on individual sites than is often the case. Some developers pointed out that development can also provide an opportunity for enhancement of some natural areas, and that some positive steps, such as planting buffers and replanting hedgerows, have and will continue to be taken.

4.1.2 Input into Criteria for Locally Significant Natural Areas

A long list of criteria drawn from the Consultants' experience as well as various criteria in use across southern Ontario (see [Table 4](#)) was presented for ranking in the Community Survey (refer to [Appendix B-3](#)) and for more general discussion at the meetings. Some parties noted that they were reluctant to select "significant" areas, as all natural areas and species are significant and deserving of protection. Nevertheless, participants recognized that difficult choices must sometimes be made, and useful insights into the community's priorities were garnered.

Another general comment made by several participants was the need to set overall targets, such as percent cover of forest. Some participants also identified the need to distinguish between criteria that apply to the overall system, those that can aid in assessing specific sites, and those that can accomplish both. The need to be more specific on some criteria (e.g., potential to be restored and habitat value) was also noted.

In the Community Survey, the long list of potential LSNA criteria was presented in 2 ways: divided into 3 categories (i.e., social/cultural, physical, biological/ecological) and as a combined list with all criteria ordered randomly. This dual approach was taken based on input from the Technical Steering Committee, who felt that categories would facilitate ranking, while the long list would yield less biased results.

In the combined list, the 7 highest priorities, in the order ranked⁴, included:

1. hydrogeological importance (e.g., recharge/discharge areas that help sustain groundwater quantity and/or quality);
2. presence of unique ecological communities (e.g., bog wetland community);
3. functions as a linkage between larger natural areas;
4. presence of mature and/or old growth habitats (e.g., 60 - 100 years or more);
5. educational and/or scientific value;
6. presence of high quality, relatively undisturbed habitats (i.e., high proportion of native plants; soils and hydrology are relatively intact);
7. and, presence of representative ecological communities, flora and/or fauna (i.e., is an example of what is historically found in the Guelph area, such as Maple-Beech forest).

It should be noted that 'hydrogeological importance' rated as the highest priority both within and across categories, and should be included as a key criteria for identifying LSNA.

Within categories, criteria that ranked highest were:

Social/Cultural Criteria

1. educational and/or scientific value;
2. aesthetic value;
3. recreational value;
4. spiritual and mental health value;
4. and, historical value (ranked equally with spiritual/mental health value).

⁴ Where two criteria were equally ranked, the one that was ranked higher within categories was given higher status.

Physical Criteria

1. hydrogeological importance (e.g., recharge/discharge areas that help sustain groundwater quantity and/or quality);
2. area is adjacent to a watercourse or valleyland;
3. and, importance for moderating microclimate and improving air quality.

Biological/Ecological Criteria

1. presence of high quality, relatively undisturbed habitats (i.e., high proportion of native plants; soils and hydrology are relatively intact);
2. functions as a linkage between larger natural areas;
3. presence of unique ecological communities (e.g., bog wetland community);
4. presence of species of conservation concern;
4. presence of high numbers of different species and/or high numbers of different habitat types (i.e., is diverse) (ranked equally with species of conservation concern);
5. and, presence of mature and/or old growth habitats (e.g., 60 - 100 years or more).

On reviewing the results, as documented in [Appendix B](#), it is noteworthy that when all three categories were merged, except for hydrogeological importance, biological/ecological criteria took precedence over criteria in the other two categories.

Finally, some additions to the criteria were suggested via the survey and the meetings as follows:

Social/Cultural Criteria

- physical health and fitness;
- is accessible for people (i.e., is near residences or schools)
- is already in public ownership;
- the landowner is willing;

Physical Criteria

- could act as a sound barrier and/or light barrier;
- contains slopes and/or diverse topography;

Biological/Ecological Criteria

- is linked with natural areas in adjacent municipalities;
- functions well as faunal habitat;
- and, regeneration/naturalization is already underway.

At the end of Phase 1, City staff and the Technical Steering Committee decided that, of the various proposed categories, the physical (see note below) and biological/ecological criteria were more likely to be defensible on a scientific basis at Ontario Municipal Board (OMB) hearings.⁵ Therefore, many of the highest ranked physical and biological/ecological criteria have been integrated into the selected working criteria, while the social/cultural criteria have been excluded. The City recognizes the important social/ cultural (e.g., educational, recreational, aesthetic, historical, scientific) values provided by natural areas, but it is anticipated that these values will be captured through both LSNAs and undesignated natural areas.

⁵ No further research has yet been undertaken to confirm that this is the case.

Further, undesignated natural areas that are valued by the community can still be protected and/or restored through voluntary initiatives, and it is recommended that the City continue to support voluntary initiatives wherever they occur.

4.1.3 Input into Natural Heritage Maps

Respondents to the survey and meeting participants were also invited to review the natural heritage maps developed for this study (see [Maps 1 & 2](#) appended to this report), identify natural features of importance to them, add natural areas and features that were not identified, and recommend high priority natural features for protection. City staff and the Technical Steering Committee will consider these suggestions when determining which areas to recommend for the draft LSNA network as part of Phase 2 of this study. Although the focus of this study is on LSNAs, natural areas that do not meet the LSNA criteria as well as potential restoration areas will also be identified as part of Phase 2, and policy recommendations for these areas will also follow.

Comments and suggestions related to the maps included:

- The natural heritage information on the current maps needs to be updated. Some identified features have already been replaced or altered.
- Add a separate color for naturalized areas.
- Overlay the map with the City's trails map. In some cases, trails and corridors/linkages can serve complementary functions.
- Overlay the map with the Zoning map to assess the need for alterations to either or both.

At the Community Forum, participants were also invited to identify features that they felt should be removed from the current Greenlands System. Although no one at the forum suggested that any features be removed, that does not necessarily mean that all participants support the protection of all noted features. Further discussion regarding which areas will and will not be included will continue through subsequent stages of the NHS process.

5 Identification of Locally Significant Natural Areas (LSNAs)

Proactive municipalities, like Guelph, have recognized that in order to plan for truly sustainable communities they require a natural heritage system approach that is consistent with the Provincial Policy Statement (1997) which states: “*the diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible*”. In practice, this means developing natural heritage systems that work at multiple scales and effectively protect locally significant natural features as well as those designated at the Regional, Provincial and National levels.

As southern Ontario becomes increasingly urbanized, the pressures on the remaining natural areas are increasing. Although the Province legislated the protection of designated Provincially Significant Wetlands (PSWs) in southern Ontario in 1992, the same type of legislation has not yet been implemented for woodlands or other upland natural areas which are becoming increasingly uncommon in the landscape (Larson et al. 1999; City of Waterloo 1999; DSRC and MTRCA 1999; TRCA 1998; TRC 2001, 2003, 2004). The identification, and ultimately the designation, of LSNA is one tool municipalities can use to help ensure the protection of significant terrestrial features that provide ecological (and other) benefits to the municipality.

The current scientific thinking is also very supportive of taking ‘systems’ based rather than ‘features’ based approaches to developing linked habitat networks in fragmented landscapes(as we have in southern Ontario) (e.g. ,Villard et al. 1999; Austen et al. 2001; Joyal et al. 2001; Fahrig et al. 2002; Haila 2002; Lee et al. 2002; Fischer et al. 2004). Although going into a review of the state of the art in landscape ecology and conservation biology is beyond the scope of this study, a number of key concepts have emerged from these sciences over the past decade which can be summarized as follows:

1. The need for ‘systems’ or landscape based approaches to ecological / conservation planning.
2. The need to look at landscapes in a more complex way, recognizing a mosaic of different habitats and land-uses with different abilities to provide ecological ‘services’.
3. In cases where connectivity cannot be improved with existing natural features, it is necessary to examine potential restoration opportunities.

As Toronto Region Conservation’s Terrestrial Natural Heritage Strategy (2004) states: “*The fundamental flaw of ... traditional approaches is that they focus on special features, not broader environmental functions ... Natural processes ... can only be maintained if there is substantial natural cover, well distributed across the landscape*”.

The ‘systems’ approach typically manifests itself in the creation of a ‘cores’⁶ and ‘linkages / corridors’⁷ and can be applied at a variety of scales. However, the difficulty lies in determining exactly what is ‘core’ and what is ‘linkage / corridor’ habitat when doing landscape planning at a

⁶ ‘Core’ habitat basically refers to the habitat required for the main resident populations of plants and wildlife to survive and complete their life cycle.

⁷ ‘Linkage / Corridor’ habitat basically refers to habitat used to functionally connect populations of flora and fauna to allow for gene flow and ensure long-term survival

different scales for multiple species in a fragmented network where impacts and species responses are still poorly understood. Looking at the landscape as a mosaic of areas modified to different degrees and able to provide different ecological functions, rather than simplified blocks of habitat versus non-habitat provides some directions for moving forward.

Many of the watershed-level, subwatershed-level and secondary planning studies conducted in the City of Guelph (University of Guelph 1972; MMM & LGL 1993; Planning & Engineering Initiatives Ltd. et al. 2004; Totten Simms Hubicki et al. 1999; Ecologistics et al. 1998) have recognized that a sustainable and functional Greenlands system needs to include more than just the large wetlands and floodplains. Many of them have made recommendations at the watershed or sub-watershed level supportive of municipal protection of a wide range of terrestrial features including the types of features being proposed for inclusion in LSNA in this project. The City has already incorporated many of these recommendations into its Official Plan through the recognized Significant Woodlands and Other Natural Heritage Features (see Section 3.1 of this report for definitions), however it has not done so using a consistent criteria-based approach such as being put forward in this project.

Another, and rarely considered, rationale for identifying and protecting LSNA is the substantial cost savings to municipalities related to the protection of greenspace and the provision of storm water management and pollution retention/ filtration “services” provided by natural areas and tree cover in urban settings (Zegarac and Muir 1996; Walton 1998; Bolund and Hunhammar 1999; Moll and Kollin 2000; American Forests 2003). For example, using the cost involved in replacing the stormwater management, pollutant removal and soil erosion control functions performed by urban forests, researchers have estimated that during a 50-year life span, one tree will generate \$39,000 in oxygen, recycle \$45,500 worth of water, and clean up \$78,000 worth of air pollution⁸. Another comparable study found that a treed boulevard (3 m wide) with native understory plantings provides \$16,000 in air pollution reduction and other environmental benefits annually (Douglas College 2001). Several other studies have shown that maintenance of ‘green infrastructure’ costs taxpayers significantly less than residential developments in the long term (CMHC 1996; UBC 2000). This illustrates the direct economic benefits of protecting and integrating terrestrial natural areas in urban settings.

The following sections provide some relevant examples of criteria-based systems for identifying locally significant natural heritage features from other southern Ontario municipalities, and present the recommended working criteria for identification of LSNA in Guelph.

5.1 Precedents from Other Southern Ontario Municipalities

A number of municipalities in southern Ontario have already or are in the process of using the authority they have under the Planning Act to ensure that locally significant natural features (primarily terrestrial) are protected along with the provincially significant natural features (primarily aquatic) to create diverse and functional greenlands systems. A number of examples are presented in Table 4 along with some examples of criteria-based terrestrial feature protection systems developed as part of background or technical studies for southern Ontario municipalities.

⁸ Cited from www.treelink.org/docs/29_reasons.phtml and converted from \$US to \$CDN at a rate of 1.30.

Table 4. Examples of criteria-based systems for identifying locally significant natural areas in southern Ontario municipalities.

Adopted or Recommended Criteria	Associated Measures / Definitions
<p>City of Hamilton (Hamilton Natural Areas Inventory Report, 2003) ADOPTED ESA (Ecologically Significant Areas) CRITERIA</p> <ol style="list-style-type: none"> 1. Significant Earth Science Feature 2. Significant Hydrological Feature or Function 3. Significant Ecological Function <p>ADOPTED SIGNIFICANT SITE CRITERIA</p> <ol style="list-style-type: none"> 1. <i>Local significance</i> (the area is locally significant; e.g. the area is an isolated remnant natural area in an intensively developed urban or agricultural landscape) 2. <i>Restoration potential</i> (the area has potential to be restored such that it may then meet one or more of the ESA criteria) 3. <i>Aesthetic or historical value</i> (the area contains natural landscapes, including landforms, biotic communities or wildlife features which are considered of aesthetic, historical or cultural importance). 4. <i>Educational or research value</i> (the area could be or is used for educational or scientific purposes) 	<ol style="list-style-type: none"> 1. The area has a distinctive and unusual landform that is significant within the City, the province or Canada. 2. The area contributes significantly to one or more of: <ul style="list-style-type: none"> ➤ groundwater recharge; ➤ groundwater discharge; ➤ groundwater quality; ➤ flow attenuation; and ➤ surface water quality. 3. The area has 1 or more significant ecological functions based on the presence of: <ul style="list-style-type: none"> ➤ a high diversity of native species or biotic communities; ➤ biotic communities that are rare in the City, province or Canada; ➤ a good representative of: a biotic community characteristic of the natural landscapes of the City and not adequately represented in existing protected areas OR a pre-settlement biotic community; ➤ a large core natural area; ➤ essential habitat for continuation of species (e.g., significant areas of species concentrations, areas essential for certain stages of the life cycle, source areas for species); ➤ significant habitat for seasonal concentrations of wildlife; ➤ significant fish habitat; ➤ a link between natural areas or a corridor for wildlife; ➤ good natural conditions with few non-native species, particularly invasive non-natives; and ➤ habitat for species considered significant in the City, province or Canada.
<p>City of Mississauga (Mississauga Plan, General Policies, May 2003) ADOPTED NATURAL AREAS CRITERIA</p> <ol style="list-style-type: none"> 1. all Areas of Natural and Scientific Interest (ANSIs), Environmentally Sensitive or Significant Areas (ESAs) and other areas designated for outstanding ecological features; 2. areas with a Floristic Quality Index (FQI) <i>as specified</i>; 3. areas with a mean Floristic Co-efficient (FCo) <i>as specified</i>; 4. woodlands with sizes <i>as specified</i>; 5. areas that support Vulnerable, Threatened or Endangered (VTE) species; 6. woodlands with the potential to provide interior conditions; 7. woodlands that support old growth trees (\geq 100 years old); 8. provincially and locally significant wetlands greater than 2 ha; 9. the Credit River and Etobicoke Creek valleys; 10. woodlands with canopy species or vegetation communities uncommon to the City; 11. areas supporting regionally rare or significant plant species; 12. all areas that include natural landscape features (e.g., valleylands) 13. all watercourses, even if engineered, that have some riparian vegetation 	<ul style="list-style-type: none"> ➤ There are <u>3 levels of Natural Areas</u> ➤ Different criteria apply to each as follows: <ul style="list-style-type: none"> ○ <u>Significant Natural Sites</u> = criteria 1 through 9, with the following specifications; FQI \geq 40; FCo \geq 4.5; woodlands \geq 10 ha. ○ <u>Natural Sites</u> = criteria 2 – 4, 10 – 12, with the following specifications; FQI 25 – 39.99; FCo 3.5 – 4.49; woodlands 2 – 10 ha ○ <u>Natural Green Space</u> = criteria 4 and 13 with the following specifications; woodlands < 2 ha

Table 4. Examples of criteria-based systems for identifying locally significant natural areas in southern Ontario municipalities *cont'd.*

Adopted or Recommended Criteria	Associated Measures / Definitions
<p>City of Cambridge (Official Plan, Sept. 1999 Consolidation) ADOPTED LSNA (Locally Significant Natural Areas) CRITERIA: Locally Significant Wetlands OR areas fulfilling at least 3 of criteria (i) - (xii): (i) Ecologically Functional; (ii) Relatively Large Size; (iii) Interior Habitat or Species; (iv) Remnant Vegetation Communities; (v) Relatively High Diversity; (vi) Presence of or Habitat for Uncommon or Rare Species; (vii) Provides a Vital Ecological Function; (viii) Limited Ecological Resiliency; (ix) Special Physical Features; (x) Educational & Passive Recreational Value; and (xi) Aesthetic & Scenic Value.</p>	<p>(i) exhibits little or no signs of stress and appears to be in a state of self-maintaining balance; (ii) is of relatively large size or areal extent for natural areas in Cambridge; (iii) contains “woodland interior species” or habitats suitable for them; (iv) contains remnant vegetation communities that are good examples for the Cambridge area; (v) supports a moderate to high diversity of life forms due to varied topography, microclimates, soils, and/or damage attributes; (vi) contains uncommon, rare, threatened or endangered communities and species suitable for them; (vii) performs a vital ecological function; (viii) has limited resiliency such that further disturbance may compromise existing ecosystem integrity; (ix) contains ‘special’ physical features; (x) is important or has the potential for education and/or passive recreation due to location or features; and (xi) has a high aesthetic or scenic value in the Cambridge area.</p>
<p>City of London (Guideline Document for the Evaluation of Ecologically Significant Woodlands, October 4, 2000; Woodlands Policy Update 1, July 2003) RECOMMENDED CRITERIA FOR EVALUATION OF SIGNIFICANT WOODLANDS: 1. Site Protection 2. Landscape Integrity 3. Size & Shape 4. Diversity of Natural Communities & Associated Species 5. Presence of Endangered or threatened Species 6. Distinctive, Unusual or High Quality Natural Communities 7. Distinctive, Unusual or High Quality Landforms</p>	<p>1. Proximity to hydrological features & erosion and slope protection 2. Local woodland cover, linkages between patches, and distance between patches 3. Woodland Community Age, mean coefficient of conservatism, disturbance 4. woodland size, patch shape/interior, conservative bird species 5. ELC community diversity, ELC vegetation type and topographic diversity, species diversity & critical habitat components for amphibians 6. Presence or absence. 7. ELC Community Srank, presence/absence of specialized or rare species, age/size/distribution of large trees 8. Presence/absence of distinctive landforms.</p>
<p>Town of Fort Erie (Natural Areas Inventory: Final Draft, March 2003) RECOMMENDED CRITERIA FOR LSNA: 1. Designated Areas 2. Hydrologic & Climatologic Functions 3. Site Condition 4. Diversity 5. Special Features 6. Key Natural Heritage System Components 7. Representation 8. Educational, Recreational or Spiritual value. 9. Economic value</p>	<p>1. Areas designated as Regional ESA, PSW, LSW, ANSI or other protective environmental designations (e.g., regulatory floodlines, shoreline protection areas and hazard lands). 2. Areas that provide important hydrological functions including (e.g., climate & flood control, maintenance of air and water quality, maintenance of natural hydrologic balance, groundwater discharge/recharge-sediment and erosion control) 3. Areas that are relatively undisturbed, highly sensitive and/or offer excellent opportunities for restoration and enhancement as self-sustaining habitats. 4. Areas supporting moderate to high levels of biological and physical diversity. 5. Areas that contain significant landforms, species, communities or habitats. 6. Areas that are essential components of the Town’s Natural Heritage System, including core areas, linkages or enhancement zones. 7. Areas that contain good examples of the typical as well as less common array of fauna, flora, communities, soils and landforms present in the Town. 8. Area utilized by individuals/ organizations for the purposes of education recreation or spiritual purposes. 9. Area supports valuable natural resources or provides ecological services of economic importance.</p>

Table 4. Examples of criteria-based systems for identifying locally significant natural areas in southern Ontario municipalities *cont'd.*

Adopted or Recommended Criteria	Associated Measures / Definitions
<p>Region of Halton (<i>Halton 2002 Official Plan Review, Draft Technical Background Paper #6, April 2002</i>)</p> <p>RECOMMENDED CRITERIA FOR IDENTIFICATION OF SIGNIFICANT WOODLANDS:</p> <ol style="list-style-type: none"> 1. Terrain 2. Groundwater Quality & Quantity 3. Surface Water Quality & Quantity 4. Age 5. Woodland Patch Size 6. Distance From Perimeter 7. Landscape Connectivity 	<ol style="list-style-type: none"> 1. woodlands occurring on slopes $\geq 10\%$ 2. woodlands draining to first order streams 3. woodlands within 30 m of all watercourses 4. woodlands with old growth characteristics (e.g., uneven age distribution) 5. woodlands ≥ 2 ha in urban areas; woodlands in rural areas south of Escarpment ≥ 4 ha, north of Escarpment ≥ 10 ha 6. at least 4 ha of interior woodland at least 100m from the woodland perimeter 7. corridors and linkages within 50 m of a major creek or river edge
<p>Region of Waterloo (<i>Regional Official Policies Plan, Dec. 1998 Consolidation</i>)</p> <p>ADOPTED CRITERIA FOR IDENTIFICATION OF ENVIRONMENTALLY SENSITIVE POLICY AREAS (ESPA):</p> <p><u>Primary Criteria:</u> Provincially or Regionally Significant ANSI</p> <p><u>Secondary Criteria:</u></p> <ol style="list-style-type: none"> i) Unique Ecological Communities ii) Uncommon or Remnant Habitats iii) Significant Size of Habitat iv) Habitat for Significant Species <p><u>Tertiary Criteria:</u></p> <ol style="list-style-type: none"> i) Habitat Diversity ii) Significant Ecological Function (i.e., hydrological) iii) Linkages or Corridors iv) Migratory Habitats v) Unique Landforms 	<p><u>Primary Criteria:</u> Be identified as Provincially Significant Life Science Area of Natural and Scientific Interest (ANSI), Regionally Significant Life Science ANSI, or a Provincially Significant Earth Science ANSI</p> <p><u>Secondary Criteria:</u></p> <ol style="list-style-type: none"> i) comprise ecological communities deemed unusual, of outstanding quality or particularly representative regionally, provincially or nationally; ii) contain critical habitats which are uncommon or remnants of once extensive habitats such as old growth forest, forest interior habitat, Carolinian forest, prairie-savanna, bogs, fens, marl meadows, and cold water streams; iii) provide a large area of natural habitat of at least 20 ha which affords habitat to species intolerant of human intrusion; or iv) provide habitat for organisms indigenous to the Region recognized as nationally, provincially, or regionally significant; or <p><u>Tertiary Criteria:</u></p> <ol style="list-style-type: none"> i) contain an unusual diversity of native life forms due to varied topography, contain microclimates, soils, and/or drainage regimes; ii) perform a vital ecological function such as maintaining the hydrological balance over a widespread area by acting as a natural water storage discharge or recharge area; iii) provide a linking system of relatively undisturbed forest or other natural habitat for the movement of wildlife over a considerable distance; iv) serve as major migratory stop-overs; or v) contain landforms deemed unusual or particularly representative at the regional scale.
<p>Federation of Ontario Naturalists (<i>Suggested Guidelines for the Identification of Significant Woodlands in Southern Ontario, DRAFT, February 2004</i>)</p> <p>RECOMMENDED CRITERIA FOR IDENTIFICATION OF SIGNIFICANT WOODLANDS</p> <ol style="list-style-type: none"> 1. woodland size 2. hydrological linkage 3. forest interior 4. connectivity 5. slope 	<p>Recommended thresholds:</p> <ol style="list-style-type: none"> 1. for planning areas with less than 5% forest cover; all woodlands 2. woodlands within 30 m of any hydrological feature (e.g., streams, wetlands, lakes, headwater sources, catchment areas of first order watercourses) 3. any woodland with at least 4 ha of interior 100m from the woodland edge 4. any corridors as defined by the municipality 5. any woodland on slopes $\geq 10\%$ or on soils subject to wind and water erosion

Table 4. Examples of criteria-based systems for identifying locally significant natural areas in southern Ontario municipalities *cont'd.*

Adopted or Recommended Criteria	Associated Measures / Definitions
<p>Toronto Region Conservation Authority (<i>Environmentally Significant Areas Criteria</i>, Oct. 22, 1993).</p> <p>ADOPTED ESA (Ecologically Significant Areas) CRITERIA:</p> <ol style="list-style-type: none"> 1. Unique Landforms 2. Significant Hydrologic Function 3. Linkage or Corridor Function 4. Habitat for Significant Species 5. Presence of Significant Species 6. Unique, High Quality or Highly Diverse Habitats 7. Unique Ecosystem 8. Significant Size (for area-sensitive species) 9. Provincially Designated Natural Heritage Feature 	<ol style="list-style-type: none"> 1. The area represents a distinctive and unusual landform or other geological feature. 2. The area serves a water storage function and/or a groundwater recharge/discharge function. 3. The area provides a linkage or corridor function between sites that are of terrestrial or aquatic biological importance, and which depend upon the linkage/ corridor for their continuation. 4. The area is essential as habitat for the continuation of significant terrestrial or aquatic species, populations, or concentrations of species, including migratory stop-over or staging areas, breeding or spawning areas, and wintering yards. 5. The area provides habitat for indigenous terrestrial or aquatic species that are considered to be rare, endangered, threatened or vulnerable within the MTRCA region, Ontario or Canada. 6. The area contains an aquatic or terrestrial ecosystem which has limited representation in the MTRCA region, Ontario or Canada. 7. The area contains an aquatic or terrestrial ecosystem which has limited representation in the MTRCA region, Ontario or Canada and/or is a small remnant of a particular habitat which has virtually disappeared with tin the MTRCA region. 8. The area is of sufficient size o provide habitat or potential habitat for species intolerant of disturbance and encroachment, and those requiring extensive blocks of habitat. 9. The area has been identified or classified by the Province of Ontario as a Significant Natural area (Area of Natural and Scientific Interest – Life or Earth) OR Provincially significant Wetland (Class 1, 2 and 3).
<p>Oak Ridges Moraine (<i>Series of Technical Papers for designation of natural heritage features by the OMNR, Final Drafts Feb. 2004</i>)</p> <p>Natural Heritage Features on ORMCP Lands</p> <ol style="list-style-type: none"> 1. Significant Woodlands 2. Significant Wildlife Habitat 3. Landform Conservation Features 4. Key Natural Heritage Features 5. Hydrologically Sensitive Features 	<ol style="list-style-type: none"> 1. ≥ 4 ha in the Countryside or Settlement Areas; ≥ 0.5 ha in the Natural Core or Natural Linkage Areas; ≥ 0.5 ha in key natural heritage or hydrologically sensitive feature 2. Seasonal concentration areas, rare vegetation communities, specialized habitats for wildlife, habitat for species of conservation concern, and animal movement corridors 3. Category 1 – lands with slopes in excess of 10%; with distinctive landform features such as ravines, kames and kettles; and/or with a high diversity of land slope classes. Category 2 – lands with 20 – 50% coverage by Category 1 lands.
<p>County of Wellington (<i>South Wellington Environmentally Sensitive Areas Study, September 1976</i>).</p> <p>RECOMMENDED CRITERIA FOR SELECTING ESAS:</p> <ol style="list-style-type: none"> 1. Distinctive or unusual landform in the municipality, Ontario or Canada 2. Provides a vital ecological function (e.g., hydrologic) 3. Plant communities of unusual or high quality in the municipality, Ontario or Canada 4. Unusual or poorly represented habitat in the municipality, Ontario or Canada 5. High diversity of biological communities 6. Habitat for Regionally, Provincially or Nationally rare or endangered species 7. Large area 8. Vital linkage between natural areas 9. Combination of landforms and habitats with high aesthetic value 	<p>N/A</p>

Other initiatives in this area of policy development currently underway include the City of Brampton which is developing a criteria-based Open Space System for its Northwestern quadrant, the Region of Waterloo which is developing a criteria-based system for the identification of Environmentally Sensitive Landscapes, and the Region of York completing a criteria-based significant woodlands study that will provide recommendations for identifying and designating locally significant woodlands.

5.2 Recommended Working Criteria for & Definition of LSNA in Guelph

Although the focus of the inventory component of this project will be on terrestrial features, the screening for LSNA will include terrestrial as well as aquatic features. This approach is not unique and has been adopted by many natural area studies conducted by other municipalities in southern Ontario (e.g., Eagles et al. 1976; Gartshore et al. 1987; TRCA 1993; Geomatics 1996; Heagy 1993; Heagy 1995; Dwyer & Lindsay 2003; Dougan & Associates 2003) and elsewhere. This is because self-sustaining natural areas typically contain a range of vegetation types, and include both aquatic and terrestrial features, that contribute to the site's significance and are critical to the life cycles of many of the species that live in these areas. For example, many species of amphibians spend most of their lives in wooded areas but require nearby ponds for breeding in the spring (e.g., Joyal et al. 2001; Helferty 2002). While we recognize that it will ultimately be necessary to distinguish different feature types and develop feature-specific policies for integration into the City's Official Plan, a landscape ecology "systems" approach was adopted at this stage of the project in order to determine what is ecologically significant at a City-wide scale. As a result, each criteria is to be applied to a defined Natural Area within the City which consists of one or more contiguous ELC polygons (see [Section 7](#) for specific methods).

The 8 criteria presented in [Table 5](#) were drawn from a comprehensive list of criteria developed for this project (see [Appendix B-3](#)) and refined based on:

- the project Team's knowledge of existing planning protection;
- defensible ecological or landscape ecology theory and concepts;
- the type and quality of natural heritage data available;
- the ability of the criteria to be applied equitably to natural areas of varying size and composition;
- the ability of the criteria to be easily understood and applied;
- useful elements from comparable studies elsewhere in southern Ontario;
- input from the City and Technical Steering Committee; and
- input from the key stakeholders and the community.

Notably, the criteria presented in [Table 5](#) are working criteria that will be subject to refinement and possible modification during Phase 2 of the NHS once data related to the size, representation and quality of terrestrial habitats is collected and analyzed. Notably, at present, Criterion #1 is considered Primary (i.e., any Natural Area fulfilling this criterion will automatically be considered an LSNA), and the remaining criteria are considered Secondary and equally weighted. However, how many Secondary Criteria will be required to fulfill LSNA status has been left open at this time and will be determined as part of Phase 2.

Table 5. Working criteria* for Locally Significant Natural Areas (LSNA) in the City of Guelph.

Criteria	Description	Measure(s)
1. Provincially and Nationally Designated Natural Heritage Features	Natural Areas supporting features and/or functions recognized as significant at the national/ provincial level and regulated or managed through existing legislation and policies.	Natural Areas containing any of the following: <ul style="list-style-type: none"> • Provincially Significant Wetlands [PSW] • Floodplains • Provincially Significant Areas of Natural & Scientific Interest [ANSI] • Habitat for Threatened & Endangered Species^o • Provincially Significant Woodlands^o • Provincially Significant Valleylands^o • Provincially Significant Wildlife Habitat^o
2. Hydrological Significance	Natural Areas that provide fish habitat, flood control, maintenance of water quality and natural hydrologic balance, groundwater discharge/recharge, and sediment and/or erosion control.	Natural Areas containing any of the following: <ul style="list-style-type: none"> • Locally Significant Wetlands [LSW] • Fish Habitat • Permanent and intermittent streams • Kettle lakes/ponds • Groundwater recharge / discharge areas
3. Landform Conservation Value	Natural Areas that contain distinctive landforms (eg., kames, kettles, drumlins, moraines) and / or areas with steep slopes (outside of floodplains).	Natural Areas containing: <ul style="list-style-type: none"> • kames, kettles, drumlins or moraines • all wetlands and associated springs or poorly drained soils' • steep slopes (in excess of 15% and at least 2 m high)'
4. Habitat Diversity	Natural Areas supporting relatively high levels of habitat diversity.	The top quartile of Natural Areas containing the most distinct habitat types (i.e., (ELC Communities).
5. Habitat Size	Natural Areas able to provide habitat for area-sensitive wildlife species.	<i>The City's current Greenlands System recognizes all woodlands of 1.0 ha or more as "significant" and meadows of various sizes are included as "Other Natural Heritage Features". The size of woodlands and meadows to be recommended as locally significant for this project will be based on data analyses conducted as part of Phase 2 of this project and guidelines from relevant studies.</i>

Table 5. Working criteria* for Locally Significant Natural Areas (LSNA) in the City of Guelph cont'd.

Criteria	Description	Measure(s)
6. Uncommon or Representative Habitats	Natural Areas that contain locally uncommon habitat types, or habitat types that are well represented in the City.	Natural Areas containing any of the following: <ul style="list-style-type: none"> • Locally uncommon terrestrial ELC communities (eg. the top quartile of most uncommon ELC communities). • Locally representative terrestrial ELC communities (eg. the top quartile of most common ELC).
7. Presence of Significant Species	Natural Areas that contain species considered significant in the County, Province or Country.	Natural Areas containing any of the following: <ul style="list-style-type: none"> • Species considered vulnerable, threatened or endangered at the Provincial or National level. • Plant species classified as rare at the regional level by the Flora of Wellington County. • Wildlife species included in the Significant Wildlife Species of Wellington County list.
8. Supportive Ecological Functions	Natural features that have limited ecological value in isolation, but contribute to the overall resiliency of a given Natural Area.	<ul style="list-style-type: none"> • Natural lands that currently provide linkage functions between ELC Communities within a given Natural Area. • Natural lands well-positioned within the landscape to provide linkage between separated Natural Areas within the City or between Natural Areas and greenspace in the surrounding County. • Natural lands well-positioned within the landscape to protect and/ or enhance the habitat quality of nationally or provincially designated natural heritage features (as listed in Criteria #1). • Relatively small Natural Areas (e.g., less than 2 ha) that are close enough to larger natural areas or to each other (i.e., within 100 m) to provide alternate habitat for some species.

* These criteria will be used to develop draft LSNA mapping for Phase 2 of this project and may be subject to revision and refinement based on the Phase 2 results.

° No such natural heritage features have been designated at the Provincial level within the City of Guelph to date, however these have been included for completeness and in case any new designations should be made.

' As per the GRCA Wetlands Policy (2003).

The recommended working definition for LSNA in Guelph, based on the working criteria, is:

“LSNAs are intended to capture Natural Areas in the City of Guelph that make a significant contribution to the City’s Greenlands System by:

- (a) providing important hydrological functions, habitat diversity, habitat for area-sensitive species, or supportive ecological functions, or
- (b) encompassing landforms, ecological communities or habitats, or species considered significant at the local level”

A preliminary list of 6 working criteria was submitted to the Technical Steering Committee (TSC) and the City in the May 27, 2004 Phase 1 Draft Report, and was discussed at the June 24, 2004 TSC Meeting. A second version of these criteria (along with a revised Phase 1 Draft Report) was reviewed and discussed with the TSC January 19, 2005 at which time general consensus was obtained as to the content and direction of the report. The final working criteria presented here are basically the same as those presented in the revised Draft (dated Jan. 5th, 2005) with minor clarifications based on feedback from the City and TSC at the last meeting. A brief discussion of some of the issues related to the various criteria and some of the key scientific rationale behind each one is provided below.

CRITERION #1. Provincially and Nationally Designated Natural Heritage Features

The purpose of this criterion is to capture all natural areas that have already been identified and designated by a higher tier of government or jurisdictional organization (i.e., in this case, the OMNR and the City) and will not be re-examined by this project. The assumption is that these features have been shown to have ecological attributes considered significant at the national and/or provincial level, and by default also have significance at the local level.

Originally, Criterion #1 included natural features designated at all levels (i.e., national, provincial and local), but was revised so that locally designated features were pulled out of this criterion and moved to others because part of the mandate of this project is to re-examine and evaluate locally significant natural areas. Although there was some discussion by the TSC about removing the nationally/ provincially designated features from this criteria list entirely because more restrictive legislation applies to those features (i.e., no development is permitted within the feature itself), this has not been done because LSNA are being identified based on ecological criteria irrespective of the different planning designations and policy implications. Once LSNA have been identified, then the differential policies that apply to specific habitat types within them will be applied or developed where required.

CRITERION #2. Hydrologically Significant Areas

Natural features play an important role in limiting soil erosion, attenuating runoff, controlling groundwater discharge and recharge, and maintaining water quality and quantity. This role is more pronounced in urbanizing areas where the hydrologic balance is being altered by the replacement of natural cover by impervious surfaces (Walton 1998; Bolund and Hunhammer 1999; Diamond et al. 2002; American Forests 2003). Although these functions have a number of benefits to people (especially in a City like Guelph which uses its groundwater for drinking) the emphasis for this project is those terrestrial areas that are important in helping sustain natural

hydrologic balance and provide critical habitat for the significant plants and wildlife in the City. Notably, this criterion was the highest ranking one through the community consultations. Given that PSW and regulated floodplains are already captured by Criterion #1, the only remaining areas considered significant in terms their hydrologic contributions to the ecological significance of an area are: (a) Locally Significant Wetlands (LSW) (b) fish habitat (c) permanent and intermittent streams, (d) kettle lakes/ponds, and (e) groundwater recharge / discharge areas.

CRITERION #3. Landform Conservation Value

The diversity of landform is known to directly effect hydrological and ecological interactions, as has been well-documented for the Oak Ridges Moraine (Diamond et al. 2002; OMNR 2004) which has an abundance of kettle wetlands as also occur in the south end of Guelph. For the purposes of this project, *landforms of conservation value* are defined as Natural Areas containing: (a) kames, kettles, drumlins or moraines, (b) all wetlands and associated springs or poorly drained soils, and (c) steep slopes (in excess of 15% and at least 2 m high). Both (b) and (c) are consistent with the GRCA's Wetland Policy (2003) and were recommended for inclusion under this criterion by the GRCA representative on the TSC (T. Zammitt, pers. comm. Jan. 2005).

Notably, a 15% slope is relatively conservative and a minimum of 10% slopes has been part of the recommendations of several progressive planning / technical documents for southern Ontario natural area conservation (Halton 2002; OMNR 2004; FON 2004). The inclusion of 15% slopes as well as all wetlands recognizes the significance of kettle wetland habitats in Guelph, as well as some of the smaller temporary wetlands in the landscape that can provide critical habitat to amphibians.

From a terrestrial habitat perspective in the context of Guelph, one key function of varied topography is that it provides opportunities for the presence of seasonal wetlands or pools in association with wooded upland habitats which is a critical requirement for many amphibians, a wildlife group considered to be a key indicator of ecosystem health (TRCA 1998; DSRC & MTRCA 1999; TRC 2001; PEIL et al. 2004). The research on herpetofaunal use of the landscape which has emerged over the past few years also supports the importance of preserving both 'core' and associated habitats, as well as the theory that small habitat patches can be critical to some species. While life-cycle patterns of amphibians are variable (i.e., some spend most life cycle in wooded areas, some spend it in wet areas), all species require; (1) a combination of high quality forests and wetlands, (2) vegetated corridors that allow for movement between upland and wetland habitats, and (3) vegetated corridors that allow dispersal and movement between populations for their long-term survival (Helferty 2002; Guerry and Hunter 2002; Regosin et al. 2003; Joyal et al. 2001; Semlitsch and Bodie 2003).

The Region of Waterloo ESPA, Toronto Region ESA, and County of Wellington ESA designations also include unusual or representative landforms as a criterion, and the FON recommends using this as a criterion for determination of significant woodlands (see [Table 4](#)).

CRITERION #4. Habitat Diversity

Preservation of habitat diversity on a variety of scales is recognized as another cornerstone in building sustainable natural heritage systems and is especially important for the various species of

birds and amphibians that can persist in an urban setting (Forman 1995; Marsh 1997; OMNR 2000; Austen et al. 2001; Joyal et al. 2001; Fahrig et al. 2002; Helferty 2002; Lee et al. 2002; TRCA 2004). Protecting a mosaic of natural habitat types in contiguous blocks in a given landscape ensures protection of the range of natural ecological communities in the City and thereby ensures habitat for a broader range of plant and wildlife species, and provides a broader range of ecological functions.

As part of Phase 2, a City-wide Ecological Land Classification (ELC) will be undertaken and Natural Areas comprised of 1 or more contiguous ELC polygons will be delineated (see [Section 7](#) for a detailed methodology). Natural Areas containing a relatively high number of ELC communities will be determined to have a high degree of natural habitat diversity and to fulfil Criterion #4. Based on the available data, this will need to be done at the coarsest ELC level, ELC Community Series, to be consistently applied across the City. Statistical analyses will be conducted using the number of ELC Community Series types per Natural Area as the critical variable, and approximately the top 25% of the Natural Areas will be considered to be highly diverse within the context of the City of Guelph. While the top 25% is expected to capture Guelph's most diverse natural areas in terms of habitat types, this number may be modified based on the results of the Phase 2 analyses.

CRITERION #5. Habitat Size

The basic rationale behind protecting a minimum size of habitat is that certain groups of wildlife require a certain minimum area in order to survive and breed. This area varies (as it does with wildlife corridors) depending on the species targeted for protection. In the context of Guelph, we know that the only large mammals are deer and that key area-sensitive species of concern are breeding birds.

According to the OMNR (2000), the larger and least fragmented forest stands within a planning area will support the most significant populations of area-sensitive forest birds. These forests should cover about 30% of the regional landscape to provide minimal conditions for these species and include several large woodlands of at least 30 ha. For area sensitive grassland bird species, large grassland or meadow areas are required that also need to be defined depending on the species in question. For example, the endangered Henslow's Sparrow requires at least 30 ha, Bobolinks, Savanna Sparrows, Grasshopper Sparrows require at least 10 ha, and at least 1 to 2 ha may be adequate breeding habitat for 1 or 2 pairs of birds of some species.

The City's current Greenlands System recognizes all woodlands of 1.0 ha or more as "significant" and meadows of various sizes are included as "Other Natural Heritage Features". The size of woodlands and meadows to be recommended as locally significant for this project are yet to be determined and will be based on data analyses conducted as part of Phase 2 of this project and guidelines from relevant studies.

CRITERION #6. Uncommon or Representative Habitats

All the significant communities or habitats recognized at the National or Provincial level in Guelph are captured under the designated areas covered under Criterion #1. This criterion is

therefore intended to capture habitat types that are classified provincially rare by the NHIC (i.e., S1, S2 or S3), locally uncommon ELC communities, and locally common ELC communities.

There are no standardized definitions for what constitutes a regionally or locally rare habitat in Ontario, however there are standards for Provincially rare species and natural communities as established by the Natural Heritage Information Centre (NHIC) and the OMNR (see <http://www.mnr.gov.on.ca/MNR/nhic/glossary/srank.cfm>). These so-called “SRANK” Definitions identify 3 levels of rarity as follows:

S1 = Extremely rare in Ontario; usually 5 or fewer occurrences in the province or very few remaining individuals; often especially vulnerable to extirpation.

S2 = Very rare in Ontario; usually between 5 and 20 occurrences in the province or with many individuals in fewer occurrences; often susceptible to extirpation.

S3 = Rare to uncommon in Ontario; usually between 20 and 100 occurrences in the province; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances. Most species with an S3 rank are assigned to the watch list, unless they have a relatively high global rank.

These numbers can be used to provide guidance at the local or regional scale, in conjunction with the results of statistical analyses conducted on the aerial extent of different ELC communities within the City. Those ELC communities having the smallest aerial coverage within the City will be considered unusual.

Although there is no known “old-growth” forest habitat in Guelph, there are some areas of mature forest considered worthy of protection. Although definitions of “mature” forest may vary depending upon tree species, generally these sites are characterized by having a large proportion of trees in moderate to older age classes, many of them over 60 years old, as well as a range of tree sizes, an uneven canopy with scattered gaps, and fallen logs in various stages of decomposition. These older forests have the potential to support a high diversity of wildlife species (OMNR 2000) and, given their scarcity in the City, will be captured under this criterion.

Natural areas containing wooded or forested habitats are amongst the most highly valued and least common natural features in Guelph, as is recognized in the current Official Plan (see [Section 3](#)). However, it takes more than just woodlands to make a functional and diverse natural heritage system. In Guelph, we know that prior to settlement by Europeans there were large tracts of woodlands, as well as many wetlands (a number of which are still present today) and some grassland or meadow areas. Therefore, in order to have a Greenlands System that provides as many ecological functions as possible within the constraints of existing and anticipated urbanization, it is critical to protect the full range of habitat types including types that are common or representative.

For the purposes of identifying representative ELC communities, we will also use statistical analyses conducted on the aerial extent of different ELC communities within the City, but will select those communities with the greatest aerial coverage within the City as representative. While it may seem counter-intuitive to protect what is common, in the current climate of increasing urbanization and agricultural intensification, many previously overlooked natural areas are increasingly subject to development pressures to the extent that features and species that were once common in the landscape are becoming rare. As Dettmers (2003) points out, the practice of conserving only ‘high’ quality natural features (e.g., mature forests) in the northeastern United

States has led to the decline of younger forests and shrublands to the point that a significant decline in the abundance of bird species requiring these types of habitat has occurred. Closer to home in the Greater Toronto Area the number of species of conservation concern has risen to 590 (TRC 2004) partially as a result of protecting 'core' natural areas at the expense of other natural areas. The rationale behind this particular measure is to take a proactive approach and protect some of what is common as well as what is uncommon or rare in order to prevent any further species losses.

CRITERION #7. Presence of Significant Species

The presence of significant species is also a standard component in recognition of significant natural areas and development of sustainable natural heritage networks (Gartshore et al. 1987; Heagy 1993; Heagy 1995; Geomatics 1996; Regional Municipality of Waterloo 1998; Region of Halton 2002; TRC 2003; Dwyer and Lindsay 2003). Nationally and Provincially significant species records can be accessed from the NHIC database. Regionally significant vascular plant and wildlife species lists will be developed as part of Phase 2 of the NHS. At present, the rare species list included in the Flora of Wellington County (Anderson and Frank 2004) will be used for this project, however efforts are underway to organize a committee of local botanists and taxonomists who will use this flora as a basis for developing a significant plant list for the County. A list of Regionally Significant wildlife species for Wellington County is being developed in-house by the consulting team and subject to extensive peer-review by local naturalists and experts. Notably, significant species lists have been developed for the County rather than just the City to be consistent with what has been done in other comparable jurisdictions (e.g., City of Hamilton, Region of Waterloo, Greater Toronto Area) and because of the recognized need to look at a broader context when examining species occurrences.

CRITERION #8. Supportive Ecological Functions

This criterion is designed to capture natural areas and habitats that, in isolation, are of relatively poor quality (i.e., no presence of or use by any significant species, relatively high proportion of non-native plants) but because of their position in relation to other natural areas they provide protective functions, linkage functions, and may also contribute to overall diversity of a given area. Examples might include successional habitats such as former agricultural areas, plantations or quarries that have been abandoned and become naturalized. This criterion is also intended to capture small habitat patches that have become isolated due to human activities but are still considered close enough to each other or to larger blocks of natural habitat to act as potential habitat refuges for species more tolerant of habitat fragmentation.

Scientific research, and practice, continues to demonstrate that maintaining terrestrial linkages and connectivity between natural habitats ensures better ecosystem functioning than having a number of isolated natural areas (Noss 1993; Naiman et al. 1993; Forman 1995; Fleury and Brown 1997; Beier and Noss 1998; Fahrig 2002; TRCA 2004). Linkages can function on a variety of scales and are typically landscape features that help connect together 'core' natural habitat features such as woodlots and wetlands. Linkages can vary in size (width and length) as well as quality (species diversity and structure).

The presence of linkages on multiple scales ensures that the best current knowledge of how to design sustainable natural heritage systems in urbanizing areas which dictates that an "ideal" system includes blocks of natural habitat linked together by corridors of natural or semi-natural habitat (e.g., Heagy 1995; Geomatics International Inc. 1996) is fulfilled to the greatest extent possible within the existing landscape constraints in Guelph. Notably, there is some research demonstrating the potential negative impacts of connecting habitat patches with linkages or corridors (eg. increased immigration rates may facilitate the spread of undesirable, non-native species of plants and animals or facilitate the spread of disease among core habitats). However, the bulk of the evidence shows that, in a fragmented landscape, the benefits of connectivity far outweigh the potential costs (Naiman et al. 1993; Beier and Noss 1998; Environment Canada et al. 1998).

In the context of Guelph, most major ecological linkages and corridors have already been identified in various watershed/ subwatershed studies and recognized in the City's Official Plan (ie. the Linked Open Space Concept) and Wellington County's Greenlands System. In this project, most of these City-wide and Regional scale linkages will be captured through the identified Natural Areas which, in addition to providing in situ habitat and other ecological functions, provide linkage functions amongst themselves and to natural areas outside the City boundaries.

Notably, there are also some potential ecological linkages (called Restoration Linkages in this project) considered of equal importance between Natural Areas in the City, and between Natural Areas in the City and greenspace in the surrounding County, that have not been incorporated into LSNAs because they currently classified as cultural rather than natural in terms of their land use. These are discussed in the [Section 5.3](#).

While research continues to show that larger patches of contiguous natural area, and particularly forested area, are required for the survival of many area-sensitive⁹ birds (Austen and Bradstreet 1996; review by Lundmark 2004), recent studies show that the presence of smaller patches of forest in the surrounding landscape also contributes to the overall abundance of area-sensitive bird species (Austen et al. 2001; Lee et al. 2002; Davis 2004) and that both the extent of habitat cover as well as its configuration are directly related to bird species abundance (Villard 1998; Villard et al. 1999). Similarly, while herpetofauna generally prefer large forested patches associated with permanent or seasonal wetlands, a number of species use multiple small wetlands for breeding and some of them require small ponds for their survival (Joyal et al. 2001; Semlitsch and Bodie 2003; Calhoun and Klemens 2002).

⁹ **Area sensitive species** are those that require large areas of suitable habitat in order to sustain their populations (OMNR, 2000). Area sensitive species are more susceptible to habitat loss and fragmentation than generalist species and therefore of greater conservation concern. Individuals from various wildlife groups may be considered area sensitive (e.g. amphibians, reptiles, birds and mammals), but most discussions related to area sensitive species usually refer to birds. Area sensitive bird species generally fall under 3 categories, depending on their habitat association: grassland, wetland and woodland area-sensitive birds.

5.3 Other Criteria Considered But Not Included

ESA (Environmentally Sensitive Areas): ESA were identified by Eagles et al. (1976) for the County of Wellington in a background study for the 1979 Official Plan Review. These areas were digitized roughly for this study (see [Map 1](#)) and, as can be seen in a comparison with [Map 2](#), have largely been protected within the City's current Greenlands system. However it was determined that it would not be practical to use these areas as criteria for identifying LSNAs within the City because the mapping is too dated.

Educational, Recreational, Health and/or Spiritual Value: Although recognizing the educational, recreational, health and/or spiritual values of a given area is considered important by the Consultants, the City and many stakeholders, the TSC decided that the natural science-based criteria were more defensible and would be easier to apply consistently than the proposed social criteria. The TSC felt that many of the areas meeting the ecological criteria for LSNAs would also provide the noted social values. To ensure that undesigned valued social spaces are still protected, the Consultants have recommended that the City continue to support voluntary initiatives on both designated and undesigned natural areas.

Restoration Linkages: Although potential linkages between Natural Areas in the City, and between Natural Areas in the City and other greenspace in the surrounding County, were originally included within the last LSNA criterion, the consultants decided to remove this component from the LSNA criteria and identify them as separate features because they are not natural at this time and likely require active management to restore them to a natural state. Nonetheless, these linkages are critical because they either (a) connect Natural Areas that will otherwise remain isolated, or (b) represent important enhancements to existing linkages that are extremely narrow and provide very limited linkage functions as they are (e.g., a hedgerow). Restoration Linkages ensure that Guelph's Natural Areas are linked to the greatest extent possible, thereby supporting a functional Greenlands System, and should be given the same degree of protection as LSNA and identified as the highest priority for restoration.

Potential Restoration Areas: Although one of this project's objectives is to identify potential restoration areas, it was agreed by the TSC that although these areas should still be identified as part of this project and incorporated into the overall NHS (as part of Phase 3 of this project), they did not warrant being included within the LSNA criteria because they cannot, in their present condition, be considered natural. As described in [Section 7](#) of this report, Potential Restoration Areas have been identified: (a) as lands well-positioned within the landscape to fill gaps in and/ or enhance delineated Natural Areas that have the potential to become naturalized or (b) as isolated natural or naturalized lands of lower quality (typically successional areas) that do not warrant inclusion in a candidate LSNA but could contribute to overall natural cover in the City.

6 Landowner Contact Program for Phase 1 & Beyond

The following recommendations for a Landowner Contact Program were developed in order to facilitate moving forward with field studies as well as other initiatives that involve private landowners. Given that many natural areas and/or adjacent lands in the City of Guelph are privately owned, outreach to private landowners is essential for:

- informing them about the NHS;
- informing them about natural areas on and/or adjacent to their land;
- informing them of any studies that are needed on their land;
- assessing their level of interest in protection, restoration and stewardship of natural features on their land;
- hearing and responding to their needs and concerns; and
- encouraging protection, restoration and stewardship.

Private landowners often lose trust in the process when their land appears on published maps¹⁰ and/or legal status changes before they have been consulted or informed. That approach is often considered too "top-down" and does not generally result in constructive relationships with landowners. Landowners should instead be consulted throughout the process.

Some efforts were made to include landowners in Phase 1 community consultations (as described in [Section 6.1](#) below), and some materials for a preliminary Landowner Contact package have also been provided to the City separately. Direct contact was made with those landowners whose natural features were identified for early site surveys (undertaken in April and May 2004), and where entry was required as part of Phase 2 of this project.

Further consultations with landowners will be undertaken in subsequent stages. Landowners whose features require further study, as well as those whose features are being considered for designation, will be contacted. In addition, it is recommended that the City continue to communicate with and encourage landowners who wish to protect natural areas outside of the designated NHS.

Recommendations for a more comprehensive Landowner Contact Program and additional support mechanisms are outlined in [Section 6.2](#) below. Recommended tools have been derived from the consultants' experience, a review of the *Landowner Contact Training Manual* available from the University of Guelph's Centre for Land and Water Stewardship (Hilts et al. 1991) and other available stewardship resources, a limited review of landowner contact tools utilized by other southern Ontario municipalities, a review of existing manuals and brochures available from the City, and input from the community consultations.

¹⁰ As recommended in [Section 8](#) of this report, the NHS maps were and should continue to be labeled as "Draft" and noted as being "subject to revision" until landowners have been approached.

6.1 Phase I Community Consultations

Although the timing and budget for Phase 1 allowed for only limited outreach to landowners, some steps were taken to inform them and garner their input at this stage. These included targeted mailings/emails, posting/circulation of public notices regarding the process, and some Survey questions specifically targeted to landowners. The number of landowners who came forward were relatively low, which may in part be due to the limited time frame for Phase 1. More landowners will be contacted as the NHS moves forward and there is more information regarding which lands are being considered.

A few landowners with both identified and unidentified natural features on their property attended the meetings and responded to the Community Survey. Participating landowners stressed that some private landowners are already stewarding their natural areas, and noted that local tax incentives would likely increase the level of stewardship, as the current municipal tax system favours other uses. Municipalities are limited in the tax incentives they can legally provide, but some form of financial incentive is recommended.

The Community Survey questions (see [Appendix B-3](#)) targeted to landowners were intended to assess the level of interest in stewardship and identify preferred landowner support mechanisms. Although there were only a small number of responses to these questions, it is interesting to note that *in-kind assistance with managing their natural features* was most often identified as a helpful support for landowners. There may be room to expand the assistance provided to private landowners by natural heritage NGOs (e.g., the Guelph Field Naturalists, the Speed River Land Trust, Evergreen), agencies and/or students. Private landowners would likely find that designating features as conservation easements would encourage more in-kind assistance, while allowing for a tax reduction.

A few landowners also mentioned current voluntary initiatives to protect or restore small spaces. Small spaces were also identified as valued features, through both the Survey and the Community Forum. Small spaces can act as microhabitats, contribute to linkages, corridors and buffers, enhance neighbourhoods, and/or be merged to create larger spaces. Although some small spaces and other natural areas may not be included in the official NHS, it is recommended that the City continue to support voluntary initiatives on undesignated features.

6.2 Landowner Contact Tools & Other Support Mechanisms

A letter template and text for a brochure targeted to landowners have been developed for use in Phase 2 of this project and provided to the City under separate cover. Landowners contacted during the course of the NHS should be provided with this information as part of the Landowner Contact Program.

This preliminary Landowner Contact package includes introductory information on:

- the NHS;
- formal and informal agreements to protect their natural features;
- existing tax incentive programs;
- some existing financial assistance programs;
- and, a few key educational resources for landowners.

Further development of landowner resources is recommended for future phases of the NHS. Specific recommended information and mechanisms include:

- information about:
 - natural features on their land;
 - existing protection mechanisms noted in the City's Official Plan¹¹ and by-laws;
 - a brief outline of relevant provincial and federal law;
 - updates on tax incentive programs and grants;
 - updates on educational resources;
 - guidelines for managing natural features;
- in-kind assistance from government agencies and/or NGOs to help manage the feature(s)¹²;
- awards or other community recognition;
- and, a formal City policy to allow for/encourage voluntary initiatives on small lots and other lands that are outside of the officially designated NHS.

Consideration should also be given to providing municipal financial incentives to further encourage stewardship. In addition, land securement by the City, GRCA, the Speed River Land Trust and/or other NGOs (e.g., Wellington County Stewardship Council, Guelph Field Naturalists, Federation of Ontario Naturalists, Nature Conservancy of Canada) should be pursued.

Although mailings, information on the City's website and public meetings are helpful, personal contact with landowners is perhaps the most important communication tool. At the very least, phone calls to individual landowners should be made. However, in-person discussion helps build positive relationships, so is preferred where possible. Personal contact can be made with individual landowners and/or through targeted workshops or focus groups that allow for several landowners to be approached simultaneously. As noted, landowners should also continue to be invited to participate in community consultations through follow-up phases of the NHS.

Finally, a Landowner Contact database should be maintained, in order to track landowners, the contact that has been made (including personal contact, attendance at workshops, etc.), resources that have been provided to them, and their level of interest in participating in the NHS.

¹¹ These include, as laid out in the Official Plan (Section 6.1.1.1): acquisition of lands by the City, request GRCA to acquire lands, enter into agreements with landowners (i.e., conservation easements), encourage landowners to preserve or convey land to a public agency or land trust; and implement municipal by-laws to protect lands.

¹² Landowners who require assistance with managing their natural features can also hire personnel.

6.3 Considerations for Working With Landowners

There are a few basic guidelines that should be remembered by personnel who are working with landowners. Some of these also apply to developers and other stakeholders. Like all members of the community, landowners are diverse, so some flexibility is required. A fair and friendly approach, in which landowners' needs and concerns are heard and addressed, tends to engender more support and is more democratic than a strictly enforced "top-down" approach.

Nevertheless, landowners do vary in their level of support for natural heritage protection. Some are already stewarding natural areas, others may be encouraged to take some steps, while still others will participate minimally.

Landowners also vary in their level of knowledge about natural heritage. In creating education and outreach tools for landowners, it is best to keep materials simple and succinct. Too much information and the use of overly technical language can be overwhelming for many landowners. Those who wish to seek additional information can be referred to other resources. Some landowners are already well informed, and well equipped to contribute to natural heritage protection. Supportive landowners can also help educate and act as role models for their peers.

Finally, landowners differ in the financial resources that are available to them. Where possible, financial incentives and/or in-kind assistance should be provided to aid those with modest resources in stewarding natural areas on their land.

7 Inventory Methodology & Monitoring Approach

The inventory methodology presented here is intended to provide specific direction for both the Phase 2 inventory work as well as any subsequent inventory work to be conducted in support of the NHS and LSNA assessment (as required).

The monitoring approach presented here is less specific than the inventory methods and is intended to provide the framework for a more detailed monitoring methodology to be developed as part of Phase 3 of this project.

Both the inventory methodology and monitoring approach have been designed in recognition of the fact that while inventory and monitoring are both essential aspects of identifying and protecting the City's significant natural heritage resources, there are normally limited resources available to conduct this work and so the approach needs to be as focused and as efficient as possible. The Natural Areas database which is to be developed as part of this project is a key tool that will facilitate environmental planning. In the City of Mississauga where they have had a comparable database for more than 5 years, the planners there have found that this resource helps guide the City with respect to proper use and management of these areas, and also provides a scientific basis for acquisitions when needed (from Notes on Protecting Natural Areas Workshop, North-South Environmental Inc., March 1, 2002). In addition, the inventory data collection has been limited to the terrestrial data required for accurate assessment of candidate LSNA (as per the working criteria laid out in Table 5), while the monitoring approach has been similarly scoped.

7.1 Inventory Methodology

Although it was originally hoped that all the Phase 2 work would be completed over the 2004 field season, it became necessary due to limited resources to partition this phase into 2 sub-components as follows:

- Phase 2A - to conduct preliminary wildlife surveys in the early spring of 2004, update the City's natural heritage mapping, create a City-wide natural heritage database focusing on terrestrial components, and develop draft LSNA mapping; and
- Phase 2B - to conduct comprehensive field assessments of proposed LSNA over the 2005 field season, and revise the LSNA criteria and mapping as required.

It is important to understand that the approach taken to identification of LSNA for this project is both a **“systems” approach and criteria-based**, and an approach comparable to the identification of ESA (Environmentally Sensitive Areas) in the City of Hamilton, ESPA (Environmentally Sensitive Policy Areas) in the Region of Waterloo, and Significant Natural Sites in the City of Mississauga, and LSNA (Locally Significant Natural Areas) in the City of Cambridge and Town of Fort Erie (shown in Table 4 and described in Section 5 of this report).

Using this approach means that in order to determine which areas are locally significant from an ecological perspective, the 1st step is to delineate *all* Natural Areas (regardless of any existing designations or land ownership), the 2nd step is to screen the Natural Areas through the established criteria, the 3rd step is to identify which Natural Areas meet which criteria and confirm which areas qualify as candidates for LSNA status, and the 4th step is to ensure the network of LSNAs is as well-linked and contiguous as possible through the identification of linkages and potential restoration areas.

Although it is recognized that the natural features most in need of study in the City are the terrestrial ones (i.e., woodlands, shrublands and meadows), it is not ecologically defensible to assess the significance of these features on a City-wide basis in isolation from the aquatic features that, in many cases, they are so closely associated with. Consequently, Natural Areas (that in some cases include aquatic as well as terrestrial features) will be used as the base reference units for field reconnaissance, data collection, and application of the criteria for local significance. However, the focus of this project will be kept to terrestrial features because:

- 1) the working LSNA criteria have been developed to (a) accept existing designations for aquatic features and (b) screen for qualities specific to terrestrial features; and
- 2) the field studies will focus on the terrestrial components of the Natural Areas.

7.1.1 Phase 2A Methods: Preliminary Field Assessments & LSNA Mapping / Database Creation

Preliminary Field Assessments

The field assessments for 2004 were limited to herptile surveys in selected areas (conducted in April 2004) and identification of major landscape changes that have occurred since 2000 not shown on the air photo base being used for this project.

Amphibian surveys were identified through Phase 1 as a high priority for 2004 since very few of these had been conducted to date in the City, and the presence of amphibians is considered a key indicator of ecosystem health and will help identify some of the City's candidate LSNA. Site selection was based on terrestrial natural features in the City thought most likely to provide habitat for frogs, toads and/ or salamanders by D&A's Wildlife Biologist (i.e., areas know to have sizeable natural features containing both wetland and upland components) outside of the Core Greenlands. These surveys are now complete and findings from them are to be integrated into the Phase 2A report.

Identification and confirmation of major landscape changes is to be primarily done through windshield surveys for Phase 2A. More comprehensive field assessments of the status of potential LSNA will be conducted using the methods described in [Section 7.1.2](#) as part of Phase 2B.

Natural Areas Mapping

For the purposes of identifying areas for consideration as candidate LSNA in the City of Guelph, it will be necessary to identify discrete land units (what we are calling "Natural Areas" for the purposes of this project) which can be evaluated using a suite of predetermined criteria (as presented in [Table 5](#)). Preliminary identification of Natural Areas is to be based on data derived

from remote sensing and secondary data sources, and refined as required following field surveys (Phase 2B). The specific methodology to be employed for delineating Natural Areas, as well as for identifying potential restoration/ enhancement areas, are described in the 3 steps below.

Step 1: Aerial Photo Interpretation and Ecological Land Classification

Digital orthogonally rectified aerial photography flown in April 2000 at a resolution of 35cm/pixel has been obtained from the GRCA and interpreted to identify discrete polygons according to Ecological Land Classification (ELC)¹³ system for southern Ontario (Lee et al. 1998). All lands are to be classified to the level of community series. Where available, vegetation community mapping from subwatershed studies, wetland evaluations and environmental impact studies will be utilized to verify and/or supplement the classification. The resulting land classification data will be entered into a GIS database developed for this project.

All natural ecological communities are to be identified using the most current version (8.0) of the Southern Ontario Ecological Land Classification Catalogue (Lee et al. 2004). Under this classification system “natural” communities include features such as forests, woodlands, savannas, wetlands, meadows and thickets. In contrast, “cultural” communities include built areas, agricultural lands, and artificially maintained or anthropogenic communities such as lawns.

Step 2: Identification and Delineation of Natural Areas

Natural Areas are to be generally defined as areas comprised of 1 or more contiguous ELC community(ies). This approach will ensure that ecological criteria can be evaluated at a scale appropriate for assessing significance at a City-wide level. The external boundaries of Natural Areas are to be established by the presence of roads, approved development and cultural communities (as defined in Step 1 above). The specific methods are laid out below.

Natural Areas are to be created by merging ELC polygons of natural ecological communities that are within the same subwatershed and are:

1. considered contiguous by virtue of not being separated by built-up areas (i.e., residential, commercial or industrial development), OR major roads (i.e., more than 2 lane); and/or
2. relatively close to each other (i.e., not separated by more than 100m) or connected to each other along a linkage feature such as a watercourse or hedgerow no more than 200m in length.

Hedgerows are only to be included in Natural Areas where they:

1. are immediately adjacent to 1 or more ELC communities; or
2. create or support close linkages between natural ELC communities (ie. no greater than 200m in length).

¹³ The ELC system is a tool for classifying natural heritage features and provides a standardized sampling method for ecosystem description, inventory and interpretation that is applicable across southern Ontario and has been the accepted industry standard for more than 5 years.

Natural Linkages will incorporate ELC communities and/or hedgerows and/or storm water management areas, be included in Natural Areas, and be identified based on:

1. existing opportunities within the current City boundaries;
2. existing opportunities in the landscape between Natural Areas defined within the City boundaries and greenspace in surrounding County; and
3. consideration for the Linked Open Space Corridors presented as Schedule 7 of the Official Plan (June 2002 Consolidation).

Cultural features not irreversibly transformed by residential, commercial or industrial development (e.g., manicured parklands, active agricultural fields, intensively managed plantations, rears of yards) that provide linkage opportunities where no other alternatives exist will be identified as outside of Natural Areas as Restoration Linkages (see below).

Recommended minimum widths for linkages used as wildlife corridors depends on the type of wildlife they are intended for and can range from 30 m to 300 m or more (Forman 1995; Beier and Noss 1998; OMNR 2000; Diamond 2002). In the context of the City of Guelph, which is already largely urbanized, linkages will primarily provide connectivity for small mammals and, in some cases amphibians, and may also be associated with existing or planned trails, and so no fixed minimum will be used.

Active agricultural lands and intensively managed plantations are not to be included in Natural Areas, but may be identified as Restoration Linkages and/or Potential Restoration Areas as described below.

Step 3: Identification of Restoration Linkages & Potential Restoration Areas

Restoration Linkages will be identified based on:

1. an identified need for a linkage between Natural Areas, or between a Natural Area and the surrounding County greenspace, where none exists;
2. an identified need for enhancement (i.e., widening) of a linkage where the existing linkage is narrow (e.g., a hedgerow);
3. consideration for the Linked Open Space Corridors presented as Schedule 7 of the Official Plan (June 2002 Consolidation).

Restoration Linkages may or may not be associated with a Natural Linkage, and will include cultural features not irreversibly transformed by residential, commercial or industrial development (e.g., manicured parklands, active agricultural fields, intensively managed plantations) that provide some opportunities for movement of flora and/or fauna.

Although recommended minimum widths for linkages used as wildlife corridors depends on the type of wildlife they are intended for and can range from 30 m to 300 m or more (Forman 1995; Beier and Noss 1998; OMNR 2000; Diamond 2002), a general rule of thumb is that a linkage width should be at least half its' length (Forman 1995; Environment Canada et al. 1998; Diamond et al. 2002) and so Restoration Linkages will be identified to widen existing narrow linkages wherever possible.

Potential Restoration Areas (PRAs) will be identified primarily for the purposes of improving the cohesiveness and/or connectivity of Natural Areas, as well as the overall Greenlands System, but will not be included in the Natural Areas because, as with the Restoration Linkages, their land cover types are not considered natural. Notably, these areas will be identified on a preliminary basis without regard for land ownership, but will be refined in consultation with affected landowners. These areas may include:

1. lands being actively managed for human uses (eg. agricultural fields, plantations) that are surrounded by identified Natural Areas or provide a potential linkage between identified Natural Areas;
2. sites where some naturalization is already occurring and where the structure and/or composition of the plant communities could be improved through some active management; and
3. other sites, primarily on City-owned lands, that have been significantly altered by some human disturbance or land-use (e.g., former gravel pit, dumping of fill) but where natural plant communities could become re-established with some active management.

Priority Restoration Linkages and PRAs will be identified based on (a) proximity to identified Natural Areas, (b) the existing land use being suited to naturalization, (c) the absence of any other existing connectivity between extant Natural Areas, and (d) the landowner (public or private) being supportive of this type of management. Other secondary PRAs may also be identified in the City.

Natural Areas Database

The Natural Areas Database to be developed for this project will allow for systematic screening of Natural Areas for consideration as candidate LSNA in the City, as well as retrieval of terrestrial natural heritage data for any Natural Area identified within the City.

This database will be designed using ESRI's ArcView 8.3™ and MS Access 2000™, and will be provided to the City in a format that is compatible with the City's existing and anticipated technical capabilities. The use of MS Access 2000™ will allow for data searches to be conducted independent of mapping queries for any of the identified Natural Areas, and for this data to be easily imported into an MS Excel or even Word format.

This Natural Areas database will:

- link natural heritage information (i.e., records of plants and wildlife) to discreet blocks of labeled Natural Areas and, where possible, to geo-referenced points in the City of Guelph;
- allow for terrestrial natural heritage data to be pulled up for a single or multiple Natural Areas;
- include information on plant and wildlife species recorded within each Natural Area (i.e., species common and latin name, current status and, if possible, floristic quality index [FQI]);
- include geodata related to the working LSNA criteria;
- include metadata (i.e., the source of the information and scale at which it was observed);
- provide a form interface for data entry that does not allow incomplete entries; and
- be easy to update by City staff or others.

Species data will be collected from all the available secondary source studies, and will be supplemented by primary data collected as part of Phase 2B. Specifically, plant and wildlife lists from all environmental impact studies (EIS) as well as watershed / subwatershed studies and Class Environmental Assessments (EA) with at least 50% of their study area within the City will be entered into the database and linked to the appropriate Natural Area(s).

Data Analysis & Development of LSNA Scenarios

Once the Natural Areas mapping and data entry is complete, various analyses will be conducted to provide information on the diversity and relative representation of different vegetation communities across the City. This will include an analysis of relative proportions of various types of ELC communities within the City, as well as proportions of overall greenspace. This will allow for a determination of what types of vegetation communities are rare or uncommon in the City, and provide area calculations that will help in establishing targets for types of greenspace cover within the City.

At this point it will also be possible to apply the working criteria for LSNA and determine which Natural Areas qualify as potential candidates for LSNA status based on the existing data collected through remote sensing analysis and secondary sources. Preliminary mapping will be developed illustrating which Natural Areas meet which criteria and ultimately a recommended LSNA network, as well as 1 or 2 other scenarios, will be presented to the Technical Steering Committee for review.

While some Natural Areas will consist of an isolated woodlot defined by a single Ecosite or Ecoelement type, others will be comprised of several ELC polygons contiguous with each other. This ecosystem-based approach recognizes the importance of recognizing a range of habitat types in order to:

1. provide habitat for a greater range of wildlife species (since many wildlife species rely on several types of habitat to complete their life cycle); and
2. establish a more sustainable natural heritage system.

Using this approach to identification of LSNA means that in some cases an entire Natural Area may be shown as fulfilling a particular criteria for local significance even though the criteria may only be applicable to a portion of the area.

Landowners concerned about the planning implications of this approach should be aware that it is not the intent of this project to try and make LSNA “no development” zones. Rather, we recommend (see [Section 8](#)) that LSNA be subject to a comparable process as is currently practiced for proposed developments, namely that an Environmental Impact Study be conducted to demonstrate no development in any provincially designated natural heritage features within the LSNA (e.g., Provincially Significant Wetlands) and that the remaining ecological features and/or functions that make the area an LSNA will be protected to the satisfaction of the City and reviewing agencies.

Assigning Status to Plant and Wildlife Species

Status for nationally or provincially significant plant and wildlife species will be assigned according to the latest standards established by COSEWIC, COSSARO and the NHIC. Regional status for

plants will be determined using the Flora of Wellington County (Anderson and Frank 2004). There is currently no list of regionally significant wildlife species for the County of Wellington, and so as part of this project the Consultants have offered to develop such a list for use in helping to identify LSNA. This list will be developed by D&A's Wildlife Biologist and subject to extensive peer-review by local wildlife experts.

7.1.2 Phase 2B: Field Assessment Methodology

The detailed field assessments (to be conducted in 2005) will focus on the terrestrial communities in Natural Areas requiring field data in order to verify whether or not they meet the working LSNA criteria. This means that the assessments will focus on collecting data that cannot be gathered from remote sensing related to finer ELC community typing, the diversity and abundance of vascular plants within those communities, and the diversity and abundance of amphibians and breeding birds.

Since the focus of this project is on terrestrial habitats, the forest/ woodland, savanna, shrub and meadow components of the Natural Areas surveyed will be the focus of these assessments.

Vegetation Assessments

Vegetation surveys will be conducted from mid-May through to September and visits to different types of Natural Areas should be timed, as much as possible, to capture the dominant herbaceous plants in flower. For example, Natural Areas with significant wooded areas should be visited in May and early June to capture spring ephemerals while Natural Areas with significant meadow components should be visited in late July through to early September to capture prairie species and composites.

Vegetation communities within each Natural Area should be mapped as polygons onto a 1:5,000 scale black and white aerial photograph (derived from the 2000 base air photos, or more current ones if available). These polygons will be classified to ELC Community Series level using air photo interpretation (Lee et al. 1998), and will be classified to the ELC Ecosite or the finer Ecoelement (vegetation type) level during field assessments wherever possible¹⁴.

Field data for the vegetation communities will be recorded on a standardized vegetation data sheet (as per the sample attached in [Appendix C](#)). The data sheet has been designed so that the data collected can be used to classify each identified polygon according to the ELC system (Lee et al. 1998). These data sheets specifically provide for characterization of:

¹⁴ The Ecoelement is the finest level of resolution within the ELC system and applies to the site or stand level of research, at a mapping scale of 1:2000 - 1:10,000 or habitats ranging from 1 - 10 ha in size. Names applied at the Ecoelement level relate more detailed information about the dominant species in the plant community, according to relative cover. For example, a Cultural Thicket on a mineral substrate is described at the Ecosite level as a "Mineral Cultural Thicket Ecosite" (CUT1), however at the Ecoelement level it might be described as a "Gray Dogwood Cultural Thicket Type" (CUT1-4). However, it is not always technically possible to classify habitats to Ecoelement, even when detailed information about species composition is available, because not all of the possible habitats in southern Ontario have been formally described and adopted into the ELC system to the finest level of resolution.

- the general biophysical conditions (including soil type(s), drainage regime, moisture regime, topography, slope),
- dominant species in the canopy, understorey and ground layers,
- relative maturity of the vegetation on the site, and
- the diversity and abundance of the vascular plant community.

A datasheet will be required for each Ecoelement, and so Natural Areas with a diversity of vegetation types will require several datasheets to be completed.

The presence and extent of disturbance will also be assessed using the ELC Management / Disturbance Data Sheet (also provided in [Appendix C](#)). Like the vegetation data, this will provide baseline information for monitoring any future impacts to the Natural Area related to activities such as dumping or trail proliferation.

Subsequent data entry of the information on these sheets (into the Natural Areas database) and analysis will allow for generation of the following for each Natural Area:

- a complete list of Ecosites/ Ecoelements and their associated provincial status;
- a complete list of vascular plant species with an indication of their relative abundance, provincial and regional status, ratio of native to non-native species, and CC value¹⁵;
- a summary of tree species with age and height class distribution (as per the ELC data collection system);
- a summary of disturbance factors, including their intensity an/or extent; and
- determination of relationship between vegetation communities and topographic features.

Vascular plant species will be documented according to the nomenclature of the Ontario Plant List (Newmaster et al. 1998). Status for nationally or provincially significant plant and wildlife species will be assigned according to the latest standards established by COSEWIC, COSSARO and the NHIC. Regional status for plants will be determined based on the Flora of Wellington County (Anderson and Frank 2004).

Wildlife Assessments

Ideally, wildlife inventories should occur between late March/early April (coinciding with the first spring thaw) and the end of June so that they provide the most accurate reflection of the species present (especially amphibians and breeding birds) within each of the Natural Areas as possible. Usually, between 2 and 3 visits are required over a season to detect calling amphibians. Seasonal and special time requirements for surveys on different target species are as follows:

¹⁵ This refers to the Coefficient of Conservatism (CC), a system whereby each native vascular plant species has been assigned a rank of 0 to 10 based on its degree of fidelity to a range of synecological parameters. Plants found in a wide variety of plant communities, including disturbed sites, were assigned ranks of 0 to 3. Taxa that typically are associated with a specific plant community, but tolerate moderate disturbance, were assigned ranks of 4 to 6. Rankings of 7 to 8 were applied to those taxa associated with a plant community in an advanced successional stage that has undergone minor disturbance. Those plants with high degrees of fidelity to a narrow range of synecological parameters were assigned a value of 9 to 10.

1) Early Spring (late March to end of April)

Target Species: Raptors (including: eagles, hawks and falcons), *Ambystomid* (or pond-breeding) salamanders, early breeding frogs (i.e., wood frog, spring peeper, chorus frog)¹⁶

Special requirements: Searches for raptors should look for or utilize the following behaviours, features or techniques: courtship flights, playback tapes, and ground searches of promising habitats for stick nests or other evidence. Conduct surveys for pond-breeding salamanders after first spring rains (during snow melt/spring thaw period). Conduct the first set of surveys for calling frogs by visiting wetland habitats at night. Use the Marsh Monitoring Program Training Kit (Chabot et al. 1998) as a guide when to go out and under what conditions, as well as definitions of calling levels.

2) Spring (May)

Target Species: Frogs, toads and raptors

Special requirements: Conduct the second set of surveys for calling frogs (and toads) by visiting wetland habitats at night. Use the Marsh Monitoring Program Training Kit (Chabot et al. 1998) as a guide when to go out and under what conditions, as well as definitions of calling levels. Searches for raptors should focus on identifying promising habitats and conducting ground searches.

3) Early Summer (June)

Target Species: Breeding birds, frogs and toads

Special requirements: Conduct breeding bird surveys in areas of interest between 5:00 – 10:00 a.m. under appropriate weather conditions, using the breeding evidence codes used in the Ontario Breeding Bird Atlas (www.birdsontario.org/download/atlas_feb03.pdf). Conduct the third set of surveys for calling frogs and toads by visiting wetland habitats at night. Use the Marsh Monitoring Program Training Kit (Chabot et al. 1998) as a guide when to go out and under what conditions, as well as definitions of calling levels.

Natural Areas thought or found to provide habitat for nationally, provincially or regionally significant species will be subject to multiple visits at different times of the day and season, if resources allow, to help ensure that all wildlife groups present are properly detected and documented.

Inventories will be carried out by slowly walking through each polygon and/or distinct vegetation community so that each unit receives thorough coverage. Periodic stops will be made to look and listen for wildlife species. All suitable coverage objects (e.g., logs, rocks and other debris) will also be overturned and searched when encountered. As a general rule, larger, more diverse habitats will receive more attention than smaller, less diverse or disturbed habitats.

¹⁶ Although recommended for inclusion by the GRCA, owls were removed as a target species because only two species, Great Horned Owl and Eastern Screech-Owl, are expected to occur. Both species are very common in Ontario and neither is considered regionally significant. The amount of time devoted to document these two species could be better served inventorying other species or specific places on more than one occasion. This should not be interpreted to mean that inventorying for owls is not necessary when conducting individual Impact Assessments. If suitable habitat exists for other less common species, such as Long-eared Owl or Short-eared Owl then appropriately timed surveys should indeed be conducted.

All wildlife species encountered will be recorded on to Wildlife Data Summary Sheets (as provided in [Appendix C](#)) along with basic information for each polygon (i.e., surveyor(s) name, weather, date, start time and finish time, habitat type).

National and provincial conservation status information for each species recorded will be based on the most current lists prepared by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Ontario Ministry of Natural Resources (OMNR), and the Ontario Natural Heritage Information Centre (ONHIC). Regional conservation status of wildlife (i.e., breeding birds, mammals, amphibians, reptiles, butterflies, and damselflies & dragonflies) will be based on a peer-reviewed list developed for this project by the consultants.

Subsequent data entry of the information on these sheets (into the Natural Areas database) and analysis will allow for generation of the following for each Natural Area:

- a list of wildlife species with their provincial and regional status; and
- determination of relationship between wildlife species and certain vegetation types.

Data Summary & Analysis

Ultimately, data summary sheets for each of the Natural Areas will be generated from the Natural Areas database that provides all the key natural heritage information as well as which LSNA criteria (see [Table 5](#)), if any, the given Natural Area fulfills.

The Natural Area Assessment summary sheets will include the following information:

General Site Description

- Natural Area name and any alternate names
- Size in hectares
- Ownership (e.g., public, private)
- Location
- Applicable Designation(s) (i.e., under the current Official Plan)

General Summary & Evaluation

- General Description of the Natural Area
- LSNA Criteria Fulfilled
- Recommended Designation

Physical Description

- Topography
- Slope
- Drainage & Moisture

Site Condition

- Disturbance types and level(s)
- History of disturbance, if available
- Non-native species cover (%) and composition
- Representation by plant species with Coefficients of Conservations > 7

Biological Description & Diversity

- ELC Ecosites and/or Ecoelements (and their status)
- Vascular Plants Observed
- Wildlife Species Observed
- Summary of plants and wildlife species observed with national, provincial or regional status

Special Features

- Vulnerable/Threatened/Endangered species, Provincially Significant species, Regionally Significant species
- Significant Vegetation Communities
- Other notable attributes (see Technical Guidelines for Significant Wildlife Habitat, OMNR 2000)

Representation

- e.g., Best example of a grassland habitat in close proximity to large wetland block in the City.

Site Visits

- Date, Duration, Observers

Data Gaps

- As applicable

7.2 Monitoring Approach

The City recognizes the importance of monitoring for the long-term protection of its natural heritage features and, as stated in the Official Plan, is committed to “establishing environmental impact monitoring programs with community partners and appropriate government agencies including the Grand River Conservation Authority” that will:

- a) assess impacts on natural features and functions during construction;
- b) assess longer term impacts on features and functions through benchmarking studies; and
- c) assist in identifying corrective or mitigation measures in instances where negative impacts to natural features and functions are occurring.

The following monitoring approach adheres to the City’s policy (and is also consistent with the Provincial Policy Statement), by providing approaches for:

- a) **Compliance Monitoring** (i.e., short-term monitoring that assesses the immediate impacts on identified natural features and functions during and after land use changes have occurred, such as development);
- b) **Effectiveness Monitoring** (i.e., assessment of the longer term impacts on identified natural features and functions following land use changes); and
- c) **Adaptive Management** (i.e., a systematic procedure for continually improving management policies and practices by learning from the outcomes of existing management and monitoring programs).

As with the inventory methods, candidate or designated LSNA should be used as the base reference unit for collection of monitoring data, but the focus of the monitoring activities should occur in the terrestrial components of these Natural Areas.

As a general principle, any monitoring that involves access to relatively undisturbed or sensitive Natural Areas must recognize the sensitivities of the site and follow strict protocols to minimize impacts related to data collection.

7.2.1 Compliance Monitoring Approach

Compliance, or what is often called short-term monitoring, for terrestrial features in identified LSNA should basically consist of a City staff member, hired consultant or volunteer qualified in conducting basic environmental inspections walking the periphery of the feature in question during and shortly after the change in land use has occurred to assess for impacts to the natural feature related to the construction activities. While this approach is not particularly ecological or scientific, it addresses the reality that efforts made to protect natural features at the planning stage can fail if these features are not protected “on the ground” during and after construction. This is a recognized, and serious, problem in the integration of natural areas in urbanizing settings (Kluza et al. 2000; Dougan 2002) that needs to be addressed.

Timing & Frequency: This type of monitoring should take place as required in LSNA adjacent to active construction sites and on an annual basis (or bi-annually if resources permit) along the perimeter of all LSNA. Although the bulk of anticipated impacts are likely to occur during

construction (e.g., inappropriate dumping of construction debris, unauthorized damage to or destruction of trees, damage to natural features by large construction equipment), there also can be significant post-construction impacts related to encroachments by adjacent residents, or others, into the retained LSNA features (e.g., dumping of household or yard waste, construction of sheds or forts, removal of natural vegetation) that also needs to be monitored.

Data Collection: The ELC Management / Disturbance data collection sheets (as provided in Appendix C) that are to be used in the inventory work should also be used here.

Resource Requirements: Ideally, the City should have in-house or contract personnel dedicated to conducting compliance monitoring and notifying the City when non-compliance has been observed. In many instances non-compliance can be prevented simply by having a City / environmental inspector on-site on a regular basis during construction, and having an on-going awareness program for residents adjacent to and visitors to LSNA consisting of tools like on-site educational / instructional signs, periodic newspaper announcements, land stewardship pamphlets for new homeowners living near protected natural features, and workshops in different community neighborhoods. Notably, the City already practices many aspects of compliance monitoring (e.g., environmental inspections during construction, development and dissemination of educational pamphlets to new homeowners, signs in naturalized or protected natural areas) in relation to protected natural features associated with approved developments, and would only need to extend its existing inspection practices to the post-development phase.

7.2.2 Effectiveness Monitoring Approach

Effectiveness monitoring will assess longer term changes to natural features or functions in the terrestrial components of LSNA over time. This will be accomplished by conducting (1) landscape level monitoring using air photo interpretation, (2) vegetation monitoring using permanent plots, and (3) wildlife monitoring using permanent point count locations for breeding birds and amphibians.

Timing & Frequency: Unless a particular LSNA is considered to be highly sensitive to changes in the landscape, this type of monitoring can generally be conducted on a 5-year cycle.

Data Collection & Analysis:

(1) LANDSCAPE: Landscape level analysis of overall changes in the types and extent of ELC vegetation types will be conducted using air photo interpretation of all LSNA across the City. This interpretation will need to be done digitally using GIS software. The LSNA delineated and ELC assessment completed as part of Phase 2 of this project will be used as the baseline information for interpretation. Although a 5-year cycle for this analysis is recommended, undertaking this task will require the availability of updated City-wide aerial photography which is normally available every 6 to 7 years.

Data analysis at the landscape level should assess changes in:

- overall LSNA quantity and quality,
- the extent and diversity of ELC vegetation types,

- the proportional representation of various vegetation types, and
- the extent of area sensitive species breeding habitat (measured as areas 100 m from the wooded edge of an LSNA).

(2) VEGETATION: Quantitative sampling plots should be established in representative as well as uncommon or unique terrestrial vegetation communities identified through the inventory process within LSNA across the City. Air photo analysis of the range and distribution of the various ELC communities can be used to select a range of possible locations. Plots should ultimately be established in sites representing the full range of ecological communities in the City in areas under public ownership or under private ownership where access is granted. Long-term plots should also be reasonably accessible and in locations unlikely to be developed in the future.

These plots should be established using the ELC protocols for long-term plot (i.e., a circular 100 m² area with a t-bar denoting the centre) establishment (see [Appendix D](#) for details of this method). The method includes an assessment of vegetation type, structure and health that includes recording data on soil type, canopy layers, plant composition, and any observed human impacts.

Monitoring should be conducted from mid-May through to September and visits to different types of vegetation communities should be timed, as much as possible, to capture the dominant herbaceous plants in flower.

The Vegetation Data Collection Sheets provided in [Appendix C](#) should be used, and data collected should be entered into the Natural Areas Database and assessed in relation to the existing baseline data for that location. Data analysis for vegetation should check for any changes in species composition, abundance and diversity within the ELC permanent plots, and should generate ratios of native to non-native species and CC values (see [Section 7.1.2](#) for a definition).

(3) WILDLIFE: Wildlife monitoring should focus on observations of (a) amphibians and (b) breeding birds using “point count” methods in different locations for each.

Breeding Birds: Permanent “point count” stations should be established throughout LSNA in the City to document breeding birds. Although other incidental wildlife observations can be made from these plots, they should be specifically located to capture the different communities of birds in occurring in the City. Specifics about the locations of the bird monitoring plots should be provided so that different surveyors can find the locations in subsequent years.

Information collection methods should follow the Forest Bird Monitoring Program (FBMP 2002), and the Wildlife Data Collection Sheets developed for this project (provided in [Appendix C](#)) should be utilized.

Breeding bird surveys should be conducted twice each year they are surveyed between May 20 and July 5, at least 10 days apart.

Amphibians: Point counts for calling amphibians should be conducted using protocols developed by the Marsh Monitoring Program (MMP) (LPBO and EC 1997), and should be located in wooded areas closely associated with wetlands.

Amphibian surveys should be conducted 3 times over the season in which they are surveyed between approximately April 15th and June 30th (see MMP protocol for more details).

Data analysis for wildlife should assess for any changes in species composition, abundance and diversity for both breeding birds and amphibians.

Resource Requirements: Although this monitoring should be coordinated by qualified staff and/or professionals and the subsequent analyses should be done by qualified professionals, some types of terrestrial data collection could be collected by qualified volunteers (i.e., from the Guelph Field Naturalists, Waterloo-Wellington Wildflower Society). For instance, while salamander surveys require skilled staff to assess their presence (since they do not call, can be difficult to spot, and are best surveyed in April and during evenings after a rain), breeding birds and calling amphibians such as frogs and toads are relatively easy to survey. Similarly, anyone with strong field botany skills and a good understanding of the ELC system could complete data collection for the vegetation plots. Because both vegetation and wildlife monitoring are based on a fixed plot system, individuals well-versed in the monitoring protocols could commit to monitoring 1 or more sites in their own neighborhood.

Depending on local interest and expertise, residents living near LSNA can also contribute to monitoring efforts by participating in the following projects: the 'Backyard Survey' portion of the Amphibian Call Count Surveys (<http://wildspace.ec.gc.ca/project.cfm?HoldID=11&Lang=e>), Frogwatch (<http://www.cnf.ca/frog/>), or Project Feederwatch (<http://www.birdsontario.org/pfw/pfwmain.html>).

7.2.3 Adaptive Management Approach

Committing to an adaptive management approach basically involves committing to conducting monitoring, synthesizing and evaluating the monitoring results, and taking action (adjusting the existing approach) as required or as feasible to address any undesirable trends or developments (as shown in [Figure 8](#)).

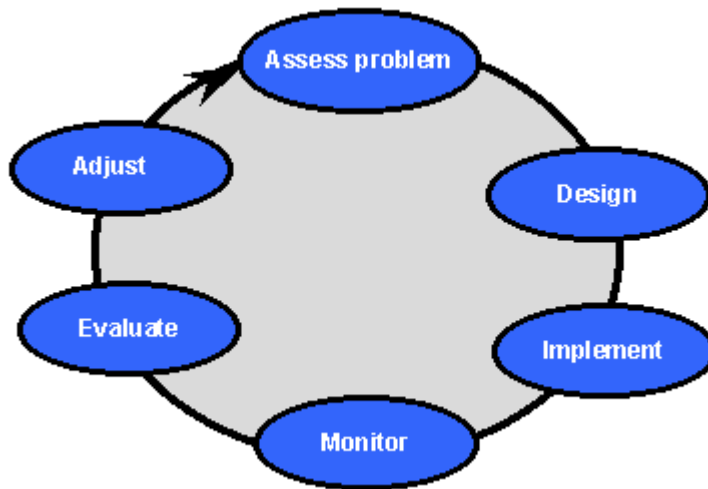


Figure 8. The adaptive management loop (from the Government of British Columbia’s Ministry of Forests website at www.for.gov.bc.ca/hfp/amhome/Amdefs.htm).

Any adaptive management actions (i.e., changes in approach or policy designed to correct or reverse an observed or measured negative impact or trend to terrestrial natural features within LSNA) undertaken in the context of protection of LSNA should be identified on (approximately) a 5-year cycle in conjunction with the City’s review of a summary report on the status of LSNA in the City based on short-term and long-term monitoring results.

8 Recommendations

The recommendations presented below are based on the Consultants' experience, consideration for input derived through the community consultation process, and comments received from the Technical Steering Committee and the City. Notably, although all of the recommendations below have evolved out of the work conducted for Phase 1, many of them extend beyond this particular phase of the project and will be built upon in subsequent phases of this project.

Land ownership, current municipal zoning, and municipal plans related to growth have not been specifically examined at this preliminary stage of the study, however it is recognized that these will all be important considerations in actually implementing the proposed NHS. It is also understood that the LSNA criteria put forward for the NHS are intended for the purposes of identifying LSNA within the City, but will need to be modified in order to be incorporated into planning policy. Furthermore, it is recognized that publicly owned lands within or adjacent to natural areas represent excellent opportunities for natural area protection and/or enhancement. Issues and opportunities related to land ownership will be explored more fully in subsequent phases of the NHS.

A total of 16 **recommendations** have evolved out of Phase 1 of the NHS. Notably, while recommendations #1 through #4, and #5 through #8 are more short-term and relate more directly to the products of Phases 1 and 2 of this project, recommendations #9 through #16 are more long-term and provide some direction for ongoing implementation of the NHS as a whole. While recommendations #1 through #8 are intended to provide direction for the subsequent phases of the NHS, recommendations #9 through #16 are intended to provide some preliminary and general policy direction based on the findings of Phase 1 of this project, and should be revisited at the conclusion of Phases 2 and 3 of the project.

These recommendations are intended to be at an intermediate level between watershed / subwatershed planning and site-specific Environmental Impact Statements (EIS). Site-specific policy direction that ties in to these LSNA recommendations (e.g., buffer requirements for different natural features, integration of parkland dedication into sites) will need to be developed separately once this project is complete.

The specific recommendations have been broken down into 'immediate', short-term' and 'long-term' categories and are as follows:

Immediate (Winter 2005)

- 1) The general tone and intent of this report should be endorsed by the Technical Steering Committee as a basis for moving forward with the NHS.
- 2) With respect to the working LSNA criteria for the City of Guelph, we recommend that:
 - a) the LSNA criteria presented in this report are endorsed by the Technical Steering Committee as working criteria for LSNA identification for Phase 2 of the NHS;
 - b) the recommended criteria be refined after more detailed analysis of the City's existing Natural Areas is completed as part of Phase 2 of the NHS, as required; and
 - c) the finalized criteria and mapping/database be used as the basis for designating LSNA in the City.
- 3) All LSNA maps should be labeled as "Draft" and noted as being "subject to revision" until landowners and City Staff have been notified and given the opportunity to provide their input.
- 4) City personnel and the Technical Committee should develop guidelines for internal protocol and a strategic plan for both technical and process-related short and long-term steps, so as to move forward in a unified and systematic manner, and maximize the value of future phases.

Short-term (Spring – Fall 2005)

- 5) The City should obtain current digital ortho-imagery for the City of Guelph.
- 6) The preliminary Landowner Contact package should be distributed as part of Phase 2 and the Landowner Contact Program and support mechanisms should be further developed (as per the recommendations in this report).
- 7) The City should engage in further discussion and negotiations with landowners and developers, as well as other key stakeholders, to develop mutually agreeable solutions whereby development needs and natural heritage objectives can both be met to a reasonable degree.
- 8) Workable targets for the City of Guelph's overall natural area coverage, as well as coverage by different vegetation types (e.g., woodlands, meadows) should be developed as part of Phase 2 of the NHS.

Longer Term (2006 – ongoing)

- 9) Phase 1 community consultation results should be taken into consideration when developing and/or revising policies, by-laws, site-level guidelines, and other support mechanisms in relation to the City’s natural heritage resources. Along with further consultations with landowners and developers, additional targeted consultations should be undertaken to review draft final criteria, maps and policies. In future phases, the facilitator of community consultations should be included in Technical Committee meetings and discussions of key decisions.

- 10) With respect to integration of the LSNA system into the City of Guelph’s Official Plan and subsequent application of the LSNA system, we recommend, as part of the next Official Plan amendment, that:
 - a) identified LSNAs be integrated into the existing “Core” and Non-Core” Greenlands categories as appropriate (e.g., Provincially Significant Wetlands within LSNAs will continue to be “Core” Greenlands, while Significant Woodlands within LSNAs will continue to be “Non-Core” Greenlands);
 - b) that the current Official Plan category of “Other Natural Heritage Features” be replaced with specific land classification categories, as based on the findings of Phase 2 of this study, and that appropriate policy be developed for each of these new categories;
 - c) if the LSNA includes “Core Greenlands” no development be permitted within these features, as is consistent with the current policy and practice;
 - d) development in identified LSNA features outside the “Core Greenlands” be contingent upon approval of an Environmental Impact Study (EIS) , as is consistent with the current policy and practice;
 - e) every EIS for an LSNA establishes no net impact to each of the criteria for which the LSNA has been designated, and outlines the mitigation required for any impacts identified;
 - f) LSNA not be accepted towards fulfillment of the required parkland dedication, but that other natural or potential restoration areas identified outside LSNA be treated more flexibly from a planning perspective; and
 - g) a detailed Restoration Plan (i.e., with a Tree Preservation and Planting Plan) using site-appropriate native species be required wherever restoration or creation of a natural feature is approved as part of an EIS.

- 11) With respect to integration of natural features outside the LSNA system into the City of Guelph's Official Plan we recommend, as part of the next Official Plan amendment, that:
 - a) the City should incorporate linkages, potential restoration areas and other undesignated natural areas that are the subject of voluntary initiatives into Greenlands System mapping as a separate category from LSNAs ; and
 - b) policy be developed to define and support identified linkages, potential restoration areas and undesignated natural areas subject to voluntary initiatives.
- 12) The City should develop land management/stewardship guidelines and plans for publicly held LSNAs.
- 13) The City should provide land management/stewardship guidelines and, where possible, in-kind support and financial incentives for encouraging protection of privately held LSNAs and other natural areas.
- 14) The City should engage in on-going education and communication to inform residents about LSNA protection and encourage stewardship of *all* natural areas.
- 15) The City, in consultation with relevant stakeholders, should develop a fund raising and land securement strategy in support of the NHS, which could involve the GRCA, the Speed River Land Trust and/or other conservation NGOs (e.g., Wellington County Stewardship Council, Guelph Field Naturalists, Federation of Ontario Naturalists, Nature Conservancy of Canada). This strategy should explore options regarding public acquisition priorities, appropriate compensation, and donor incentives for lands that are identified as part of the NHS.
- 16) In terms of general environmental policies and practices that will support the effective implementation of the NHS, the City should work towards encouraging smart growth and accommodating alternative development standards, as well as implementing and enforcing effective buffers between developed/ developing and natural areas. More specific recommendations addressing these two approaches should be provided as part of Phase 3 of the NHS.

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10 Glossary of Acronyms

ANSI: Area of Scientific Interest
COSEWIC: Committee on the Status of Endangered Wildlife in Canada
COSSARO: Committee on the Status of Species at Risk in Ontario
ELC: Ecological Land Classification
ESA: Environmentally Sensitive Area
GIS: Geographic Information System
GRCA: Grand River Conservation Authority
LSNA: Locally Significant Natural Area(s)
LSW: Locally Significant Wetland
NHIC: Natural Heritage Information Centre
NGO: Non-governmental Organization
NHS: Natural Heritage Strategy
OBBA: Ontario Breeding Bird Atlas
OHS: Ontario Herpetofaunal Summary (Atlas)
OMNR: Ontario Ministry of Natural Resources
PSW: Provincially Significant Wetland

Appendix A: Study Terms of Reference Provided by the City of Guelph, Department of Planning & Building (January 2004)

1.0 EXECUTIVE SUMMARY

The inventory is part of the first year implementation of the Environmental Action Plan that was brought to Planning, Environment and Transportation Committee in June of 2003; whose ultimate purpose is to provide the basis for maintaining and enhancing the ecological function of our Core Greenlands system while at the same time accommodating urban development.

When assessing development proposals, the City's environmental data is limited. The inventory will allow us to more accurately characterize and rank the importance of features in question as well as create:

- a definition for "locally significant" to use for ranking features (under the authority of the Provincial Policy Statement and the Guelph Official Plan);
- a more flexible and creative approach to managing the health of existing systems (e.g. permit removal of an isolated woodlot and rehabilitate a degraded area that is connected).
- clear standard guidelines and methodology for conducting environmental studies (e.g., Environmental Impact Studies, Environmental Implementation Reports, Tree Conservation Plans) particularly in areas lacking a (sub)watershed study
- a more consistent Environmental Planning/ environmental policy implementation;
- a basis for creating partnerships (e.g. for stewardship activities or land acquisition) to share the responsibility of environmental protection; and
- baseline data for on-going monitoring that will allow us to understand trends and thus more effectively employ mitigation measures.

For greater efficiency, this project will be split into three phases.

Phase 1:

- 1.1 Staff to assemble partnerships and volunteer Technical Committee. The committee may recommend amendments to the project Goals and Objectives.
- 1.2 Consultant to assemble and review existing resources such as aerial photographs, (sub)watershed reports, Environmental Impact Studies, Bird Studies Canada mapping, groundwater protection mapping, etc. with assistance from staff and Technical Committee.
- 1.3 Consultant to lead the process defining local significance as it pertains to terrestrial features using best practices from other municipalities as a starting point. Staff and Technical Committee will provide feedback. Consultant will lead community consultation. Evaluation methods for the project will be included.
- 1.4 Consultant will research and select methodology for inventory (including recommendations for a database/GIS); prioritize areas for inventory based on definition of local significance (including sites for restoration and rehabilitation that would contribute to core system); and establish general approach to monitoring to ensure data collection is forming baseline data. Staff and Technical Committee will provide feedback. Results of Phase 1 will form the basis for Phase 2.
- 1.5 Consultant will develop and implement landowner contact program for those who have potentially significant features on their property (implementation to be confirmed during Phase 1). Dovetail with stewardship promotion (e.g. process already prepared by University of Guelph Land Stewardship centre).

Phase 2 (not included in this RFP):

- 2.1 Establish database/GIS.
- 2.2 Field work.
- 2.3 Re-visit site prioritization based on results of field work if necessary.
- 2.4 Populate database/GIS.

Phase 3 (not included in this RFP):

- 3.1 Develop monitoring and management systems specific to new and existing core areas that need it (for example, this may include issues such as invasive exotic plants, recreation impacts in a particular area).
- 3.2 Create core natural heritage system goal(s).
- 3.3 Make any necessary changes to the Official Plan including mapping amendments and reference to environmental studies.
- 3.4 Establish funding for long-term monitoring and outstanding inventory work (e.g., other Municipalities have successfully retained local Field Naturalists who were granted Trillium Foundation Funding).
- 3.5 Monitor (involve the community). Methodology, frequency and responsibility will be established in previous step using new information as well as information in Environmental Impact Studies.
- 3.6 Based on monitoring results, make any necessary amendments to mitigation measures or compensation policies, etc.

The consultant will be responsible for creating a detailed work plan for Phase 1 and carrying it out within the timeframe specified in Section 3 below. The detailed work plan will be approved by staff.

Community, stakeholder and property owner consultation is integral to the project. The project will be administered by staff from Planning and Building Services.

Respondents should address all of the following matters:

2.0 PROJECT GOALS, OBJECTIVES & GUIDING PRINCIPLES:

Goals

- To identify a collectively agreed upon goal for a creating a core natural heritage system focusing on the inclusion of locally significant terrestrial features and/or areas suitable for restoration as well as areas suitable for development;
- To provide clear guidelines for development based on this established core (e.g., guidelines for Environmental Impact Studies, Terms of Reference and Environmental Implementation Reports);

Objectives

- To increasing our understanding of the City's terrestrial features (e.g. woodlots, wellhead protection areas, hedgerows, corridors, linkages, and other terrestrial features);
- To develop a database of ecological data; and policies and guidelines that identify, protect and enhance the City's core natural heritage features and system while recognizing urban growth realities;
- To encourage and facilitate private stewardship and public education;
- To develop a land acquisition strategy;
- To develop a consistent methodology to evaluate and monitor locally significant features and land use planning decisions.

Guiding Principle(s)

- Transparent and participatory process based on a long term vision.
- Precautionary Principle as defined in the Canadian Environmental Protection Act (S. 2 CEPA, 1999)

"...where there are threats of irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation, and promotes and reinforces enforceable pollution prevention approaches; take preventative and remedial measures to protect, enhance and restore the environment; take the necessity of protecting the environment into account in making social and economic decisions; implement an ecosystem approach that considers the unique and fundamental characteristics of ecosystems endeavour to act in cooperation with governments to protect the environment..."

2.0 PROJECT SCOPE & REQUIREMENTS:

COMMUNITY CONSULTATION:

Given the potential for varied public opinion regarding the definition of significance and approaches to environmental protection, it is critical that the consulting team undertake at least two stages of public input, with at least one community forum. Additionally, a communication system needs to be established in order to keep the community, key stakeholders, staff and Council informed and/or participating by use of the City web site, email and newsletters etc.

PROJECT DELIVERABLES & TIMING:

The following items will be completed by April 21, 2004:

- 1) Confirmed project Goals, Objectives
- 2) Methodology for the Phase 2 inventory including data management
- 3) Definition of local significance
- 4) Identification and prioritization of sites for inventory (mapped)
- 5) General methodology for a future monitoring strategy in Phase 3
- 6) Landowner contact program (implementation to be determined during Phase 1)

SUGGESTED WORKPLAN:

See attached table with tasks and responsibilities to use as a guide.

INFORMATION TO BE PROVIDED TO THE CONSULTING TEAM:

The following information will be provided to the selected consulting team:

- SmartGuelph Principles, excerpts from the City of Guelph Official Plan, Zoning By-law, Green Plan, (sub)watershed studies, Environmental Impact Studies and any other necessary documents;
- The Environmental Action Plan;
- Base mapping for the area (all information is two dimensional); and
- Other background information including: aerial photos, topographical mapping, additional studies on hand, landowner information.

CITY OF GUELPH TERRESTRIAL INVENTORY PHASE 1

January - April 2004

TASKS (in chronological order)	RESPONSIBILITY
Establish Technical Committee	City Staff
Vet Suggestions through GPSC	City Staff
Send Invitations to Potential TC Members	City Staff
Set up Orientation Agenda/Package	City Staff
Prepare RFP	City Staff
Meet with Internal Staff	City Staff
Draft Work Plan and Budget	City Staff
Circulate RFP	City Staff
Research Best Practices	City Staff
Prepare Orientation Package for TC	City Staff
Technical Committee Orientation Meeting #1	
Set up Orientation Package for Consultant	City Staff
Create Suggested Work Plan for Consultant	City Staff
Gather Resources (from TC, internal, best practices)	City Staff, Technical Committee
Award Contract	City Staff
Orientation for Consultant	City Staff, Consultant
Determine Process for defining Significance	Consultant, City Staff, Technical Committee
Community Consultation	Consultant, City Staff
Mapping	Consultant, City Staff, Technical Committee
Technical Committee Meeting #2	
Define Significance	Consultant, City Staff, Technical Committee
Consultant Research	Consultant
Technical Committee Meeting #3	
Public Consultation #1	Consultant, City Staff
Select Areas of Potential Significance	Consultant, City Staff, Technical Committee
Consultant Research	Consultant
Public Consultation #2	City Staff
RFP for Phase 2	City Staff
Identify Areas for Inventory	Consultant, City Staff, Technical Committee
Technical Committee Meeting #4	
Landowner Contact (if appropriate)	Consultant
Circulate RFP for Phase 2	City Staff
Recommend Database/GIS and Inventory Methodology	Consultant
Revise Environmental Report guidelines	City Staff

Appendix B: Community Consultations

Appendix B-1: Results of the Key Stakeholder Workshop (March 23, 2004)

Appendix B-2: Results of the Community Forum (April 7, 2004)

Appendix B-3: Results of the Community Survey

Appendix B: Community Consultations

Comments documented in this Appendix represent the views of individual participants as opposed to agreed decisions. Although the various perspectives were considered, it was not possible to accommodate all views when determining the final working criteria for identification of Locally Significant Natural Areas in the City. To accommodate the maximum range of valued natural spaces, the Consultants have recommended that the City provide on-going support for voluntary initiatives outside of the designated NHS.

Appendix B-1: Results of the Key Stakeholder Workshop (March 23, 2004)

GOAL: The purpose of the Key Stakeholder Workshop was to inform and obtain input from groups or individuals within the City who have a known interest in natural heritage protection and/or land development. The workshop was held on March 23, 2004, from 7 - 9:30 p.m. at the Evergreen Centre in Guelph. Relevant government agencies, local naturalist/environmental organizations, local trails enthusiasts, University of Guelph researchers, the Guelph Chamber of Commerce, local representatives from the development industry, landowners with known natural heritage features on their properties, and the agricultural sector were invited to attend or send representatives to the workshop. Of 33 invited representatives, 21 were able to attend.

FORMAT: The workshop began with a presentation on the background for the study and the current state of natural heritage protection in Guelph. This was followed by a question/comment period and a discussion of the proposed criteria for Locally Significant Natural Areas. Key points of the discussion are presented here and summarized in the main report. Noted responses were from the Consultants and/or City staff.

Questions

Q1: How does Guelph compare with other Cities regarding percent cover of forest?

A1: The percentage is higher than in many other municipalities in the GTA. Some municipalities are now restoring forests in order to increase forest cover. It is much more difficult and costly to restore missing forest than to protect existing forest. Guelph has an opportunity to protect and enhance intact forests.

Q2: Does this phase of the study allow for review of policies?

A2: Yes (Note: More detailed review and revision of policies is recommended as a follow-up step.)

Q3: Why are Core Greenland areas and Non-Core areas separate?

A3: Core areas are protected at the provincial level, while Non-Core areas are not. Furthermore, Non-Core areas were considered areas that play a support function or have fewer attributes than Core areas. The values and designations of the Non-Core areas are under review through this NHS process.

Q4: Are naturalized areas included as natural heritage features?

A4: Yes, and new naturalization areas may be identified through this study.

Q5: Where do naturalized stormwater ponds fit? Could they be factored in for no net loss or even net gain?

A5: Stormwater ponds are more aptly considered Open Space or infrastructure as opposed to natural heritage features. Research indicates that, given current surface water quality (pesticides, fertilizers, oil and grease, etc.), even when naturalized, storm ponds may have a deleterious impact on wildlife.

Q6: Who currently maintains forests and trees on Municipal land?

A6: The Public Works Department maintains these features. The Parks Department has maps of naturalized areas, trees and trails.

Comments

- We need to set overall targets, such as the percentage of forest cover in the City.
- Where the topography can still support the features, efforts should be made to recreate representative ecological communities.
- For long-term sustainability, protected areas also need to be well managed.
- Development can provide an opportunity to naturalize. For example, at Hanlon Creek developers vegetated some buffer zones and naturalized some degraded areas.
- There are benefits of maintaining compact urban form, as opposed to interspersing natural areas and development across a larger area.
- We need to recognize the benefits of development and not just the impacts. I would like to see the word "losses" (of natural areas) replaced with a less sensitive word.

Maps

- Start by mapping *all* existing natural features. Then consider the criteria and policy implications.
- Include Environmentally Significant Areas (ESAs) on the maps.
- Some of the figures and maps from past watershed and sub-watershed studies need to be updated. For example, Hall's Pond is no longer as it appears on the map.
- Add a separate color on maps for naturalized areas.

Criteria

Overall

- I am hesitant to choose criteria, as it is forcing me to choose some natural areas over others. To me, all natural areas are important. Response: *It is a difficult choice, but the current reality is that some natural areas and features will be replaced by development. We need to determine which areas and features are the highest priorities for protection.*
- Set targets for the overall system; then revisit the criteria from that perspective.
- Distinguish between criteria that apply to the overall system and those that are site-specific.
- Consider ways in which Guelph's NHS can contribute to a regional system. Include areas that are linked with areas in adjacent municipalities.
- Consider also the quality of natural areas. Do not stress quantity over quality.
- How will the criteria be weighted? We need a scoring/ranking system for the criteria. For example, the social criteria could be weighted as a percentage of the overall criteria. Response: *The weighting is best determined after the results of consultations are collated.*
- Give higher weighting to scientifically defensible criteria.

Proposed Social Criteria

- The socio-cultural criteria are very important for "saleability" and for contributing to a sense of community. These criteria should be given adequate weighting.
- "Aesthetic" is subjective and will be difficult to argue.
- Merge aesthetic with spiritual and mental health.
- Add "physical health and fitness".
- Scientific value should include areas that are the focus of long-term study.
- Cutbacks in outdoor education in schools mean that local natural areas are especially important for education and low-impact recreation.
- Add "already in public ownership". Unless landowners are willing, public land is generally easier to protect than private land.

Proposed Physical Criteria

- Air quality is very important. For example, trees help mitigate pollution.
- Add "sound barrier/light barrier".
- Terrestrial features contribute to hydrology and hydrogeology.
- Guelph is being flattened. We need to protect slopes and diverse topography as well as unique landforms.
- Consider that servicing costs increase when slopes are retained.

Proposed Biological/Ecological Criteria

- Are there ever any problems associated with linkages? *Response: There are some concerns about transport of invasive species and leaving species more vulnerable to predation, but there are also many benefits. It is best to make corridors as wide as possible.*
- Size is not as meaningful as functions.
- Size should specify a minimum area. It is not usually possible to protect all small features on development sites.
- Heterogeneity (diversity) is important on sites and across the overall system.
- Sites with relatively intact soils should be given high priority, as soils are not easily reproduced.

Note: Discussion of biological/ecological criteria was brief due to time constraints. Participants were also invited to provide written responses and input into the maps via the Community Survey, results of which are documented in Section B-3.

Appendix B-2: Results of the Community Forum (April 7, 2004)

The Community Forum provided an opportunity to inform and garner input from the wider Guelph community. The forum was held on April 7, 2004, from 7 – 9:30 p.m. at the River Run Cooperators Hall in Guelph. Approximately forty participants were present. A list of attendees is available from the City on request.

The meeting began with a brief presentation on the background for the study and the current state of natural heritage protection in Guelph. This was followed by a brief question/comment period and a discussion focusing on the questions: "Which natural areas and features in Guelph are most significant to you? Why"? All participants were given an opportunity to respond to the questions, in roundtable manner. Most participants responded to the 2 questions in general terms, and many also made suggestions regarding the overall NHS or development guidelines. Participants were given an opportunity to note more specific areas or features on the maps. Key points of the discussion are presented here and summarized in the main report. Except where noted, responses were from the Consultants and/or City staff. . Participants were also given an opportunity to note specific areas or features on poster -sized maps. These maps were retained on file and will be used as a resource when mapping natural areas in Phase 2 of the study.

Significant Natural Areas and Features in Guelph*	Reasons (where cited)**
All natural areas and features (noted by several participants)	<ul style="list-style-type: none"> ➤ I love the outdoors. ➤ I love my community. ➤ They provide habitat/homes for living beings. ➤ All living beings are important. I cannot choose one over the other. ➤ They provide accessible opportunities for education/nature appreciation for children. ➤ They provide accessible opportunities for recreation and education for all citizens. ➤ They fulfill a variety of needed ecological functions. ➤ They should be considered our City's green infrastructure. ➤ Green infrastructure saves money. ➤ They are the City's heart and soul.
Rivers, creeks (noted by several participants)	<ul style="list-style-type: none"> ➤ I enjoy the pathways along the rivers. ➤ They are cooling in summer. ➤ They are already continuous corridors, except where they have been culverted.
Woodlands, forests, trees (noted by several participants)	<ul style="list-style-type: none"> ➤ They are cooling in summer. ➤ They contribute to healthy air quality. ➤ They act as a sound barrier.
River banks, steep slopes, valleys, hills (noted by a few participants)	<ul style="list-style-type: none"> ➤ They provide views/vistas, including views of Guelph's wonderful historical architecture. ➤ Topography is needed for sustaining diverse ecological communities. ➤ Diverse topography and natural areas are more aesthetically pleasing than flattened barren land with only houses and industries.
Old fields (noted by a few participants)	<ul style="list-style-type: none"> ➤ They provide nesting and feeding habitat for birds. ➤ They are naturally regenerating forests.

Significant Natural Areas and Features in Guelph*	Reasons (where cited)**
Buffers/lands adjacent to existing natural features and areas (noted by a few participants)	<ul style="list-style-type: none"> ➤ With adjacent development, natural areas and features deteriorate without buffers. ➤ Even “protected” wetlands disappear with adjacent use. ➤ Water quality in wetlands diminishes with adjacent use. ➤ Current development – natural area separation is too harsh.
Areas that help sustain water tables	I noted that ponds on or near my land were dry last year. I believe that the water table is diminishing.
Areas surrounding water sources	
Meadows	They provide habitat for many species of flora and fauna.
All large natural areas	Large areas are needed to sustain some species and functions.
Small pockets	They can be expanded and they can contribute to linkages.
Flora	
Fauna	
Rare plants	
Rare communities and species	
Bur oaks	Bur oaks were once widespread in Guelph; they need to be protected <i>and</i> restored.
Connecting corridors	
Railway corridors	Many are already naturalized and others could be enhanced so as to contribute to connecting corridors.
Hedgerows	Can act as connecting corridors and are part of our cultural heritage.
Naturalized areas where people have already planted trees or meadows	<ul style="list-style-type: none"> ➤ They can recreate lost areas and/or act as buffers or linkages. ➤ Many volunteer hours and financial resources have been put towards these areas. Volunteers care about them. ➤ Small, naturalized urban lots can contribute to the overall system.
All areas and features, even small areas or single trees, in the developed areas of the City	<ul style="list-style-type: none"> ➤ Contribute to the quality of life in people's immediate neighbourhoods. ➤ They help increase awareness within the general population. ➤ Current development – natural area separation is too harsh. ➤ Possible loss of the woodlot in my neighbourhood is disturbing.
Mature trees and woodlands in the urban core	<ul style="list-style-type: none"> ➤ We moved to the core to get away from urban sprawl, but mature trees are being cut for development even in the core. ➤ It is a quality of life issue for residents. ➤ Urban areas can contribute to the overall system.
Natural areas at the entrances to Guelph	They are aesthetically pleasing and create a good impression for visitors. The south entrance to Guelph is no longer attractive.
The 2 woodlots on private land in my neighbourhood (noted on the map)	They are accessible and they contribute to the quality of life in my neighbourhood.
Homewood Woodlot	
Silver Creek	
Exhibition Park	
Arkell Springs	

* No one specifically noted wetlands, but many participants expressed concern over loss of wetlands.

**This list of reasons should not be considered comprehensive, as not all participants were able to note reasons for their choice of significant areas or features due to time constraints.

Concerns about the NHS

- Many of us have been to public meetings and identified priorities for protection before, but some of those places were developed anyway. At least 6 wetlands identified for protection have recently disappeared or become degraded (e.g., Hall's Pond). Will this process lead to any different results? *Response: City planning staff will need both internal and community support if this process is to be successful. Consider also other ways to protect natural areas besides through the OP process.*
- I am consistently disappointed as new places fall through the cracks.
- The current planning approach is not working. Can alternative mechanisms be put in place?
- We are losing natural areas at Hanlon Creek. Consultants' reports were "put through the ringer", so the problem is with the policies and laws.
- We need zoning amendments and new by-laws (eg. a Tree By-law). *Response: The intent is that these will be developed over time. In some cases, development guidelines and requirements will suffice. An updated Tree By-law is now underway.*
- How will the plan review unfold? *Response: The proposed NHS will be provided as an overlay to the existing plan. The NHS and resulting OP amendments will have to be officially adopted by Council.*
- Some of the areas are at risk now and cannot wait for OP amendments and new by-laws. Is it possible to place a moratorium on development in critical areas? *Response: Shannon will investigate that.*
- We also need to work with existing policies and by-laws to do what we can now.
- We need to improve implementation of plans and policies, and enforcement of by-laws.
- Provincial policy is seriously flawed. (How) will that affect what happens in Guelph? *Response: Guelph can proceed to the extent that is currently legally possible and defensible at the OMB.*
- Will the results of this process be incorporated into a Provincial LSNA strategy? *Response: The Province is leaving LSNAs up to Municipalities.*
- In reference to the hand out on the cost savings provided by trees, I noted that the statistics are American. Are there Canadian statistics that can be drawn on? *Response: No comparable Canadian statistics were found.*
- Guelph's natural areas are vulnerable to "death by 1,000 cuts".

Suggestions for the NHS

- Concerned citizens should provide on-going support to City staff on this. I offer my support. (Noted by Shannon.)
- The City now accepts cash in lieu of parkland from developers. Can those funds be put towards supporting the NHS?
- City engineer(s) and public works personnel should be involved in this process.
- Develop a process for good inter-departmental communication within the City on this.
- Studies of all natural areas are needed regardless of current zoning, so that we can make more informed decisions for site planning and re-zoning.
- We need to overlay the proposed NHS map with the current Zoning map.
- Create a new designation for LSNAs; should be given more protection than current Non-Core status.
- Create a natural greenbelt - a natural "ring" - around the entire City.
- Identify all hedgerows on the map.
- Retain all existing connecting corridors on public lands.
- We need to overlay the proposed NHS map with the current Trails map. Trails and connecting corridors can serve complementary dual functions.

- Securement is the best approach to protecting larger areas. Along with public procurement, a local Land Trust, such as Speed River Land Trust, could aid in securing natural areas.
- Approach private landowners to see if they are willing to protect and/or restore natural features on their land.
- Some landowners are already stewarding natural areas on their land and should be credited for that. Change tax laws that currently favour high-impact recreation (e.g., golf courses) over stewardship.
- Encourage improved management/stewardship of existing areas on public and private lands.
- Many urban citizens are still unaware of natural areas. Provide interpretive opportunities and encourage (gentle) entry.
- Improve the existing educational materials for neighbours of natural areas.
- Provide education on what it means to live in a watershed.
- Through promoting the NHS, people could become more aware and involved.
- Greenspace should be interwoven throughout the entire City, not just in some places.
- Developing an NHS is like quilting. We need to consider the whole and the parts.

Criteria

- If we are saying some areas are "significant", are we saying other areas are "insignificant"? Will those areas considered "insignificant" become more vulnerable? *Response: It is hoped that more natural areas will be protected and restored through this process than otherwise would be.*
- Look at MNR criteria for Significant Habitat.
- What does "potential" to be integrated mean? *Response: Can feasibly be zoned or rezoned and can contribute to the overall NHS.*
- "Potential" may be too subjective and difficult to argue. We need a more precise definition of "potential" relative to both protection and restoration.
- Restoration priorities should be based on what the overall system needs.
- Consider also the shapes of natural areas for maximum habitat value.

Development Guidelines

- The current approach to development is having a negative impact on aesthetics and ecological integrity. We need to develop more responsibly.
- Required hook up to City water and sewers may be a barrier to responsible development.
- EIS consultants should not be hired by developers. Instead, developers should contribute to a fund that is managed by an independent 3rd party who hires the consultants. (A participant noted that EISs are subject to CA review and often to peer review).
- Monitoring should be paid for by developers. *Response: That can only apply for a set time frame. We need other funding sources for long-term monitoring.*
- Do not flatten sites; work with natural topography as far as possible.
- Why do developers strip the entire site? When creating a subdivision, work with what is there.
- It is possible to retain some existing features and buffers on development sites. For example, a Norwegian developer working on Willow Road in Guelph was able to protect most mature trees. (A developer at the meeting confirmed that it is possible to do that).
- Although some blending is possible, development is not always compatible with ecological integrity. Development-free natural areas and buffers are still required.
- Protecting some natural areas is not enough to sustain a healthy environment. We also need to change the way we live.

Appendix B-3: Results of the Community Survey

The survey was designed to provide qualitative information to aid in selecting and ranking criteria, identifying possible Locally Significant Natural Areas, and identifying possible additional steps. The survey was posted on the City's website over March and April of 2004, and was circulated to all Key Stakeholder Workshop and Community Forum invitees contacted via email for them to circulate as desired. All members of the Guelph community were invited to respond.

Number of surveys returned: 30. Note that not all respondents answered all questions.

Affiliations(s) - Please mark all that apply

Resident of City	18
Resident of other Municipality	2
Owner of land in Guelph that contains one or more existing natural feature(s) (natural features can include: forests/woodlands, hedgerows, grasslands (meadows/prairies), wetlands, streams/rivers).	1
Naturalist, environmentalist, ecologist or related conservation interest (amateur or professional)	15
Developer, architect, engineer, builder or related development industry interest	0
Landscape architect/designer, horticulturalist, forester, landscape maintenance or related landscape/forestry industry interest	5
Operate a farm in Guelph	0
Operate a business in Guelph	2
Trails promoter and/or user	9
Educator	8
Student	3
City of Guelph employee or elected official	3
Other government agency	1 (CVCA)
Other (please specify): Member of Green Plan Steering Committee (2)	

1. Have you read the project summary and reviewed the map of recognized natural areas in Guelph (Map 1)? Please check one.

Yes: 27 No: 2 had not seen maps, 1 had seen neither

2. The following is a list of eight (8) proposed **Social/Cultural criteria** for identifying Locally Significant Natural Areas (LSNAs) in the City. Please **select** the **four (4)** criteria that are most important *to you* and mark in the column to the right. If you wish to add a criterion, please note in the space provided.

Note on collation: Top selections are bolded.

Category	Proposed Criteria	Top FOUR
Social/ Cultural	Aesthetic value	20
	Educational and scientific value	25
	Recreational value	19
	Spiritual and mental health value	14
	Historical value	14
	Forest or other economic resource value	9
	Impact on property value	1
	Tourism value	3
	OTHER (please specify): <ul style="list-style-type: none"> ➤ Owner is willing (1) ➤ Is in the urban core, so can improve the urban core (1) ➤ Is near any residences, so is accessible (1) ➤ Legacy for future generations (1) ➤ Others noted were included in above categories 	

3. The following is a list of six (6) proposed **Physical criteria** for identifying Locally Significant Natural Areas (LSNAs) in the City. Please **select** the **three (3)** criteria that are most important *to you* and mark in the column to the right. If you wish to add a criterion, please note in the space provided.

Category	Proposed Criteria	Top THREE
Physical	Presence of unique landform (e.g., moraine, cliff or kame)	10
	Area is adjacent to a watercourse or valleyland	21
	Hydrogeological importance (e.g., recharge/discharge areas that help sustain groundwater quantity and/or quality)	28
	Hydrological importance (e.g., flood control, improves surface water quality)	15
	Importance for moderating microclimate and improving air quality	18
	Contributes to soil erosion control and/or topsoil renewal	5
	OTHER (please specify): <ul style="list-style-type: none"> ➤ Diverse topography/slopes (1) 	

4. The following is a list of twelve (12) proposed **Biological/Ecological criteria** for identifying Locally Significant Natural Areas (LSNAs) in the City. Please select the **six (6)** criteria that are most important *to you* and mark in the column to the right. If you wish to add a criterion, please note in the space provided.

Category	Proposed Criteria	Top SIX
Biological/ Ecological	Size of natural feature (i.e., is 1 ha or larger in size)	5
	Proximity to other natural features	8
	Area functions as a linkage⁺ between larger natural areas	20
	Area functions as a buffer ^{**} to an existing natural feature	15
	Presence of unique ecological communities (e.g., bog wetland community)	18
	Presence of mature and/or old growth habitats (e.g., 60 – 100 years or more)	16
	Presence of species of conservation concern	17
	Presence of high numbers of different species and/or high numbers of different habitat types (i.e., is diverse)	17
	Presence of representative ecological communities, flora and/or fauna (i.e., is an example of what is historically found in the Guelph area, such as Maple-Beech forest)	15
	Presence of high quality, relatively undisturbed habitats (i.e., high proportion of native plants; soils and hydrology are relatively intact)	21
	Is an undesignated area with high potential for integration into the Greenlands System (e.g., location is conducive and/or is already in a natural or semi-natural condition)	9
	Area has high potential to be restored or enhanced so as to fulfill other key criteria	9
	OTHER (please specify): <ul style="list-style-type: none"> ➤ <i>Is a remnant Carolinian forest (1, was included in representative)</i> ➤ <i>Can fulfill needs of the overall system (1)</i> ➤ <i>Faunal habitat (1)</i> 	

⁺ Natural linkages provide needed movement corridors for flora and fauna as well as other benefits.

^{**} Buffers are vegetated areas immediately adjacent to natural features that help reduce negative impacts on the natural feature.

5. On the following page is a **list of ALL** of the twenty-six (26) proposed criteria for identifying Locally Significant Natural Areas (LSNAs) synthesized from questions 2 through 4 above. Please note that the criteria have been randomly listed and mixed up from their original categories intentionally.

Please **select** the **seven (7)** criteria that are most important *to you* overall and mark in the column to the right, including any “other” criteria that you have identified as most important.

5. (See previous page)

Proposed Criteria	Top SEVEN
Presence of high numbers of different species and/or high numbers of different habitat types (i.e., is diverse)	8
Educational and scientific value	13
Importance for moderating microclimate and improving air quality	7
Area functions as a buffer to an existing natural feature	11
Historical value	3
Forest or other economic resource value	1
Presence of unique landform (e.g., moraine, cliff or kame)	6
Tourism value	0
Size of natural feature (i.e., is 1 ha or larger in size)	4
Proximity to other natural features	3
Area functions as a linkage between larger natural areas	16
Presence of species of conservation concern	11
Presence of unique ecological communities (e.g., bog wetland community)	17
Aesthetic value	3
Contributes to soil erosion control and/or topsoil renewal	1
Presence of representative ecological communities, flora and/or fauna (i.e., is an example of what is historically found in the Guelph area, such as Maple-Beech forest)	12
Spiritual and mental health value	5
Recreational value	6
Presence of mature and/or old growth habitats (e.g., 60 – 100 years or more)	16
Area is adjacent to a watercourse or valleyland	4
Hydrological importance (e.g., flood control, improves surface water quality)	7
Hydrogeological importance (e.g., recharge/discharge areas that help sustain groundwater quantity and/or quality)	17
Presence of high quality, relatively undisturbed habitats (i.e., high proportion of native plants; soils and hydrology are relatively intact)	12
Is an undesignated area with high potential for integration into the Greenlands System (e.g., location is conducive and/or is already in a natural or semi-natural condition)	7
Area has high potential to be restored or enhanced so as to fulfill other key criteria	7
Impact on property value	0
Other (please specify): <ul style="list-style-type: none"> ➤ <i>Is in the urban core, so can improve the urban core (1)</i> ➤ <i>Faunal habitat (1)</i> 	

6. Please refer to **Map 1** to answer the questions in Section 6.

Notes on collation: Information provided on maps was transferred to maps. A few respondents noted they could not print the map from the website.

6a. Of the various Significant Woodlands that are identified on Map 1, can you identify any that you feel should be given **high priority status** for protection or enhancement? If so, please circle on the map and mark with a **W** (woodland). Please confine your response to up to three (3) woodlands.

- Sanctuary Woods near Preservation Park (*Note: The City agreed to purchase these Woods in August 2004*)
- Hewitt Park Woodland off Waterloo Rd.
- Homewood Forest
- Torrance Creek Forest
- Mature Hemlock Forest north of Woodlawn
- Woodland north of Preservation Park
- Woodlands on private lands

6b. Of the various other natural areas (i.e., Locally Significant Wetlands, Unevaluated Wetlands, Other Natural Heritage Features) identified on Map 1, are there any that you feel should be given **high priority status** for protection or enhancement? If so, please circle on the map. Please confine your response to up to five (5) “other natural areas”.

- Hewitt Park
- Old Correctional Facility
- Clythe Creek Watershed and headwaters
- Creeks and their floodplains
- Wetlands and forests identified in the Hanlon Creek Watershed study

6c. Are there any additional natural features that are not currently indicated on the map that you think should be given **high priority status** for protection or enhancement? If so, please briefly describe below. If possible, please circle on the map and indicate with **NF** (new feature). Please provide information about the feature to the extent possible, as noted below (requested name, location, type of feature):

- Richardson's Pond between Richardson & York
- Woodlot at York & Richardson
- Old Stone Quarry (woodlot and quarry) on Huron St.
- Woodlot at Kortright Rd. and Edinburgh
- Wetland at the northwest corner of Stone Rd. & Watson (resident Red-tailed Hawk, Killdeer, others)
- Woodlot, wetland, aquatic feature and grassland on the Lafarge property behind Silver Creek
- Two woodlots on Maple St. just north of 100 Maple St. (may feed an underground stream that enters Speed River near Gow's bridge)
- All mature woodlots and natural linkages in the urban core
- Existing corridors, such as railway buffers and hydro corridors
- Little Bluestem (general area noted on map)
- Butternut (site unidentified)

- Moonseed seen on the Eramosa River floodplain
- Regionally rare plants

7. Do you have any concerns about Guelph's Natural Heritage Strategy (NHS)? If so, please briefly describe.

- The NHS may be too late.
- We must identify areas that are subject to immediate development and put protection mechanisms in place now, while concurrently further developing a coherent plan.
- The study should have a clear purpose.
- The strategy may prove ineffective, given existing zoning and inconsistent enforcement of policies and regulations (noted by several respondents).
- Current policies to protect Non-core Greenlands are being ignored.
- The final study should have strength/teeth.
- We need a Tree By-law, Pesticide By-Law, and promotion of wildlife habitat on public and private lands. (Note: The existing Tree By-law is currently under review.)
- We need stricter EIAs, so as to reduce cumulative impacts.
- Developers should be required to monitor for over 10 years.
- Increasing use of trails and woodlots is impacting plants. We have lost at least 3 species (the respondent did not note the time frame).
- We need to educate people and encourage stewardship.
- Put tax incentives and other mechanisms in place to encourage private landowners (a few respondents).
- The current tax system favours developers and encourages sales.
- We need accurate mapping.
- It is unclear how restoration areas will be identified. I suggest focusing on vital links and hazard lands.
- Protecting intact rural areas should be a higher priority than adding new low quality areas in the inner City. Rural areas also have a positive impact on rivers in the inner City.
- Protect small areas in the inner City and throughout the City. We need a balance of natural areas and development everywhere (a few respondents).
- Protect large areas.
- Protect areas at the entrances to the City.
- I do not see enough discussion about faunal habitat.
- I need on-going information about the NHS.
- We also need to reduce our ecological footprint and stop harming natural areas in the rest of the world.

The following section is intended *for landowners only*. Please note that further discussions with landowners will be undertaken as the Natural Heritage Strategy (NHS) proceeds.

8. Do you have natural features on your land that are currently designated as Non-Core Greenlands in the City's Official Plan? No responses.

If yes, are you are interested in protecting all or parts of these natural features?

If no, please briefly explain why not.

9. Are you interested in restoring or creating one or more natural features on your land (e.g., woodland, wetland, grassland)?

Yes: 3 No: 1 Might Consider: 0

The three who responded with "yes" noted they are already doing it. At least two of the three are working on small lots. The fourth respondent stated that the land is too small.

10. If you are interested in protecting or restoring/creating natural features on your land, please rank the following resources in terms of helpfulness to you. Please rank each resource as high, medium or low (i.e., high = very helpful).

Collation note: One person responded to question 10 but not to question 9.

Resources for Landowners	High	Medium	Low
More information about your natural feature(s)		3	1
A formal ecological assessment of your land	1	1	2
Information on legal agreements to protect the natural features		2	2
Information on semi-formal or informal agreements to protect the natural features	1	2	1
Information on available tax incentive programs	2	1	1
Financial assistance to help you manage the feature(s)		3	1
In-kind assistance to help you manage the feature(s) (e.g., volunteers, community organizations)	3		1
Assistance from government agency staff	1	1	2
Assistance from personnel hired by yourself		3	1
Access to educational resources		3	1
Purchase of the natural feature(s) by the City, GRCA or community organization	1	2	
Awards or other community recognition	2		2
Other (please note): A formal policy to allow for/encourage naturalization on small lots (1)			

* Noted as NA by 1

Appendix C: Data Collection Sheets for Natural Areas in the City of Guelph (Vegetation, Disturbance / Management, Wildlife)

GUELPH NATURAL AREAS INVENTORY – VEGETATION DATA COLLECTION SHEET

SITE NAME:	OBSERVER(S):	WEATHER:
OWNERSHIP:		TEMP:
DATE:	START TIME:	END TIME:

UNIT DESCRIPTION

SYSTEM	SUBSTRATE	PLANT FORM	COMMUNITY
TERRESTRIAL	MINERAL SOIL	DECI DUOUS	LAKE/ POND
WETLAND	PARENT MI N	CONI FEROUS	RIVER/ STREAM
AQUATIC	BEDROCK	GRAMI NOID	FOREST (> 60 %)
LANDSCAPE POSITION / FEATURE	ORGANI C	FORB	WOODLAND (35-60%)
LACUSTRINE	TOPOGRAPHY	MI XED	SAVANNAH (25-35 %)
RIVERINE	UNI FORM/LEVEL	FLOATI NG LVD.	REGENERATI NG FOREST
FLOODPLAIN/BOTTOMLAND	UNEVEN	LI CHEN	PLANTATI ON
VALLEY TERRACE	HIGHLY VARI ABLE (hummocky)	BRYOPHYTE	THI CKET
VALLEY SLOPE	SLOPE	COVER	PRAIRIE
TABLELAND	0-10%	OPEN	MEADOW
ROLLI NG UPLAND	10-25%	SHRUB	SWAMP
ROCKLAND	> 25 %	TREED	MARSH
BEACH / BAR	DRAINAGE	CANOPY CLOSURE	BOG
SAND DUNE	WELL	<25%	FEN
BLUFF	IMPERFECT	25-50%	BARREN
CLIFF/TALUS	POOR	>50%	ALVAR
CREVICE/CAVE	SEASONAL PONDING	RELATIVE AGE	BEACH / BAR
NATURALI ZED	SOIL TEXTURE:	I MMATURE	SAND DUNE
CULTURAL	MOI STURE REGI ME:	MATURE	BLUFF
OTHER:	STAND AGE TYPE: UNEVEN / EVEN	OLD GROWTH	CLIFF

VEGETATION DESCRIPTION

LAYER	CANOPY LAYER.	#	UNDERSTOREY	#	GROUND LAYER	#	GROUND LAYER	#	GROUND LAYER	#	GROUND LAYER	#
SPECIES CODES												
HEIGHT												
COVER												
DIAMETER RANGE												
ABUNDANCE CODES (#): D=DOMI NANT; A=ABUNDANT; F=FREQUENT; O=OCCASI ONAL; S=SPARSE HEIGHT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT<0.2 m (MULTI PLE CODES AND RANGES ARE ACCEPTABLE) COVER CODES: 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%												

ELC COMMUNITY CLASSIFICATION	ELC CODE
COMMUNITY CLASS:	
COMMUNITY SERIES:	
ECOSI TE:	
ECOELEMENT:	

WILDLIFE HABITAT DESCRIPTION / INCIDENTAL WILDLIFE OBSERVATIONS

SPECIES CODE	BREEDI NG EVIDENCE	#	REMARKS: (UTM FOR SAR, ETC)	SPECIES CODE	BREEDI NG EVIDENCE	#	REMARKS (UTM FOR SAR, ETC)
DISTURBANCE OBSERVATIONS:							

DD / MM / YYYY

ELC Management / Disturbance	Date:	Site:
	Polygon:	Surveyors:

DISTURBANCE / EXTENT	0	1	2	3	SCORE †
TIME SINCE LOGGING	> 30 YRS	15 - 30 YRS	5 - 15 YRS	0 - 5 YEARS	
INTENSITY OF LOGGING	NONE	FUEL WOOD	SELECTIVE	DIAMETER LIMIT	
EXTENT OF LOGGING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
SUGAR BUSH OPERATIONS	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF OPERATIONS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
GAPS IN FOREST CANOPY	NONE	SMALL	INTERMEDIATE	LARGE	
EXTENT OF GAPS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
LIVESTOCK (GRAZING)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF LIVESTOCK	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ALIEN SPECIES	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF ALIEN SPECIES	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
PLANTING (PLANTATION)	NONE	OCCASIONAL	ABUNDANT	DOMINANT	
EXTENT OF PLANTING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
TRACKS AND TRAILS	NONE	FAINT TRAILS	WELL MARKED	TRACKS OR ROADS	
EXTENT OF TRACKS/TRAILS	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DUMPING (RUBBISH)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DUMPING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
EARTH DISPLACEMENT	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISPLACEMENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
RECREATIONAL USE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF RECR. USE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
NOISE	NONE	SLIGHT	MODERATE	INTENSE	
EXTENT OF NOISE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
DISEASE/DEATH OF TREES	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF DISEASE / DEATH	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
WIND THROW (BLOW DOWN)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF WIND THROW	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BROWSE (e.g. DEER)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BROWSE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
BEAVER ACTIVITY	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF BEAVER ACTIVITY	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FLOODING (pools & puddling)	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FLOODING	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
FIRE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF FIRE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
ICE DAMAGE	NONE	LIGHT	MODERATE	HEAVY	
EXTENT OF ICE DAMAGE	NONE	LOCAL	WIDESPREAD	EXTENSIVE	
OTHER	NONE	LIGHT	MODERATE	HEAVY	
EXTENT	NONE	LOCAL	WIDESPREAD	EXTENSIVE	

† INTENSITY x EXTENT = SCORE

Appendix D: ELC Permanent Monitoring Plot Methodologies

Appendix D: ELC Long-term Monitoring Plot Methodology

The methodology used for the Hanlon Creek Watershed long-term vegetation monitoring plots is based on Ecological Land Classification (ELC) protocols that were developed specifically for permanent plots (Chambers and Lee, 1992). The following pages are excerpts from the unpublished manual that was used to develop this methodology.

The monitoring plots are 10 x 10 m in area. A metal t-bar was placed at the centre of the plot and Global Positioning System (GPS) coordinates were taken from next to the t-bar. Flags or posts were set up at the north, east, south, and west corners of the plot at a distance of 7.07 m from the t-bar to establish the corners of the plot. Vegetation cover data collected generally follows the ELC system (Lee *et al.*, 1998), except the height classifications for the canopy layers are modified (see the “Vegetation Form” section in the preceding pages). Disturbance observations were collected from within the plot and the area surrounding the 10 x 10 m plot (the vegetation polygon).

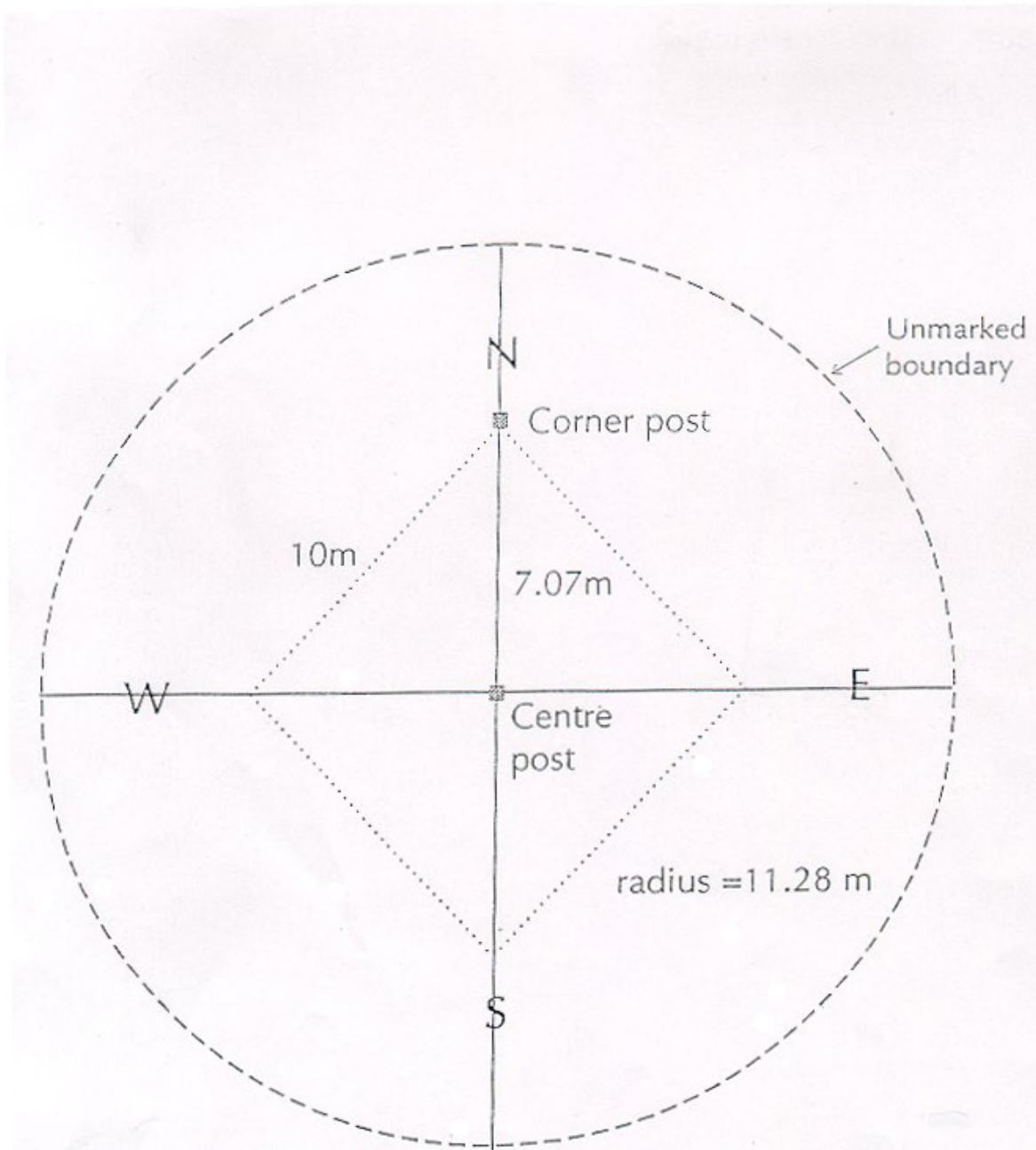
To assess percent cover by species, the plot was divided into four subplots. The percent cover of each species in each height category from each of the four subplots was recorded on the data sheets. One square metre of the 10 x 10 m plot was considered 1% cover. Anything less than one square metre was recorded as “Trace” which is denoted with a “T” on the data sheets.

Chambers, B., and R.M. Lee, 1992. Central Ontario Forest Ecosystem Classification (COFEC): Field Data Collection Manual. Version 1. Central Ontario Forest Technology Development Unit.

Lee, H., W. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Sciences Section, Science Development and Transfer Branch, SCSS Field Guide FG-02.

Appendix D: ELC Long-term Monitoring Plot Methodology *cont'd*

Figure 8. Diagram of an ELC plot



Appendix D: ELC Long-term Monitoring Plot Methodology *cont'd*

D.1.3 Set up the vegetation (10X10m) plot perimeter by looping bungee cord over the first post and run the cord around the other posts, tying it off at the first post.

D.2.0 Vegetation Data

D.2.1. Vegetation Data Set (includes Vegetation Form and Species Checklist)

D.2.2. Vegetation Form (Appendix 10)

40. *Species.* Enter the complete Latin name of each plant species. If the species name is unknown, a descriptive name and sample number for the species should be entered on the vegetation form. A sample of the species should be kept in the plant press until it can be correctly identified.

41. *Layer code.* Enter the layer code from the following choices. Figure 10 illustrates the crown classes.

Layer code	Vegetation Layer	Vegetation
1	>10m height (Codominant, Dominant or Emergent crown)	Dominant Canopy Position
2	>10m height (Intermediate, Overtopped Suppressed and Understory crown)	Subdominant Canopy Position
3	2m< height<10m	Sapling trees and shrubs
4	0.5m<Ht<2.0m	Regeneration
5	0m<Ht<0.5m	Seedlings
6	Herbs	Herbs, grasses, sedges
7	Ground cover	Mosses, lichens, liverworts
8	Floating aquatic	
9	Submergent aquatic	

Appendix D: ELC Long-term Monitoring Plot Methodology *cont'd*

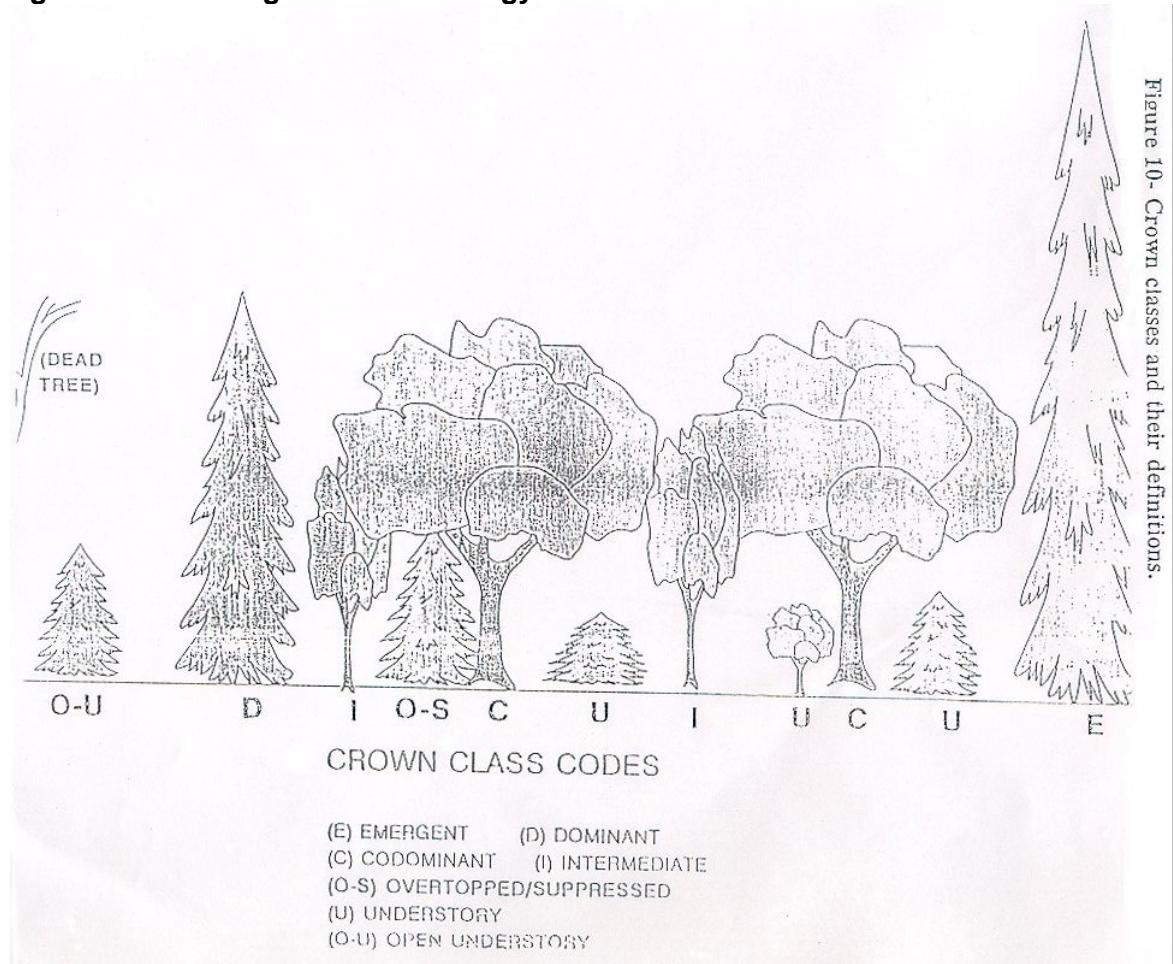


Figure 10- Crown classes and their definitions.

Appendix D: ELC Long-term Monitoring Plot Methodology *cont'd*

CROWN CLASS DESCRIPTION

Emergent	A tree with a crown extending well above the general level of the crown layer of the stand which receives full light from above and from the sides. Much larger than the neighbouring trees with a more fully developed crown. (ie. White Pine extending beyond the canopy.
Dominant	A tree with a crown extending above the general level of the crown layer of its' immediate neighbours which receives full light from above and partly from the side.
Co-dominant	A tree with a crown that forms a part of the general level of the crown cover of its' immediate neighbours which receives full light from above and comparatively little light from the sides. This class is normally used when there are two or more trees of equal size adjacent to one another.
Intermediate	A shorter tree when compared to its' immediate neighbours but with a crown which extends into the neighbouring trees which receives direct light from above but not from the sides. Usually small crowded crowns on the side.
Overtopped/ suppressed	A tree with a crown entirely below the general level of the crowns of its' immediate neighbours and receives no direct light either from above or from the sides. These trees normally have restricted height growth due to the neighbouring trees and may exhibit elongated lateral branches.
Understorey	Trees clearly of a much younger age class than the stand as a whole in even aged stands. These trees would otherwise be in the overtopped/suppressed category.
Open Under- storey	A tree previously classified as overtopped/suppressed or intermediate that has been "released" due to stand break up, windthrow or blowdown etc. This tree now receives full light from the top and sides. This category also includes trees that have established themselves in an area not previously occupied by other trees (ie. smaller Jack Pine on exposed bedrock within a mature Jack Pine stand).

Appendix D: ELC Long-term Monitoring Plot Methodology *cont'd*

42. *% cover.* Record all of the species found in the plot and their layer on the vegetation form (Appendix 2). A description of the vegetation layers is provided in Section B.2.1.. Start with the mosses and herbs (layer 7 and 6), and work your way up to the trees (layers 1 and 2). The layer codes do not have to be in precise order, however it is preferable to use a consistent approach. As the species and their layer code are identified, assign a percent cover for each species in each layer. Percent cover is the vertical projection of each species on the ground, that is whole area the species is occupying including space between leaves and branches. A species can occur in more than one layer, for example Sugar Maple can occur in layers one through five. Use the following as aids in assigning percent cover:

- 1) the OIP manual's % cover charts (Figure 9),
- 2) imagine taking all of the plants and placing them in one corner of the plot. If all of the plants can fit into:

1/2 of the plot =50%
1/4 of the plot =25%
1/2 of 1/4 of the plot =12%
1/4 of 1/4 of the plot =6%.

This guide is useful for plants which occupy large percentages of the plot.

- 3) If the plant occupies smaller percentages of the plot, use the following as guidelines:

1 meter² of the plot is 1% cover.
Anything less than 1 meter² is a trace.

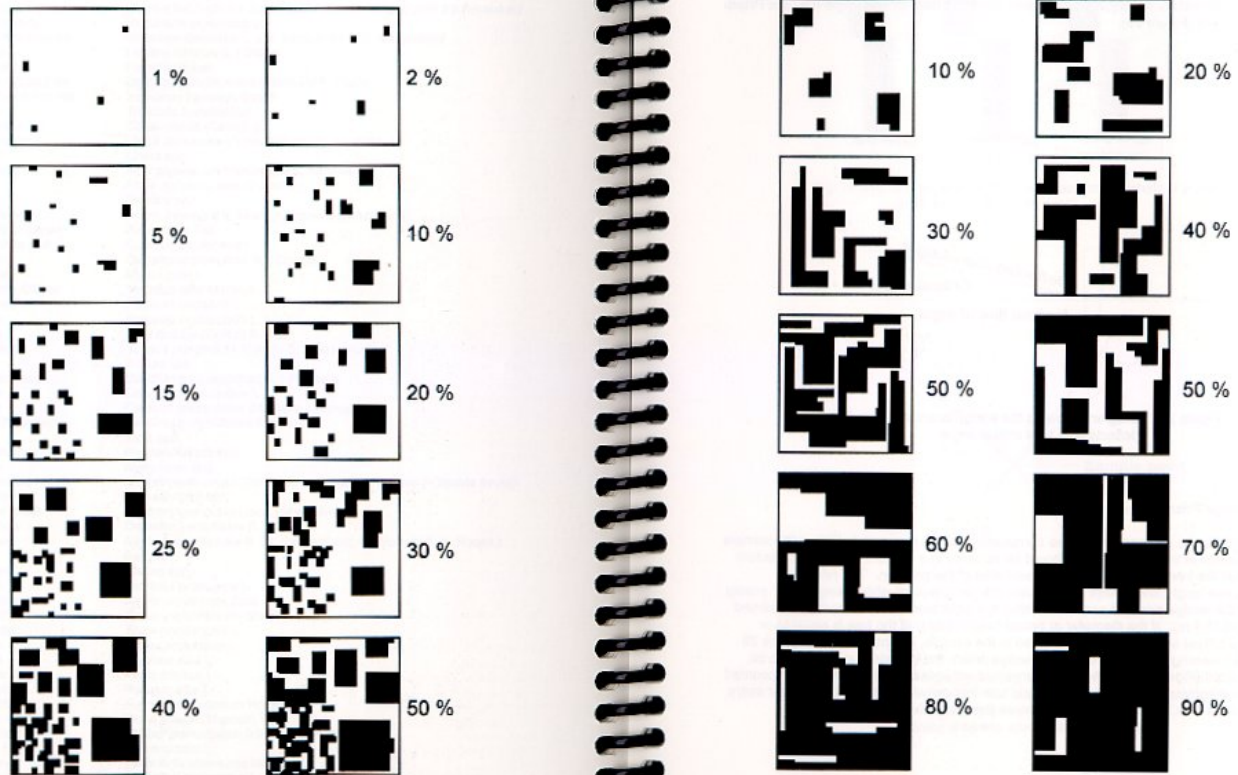
- 4) For trees (layers 1 and 2) use one of the following two methods for assigning percent cover. Method A: For each tree, estimate the area of the crown. If the area of the crown is 6m by 4m this equals 24m² or 24% cover in this plot. Since percent cover is estimated for each species, do not take into account overlap between trees of the same species, but do consider overlap between species. After estimating canopy area of all trees in one layer, sum the % covers to get a total by species for that layer. Percent cover cannot exceed 100% for one species, but may exceed 100% in total when all species are considered. Use the following examples to help guide your estimations:

In Figure 11A, there is complete canopy closure of Sugar Maple in the canopy layer, with a large emergent White Pine above this layer. All of these trees are in Layer 1. In this example, Sugar Maple % cover is 100%, and White Pine % cover is 15%. It is not correct to estimate the

Appendix D: ELC Long-term Monitoring Plot Methodology *cont'd*

Appendix C: Area Percentage Charts

The following charts represent a tool to assist practitioners in estimating area percentages. These charts are an excerpt from OIP (1985).



Appendix D: ELC Long-term Monitoring Plot Methodology *cont'd*

Figure 11 a - c

Figure 11a

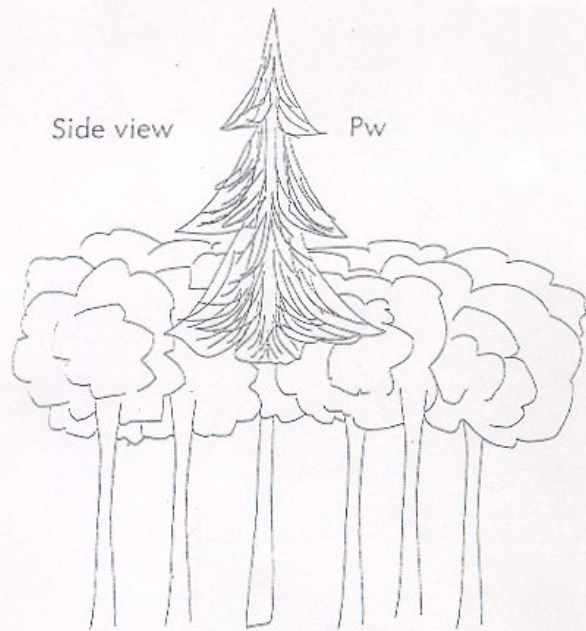
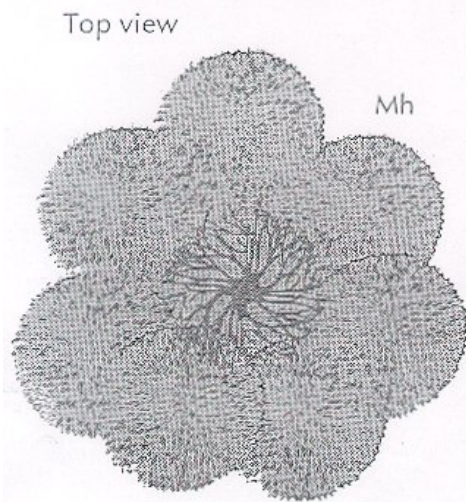


Figure 11b

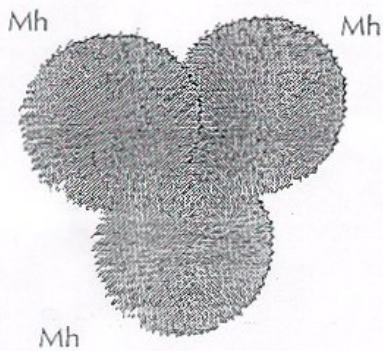
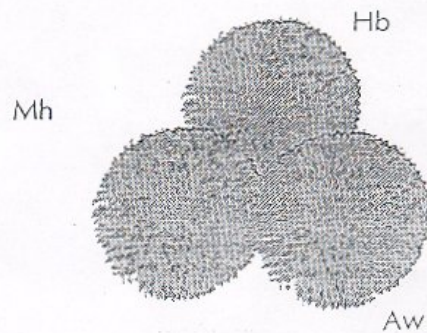


Figure 11c



Appendix D: ELC Long-term Monitoring Plot Methodology *cont'd*

White Pine % cover at 15%, and then to estimate Sugar Maple % cover at $100-15\%=85\%$. This example could also occur in the herbaceous layer, Layer 6. Here there could be a solid carpet of ostrich fern with several emerging spikenards. Use the same guidelines to assess % cover here.

In Figure 11B, there are three overlapping Sugar Maples, each with 5m^2 of canopy area (5% cover). The correct way to assign a percent cover value here is to ignore the overlap between the same species and assign a percent cover value of 12%.

In Figure 11C, again three trees overlap, however this time there are three different species, each with 5m^2 of canopy area. In this case, the percent cover estimate would be 5% for each tree, or 15% in total.

Crews should work together closely on assigning percent cover for at least the first several weeks. Working together in this manner will ensure consistency within a team. In all layers consider all plants that hang over the 10X10m vegetation plot regardless of whether they are rooted in the plot or not. For leaning trees which are rooted in the plot but have a canopy outside the plot, consider the percent cover of the bole and stem within the plot only. This partially addresses the fact that this tree removes nutrients and water from the plot, but does not have canopy percent cover.

Each data collection team has the option of doing one quarter of the 10X10m vegetation plot at a time, or doing the whole plot at one time. Either way the percent cover for the whole plot is what is required. Field experience has generally shown that estimating by the four quarters is best for smaller plant species and the whole plot method is best for small trees etc. The Vegetation Form is designed to allow the team to select either method. When using the four quarters method, care should be taken when assigning trace values. A trace in the quarter plot is less than 0.25m^2 .

Assign a value for **canopy closure** using the same % cover guidelines. Canopy closure is essentially the percent cover for all species in Layer codes 1 and 2.

D.2.3. Plant checklist

A brief reconnaissance of plants in the site (wetland) surrounding the plots is made. Use the species checklist provided (Appendix 2). Additional species can be added to this list after the data is collected from the other plots. Attach a number to each species to indicate abundance. Use the following guidelines:

- 1-rare 0-10 individuals in the stand.
- 2-uncommon 10-100 individuals in the stand
- 3-common 100+ individuals in the stand.

