City of London

ENVIRONMENTAL MANAGEMENT GUIDELINES

Revised January 2007

The following document is a compilation of policy guidelines, standards, process and procedures for the preparation and review of Environmental Impact Statements, Subject Lands Status Reports, Evaluations of Environmentally Significant Areas, Evaluations of Significant Woodlands, Boundary Delineation of Vegetation Patches, Determination of Buffers and Setbacks, Planting Guidelines for Natural Areas ands Storm Water Management Facilities as required by the Province and the City of London. It is not intended to serve as a complete source of information and other essential references should be reviewed before initiating an environmental study. For further information on the process, contact the City Planning Division at (519) 661-4980.

The practice of environmental management requires a systematic approach which follows a predictable and traceable pattern. The use of a consistent template provides clear expectations for the proponents and will ensure that relevant issues are not overlooked and that unnecessary items are excluded. The outcome in terms of process will be an expedited review, and the product will be a document that will assist decision – makers in their assessment and review of the development proposal and its environmental impacts.

The City of London published, in 1997, the Guideline Documents for Environmentally Significant Areas Identification, Evaluation and Boundary Delineation and at the same time "Draft Guidelines for the Preparation of a site-specific environmental impact study (EIS)". Subsequently the EIS Scoping List was prepared by the Environmental and Ecological Planning Advisory Committee (EEPAC) which closely follows the Natural Heritage Reference Manual for Policy 2.3 of the Provincial Policy Statement (MNR 1999). Together, these describe a collaborative process between the City, the proponent and the professional consultants; and, they set out the contents and expectations for the completed Studies. Since that time, reports following this process and these guidelines have been submitted to the City largely through area (community) planning studies, establishing a successful track record for proponents, staff and the review process. The following document is a synthesis of work completed by the City, EEPAC, professional consultants, the province and the Ontario Municipal Board.

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1.0

City of London

GUIDELINES
For the Preparation and Review of Environmental Impact Studies (EIS)

November 2003

Council Approved January 19, 2004

The following document is a compilation of policy guidelines, standards, process and procedures for the preparation and review of Environmental Impact Studies as required by the Province and the City of London. These policies require an environmental impact study be prepared where development is proposed within or adjacent to components of the natural heritage system as defined in the City of London Subwatershed Planning Studies and Official Plan. It is not intended to serve as a complete source of information and other essential references should be reviewed before initiating an environmental study. For further information on the process, contact the City Planning Division at (519) 661-4980.

Typical Steps in the Review Process of an Environmental Impact Study

STEP 1

- 1.1

Pre-consultation: The requirement for an EIS is established and confirmed with the applicant. The applicant will be given general direction and guidance as to the anticipated form and content of the EIS based on preliminary identification of issues and concerns. Members of the Technical Advisory Review Team (TART) will be identified.

- 1.2

Site Suitability and Scoping of the EIS: An Issues Summary Checklist Report is prepared by the applicants' consultants and submitted to the Technical Advisory Review Team. A meeting is held to discuss the suitability of the development application based on the natural heritage context and to develop and agree on more detailed terms of reference for the EIS. In some cases, issues that were identified in the pre-consultation may be shown to be insignificant and/or additional issues for study may be identified.

- 1.3

Review of Step I Report – must be accepted to continue

STEP 2

- 2.1

Site Visit and Ongoing Consultation: Interim reporting and ongoing dialogue between the consulting team and the Technical Advisory Review Team is recommended to maintain a clear understanding of the process and allow for some degree of flexibility and adaptation of the Terms of Reference as warranted. Where unforeseen issues require additional studies to be undertaken, the timelines for reporting and review may also have to be amended.

- 2.2

Description of Proposed Development

- 2.3

Assessment of Development Impacts: This is the biggest and most difficult step in the process. It includes the identification of existing and potential direct and indirect impacts, assessment of alternatives, recommendations for protection, rehabilitation, mitigation or compensation and monitoring.

- 2.4

Preparation of the Step 2 Draft EIS Report:

- 2.5

Review of the Draft EIS Report: The draft report will be submitted to the Planner for the file who will distribute copies to the Technical Review Advisory Team for review. If required, additional information will be presented in an addendum. **The report must be accepted to continue.**

STEP 3

- 3.1

Development Application and Final Report: A final EIS report will be prepared and submitted as part of the standard application review process. Recommendations of the EIS, as supported by the Technical Review Advisory Team, will be carried forward as draft conditions and/or be incorporated into grading, storm water and landscape drawings.

- 3.2

Recommendations for Development Conditions

BACKGROUND AND FRAMEWORK

Section 3 of the Planning Act of Ontario requires that in exercising any authority that affects planning matters, planning authorities "shall have regard to", among other matters, the protection of ecological systems, including natural areas, features and function. Section 2.3 of the Provincial Policy Statement (1997) states, that where development and site alteration may be permitted, within or adjacent to significant areas, proponents must demonstrate that there will be "no negative impact" (loss) on the natural features or the ecological functions for which the significant area is identified. Municipalities through their official plan set out how to satisfy the requirements of "no negative impact". The process involves the preparation of a report typically called an Environmental Impact Study (EIS), or Development Assessment Report (DAR).

PURPOSE – *Environmental Impact Studies are required to clearly determine and describe the significant features and functions of a component(s) of the City's Natural Heritage System, outline the proposed development and precisely determine potential impacts on those features and functions.*

An EIS will contain recommendations for avoidance of impacts, mitigation of impacts, environmental management strategies, monitoring requirements or other processes to protect these significant features and functions. These recommendations are formalized as conditions of the development approval process.

The function of the EIS process is to assist planners and politicians to make informed decisions about the potential impacts of development, including the determination of which impacts are acceptable with and without mitigation, and those impacts that should be avoided.

The proponent of development has a responsibility to fulfill the requirements established by the Province and the municipality for an Environmental Impact Study with consideration of all aspects of the development. While the process is developer led and paid for by the proponent, the "client" for an EIS is always the environment.

The completion of an EIS does not assure the approval of a development proposal. The process of an EIS provides the mechanism for assessing impacts. Accepting, modifying, or rejecting development proposals in and adjacent to natural areas is part of a larger planning approval process which includes the EIS. The EIS process will help to protect natural heritage features and provide guidance as to the compatibility of development with those features.

Areas Subject to EIS

In general, the natural heritage features and areas of concern to the municipality are recognized in the Official Plan as significant components of a natural heritage system, which are important for their environmental and social values as a legacy of the natural landscapes of an area. The policies in section 15.4 and 15.5 apply to recognized and potentially significant components of the natural heritage system as delineated on Schedule "B" (Table A). The policies also address the protection of environmental quality and ecological function with respect to water quality, fish habitat, groundwater recharge, aquifers and other natural heritage features not specifically identified, including headwater areas, streams and drainage corridors and remnant vegetation.

The identification and/or clarification of natural heritage features and functions of lands designated Environmental Review or Open Space on Schedule "A", are completed independently and prior to the EIS, through an Area Plan Study, or a Subject Lands Status Report for sites where there is no Area Plan. Table A sets out the requirements for completing an EIS, where development is proposed entirely or partially within the distances adjacent to natural heritage system components (source: Official Plan Table 15-1).

Table A: Areas Subject to Environmental Impact Study Requirements

DISTANCE	COMPONENTS	REGULATORY AGENCY
Within 120 metres	Provincially Significant Wetlands (PSW) and all lands connecting Provincially Significant Wetland areas within a designated wetland complex	Provincial Ministry of Natural Resources
Within 100 metres	Locations of vulnerable, threatened, or endangered species (VTE), where the extent of significant portions of the habitat is not mapped or where management guidelines are unavailable	Provincial Ministry of Natural Resources
Within 50 metres	Environmentally Significant Areas (ESA); Life Science areas of Natural and Scientific Interest (ANSI- Life science component); Locations of Vulnerable, Threatened, or Endangered (VTE) species, where the extent of significant portions of the habitat is mapped or where the management guidelines indicate the appropriate extent of significant portions of habitat; Significant woodlands; Significant wildlife habitat; Significant river, stream, and ravine corridors; Significant upland corridors	Provincial Ministry of Natural Resources Conservation Authority City of London
Within 30 metres	Locally Significant Wetlands (LSW) and all lands connecting Locally Significant areas within a wetland complex ; Designated Fish habitat	City of London Conservation Authority Department of Fisheries and Oceans
Within 15 metres	Earth Science Areas of Natural and Scientific Interest (ANSI- Earth science component)	Provincial Ministry of Natural Resources
Within a distance appropriate to the specific components of the Natural Heritage System (NHS) contained on the lands	Areas designated as Environmental Review (ER) on Schedule 'A' of the Official Plan	City of London

Framework for Completing an Environmental Impact Study

A. Subwatershed

The broad planning framework to establish the context and direction for Environmental Impact Studies is provided by the City of London Sub- Watershed Planning Studies. These studies provide a generalized level of direction for the identification of lands to be protected or conserved, criteria to be applied in the planning and design of development to protect natural features and ecological functions, management practices to mitigate impacts from existing land uses, and programs to promote education, awareness and stewardship. Recommendations are summarized in Tributary Fact Sheets for each of 13 subwatersheds within the City of London. Implementation of the Sub-Watershed studies is provided through the Official Plan policies including: Chapter 2 - Planning Framework; Chapter 15 - Environmental Policies; and Chapter 8 - Open Space and Environmental Review Policies.

B. Area Plan/Secondary Plan

Area (Community) Plan studies are generally required to guide land use in the Urban Growth areas of the City of London. These studies provide sufficient level of ecological resources inventory and evaluation to assess significance of natural heritage features and recommend appropriate designations. The natural heritage or environmental management strategy developed through this process generally fulfills the requirements of a Comprehensive EIS by identifying areas requiring further studies or investigations at a more site-specific level (subdivision, or site plan application). The Natural Heritage Strategy for the long-term protection of the natural heritage system identifies areas of constraints (areas where development is precluded or limited, based on the significance or sensitivity of natural heritage features and/or functions) and opportunities (areas where development may occur based on the absence of constraints, or areas where ecological restoration or enhancement may be implemented). The recommendations or guidelines for future studies in support of development applications are summarized on maps and in feature fact sheets or summary tables.

C. Subject Lands Status Report

Subject Lands Status Reports (SLSR) are completed for development applications that have not been the subject of an Area Planning Study and where limited background information is available and/or the framework for background studies is not in place. They are completed for lands designated Environmental Review or Open Space on Schedule "A", or appear on Schedule "B" as an unevaluated feature (e.g. stream or vegetation patch). The objective is to inventory, evaluate, assess significance of features and functions, delineate boundaries and make recommendations for designation. A SLSR must give special consideration to the identification of environmental management requirements and ensure that key resources are adequately studied and protected through connectivity, buffers and monitoring. Draft Guidelines for completing a Subject Lands Status Report are available from the Department of Planning & Development.

EIS REVIEW PROCESS

The process for completion of an EIS is conducted in three steps. These steps are structured to streamline the process, ensure that the necessary information is available and accepted at each decision point, and to avoid unnecessary pre-development investment in lands not suitable for development. The applicant and consulting team should conduct this investigation using their professional judgment and experience as guidance. It is the responsibility of the owner to retain a team of consultants who meet the qualifications in Appendix C.

STEP 1

1.1 PRE-CONSULTATION

Some preliminary data gathering and early contact with the municipality should and will take place by the applicant before determining the suitability and the planning direction of a proposed development or development concepts. Municipality staff is available to assist with the identification of background material and required studies. The municipality will identify the members of the Technical Advisory Review Team (TART).

PURPOSE - *The purpose of the TART is to facilitate communication and discussion of issues with the proponent and consulting team at the earliest stage and before significant pre-development investment has been made. The role of early dialogue has been found to be a very important part of the process.*

The TART will consist of a City staff member and representatives from various agencies (e.g. CA, MNR, MOEE, MMAH, MAF), the Environmental and Ecological Planning Advisory Committee (EEPAC) and other groups or associations with an interest in the application.

1.2 SITE SUITABILITY AND SCOPING OF THE EIS

The suitability of the development proposal will be confirmed with the Planning Division in the context of the current Official Plan and/or Zoning By-Law designations, Sub-watershed and/or Area Plan recommendations, Provincial Policy, and approval process for Plans of Subdivision or Site Plans. Other applicable legislation that will need to be addressed should be identified at this time (e.g. Environmental Assessment Act, Conservation Authorities Act, Ontario Water Resources Act, and Fisheries Act).

Issues Summary Checklist Report

The applicant will be instructed to complete an Issues Summary Checklist Report and submit copies to the municipality for circulation and approval (Appendix A).

PURPOSE – *The main purpose of the Issues Summary Checklist Report is to assess the potential impacts of the site development based on the significance of existing natural heritage system features and functions. The potential impacts and extent of development will be determined by land use designation and permitted uses, and the opportunities and constraints for the proposed land use in relation to its location within or adjacent to the natural heritage system.*

Section 1.0 of the Issues Summary Checklist Report will be completed in consultation with the municipality. It should identify, up front, to the greatest degree possible, the existing biophysical inventory of both terrestrial and aquatic communities, physical and biological features, functions, and processes that occur on and beyond the site that will be affected, or that might reasonably be expected to be affected, either directly or indirectly. The first box will be checked if it is a required element of the study (e.g. aquatic habitat would not be an issue if there are no associated streams). The second box will be checked if there is sufficient background information available, and the source or reference provided. This will include previous inventories, methodologies and relevant reports prepared for/by other agencies, the contacting of local naturalists who may be familiar with the site, as well as current inventory requirements and data (to be) collected. The consultant should check the data collection standards (1997, revised 2003, available from the Planning Department) and/or confirm with the municipality if a three-season inventory would be required where there is limited or dated background information. Areas where there are data gaps in the study requirements will be easily identified. The existing conditions will be presented as text and maps or figures prepared at the same scale and must include:

- Terrain and drainage features (on a base that shows contours, e.g. Ontario Base Map);
- Vegetation (OBM or ortho-image);
- Ecological functions and linkages (OBM or ortho-images).

A summary of issues that will have to be considered and addressed through additional component studies will be identified at this time (e.g. geotechnical, storm water management, etc.).

Sections 2.0 and 3.0 of the checklist report may be completed only when there is sufficient information available to assess significance of the existing environment features as components of the natural heritage system (i.e. local or provincial wetland, ESA, woodland, wildlife habitat, fish habitat, and river, stream, or ravine corridor); and describe ecological features and functions. A figure should be prepared that depicts the key environmental management areas or units that comprise the feature, noting for each area or unit:

- How it contributes to the identification of the feature as "significant";
- The primary environmental management objectives required to maintain overall site quality and integrity;
- How the functions/area may be measured and impacts quantified or qualified (e.g. change in area, predictions through modeling theories);
- The sensitivity of the area to potential development impacts.

Where the municipality is satisfied that the required background information and studies are sufficient, are assembled at a scale commensurate with the development concept, and there is general agreement about the significance of natural heritage features, functions and areas, the checklist report will be submitted for review.

1.3 REVIEW OF ISSUES SUMMARY CHECKLIST REPORT

The municipality will distribute copies of the report to the Technical Advisory Review Team who will be given 15 business days to review and provide comment. A summary of issues, concerns, questions, or clarifications will be compiled and carried forward through the Planning Division.

The municipality may also review and discuss the applicability of exemptions to an EIS (see Appendix C). In the event that the City of London waives the requirement of an EIS, in whole or in part, the TART will receive the checklist report and the rationale in support of the exemption for their consideration and review.

There are two possible outcomes of the preliminary review process:

1. The site or portions of the site may be determined to be unsuitable and inappropriate for the type of development and /or land use proposed;
2. The site or portions of the site may be determined to be suitable for consideration of the proposed development and land use or alternatives.

Where insufficient knowledge about natural features or areas exists, or there is dispute about the significance of an area, the municipality will direct the collection of additional information to evaluate significance, describe functions and identify environmental management areas for protection, and Step 1 re-visited at that time.

Where the natural heritage features and functions have been adequately described, Step 2 can be initiated. The parties will discuss and agree on the terms of reference for site issues that need specific or further consideration. This may include the identification of standards and protocols for accepted methods of data collection, analysis and evaluation of potential impacts. They will also discuss additional supporting studies that may be required. The opportunities and constraints mapping and the environmental management areas identified in the checklist report will be used to guide the development concept and identify potential areas of impact.

STEP 1 REVIEW
(provide recommendations for any questions answered as "No").

Section 1.0 Description of the Environment

1) Have key ecosystems components been described?	**YES**	**NO**
2) Are the data and sources of information referenced?	**YES**	**NO**
3) Have the facts been accurately represented and interpreted?	**YES**	**NO**
4) Is the time frame for studies appropriate to the ecosystem components present?	**YES**	**NO**

Sufficient information is presented to proceed to Sections 2.0 and 3.0 **YES** ⇩ **NO**⇧

Section 2.0 Evaluation of Significance

5) Have the criteria been applied appropriately?	**YES**	**NO**
6) Are boundaries appropriately delineated?	**YES**	**NO**
7) Analytical methods have been appropriately documented?	**YES**	**NO**

Section 3.0 Identification and Description of Functions

8) Have all features and functions that are reasonably expected to be affected directly or indirectly by the proposal been identified?	**YES**	**NO**
9) Are identified functions measurable (i.e. functional loss can be predicted through sampling, modeling, or other accepted methods) and/or serve as good indicators of effects?	**YES**	**NO**

Phase I report meets minimum requirements **YES** ⇨ go to Step 2
NO ⇨ send back to consultant

Signed _____
Date _____

STEP 2

2.1 SITE VISIT AND ONGOING CONSULTATION

Site Visit

A site visit may be conducted by the applicant and members of the Technical Advisory Review Team as appropriate and convenient. A site visit early in the process, to define pertinent natural heritage and natural hazard concerns, can be a starting point for the development proposal and aid on-site interpretation. Preliminary boundaries of the natural heritage feature(s) of concern should be established and surveyed as early as possible in the process (exclusive of buffers), in order that impacts can be specifically addressed in relation to the sensitivities of the natural feature(s), the environmental management requirements, and the condition of the vegetation along the edge of the feature (and for a distance both inside and outside the edge). It is useful to number and survey boundary markers and other locations of particular features so that reference points on the ground can be shown on the plan

Ongoing Consultation

Interim reporting and ongoing dialogue between the consulting team and the Technical Review Advisory Team is recommended to maintain a clear understanding of the process and allow for some degree of flexibility and adaptation of the Terms of Reference as warranted. This would include both the waiving of certain data collection or study requirements and the expansion of the terms of reference if the initial data collection and analysis efforts reveal new issues or concerns of significance that were overlooked in the scoping meeting. Where unforeseen issues related to the significance of the features or functions require additional studies to be undertaken, the timelines for reporting and review may also have to be amended.

Scoped Site EIS

If at this stage the applicant agrees to adhere to adequate development setbacks and buffers from natural heritage/hazard areas, recommended through consultation, a detailed assessment of impacts and effects may not be required. A scoped site EIS may be completed in consultation with the Ecologist Planner and planner for the file. The report must, at minimum, identify potential edge effects and propose mitigation measures to limit construction impacts. Other conditions of development will be included to ensure the integrity of the natural heritage feature and functions will be maintained. The requirement for monitoring will be discussed.

2.2 DESCRIPTION OF THE PROPOSED DEVELOPMENT (section 4)

> **PURPOSE**: *To obtain a thorough understanding of the proposed development in relation to the surrounding landscape features (natural heritage and hazard) and adjacent lands.*

Complete mapping of all aspects of the development concept is required, including proposed land uses, alterations to drainage for storm water management, infrastructure such as roads and sewers, and other servicing requirements, parks and open space. When there is a question as to whether there is adequate or suitable area for development, more detailed concept plans for the lots or blocks in question will be required. These will show building envelopes, relevant building setbacks, driveways, parking and location of utilities and services. A description of the municipal requirements, standards, etc., which will effect the development, such as: provision of useable privacy area for residential development, rear lot grading requirements and the proposed type of dwellings to be constructed (i.e. ground floor area) to fit in with the neighbourhood, a preliminary grading plan indicating both existing and proposed grades for services and building envelopes, including useable privacy areas, etc. Specific design features or considerations to meet environmental management objectives will be identified at this stage.

Grade changes result in one of the greatest impacts on the landscape, often determined by sanitary sewer depth and/or by maximum allowable road grades. A cut and fill diagram using contour lines and/or colours to show areas of cut/fill from the original soil surface in 0.5 meter intervals is highly illustrative. Consideration should be given to moving sewers deeper/shallower, using pumping stations, and modifying road grades to reduce the impact of cut/fill on landform, vegetation and wildlife habitat.

Mapping shall be provided in paper copy and digital format compatible with the municipality's GIS facilities if required. Figures to include the following:

☑ Proposed development footprint in relation to those parts of the adjacent lands (*as identified in OP Section 15.5, Table 15.1)* and significant natural heritage features or areas potentially affected by the development.

☑ Groundwater recharge areas

☑ Watercourses / streams / drains

☑ Areas of grading, filling

☑ Potential alterations to drainage

☑ Conceptual location of storm water management facility

2.3 ASSESSMENT OF DEVELOPMENT IMPACTS (section 5)

The most difficult task in completing an EIS is the accurate and reasonable prediction of potential impacts that the development proposal will have on the environment. For the majority of housing development proposals (subdivisions or site plans), impacts can be categorized into *direct,* and *in-direct,* and the duration of impacts may be *short-term* or *long-term.*

> **PURPOSE**: *To predict possible effects of proposed development on natural heritage system, both direct and indirect impacts should be described. For a development proposal to be acceptable, the EIS must clearly demonstrate that the proposed development will have no negative effects on the area for which it was identified as a significant component of the Natural Heritage System. A list of features, functions, linkages and values to be considered include items checked in Step 1, section 1-3 and generally as categorized below:*

The characterization and identification of impact must be considered over three stages or periods of time beginning with the existing pre-development conditions. The documentation of existing conditions and impacts is important to establish the baseline over which development impacts may be measured. An important part of the baseline reporting is the delineation of the ecological boundary of the feature (Boundary Guidelines are available from the Planning Dept.).

Identification of E*xisting* Impacts

The recognition of existing stressors or other factors that may be affecting the subject lands should be recognized as part of the baseline for impact assessment. Mitigation measures or environmental management strategies associated with development of a site may improve existing conditions.

Identification of Direct (D) and Indirect (I) Impacts

Most direct and short-term impacts are associated with the construction stage of land development. Generally, these "contractor impacts" are temporary in nature and preventable through proper construction practices and site inspections. Many of the potential short-term impacts are common to various types of land development, and are associated with standard mitigation measures (Table 3).

Longer term and indirect impacts are more generally associated with the post-development stage and recovery period. Most development related long-term impacts can be categorized into six areas:

1. Impacts related to the land use designation/ development design/location;
2. Impacts related to site preparation, servicing and grading;
3. Impacts associated with storm water management facility and outlet design;
4. Impacts associated with roads and other utility corridors;
5. Impacts associated with community park and recreational trail development;
6. Impacts associated with general operations and maintenance.

		D	I
Land Use Impacts (see also Table 1)			
LU1.	Land use designation	☐	☐
LU2.	Development design and location	☐	☐
LU3.	Increased edge effects (Appendix D)	☐	☐
LU4.	Interruption or change of surface water and ground water flows (water balance)	☐	☐
LU5.	Increased hard surface / decrease in infiltration	☐	☐
LU6.	Interruption of corridors	☐	☐
LU7.	Flora (loss of conservative, rare or specialized species)	☐	☐
LU8.	Other _____	☐	☐
	_____		
Construction Impacts (see also Table 2)			
CO1.	Site grading (erosion from runoff and sedimentation)	☐	☐
CO2.	Compaction of soils within tree rooting zones	☐	☐
CO3.	Site clearing and vegetation removal	☐	☐
CO4.	Scarring and damage to vegetation by machinery	☐	☐
CO5.	Decreased health of vegetation from dust and sedimentation	☐	☐
CO6.	Disturbance to wildlife from machinery equipment noise, traffic	☐	☐
CO7.	Introduction of non-native species	☐	☐
CO8.	Drainage of wetlands	☐	☐
CO9.	Fragmentation of habitat and linkages	☐	☐
CO10.	Fish habitat (harmful alteration, damage, destruction HADD)	☐	☐
CO11.	Other _____	☐	☐
	_____	☐	☐
Storm Water Management Development Impacts			
SWM1.	Location of the facility	☐	☐
SWM2.	Change and/or loss of habitat	☐	☐
SWM3.	Erosion and sedimentation related to construction	☐	☐
SWM4.	Alterations to surface water flow patterns (ponding, erosion, volume, duration, intensity)	☐	☐
SWM5.	Stream morphology	☐	☐
SWM6.	Discharge outlet configuration	☐	☐
SWM7.	Impact on receiving watercourse	☐	☐
SWM8.	Other _____	☐	☐
	_____	☐	☐
Impact of Roads and Utility Corridors			
RO1.	Width of road (species movements)	☐	☐
RO2.	Mortality of wildlife	☐	☐
RO3.	Drainage	☐	☐
RO4.	Microclimate	☐	☐
RO5.	Salt damage within 30 m up to 150 m	☐	☐
RO6.	Noise	☐	☐
RO7.	Heavy metals	☐	☐
RO8.	Road dust (photosynthesis, leaf temperature)	☐	☐
RO9.	Wind effects	☐	☐
RO10.	Other _____	☐	☐
	_____	☐	☐
	_____	☐	☐

Parks / Recreational/ Cultural Impacts

PA1.	Increased recreational use (by season and activity)	☐	☐
PA2.	Compaction of soils / trampling of vegetation	☐	☐
PA3.	Disturbance to wildlife	☐	☐
PA4.	Change in cultural values (aesthetics, education)	☐	☐
PA5.	Archeological resources	☐	☐
PA6.	Other _____	☐	☐
	_____	☐	☐

Land Use Management Impacts

LM1.	Property maintenance – herbicides / pesticides / fertilizers use	☐	☐
LM2.	Yard waste disposal	☐	☐
LM3.	Non-native species planting	☐	☐
LM4.	Domestic pets	☐	☐
LM5.	Lighting	☐	☐
LM6.	Property encroachments	☐	☐
LM7	Other _____	☐	☐
	_____	☐	☐
	_____	☐	☐

Evaluations of the Potential Effects, Mitigation and Net Effects (Section 6)

> **PURPOSE**: *To demonstrate no net negative effects through avoidance, rehabilitation, mitigation or compensation*

The ***intensity*** or degree of impact and predicted effect (none, low, medium, high, unacceptable; positive and/or negative) will depend on the relative sensitivity and significance of functions and features to be protected and maintained and the ***ecological integrity***, or ability of the natural area and ***adjacent lands*** to respond, recover and adapt to a changed ***landscape matrix.***

The net effects of all potential impacts are assessed on the degree to which recommended mitigation measures can prevent and/or mitigate the proposed effects. Therefore, net effects are those impacts that remain after mitigation has been implemented. The evaluation of the effects of a proposed development on the environment is best presented in a **Net Effects Assessment Table** that includes:

- Identification of all sources of impact/potential impact;
- Identification of ecological functions, features or linkages that might reasonably be expected to be affected;
- Predictions of potential physical impacts and effects on features, functions, linkages;
- Proposed mitigation strategy including avoidance, use of **ecological buffers (a)**; additional **mitigation techniques (b)**, and **compensation (c)**;
- A **net effects summary** prediction and rationale (**see d**);
- Recommendations for a site-specific management plan and monitoring (chapter 7).

a) Provide an analysis of reasonable buffers that are relevant to protect and enhance the type of ecological feature or function being affected (positive effects).
b) Indicate and explain as many alternative methods and measures for mitigating negative effects of the proposed development e.g. zoning or building setbacks, site design, alternative adjacent land uses such as storm water management measures, parkland, pathways and trails; installation of construction barriers such as robust silt fencing, construction fencing, tree guards; installation of permanent markers such as boundary demarcation, restricted access, fencing, vegetation buffer zones; implementation of environmentally sound management practices, rehabilitation and restoration opportunities;
c) Describe any proposed compensation for those effects which cannot be mitigated and/or rehabilitation/restoration plans for areas disturbed.
d) Predictions of "Net Effect" are assessed based on the degree to which recommended mitigation strategy measures can mitigate negative impacts, and are assessed using an ordinal scale (e.g. none, low, medium, high, unacceptable – refer to Table 4).

Assessment of Alternatives

> **PURPOSE**: *To identify opportunities for future management alternatives and multiple use objectives that satisfy policy 15.3.3 "New or expanded infrastructure shall only be permitted within natural heritage areas including stream corridors where it is clearly demonstrated through an environmental assessment process or an environmental impact study that there is no reasonable alternative for locating that infrastructure elsewhere."*

Storm Water Management Facility (SWM)

Size, integration with OS uses, catchment area, channel design, outfall design, and alternative facility design standards.

- ☐ Demonstration of net environmental benefit (17.6.1) (the facility design will achieve or surpass the targets of the subwatershed tributary fact sheets for aquatic and terrestrial resources
- ☐ Demonstration that the facility will enhance natural features and ecological functions (17.6.1)
- ☐ Demonstration of no reasonable alternative.

Groundwater recharge

- ☐ Compensation for loss, mitigation techniques

Woodlot management

- ☐ Multiple use objectives
- ☐ Good Forestry Practices (maintain biotic productivity, biodiversity)
- ☐ Management plan

Linkages

- ☐ Strengthen, extend

Other

- ☐ _____

Table 1: Potential impacts associated with different land uses

LD: Low density residential
MD: Medium density residential
HD: High density residential
CO: Commercial or industrial operation including high intensity livestock operations
SC: School
PA: Parkland, including sports fields

Potential Impacts	Land Use					
	LD	**MD**	**HD**	**CO**	**SC**	**PA**
Artificial lighting	L	L-M	M	H	M	H
Litter and garbage	L	L-M	M	M	H	M
Yard Waste/ Compost/ Refuse	H	H	L	L	L	L
Increased access to sensitive areas	H	H	H	L	H	H
Creation of new trails, off-trail trampling	H	H	H	L	H	H
Increased trail use - compaction, erosion, damage	M	M	H	L	H	H
Tree damage (trunk and limb removal, forts, etc)	M	M	M	L	H	L
Increased noise levels	L	L	LM	H	M	M
Decreased infiltration and increased run-off volume	L	M	L	H	L	L
Increased erosion	L	M	L	H	H	L
Increased nutrient, pesticide and sediment input	M	H	H	L	H	H
Visual intrusion/ loss of quality of experience	L	M	H	H	L	L
Domestic animals - faeces, predation on wildlife	H	H	M	L	L	H
Introduction of invasive plants	H	H	L	L	L	L
Increase in urban wildlife species	M	H	L	H	L	L
Air pollution - emissions, smoke, aerosols	L	M	H	H	L	L
Fire hazards	L	L	L	L	M	H

L = low impacts expected, M = moderate impacts, H = high level of impact expected.

Table 2: Construction Related Impacts and Mitigation Measures

(From Earth Tech Canada Inc. 2003)

ACTIVITY	POTENTIAL IMPACTS	MITIGATION MEASURES
Use of Heavy Machinery	- Broken or split branches - Wounded trunks or roots (roots generally grow within a few inches of soil, so potential for damage - Water contamination by oils, gasoline, grease, etc.	- Install construction fences around remaining trees as far from trunk as possible to protect root system - Establish storage/refueling area for heavy machinery away from sensitive areas
Soil Compaction -heavy machinery -pedestrian traffic	-increased erosion, sedimentation and turbidity of adjacent aquatic features, resulting from increased surface runoff - decreased pore space between soil particles, resulting in reduced oxygen available to roots and accumulation of carbon dioxide and other gases. - reduced soil-water infiltration and impaired drainage -reduced root growth, resulting in decreased ability to absorb water and minerals	- install construction fences around sensitive areas, and avoid construction activities within drip line of trees - control erosion, sedimentation and nutrients inputs through use of BMP's, such as silt fencing - use structured soil mixes to allow for acceptable levels of soil compaction and reduced tree stress
Lowering or Raising Soil Grade	- lowering grade may result in removal of large percentage of tree roots (symptoms may show within a few months or a few years) - raising grade may result in root suffocation - grade changes in vicinity of root zone may alter water table or affect drainage patterns -may result in increased erosion, sedimentation and turbidity, depending on slope - increased inputs of nutrients and contaminants to adjacent aquatic features	- aeration of remaining root zone (trees should be watered and fertilized if necessary) - pruning should be limited to removal of dead, diseased or hazardous limbs immediately following root loss - avoid placement of soil within drip-line of tree -minimize changes in grade, particularly near sensitive species - during construction, any drainage channels presently directing storm water flows should have straw bales placed across their cross-sections to prevent sedimentation

ACTIVITY	POTENTIAL IMPACTS	MITIGATION MEASURES
Clearing or Trampling Vegetation - direct clearing - heavy machinery - pedestrian traffic	- reduced bank stability and ability to trap sediment run-off from upland areas - increased erosion, sedimentation and turbidity - loss of wildlife habitat and/or habitat productivity - damage to vegetation root mat - loss of shade, resulting in increased soil and water temperatures - reduced input of organic matter (leaves, twigs, insects)	- develop and implement an erosion and sediment control plan before removing vegetation - maintain vegetative buffers - maintain as much riparian vegetation as possible
Installation of Services and Utilities, and Building Placement	- increased erosion, sedimentation and turbidity -loss of vegetation and/or fragmentation of habitat - increased vegetation trampling from domestic animals and/or pedestrian traffic - run-off from pesticides, herbicides, domestic animal waste, etc. - increased predation and susceptibility to predation (from wild and/or domestic animals) - natural gas from leaking gas main may have adverse effects on soil and tree roots (signs of stress include declining or dying plants in vicinity of suspected leaks)	- develop and implement an erosion and sediment control plan - maintain vegetative buffers between buildings and significant wildlife habitat - time activities to avoid sensitive periods of wildlife habitat use - maintain wildlife corridors wherever possible - re-vegetate as soon as possible
Paving	- increase in impervious surfaces - increased surface run-off may exacerbate erosion and siltation - changes in water regime may contribute to soil desiccation and compaction (influences on soil micro-and macro- flora and fauna - reduced infiltration, groundwater baseflow and upwelling - asphyxiation of tree roots	- minimize area of paved surfaces - design driveways/roads with vegetated centers and reduced curbs, gutters and sidewalks to promote infiltration - maintain of provide vegetative buffers - control quantity and quality of stormwater run-off

Table 3: Typical Observed Effects of Impacts at Various Stages in the Development Process

STAGE IN DEVELOPMENT PROCESS	IMPACT ISSUE OR ENVIRONMENTAL CONCERN	COMMON EFFECT OR OBSERVED CONDITION
Planning & Design	Buffer Adequacy	Size, form, function insufficient to protect
	Habitat alteration/ destruction/ disturbance/ conservation	Removal or damage to habitats; conversion of local wetlands to SWM; vegetation injury
	Landform Conservation	Significant grade changes between rear lot and the natural area
	Adequacy of lots	Insufficient size to allow use of rear yard without need for encroachment; small lots not feasible to implement tree preservation policies
Construction	Erosion / sediment control	Inadequate sediment control measures (filter fences, check dams) or not maintained
	Debris Management	Discarded, windblown or surplus construction materials
	Exposure of Subsoil	Large areas exposed and unvegetated for prolonged periods
	Habitat protection measures, e.g. snow fences or sediment fence	Uneven and sporadic maintenance; grading and disturbance beyond development limits; minor or major damage from cut and fill, sedimentation
	Environmental Inspection and maintenance	Regular inspection reports and follow-up not a standard practice
Homeowner / Occupancy	Maintenance of buffers or no build zones	Mowing, damage to trees, exotic species planting, compost dumping
	Pets	Off leash dogs; outdoor cats
	Stewardship Guides	Requires voluntary action
	Encroachment	Tree forts, party pits, pools, sheds, composters, woodpiles
	Refuse	Garbage, yard debris and compost dumping
	Access	Fences with gates common, private laneways
Municipality or Agency	Exotic species control	Common along recreational paths and naturalization / buffer areas
	Access	Recreational paths
	Encroachment issues	Inconsistent boundary demarcation, enforcement, signage, management
	Monitoring	Long term costs and staff needs

Table 4: Net Effect Predictions of Development Impacts on the Terrestrial Environment

(as adapted from the Draft Terrestrial Resources Strategy, Terra Geographical, 1994).

NO Net Effect – There is no measurable impact to any of all the identified ecological features and functions (primary or key, and associated or secondary functions)
LOW Net Effect – There is any one of the following: (1) a loss of common habitat type, and/or habitat area which will not result in long-term impacts to remaining habitat, or linkages (2) a reduction in the local size of a population, or guild of species (flora or fauna), without impact on other species life-cycles, (3) short, infrequent interruptions of animals normal behavior activities, (4) the conversion or replacement of a portion of a system (natural or cultural) without losing existing function.
MEDIUM Net Effect - There is any one of the following: (1) a loss of uncommon habitat type, and/or habitat area that may result in long-term impacts to remaining habitat, and temporary impact on habitat linkages, (2) a reduction in local size of a population or guild of species that may impact on other species life cycles, (3) longer and more frequent interruptions of animal behavior activities such that individuals will flee or flush from their home for the duration of impact, (4) the conversion or replacement of a system (natural or cultural) with some loss of ecological function.
HIGH Net Effect - There is any one of the following: (1) a loss of rare or unusual habitat type and/or habitat area that will result in long-term and cumulative impacts to remaining habitat and linkages, (2) a significant reduction in the local size of a population, or guild of species that will impact on other species life cycles, (3) long-term, continuous interruptions of animal behavior activities that results in loss of productivity, or death of young while animal is away, (4) the conversion or replacement of a cultural system with complete loss of ecological function.

Environmental Management and Monitoring Plan (Section 7)

PURPOSE: *The purpose of monitoring is to measure effects over time. Monitoring will enable planning agencies, through development agreements, to require subsequent changes to site conditions if the environmental effects are found to exceed predicted effects or targets, or if there are identifiable negative effects. Monitoring the environmental effects of developments also provides well-documented, local examples of best management practices for particular types of development and particular types of features or functions.*

The concept of adaptive management has an important relationship to adequate safeguards and buffers. It requires that there be some thought of possible negative outcomes in order to ensure that there is space and resources to adjust in the future. The description of mitigation measures and management options and opportunities must include identification and detailed explanation of alternatives that could mitigate the predicted environmental impacts (see table below). This should include modifications to development proposals to avoid effects on, not only key features or functions, but also associated or secondary features and functions, and/or methods to restore features or functions that might be impacted. Of these, avoidance is preferred. Where avoidance is not possible, alternative options must include measures to minimize impacts and include subsequent monitoring of effects to ensure successful implementation.

EXAMPLES OF MITIGATION MEASURES AND MANAGEMENT OPTIONS AND OPPORTUNITIES

- ☐ Opportunities for trail development, controlled access points, recreational load
- ☐ Opportunities for conservation easements, stewardship agreements
- ☐ Opportunity to augment water quality/quantity
- ☐ Opportunity to restore dynamically stable stream
- ☐ Opportunity to compensate groundwater reduction
- ☐ Encroachment, demarcation, fencing
- ☐ Linkage with NHS setbacks to rear lot lines
- ☐ Rehabilitation from negative effects of preceding land

Where mitigation is achieved through avoidance of negative impacts, a simplified monitoring plan to ascertain the success of the project is all that is required. In these situations, the predicted net effects after mitigation may be negligible, and only the assumptions need to be tested. However, where mitigation is achieved by methods or measures to minimize but not to eliminate environmental effects, the predicted net effects after mitigation will be described and a monitoring plan designed to measure those effects will be implemented. A monitoring plan will measure effects against pre-determined threshold that, if exceeded, trigger effective remedial response.

The technical manual produced from the Ministry of Natural Resources (MNR) states that monitoring may be required where:

- The large scale of a development or the sensitivity of the key functions are such that effects may be difficult to predict and/or are relatively untested or unproven in the field;
- The mitigation technology proposed is not proven in Ontario;
- There are some long-term operations associated with a development that could facilitate some future or ongoing refinement to the mitigation strategy.

Depending on specific circumstances, monitoring will need to be undertaken in pre-construction, construction/operation and post-construction periods. Details of the monitoring program will be specific to the development proposal and will be determined through the review of the development application and the EIS. As a result, the EIS shall include:

a) An environmental monitoring strategy will be designed, for pre-construction, within construction and post-construction periods until assumption by the municipality; including expertise required, reporting responsibility, monitoring partners, and contingency provisions for upgrading or expanding/intensifying recommended mitigation measures and allowances to respond to development related impacts as necessary, or where the mitigation measures are found to be deficient.

b) Recommendations for a long-term monitoring program to assess cumulative impacts on future public lands that the municipality will maintain, will be made at the time of assumption.

c) Requirements for Monitoring

- ☐ Baseline Data – documentation of existing conditions
- ☐ Level 1 Monitoring – continued baseline data plus vegetation / wildlife / aquatic evaluation and surveys during period of construction
- ☐ Level 2 Monitoring – Level 1 plus intensive monitoring of wildlife use or vegetation changes post-construction and until assumption

Supporting Evidence, References, Executive Summary (Section 8)

> **PURPOSE:** *To ensure that the quality of work has been created by the required and recommended professionals.*

Fieldwork

- ☐ Personnel, qualifications
- ☐ Date/season
- ☐ Weather conditions

Citation / Literature References

- ☐ Supporting sources

Executive Summary / Conclusion

A summary will be prepared that contains a description of the proposed development, the predicted effects on the environment and all recommendations for mitigation measures to demonstrate that the development will have no net negative impact on the ecological features or functions for which the natural area has been identified.

2.3 PREPARATION OF THE DRAFT ENVIRONMENTAL IMPACT STUDY

> **PURPOSE -** *The Step 2 report will describe and assess the potential outcomes or impacts of a preferred development concept, recommending one that will result in no net loss to the natural heritage functions and features for which the area has been identified. The report will also address opportunities and actions to enhance beneficial effects, and other mitigation measures to prevent, modify or alleviate impacts. This would include rehabilitation and restoration of disturbed areas, and other appropriate contingencies or compensation. Requirements for monitoring will be considered on a case by case basis. Where unacceptable impacts cannot be described or assessed, avoided or mitigated; the proposal should not proceed as planned.*

There are eight sections to be included in a Draft EIS. They are:

1. Study area location and description of existing conditions;
2. An assessment of the significance of features and functions;
3. An identification of environmental constraints and opportunities mapped and described as environmental management areas;
4. A description of the proposed development concept;
5. An assessment of potential impacts;
6. Evaluation of potential effects, mitigation and net effects;
7. An environmental management and monitoring plan;
8. Conclusion

The draft EIS will be prepared as directed by the standards outlined in Appendix C. The background information from the approved checklist report is used to write the first 4 sections of the draft EIS. Much of the information can be shown on figures and maps. Current aerial photography, preferably ortho-images and/or Ontario Base Mapping will be used as a base map. Figures must be presented at the same scale for comparison purposes. The subject site and adjacent lands natural heritage and hazard resources will be summarized and mapped as environmental constraints and opportunities that may affect the suitability of the site for the proposed land use and/or development.

2.4 REVIEW OF THE DRAFT EIS

Upon receipt of the Step 2 draft EIS, as documented on the monthly agenda of EEPAC, the TART will have 45 working days in which to review and provide comments and recommendations on the content, clarity and completeness of the EIS. The Technical Advisory Review Team should disclose any major concerns or issues to the planner for the file ***as soon as possible*** after receipt of the EIS in order that they may be promptly addressed. A meeting with City of London personnel and representatives of the applicant will be held at the end of the review period to discuss and receive the comments. A decision will be made at this meeting.

It may be one of:

1. reject completely
2. accept with revisions to be addressed in an addendum
3. accept with conditions.

Final recommendations of the EIS and Technical Review Team will be forwarded to the planner for the file. Implementation of impact mitigation will occur through conditions of approval which incorporate prescribed mitigation measures into the development agreement with the City and the subsequent construction contract for the development.

For large-scale developments or developments potentially affecting very sensitive areas, the municipality may require a Peer Review by a qualified consulting team at the expense of the municipality.

Recommendations should clearly outline how any residual impacts will be addressed to ensure no net loss and to address net gain opportunities. The development proposal must demonstrate that ecological functions and features can be maintained and, if possible, enhanced. Adaptive management in relation to adequate safeguards and buffers requires that some thought of possible negative outcomes be considered in order to ensure that there is space and resource to adjust in the future.

STEP 2 - REVIEW OF DRAFT EIS

(provide recommendations for any questions answered as "No").

10) . Does the checklist accurately describe impacts? **YES NO**

11) Have the issues been clearly stated? **YES NO**

12) Have all underlying assumptions been clearly stated and biases acknowledged? **YES NO**

13) Are the predictions reached regarding the potential impacts clearly explained and supported by the data. **YES NO**

14) Is there preferred alternative clearly supported by the evidence (for SWM, Road, land use designation, zoning, etc) **YES NO**

15) Are the conclusions and recommendations supported? Do they meet subwatershed targets? **YES NO**

16) Will the proposed development have adverse impacts on key functions and features? **YES NO**

Phase II draft report meets minimum requirements **YES** ➲ go to Step 3
NO ➲ send back to consultant for additional information

Signed _____
Date _____

STEP 3

3.1 DEVELOPMENT APPLICATION AND FINAL REPORT

It is preferred that the development application process be initiated upon completion of the Step 2 draft EIS. This will allow reasonable time for review of all required reports. In arriving at recommendations and conclusions, the EIS should refer to the findings of other reports (e.g. geo-technical, storm water management functional plan). The final recommendations of the Technical Advisory Review Team for the EIS will be incorporated with other planning requirements and considerations.

3.2 RECOMMENDATIONS FOR DEVELOPMENT CONDITIONS

PURPOSE: *To establish priorities for management of problems.*

Examples of some types of development conditions or site plan controls:

- ☐ Setbacks to rear lot lines
- ☐ Maintenance and monitoring of construction impacts and encroachments
- ☐ Best management practices (BMP's)
- ☐ Requirements for additional studies related to ground hydrology, surface hydrology, geotechnical issues
- ☐ Site planning design
- ☐ Boundary demarcation including vegetation barriers, fencing
- ☐ Homeowner education and stewardship programs and materials,
- ☐ Conservation or management strategies
- ☐ Ownership

EIS recommendations are applied:

1) as site specific requirements for area plan to implement land use change
2) as conditions of approval for a subdivision that implements land use or zoning change
3) as agreements made at time of site plan development

_____

ACCEPT

_____

ACCEPT WITH CONDITIONS

_____

UNACCEPTABLE

Name: _____

Signature: _____

Title: _____

Date: _____

APPENDIX A

Environmental Impact Study
ISSUES SUMMARY CHECKLIST REPORT

Application Title: _____

Date Submitted: _____

Proponent: _____

Qualifications

Primary Consultant: _____

Key Contact Person: _____

Other Consultants/field personnel:

Hydrogeology / Hydrology : _____

Geotechnical : _____

Biological - Flora _____

Biological – Fauna _____

Other: _____

Context for Background Information

Subwatershed : _____

Tributary Fact Sheet Number : _____

Planning/Policy Area: _____

Technical Advisory Review Team

- ☐ **Ecologist Planner**
- ☐ **Planner for the File**
- ☐ **EEPAC**
- ☐ **Conservation Authority** _____
- ☐ **Ministry of Natural Resources**
- ☐ **Ministry of Energy and Environment**
- ☐ **Ministry of Municipal Affairs and Housing**
- ☐ **Ministry of Agriculture and Food**

Other Review Groups (eg. Community Associations, Field Naturalists)

_____

1.0 DESCRIPTION OF THE ENVIRONMENT (Features)

Purpose: To have a clear understanding of the current status of the land, and the proposed "development" or land use change.

1.1 Mapping (Location and Context)

(current aerial photographs, preferably ortho-images, 1:2000 Ontario Base Map, NTS 1:50,000 maps)

- ☑ Land Use - Excerpts of the Official Plan for the City of London Ontario Schedules A, B, showing a 5-10km radius of subject site
- ☑ Terrain setting @ 1:10,000 – 1:15,000 scale showing landscape features, subwatershed divides
- ☑ Existing Environmental Resources @ 1:2,000 -1:5,000 showing Vegetation, Hydrology, contours, linkages
- ☑ Environmental Plan or Strategy from Subwatershed reports (tributary fact sheet), Community (Area) Plans, or other

1.2 Description of Site, Adjacent lands, Linkage with Natural Heritage System

List all supporting studies and reports available to provide background summary (e.g. *sub-watershed, hydrological, geo-technical, natural heritage etc.); check the first box if it is relevant to the subject area and surrounding landscape, and check the second box if it is determined that sufficient information is available.*

_____

_____

_____

_____

_____

_____

1.2.1 Terrain Setting

☐	☐	Soils (surface & subsurface)
☐	☐	Glacial geomorphology- landform type
☐	☐	Sub-watershed
☐	☐	Topographic features
☐	☐	Ground water discharge
☐	☐	Shallow ground water/baseflow
☐	☐	Ground water recharge/aquifer
☐	☐	Aggregate resources

1.2.2 Hydrology

☐	☐	Hydrological catchment boundary
☐	☐	Surface drainage pattern
☐	☐	Watercourses (Permanent, Intermittent)
☐	☐	Stream order (Headwater, 1st, 2nd, 3rd or higher)
☐	☐	Agricultural drains
☐	☐	Downstream receiving watercourse

1.2.3 **Natural Hazards**

- ☐ ☐ 100 year Erosion Line
- ☐ ☐ Floodline mapping
- ☐ ☐ Fill line mapping

1.2.4 **Vegetation**

- ☐ Vegetation Patch number _____
- ☐ ☐ System (Terrestrial , Wetland, Aquatic)
- ☐ ☐ Cover (Open, Shrub, Treed)
- ☐ ☐ Community Type(s)
- ☐ ☐ ELC Community Class (Bluff, Forest, Swamp, Tallgrass Prairie, Savannah & Woodland, Fen, Bog, Marsh, Open Water, Shallow Water)
- ☐ ☐ ELC Community Series
- ☐ ☐ Rare Vegetation Communities

1.2.5 **Flora**

- ☐ ☐ Flora (inventory dates, source)

_____
_____
_____
_____

- ☐ ☐ Rare flora (National, Provincial, Regional)

_____
_____
_____

1.2.6 **Fauna**

- ☐ ☐ Fauna (inventory dates; source)
- ☐ ☐ Breeding Birds _____
- ☐ ☐ Migratory Birds _____
- ☐ ☐ Amphibians _____
- ☐ ☐ Reptiles _____
- ☐ ☐ Mammals _____
- ☐ ☐ Butterflies _____
- ☐ ☐ Odonata _____
- ☐ ☐ Other _____
- ☐ ☐ Bird Species of Conservation Priority

_____
_____
_____
_____

- ☐ ☐ Rare Fauna

_____
_____
_____
_____

1.2.7 **Wildlife habitat**

- ☐ ☐ Species-At-Risk critical habitat mapping_____
- ☐ ☐ Winter habitat for deer, wild turkey
- ☐ ☐ Waterfowl Habitat (wetlands, poorly drained landscape – bottomlands, beaver ponds, seasonally flooded areas, staging areas, feeding areas)
- ☐ ☐ Colonial Birds Habitat
- ☐ ☐ Hibernaculua
- ☐ ☐ Habitat for Raptors _____
- ☐ ☐ Forests with springs or seeps
- ☐ ☐ Ephemeral ponds
- ☐ ☐ Wildlife trees (snags, cavities, x-large trees > 65 cm dbh)
- ☐ ☐ Forest Interior Birds

_____
_____
_____

- ☐ ☐ Area-sensitive birds

_____
_____
_____

1.2.8 **Aquatic Habitat**

(*SWS Aquatic Resources Management Reports*)

- ☐ ☐ Fish communities

_____
_____

- ☐ ☐ Fish spawning areas
- ☐ ☐ Fish migration routes
- ☐ ☐ Thermal refuge for fish
- ☐ ☐ Thermal Regime (cold, cool, warm)
- ☐ ☐ Benthic inventory

_____
_____
_____

- ☐ ☐ Substrate _____

_____

- ☐ ☐ Riparian habitat (extent and type)

_____
_____
_____

1.2.9 **Linkages and Corridors**
(The diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible. Provincial Policy Statement 2.3.3).

☐ ☐ Valleylands
☐ ☐ Significant Watercourses (Thames River, Stoney Creek, Medway Creek, Dingman Creek, Pottersburg Creek, Wabuno Creek, Mud Creek, Stanton Creek (Drain), Kelly Creek (Drain)
☐ ☐ Upland Corridors / migration routes
☐ ☐ Big Picture Cores and Corridors
☐ ☐ Linkages between aquatic and terrestrial areas (riparian habitat, runoff)
☐ ☐ Groundwater connections
☐ ☐ Patch clusters (mosaic of patches in the landscape)

_____
_____
_____
_____

1.3 Social Values

1.3.1 **Human Use Values**

☐ ☐ Recreational linkages for hiking, walking
☐ ☐ Nature appreciation, aesthetics
☐ ☐ Education, ,research
☐ ☐ Cultural / traditional heritage
☐ ☐ Social (parks and open space)
☐ ☐ Resource Products (e.g. timber, fish, furbearers, peat)
☐ ☐ Aggregate Resources

1.3.2 **Land Use-Cultural**

☐ ☐ Archaeological (pre 1500)
☐ ☐ Historical (post 1500-present)
☐ ☐ Adjacent historical and archeological
☐ ☐ Future

1.3.3 **Land Use-Active**

☐ ☐ Current
☐ ☐ Historical (past 50-100 years)
☐ ☐ Adjacent lands
☐ ☐ Future

1.3.4 **Other** _____
_____

2.0 EVALUATION OF SIGNIFICANCE

Components of the Natural Heritage System

The policies in Section 15.4 apply to recognized and potential components Of the natural heritage system as delineated on Schedule "B", or features that may be considered for inclusion on Schedule "B". They also address the protection of environmental quality and ecological function with respect to water quality, fish habitat, groundwater recharge, headwaters and aquifers.

1.1 Environmentally Significant Areas

- ☐ Identified Environmentally Significant Areas (*Recognized in Official Plan (Schedule "B" and/or Section 15.4.1.1*
  Name _____
- ☐ Potential Environmentally Significant Areas – Expansion of (*Recognized in Section 15.4.1.2 and Schedule "B")*
  Name _____
- ☐ Potential Environmentally Significant Areas (*Recognized in Section 15.4.1.5 and Schedule "B")*
  Name _____

1.2 Wetlands

- ☐ Provincially Significant Wetlands
- ☐ Locally Significant Wetlands
- ☐ Unevaluated Wetlands

1.3 Areas of Natural and Scientific Interest

- ☐ Provincial Life Science ANSI
- ☐ Regional Life Science ANSI
- ☐ Earth Science ANSI

1.4 Habitat of Species-At-Risk (SAR)

- ☐ Endangered
- ☐ Threatened
- ☐ Vulnerable

1.5 Woodlands

- ☐ Significant Woodlands
- ☐ Unevaluated Vegetation Patches

2.6 Corridors and Linkages

- ☐ River, Stream and Ravine Corridors
- ☐ Upland Corridors
- ☐ Naturalization and Anti-fragmentation Areas

3.0 IDENTIFICATION AND DESCRIPTION OF FUNCTIONS

Ecological Functions The natural processes, products or services that species and non-living environments provide or perform within or between ecosystems and landscapes. Check those functions that will be required to assess for the study (key and supporting functions).

3.1 Biological Functions

- ☐ habitat (provision of food, shelter for species)
- ☐ limiting habitat
- ☐ species life histories (reproduction and dispersal)
- ☐ habitat guilds
- ☐ indicator species
- ☐ keystone species
- ☐ introduced species
- ☐ predation / parasitism
- ☐ population dynamics
- ☐ vegetation structure, density and diversity
- ☐ food chain support
- ☐ productivity
- ☐ diversity
- ☐ carbon cycle
- ☐ energy cycling
- ☐ succession and disturbance processes (natural and man-made)
- ☐ relationships between species and communities

3.2 Hydrological and Wetland Functions

- ☐ ground water recharge and discharge (hydrogeology)
- ☐ water storage and release (fluvial geomorphology)
- ☐ maintaining water cycles (water balance)
- ☐ water quality improvement
- ☐ flood damage reduction
- ☐ shoreline stabilization / erosion control
- ☐ sediment trapping
- ☐ nutrient retention and removal / biochemical cycling
- ☐ aquatic habitat (fish, macroinvertebrates)

3.3 Landscape Features and Functions

- ☐ size
- ☐ connections, corridors and linkages
- ☐ proximity to other areas / natural heritage features (e.g. woodlands, wetlands, valleylands, water, etc.)
- ☐ fragmentation

3.4 Functions, Benefits and Values of Importance to Humans

- ☐ contributing to healthy and productive landscapes
- ☐ improving air quality by supplying oxygen and absorbing carbon dioxide
- ☐ converting and storing atmospheric carbon
- ☐ providing natural resources for economic benefit
- ☐ providing green space for human activities
- ☐ aesthetic and quality-of-life benefit
- ☐ environmental targets and/or environmental management strategies

Appendix B

Glossary

Adjacent lands – those lands within a set or specified distance of an individual component of the natural heritage system.

Conversion - the complete loss of function where the ecosystem is changed through land use

Cumulative impact - the sum of all impacts over time and space

Degradation - when an impact does not change the ecosystem type but alters function in a negative way

Disturbance - any action that will cause an ***effect*** or ***stress***; can be natural (eg. fire, flood) or human –generated (e.g. various forms of development activity or agricultural uses)

Direct impact – an activity that immediately generates an ecological response. Often associated with short-term impacts.

Duration - the length of time an impact may occur; commonly separated into pre-development baseline condition, during development impacts, and post-development recovery.

Ecological functions - *means the natural processes, products, or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes. These may include biological, physical and socio-economic interactions.*

Ecological integrity

1. The ability of a system to resist disturbance (resistance).
2. The ability of a system to recover or return to a balanced state when subject to some degree of perturbations and disturbance (resilience)
3. The ability to persist in the long term with the minimum level of human maintenance.
4. The ability to maintain a structure of native flora and fauna.

Ecological response - a combination of stress (direct effects) and response (indirect effects) limited to changes resulting from human actions

Edge Effects –refers to the distinctive species composition or abundance in the outer portion of an ecosystem near its perimeter, where influences of the surroundings prevent the development of interior environmental conditions.

Effects - the physical, chemical and biological changes that result from an impact or disturbance; any ecological response of a natural system to stress (direct impact)

Endangered – Any native species that on the basis of the best available scientific evidence, is at risk of extinction or extirpation throughout all or a significant portion of its (Ontario) range; a species threatened with imminent extinction or extirpation (COSEWIC).

Enhancement - ecosystem functions are improved at the expense of others

Impact - a subset of disturbance or human generated action or activity which can directly (stress) or indirectly (response) affect the characteristics of an ecosystem.

Indirect impact - an activity that generates a response over time and space, often associated with long-term impacts.

Intensity of impact – measurable amount of the relative quality of impact (e.g. high, medium, low, none, positive, negative)

Landscape matrix – a heterogeneous land area composed of a cluster of interacting ecosystems within which materials and energy are transferred as a result of various ecological processes.

Linkages - are pathways, connections or relationships between natural heritage features and areas. They can be connections between surface and ground water that are important to maintain fish and aquatic habitat. Aquatic habitat can be linked by intermittent and permanent watercourses. Terrestrial linkages are areas linking woodlands, valley lands, wetlands, wildlife habitat and are described in terms of length, width and vegetation type.

Mitigation – the prevention, modification, or alleviation of impacts or actions on the natural environment through actions that enhance beneficial effects.

Net Environmental Benefit or Gain (NEB) – a working principle which strives to achieve a relative increase in environmental features and natural system functions resulting from new development or new land uses or rehabilitation over the long term. NEB will be determined using such measures as biological diversity (including species, ecosystem, genetic diversity) ecosystem function and wildlife habitat. NEB will be determined by comparing the baseline state of the environment prior to development, to the long term expected results of measures taken to protect and enhance the environment given the technical feasibility of the mitigation measures proposed. The concept of NEB does not mean that there will be no changes in the state of the environment or tolerance for unavoidable loss on a project by project basis (County of Oxford, 1995).

Predicted response - the long-term physical, chemical and biological that indirectly result from a disturbance.

Processes- There are physical, chemical and biological processes. Movement of surface and ground water and their associated chemical characteristics are examples of physical or hydrological processes. Nutrient cycles are chemical processes. Biological processes may include succession and decomposition.

Rehabilitation – to improve or restore an ecosystem to a higher functioning level.

Replacement Potential- the relative sensitivity and complexity of an ecosystem to create and maintain.

Species-at-Risk- is used to describe species that are listed in one of the conservation categories of "endangered", "threatened" or "vulnerable"/ "special concern"

Threatened- any native species that, on the basis of the best available scientific evidence, is at risk of becoming endangered throughout all or a significant portion of its (Ontario) range (COSSARO); a species likely to become endangered if the limiting factors are not reversed (COSEWIC)

Values - Social and economic interactions describe human values that are derived from natural environments. These can include recreational activities such as eco-tourism, hunting, angling, and nature appreciation. Product values are assigned to resources which are harvested, such as timber, peat, furbearers. Cultural and social values relate to functions which contribute to enhanced appreciation, such as landscape aesthetics, traditional use, spiritual inspiration.

Vulnerable - any native species that, on the basis of the best available scientific evidence, is a species of special concern (in Ontario), but is not a threatened or endangered (COSSARO); a species at risk because of low or declining numbers, small range or because of characteristics that make it particularly sensitive to human activities or to natural events (COSEWIC). COSEWIC has replaced the category of "Vulnerable" with "Special Concern".

Appendix C
Procedural Notes

Exemptions

An EIS is not required when a written Environmental Assessment has been completed and approved in accordance with the Ontario Environmental Assessment Act or Canadian Environmental Assessment Act. Other environmental planning processes may incorporate the elements of an EIS and serve the same purpose. For example, where detailed development criteria has been applied to a site through a mechanism such as a comprehensive planning process, a comprehensive EIS, or on the basis of a watershed or sub-watershed plan, a detailed EIS may not be required. The waiver of the EIS requirement will be at the discretion of the General Manager of Planning and Development or his/her designate in consultation with other relevant agencies.

Options for Implementation of an Official Plan or Zoning Bylaw Amendment in Areas Subject to Environmental Impact Study Requirements

1. Avoidance of an EIS through Policy: The Official Plan policy 15.5 and adjacent land distances as set out in Table 15-1are applied to establish a zone line between Open Space and the subject lands area. In this option, the existing natural feature or area as established in the field (based on the tree drip-line or limit of naturalized vegetation) plus the adjacent land distance defined in Table 15-1 for the appropriate component of the natural heritage system is protected as open space. Development of the subject lands may proceed without further study unless the applicant proposes to develop within the adjacent lands, such as situating storm water management facilities.

2. Pre-zoning: The boundary of the significant natural feature or area would be established in the field as above and designated as a preliminary Open Space zone line. The adjacent lands on the subject site as defined by Table 15-1 for the appropriate component of the natural heritage system, or for a width less than those prescribed with the appropriate documentation would be zoned for the proposed land use but with a special holding provision. The holding provision would require the completion of an EIS prior to removal of the holding provision in order to determine the appropriate setback necessary to protect the ecological features and functions and establish the final zone line.

3. Zoning Regulations: The EIS would be completed as required by Table 15-1 and the zone line established through this process.

Other Studies

An approved EIS should be used to influence and inform how a development concept can be achieved while avoiding or minimizing impacts of development. It may specify more detailed study requirements, such as Canopy Retention Studies, Tree Preservation Reports and Plans, and Individual Lot/Block Preservation Plans to be carried out at more site specific stages of the development process. Requirements for these reports can be found in the Planning Department's Subdivision Requirements Manual.

Revisions

If a development proposal is revised after approval of an EIS, an updated study or addendum may be required.

Reporting Standard

Unless otherwise indicated, ten (10) copies of the EIS, dated and signed by the principle author shall be submitted to the Planning and Development Department (Rm. 609, City Hall) through the Director of Planning. Distribution of the EIS to the appropriate agencies and the Ecological and Environmental Planning Advisory Committee (EEPAC) will be done by the designated planner for the file in the Planning and Development Division.

The format of the report must include:

- 8½ by 11 paper, double-sided.
- Maps 11 by 17 shall be bound into the report. Larger maps shall be inserted in a pocket inside the back cover of the report.
- A title page listing the name of the proponent, address of the subject property, list the principal author of the report, and his or her firm, and the date the report was completed.
- An executive summary (no longer than one page) following the title page.
- A C.V. of the principal author(s)
- Following the Executive Summary, the report shall contain a statement to the effect of whether the report has been edited, by whom, and for what purpose, including normal editing which would occur by the chief ecological consultant with respect to text prepared by the firm's field staff.
- A complete list of dates of site investigation including the names of every person involved in investigations
- minimum map size is 8.5 X 11 inch, maximum 36 X 60 inch
- all maps to include scale, north arrow, wetland boundary and complete legend
- surveyed site plan with ELC community boundaries, locations of significant species and surveyed wetland boundary, flood and fill lines, existing land uses and ownership patterns
- orthographic imagery is encouraged
- appendix to include:
    - ELC data sheets
    - a brief CV of author(s)
    - copy of the approved terms of reference,
    - checklists of flora, and fauna
    - A release statement stating that the information collected in the report may be used by the City of London to contribute to its programs as well as those of the conservation authorities, other member municipalities and the province.
    - Submitted documents remain the property of the City of London and will not be returned

Qualifications

Few professional designations exist for ecological professionals and thus a standard level of expertise such as that created by professional engineers is not available. Ecological professionals can come from various fields but normally have undergraduate or graduate degrees in biology with general specialties in ecology, botany, forestry, or wildlife biology as well as several years of experience in the field. Planners, landscape architects, engineers, geologists, surveyors, and arborists do not generally receive the necessary knowledge in their field to complete an EIS without supplementary education and experience. All ecological professionals and others alike require some specialized training in order to complete an EIS. Because the Ecological Land Classification system is used in these guidelines it is necessary for the professional to demonstrate successful certification. Wetland delineation also requires training in the provincial wetland evaluation system and should be demonstrated in the CV of the submitting author.

Appendix D
Edge Effects of Natural Areas

Edge:
The portion of an ecosystem near its perimeter, where influences of the surroundings prevent the development of interior environmental conditions. Edge effect refers to the distinctive species composition or abundance in this outer portion.

Impaction:
The accumulation of materials on surfaces is higher at the forest edge (e.g. fog, mist aerosols, mineral nutrients, pesticides and toxins).

Edge width of a vegetation patch:
The edge width extends from the perimeter of a patch towards the centre to the point where there is no significant change on proceeding towards the centre. Microclimate used as a measure of edge width will give minumum value. Other variables used to determine edge width may include plants and/or animals (mammals, birds, insects) and measure cover, density, biomass, stratification, species richness, species composition etc.

Range of different edge widths measured:
(taken from Forman, R.T.T. 1995. Land mosaics: the ecology of landscapes and regions. Cambridge University Press and based on various sources)

Insects:	metres to tens of metres
Vegetation:	metres to tens of metres
Human effects in suburban woods:	tens of metres
Microclimate:	tens of metres to hundreds of metres
Insectivorous birds:	tens of metres to hundreds of metres
Butterflies:	hundreds of metres
Small mammals:	hundreds of metres
Nest predators:	hundreds of metres
Large mammals:	thousands of metres

Edge microclimate:
Sun and wind are the overriding controls of the edge microclimate. They determine which plants survive and thrive as well as having a major impact on soil, insects and other animals. The ecological effects increase with the difference in vegetation height between adjacent ecosystems.

- South-facing edges are wider than north-facing edges.
- Windward edges are wider than leeward edges.
- The mantel plays an import role in determining forest edge width.
- New edges will be wider than older edges.

Environmental factors affected by edge include light, evapotranspiration, temperature, temperature fluctuation, carbon dioxide levels and snow melt. Sand, silt, snow, seed and spiders accumulate at the forest edge because of the sudden drop in wind speed.

Wind speed:
Air velocity upwind of a forest is typically reduced for a distance of about 8h (8 times the height of the trees). Downwind the wind speed is reduced for 25h or more. Turbulence zones in these areas may be a source of erosion and dust. Wind penetration into a forest increase for about 1h on the upwind side, but the elevated wind speed on the downwind forest edge is only about 0.5 h.

The effects of edge aspect:
Maximum light is experience in summer for N-facing edges and in spring and fall for S-facing edges.

Residential development and neotropical migrant birds:
The number of houses surrounding a forest seriously undermine its suitability for neotropical migrants. Neotropical migrants consistently decrease in diversity and abundance as the level of adjacent development increase, regardless of forest size.

"Current planning regulations generally permit housing right up to forest edges. This practice may prevent protection of ecological features within the forest."
Friesen, L., P.F.J. Eagles and R.J. Mackay. 1995. Conservation Biology 9(6):1408-1414.

Encroachment:
Encroachment always occurs when residential developments are built next to natural areas. Encroachment may include dumping garden refuse in the natural area, creating access, management and manicuring, building structures or other activities. Encroachment is usually more pronounced where the backyards are not fenced, especially when the rear lot line is within the natural area.

2.0

DATA COLLECTION STANDARDS FOR ECOLOGICAL INVENTORY

DATA COLLECTION STANDARDS FOR ECOLOGICAL INVENTORY

Guiding Principle

Knowledge about the features and functions of natural areas is considered central to the assessment of significance and to the evaluation of potential impacts of development and recommendations of environmental management strategies.

Background

A natural area is characterized by natural features and by ecological functions, and these are inter-connected. Establishment of "significance" (as in "significant woodland" in the Provincial Policy Statement) requires comparative evaluations to be undertaken. Comparative evaluations require extensive knowledge of regional ecosystems with a consistent set of data. Data from Ontario indicates that in landscapes with less than 30% natural cover all natural heritage features are important to regional biodiversity and watershed function.

The identification and evaluation of natural features and ecological functions form the basis for assessing the effects of a proposed development on an area and its adjacent lands. Comparative evaluations are more difficult to make in isolated studies such as a site-specific EIS unless regional information is available.

Watershed and sub-watershed studies establish a good baseline of information from which comparative evaluations can be made. The intention of data collection standards is to ensure that all new information collected for various studies, including EIS, uses a similar approach and format so that it may be entered into regional databases and compared with existing information. The size of the study area should not affect the ability to make comparative evaluations.

The level of effort required to determine significance may be made at a landscape level, without even conducting a detailed site inventory. However, it is important to collect all levels of information required at the landscape, community and species levels to address the potential for impacts. The specific elements required for the natural heritage inventory and analysis component of an EIS will vary depending on the size, type, location of the development and the natural feature that may experience negative impacts. Important elements of study for any given EIS will be selected from a detailed list. Not all elements will need to be studied for all EIS's.

Guidelines for Data Collection

The following guidelines indicate the requirements and circumstances under which the level and detail of inventory may be reduced or refined.

1) Where relatively current (up to 3 years) data is available for the site and it meets the City standards required for collection and analysis, these data may be applied to meet some of the requirements for three season inventory. Such studies may include subwatershed studies, terrestrial life science inventories, inventories completed and approved for Area/Community Planning Studies, wetland evaluations, site-specific biological studies completed for the city or in support of development applications. However, a minimum of two wildlife / ecological site visits will still be required to verify and document current/existing conditions. The timing of the site visits will be made to supplement information gaps, confirm significant and sensitive features, and demarcate ecological boundaries and environmentally sensitive zones and to identify site specific impact, mitigation, and management requirements.

2) Where there is older inventory information available (4 to 10 years) it must be confirmed through current inventory studies. The existing data may be used to supplement current field studies and provide historical context and population, species, vegetation trends, and changes over time. Such studies may include life science inventories, conservation master plan background inventory studies as well as those noted above. The use of these data to supplement or replace the need for more current inventory will be evaluated on a case by case basis.

3) Where a specific development requiring an approval under the Planning Act is proposed and the evaluation of significance of the natural heritage feature or function is not an issue (i.e. the feature and functions are to be retained), the requirement for three season inventory may be waived or reduced in scale. This is often applied at a site plan application where there are no permanent changes proposed for Official Plan or Zoning By-Laws. It may also apply at an area plan level where general boundaries and buffer requirements are identified at a very large scale (1:10,000 - 1:30,000). It would also apply to development proposals where the proposed land use changes are expected to be minimal and will not require significant mitigation or monitoring.

Inventory Protocol

The standard protocol for conducting a comprehensive survey of wildlife (flora and fauna) is generally referred to as a "three-season inventory", where field investigations for a site are made at three different times of year. These times must cover the spring, summer and fall seasons. The important aspect of the three season inventory is that it must be scheduled to be done at the proper time of year that will be of greatest benefit to the data requiring collection. These best times vary for migratory birds, wetlands, breeding birds, amphibians and reptiles, butterflies and flowering plants.
Appendix D of the Significant Wildlife Technical Guide (OMNR, 2000) is the standard reference guideline for conducting field investigations for specific natural features.

A refinement of the three-season inventory has been suggested that spreads the inventory over five seasons in order to fully account for all wildlife, especially those that are only observed in a narrow temporal window (North-South Environmental Inc., 2003).
The five seasons are described below.

1) **Early Spring (late March/early April)**
   Target Species - Salamander breeding, early frog breeding (wood frog, spring peeper, chorus frog)
   Special time requirements - track snow melt/ spring thaw /first spring rains/ night inventory

2) **Spring (May)**
   Target Species – Frogs, migratory birds
   Special time requirements - warm spring evenings using road-side survey for frogs

3) **Early Summer (June)**
   Target Species – Breeding Birds, spring ephemeral flora, forestry, vegetation community, fish habitat
   Special time requirements - 5:00 to 10:00 a.m. for breeding bird survey

4) **Summer (mid-July / early August)**
   Target Species – ELC field data collection, wildlife habitat, summer flora, wetland species, prairie species, butterflies
   Special time requirements - none

5) **Fall (September)**
   Target Species – compositae plant species (e.g. asters, goldenrods), prairie species, migratory birds, butterflies
   Special time requirements – track flowering times

Vegetation

Vegetation Communities Survey:

A survey of vegetation community types should be undertaken during the main growing season, preferably over three different seasons, spring, summer and fall (generally during the period late May to early September). Community description outlines may be qualitative, but should follow the Ecological Land Classification for southern Ontario (Lee et al., 1998) to Vegetation Community Type, or contain an equivalent or greater level of structural and floristic detail. The report should present both a description of the communities and vegetation maps superimposed on an air photo or a base map of scale 1:5 000 that shows contours and water courses.

For each community type the following technical information should be included:

(i) A full list of vascular plant species present and an indication of their abundance.
(ii) An assessment of soil type(s), drainage regime and moisture regime.
(iii) An identification of the Ecological Land Classification Class, Series, Ecosite, Vegetation Type (Lee et al., 1998).
(iv) The element ranking for each ELC Vegetation Type (Bakowsky, 1997).
(v) Calculation of the following floristic quality indicators (Oldham et al. 1996) by community: number of native species, number of non-native species, number of conservative species (conservatism coefficient >=7), mean conservatism coefficient of native species and sum of weediness scores.
(vi) A summary of tree species, with age and/or size class distribution, including basal area by size class.
(vii) An annotated assessment of community condition based on the following broad criteria (adapted from Brownell and Larson, 1995) or equivalent:

A Excellent Condition: nearly undisturbed, or nearly recovered from previous disturbance.
B Good Condition: recovering from earlier disturbance or from light levels of recent disturbance, but which, if properly managed, will recover to undisturbed condition.
C Fair Condition: in the early stages of recovery from disturbance, or altered in structure and composition such that the original vegetation of the site will never rejuvenate, but with proper management partial restoration is possible.
D Poor Condition: severely disturbed, structure and composition so altered that recovery to original condition will is unlikely even with proper management.

(viii) A summary of disturbance factors, including their intensity and extent.
(ix) Other indications of community condition including amount of decayed coarse woody debris.
(x) Where appropriate, community profile diagrams showing the relationship between the vegetation communities and topographic features.

Flora and Fauna

Species with high conservation priority:

Annotations on the population size, condition, and the significance of the site for all species with high conservation priority. These include, but are not necessarily limited to:

Vascular Plants:

Locations of globally, nationally, provincially and regionally rare vascular plant species should be mapped, and the extent of habitat for each species outlined. Recommendations should be made for additional protection of rare species.

Nationally rare species as listed in the NHIC website; species with a global rank (G-rank) for G1 to G3 (Oldham, 1996, NHIC website), or with a COSEWIC status of Endangered, Threatened, or Special Concern.

Provincially rare species are those listed with a sub-national rank (S-rank) of S1 to S3 in Oldham (1996, Natural Heritage Information Centre (NHIC) website) and MNR species at risk in Ontario (Bowman, 1996) and COSSARO.

Regional status for SW Ontario should be assessed from Oldham (1993) or from the best available information.

***Fauna*:**

Habitat, den sites, nesting areas and other locations should be mapped for significant fauna, where appropriate.

National, provincial and regional rarity should be assessed from the best available information, including the following:

COSEWIC status reports;
MNR species at risk in Ontario (Bowman, 1996); COSSARO
NHIC website for G-ranks and S-ranks for various faunal groups:

Regional status should be assessed based on the best available information including, but not limited to :

Mammals (Dobbyn, 1994)
Breeding birds (Cadman et al., 1987) and current atlas updates
Butterflies (Holmes et al., 1991)
Herpetofauna (Weller, 1994)

Interior forest and area-sensitive species should be based on the best available information.

Priority birds' species for each municipality should be determined from (Couturier, 1999, Bird Studies Canada website bsc-eoc.org).

Breeding bird survey:

A survey of breeding birds should be carried out during June to mid July. The following technical information should be included in the report:

(i) A full list of bird species present.

(ii) An annotated assessment of confirmed, probable or possible breeding birds and the number of territories.

(iii) Where appropriate, maps showing the location of nesting species and their habitat.

Other wildlife habitat:

Other wildlife functions should be identified and assessed, and, where possible, mapped. Wildlife functions include, but are not limited to, waterfowl staging areas, fish spawning or nursery habitat, hepetofaunal breeding or hibernacula areas, areas that provide temporary shelter for migratory wildlife, areas that provide critical life cycle habitat, and wildlife corridors.

Corridors and linkages:

Linkage with other sites. The EIS should assess the following linkage functions of the site:

- Hydrological function (riparian areas, flood plains, valley lands, surface and ground water connections, recharge and discharge areas);
- Degree of connection with natural areas (proximity, distance, intervening land use, corridors);
- Linkage along the river corridor and the effect of stormwater management proposals on these;
- Movement patterns of wildlife groups.

Assessment of linkage should take into account both linkage within the site and connections with other sites and include an evaluation of:

- The natural areas and habitats linked (number of sites linked and site sizes and conditions);
- Linkage habitat type (anthropogenic [e.g. utility corridor, hedgerow, plantation]; to natural community, river floodplain, etc)
- Main cover type quality (e.g. from low [<40% forest cover or <50% thicket cover and native species <40% of total cover] to high [>60% forest or >75% thicket and >90% native cover]);
- Width; Length; and Continuity (e.g. long gaps >100 m, or gaps containing roads or other barriers to gaps <30 m wide containing no barriers).

Aquatic communities and habitats survey:

A survey of aquatic communities and habitats should be completed at the most appropriate times for sampling various species over the course of a year. The following technical information may include, but is not limited to the following:

1) *Fisheries Inventory*

- seine, minnow traps and electrofishing sampling techniques
- Index of Biotic Integrity (IBI) which is based on the ecological attributes of fish communities under three categories:
  - i) species richness and species composition (# native fish species; # darter species; # sunfish and bass species; # sucker and catfish species; # intolerant species; proportion of tolerant fish)
  - ii) trophic composition (proportion of omnivorous cyprinids; proportion of insectivorous cyprinids; proportion of piscivores)
  - iii) fish composition and abundance (proportion of diseased fish; catch per minute of sampling)
- Habitat Assessment and Stream Inventory (include parameters found on all standard OMNR fish collection forms)(see also 3 below)
- Target Habitat Suitability Index (THSI) are habitat models developed for specific target species. Habitat variables include: stream morphology; riparian habitat; in-stream cover; water temperature; in-stream flow.

2) *Benthic Survey*

- qualitative and quantitative sampling of macro invertebrates
- numeric taxonomic analysis (species richness and composition)
- density
- presence/absence of indicator taxa known to be sensitive or tolerant to stress and disturbance
- EPT Index is the relative measure of diversity of pollution sensitive macro invertebrates
- Water Quality Index (WQI) is the function of macro invertebrate densities and their tolerance to stress and disturbance
- percent abundance of shredders which are sensitive to riparian zone degradation
- Hydropsychidae/Trichoptera Index which measures the relative abundance of the generally mild pollution tolerant family Hydropsychidae to the total Trichoptera, most of which are less tolerant
- percent contribution of the dominant taxa which include worms, mayflies, stoneflies, caddisflies, beetles, midges, snails and clams

3) *Habitat Assessment and Stream Analysis*

- base flow (water velocity, stream order, water depth, stream width and bankfull width)
- water chemistry (dissolved oxygen, temperature, pH, conductivity, water colour and transparency
- substrates (texture, presence of aquatic vegetation, odours/discolouration of the sediments)
- in-stream riparian cover (presence and extent) and shading
- surrounding land uses

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3.0

GUIDELINE DOCUMENTS FOR ENVIRONMENTALLY SIGNIFICANT AREAS IDENTIFICATION, EVALUATION AND BOUNDARY DELINEATION

July 31, 1997

Approved by Council August 5, 1997

1.0 BACKGROUND

1.1 Planning Process for the Designation and Evaluation of Environmentally Significant Areas

Criteria for the evaluation and identification of natural areas (Environmentally Significant Areas) were introduced in the current City of London Official Plan as adopted by City Council in 1989. In 1992, revisions to these criteria were developed by the technical Advisory Committee on Natural Areas (TACNA), now known as the Environmental and Ecological Planning Advisory Committee (EEPAC). Significant changes were recommended to these criteria to provide a more technical and scientific basis for the evaluation of candidate areas. The recommended criteria were similar to those used in other jurisdictions. They dealt with broad ecological principles. These revisions were adopted by Council and came into effect with the partial approval of OPA 41 in March 1994. There was an objection to this amendment by the London Development Institute and a referral to the Ontario Municipal Board. The City responded to the referral by recommending an adjournment of the hearing as it pertained to the amendment to replace the criteria to be used in the evaluation and recognition of Environmentally Significant Areas, until such time as the Vision '96 planning process was completed. This was acceptable to LDI.

Vision '96 was a comprehensive, community-based program initiated by the City of London in 1993 to encompass all aspects of planning for the future of the City. The principal product of the planning exercise was a major amendment to the Official Plan for the lands annexed to the City in 1993. As part of the development of the Official Plan, subwatershed studies were undertaken for the entire City.

The aim of the subwatershed planning studies was to identify important natural resources and to develop strategies to protect and enhance them as land use changes. Candidate Environmentally Significant Areas were one of these important natural resources to identify and protect within the boundaries of the City of London.

Minor modifications to the EEPAC ESA Criteria were made in 1994 at the outset of the Terrestrial Resource Strategy component of the City of London Subwatershed Studies. The subwatershed consultants endorsed the use of the EEPAC criteria as a basis for the identification of ESA's in the new Official Plan. To address the broadness of the wording of the criteria, they developed application guidelines that would provide a more specific context and consistency in application.

In an initial review of the Candidate ESA's selected during the Subwatershed Studies, the EEPAC found that both the background material provided and the application guidelines for meeting the Criteria were inadequate for a fair assessment to be made. The development industry also expressed reservations over the lack of preciseness or subjectivity of some of the criteria and their application guidelines.

In response, EEPAC drafted and adopted a revised set of application guidelines by which the EEPAC Criteria could be applied and Candidate ESA's assessed in a consistent and ecologically defensible way (June 1995). These guidelines used all available information from the Subwatershed Studies Life Science Inventory Database and were in general, more rigorous.

EEPAC's review of the candidate ESA's using their revised application guidelines resulted in a majority of the candidate ESA's being recommended for inclusion in the Vision London Official Plan Amendment. Several candidates were not recommended by EEPAC. Two areas (Coves, Kilally) not assessed in the Subwatershed Studies as Candidate ESA's because they were outside the Subwatershed Studies boundary, were added as recommended ESA's by EEPAC.

In addition to the application guidelines, EEPAC also prepared Guidelines for Assessing Boundary Delineation of Environmentally Significant Areas (January 1996). These guidelines were needed in order to present to the public an objective process for determining the appropriate limit of a natural area that is ecologically significant.
These revised guidelines were still not satisfactory to the development industry who employed consultants to undertake formal reviews of the ESA Criteria and Application Guidelines. For the most part, these submissions questioned the application guidelines that were used to interpret and apply the ESA criteria (as opposed to the criteria themselves). Discussions relating to these concerns and issues resulted in an agreement of the City of London to work with the developer's consultants to review and revise the ESA Criteria and Application Guidelines. When Official Plan Amendment number 88 was adopted by Council in July 1996, the ESA Criteria were deferred from inclusion until they could be tested.

A process and approach was determined for this review that included test sites for evaluation. Two sites were chosen in Community Plan areas located in the urban growth boundary of the recently annexed lands that each contained an ESA as identified through the subwatershed studies (Figure 1).

The Candidate ESAs recommended by EEPAC are identified on Schedule B, OPA 88 (July 1996) as ESA's if subject to provincially-mandated development restrictions or to landowner agreement; or as Potential ESAs if there was no landowner agreement. The status of these Potential ESAs will be determined on the basis of site-specific evaluation undertaken in conjunction with community planning studies or environmental impact studies and pending further evaluation according to the ESA Evaluation Criteria.

1.2 Subwatershed Studies Candidate ESA Identification

The following describes the historical process of Candidate ESA identification that was completed during the Subwatershed Studies and in the preparation of the Vision London Official Plan Amendment. This work is being tested and refined through the current process of ESA evaluation and boundary delineation for Community Planning Studies, environmental impact studies and/or other site-specific planning studies.

Designation of Candidate ESAs was made at the level of the Patch or Patch Cluster as recognized and mapped during the City of London Subwatershed Studies. These vegetation patches are important because they represent what is left of the original continuous upland and wetland cover. Their pattern is a reflection of land use practices, topography, edaphic conditions (soil, moisture, nutrients) and microclimate. The patches represented a starting point for the DTRS. The DTRS proposed to build on these fragments and to use them to rebuild, where possible, a more interconnected and extensive terrestrial system (TERRA 1994). In general, 4 ha was the minimum patch size, with allowance made to include smaller patches (satellites) in close proximity to each other. Patches or Patch Clusters that met the Criteria for the evaluation and identification of Environmentally Significant Areas (ESAs) qualified as Candidate ESAs.

1.2.1 Vegetation patches

The identification and outlining of patches was based on 1:10,000 OBM mapping (1985) and 1:6,250 aerial photography (1993). It was understood that modification of these patches in outline may be made during the course of the subwatershed studies based upon the most recent information with respect to development proposals and state of the vegetation cover (Terra 1994). An initial cut-off size of 4 ha was determined on the basis of the discussion in Riley and Mohr (1994) on the minimum size for functional woodlands. The mapping of existing vegetation patches was undertaken by the UTRCA using the following guidelines developed jointly by the UTRCA and TERRA:

- Patches 4 ha or more were mapped. A patch bisected by a utility corridor was outlined and considered as one patch. A patch bisected by a road but connected by a stream and culvert was outlined and considered one patch.

- Certain patches less than 4 ha were mapped if:
  - The patch was located within 100 m of a larger mapped patch and the land between the patches was absent of any permanent disturbance which may act as a permanent barrier to flora or fauna (e.g., roads, railroads, buildings). Areas such as naturalizing land (i.e. abandoned farm land - old fields), farm land, stream tributaries of any order, and utility corridors were not considered permanent cultural barriers.
  - The patch was located within 100 m of another patch less than 4 ha and the land between the patches was absent of any permanent disturbance which may act as a permanent barrier to flora or fauna (e.g., roads, railroads, buildings) and the total area of the two (or more) patches was 4 ha or more. Areas such as naturalizing land (i.e. abandoned farm land - old fields), farm land, stream tributaries of any order, and utility corridors are not considered permanent cultural barriers.
  - Advice obtained from the subwatershed terrestrial biologists suggested that some smaller patches should be considered. This was particularly applicable in the case of certain wetland areas or remnant habitats.

1.2.2 Clustering methodology guidelines for Candidate ESAs:

The following methodology describes the process by which vegetation patches were complexed to form a patch cluster. The scale of resolution for this methodology was 1:30,000, based on 1:10,000 Ontario Base Mapping and 1:6,250 aerial photographs.

Where two or more Patches or Patch Clusters were contained in a Candidate ESA, one or more of the following criteria were met:

1. Patches were contiguous or joined by a naturally vegetated corridor;

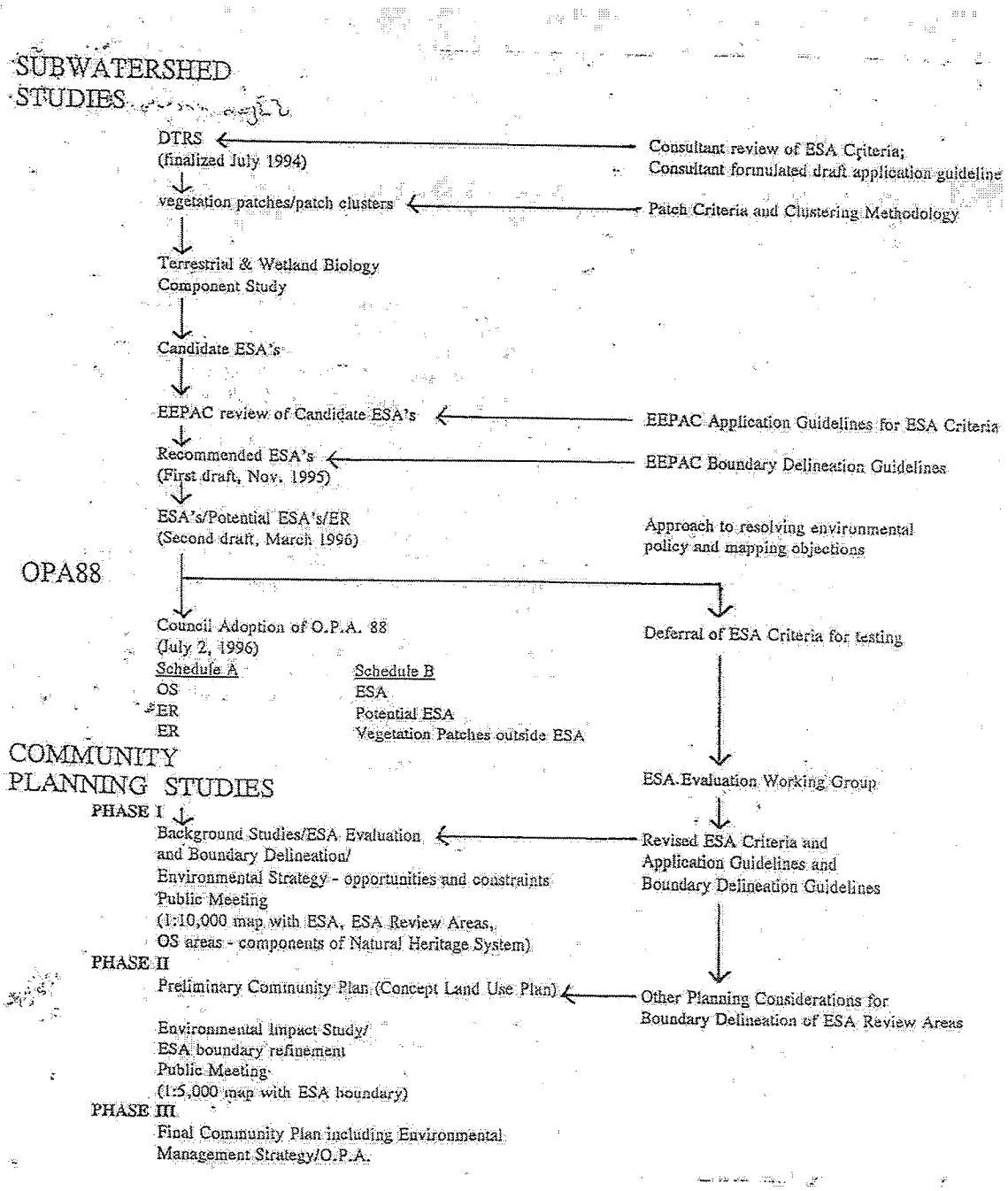
2. Patches were separated by a gap less than 100 m wide;

3. Patches were joined by natural or planted woody vegetation, or by naturally succeeding early successional vegetation (including, but not limited to, old fields and riparian meadow);

4. Patches contained different parts of a provincially significant (Class 1-3) wetland complex;

5. Patches were directly connected by a permanent, natural watercourse or stream corridor.

Figure 1: Flow Chart depicting the ESA identification, evaluation, boundary delineation and community planning process



2.0 CITY OF LONDON ESA EVALUATION CRITERIA APPLICATION GUIDELINES

2.1 Purpose

This report:

a) is based on the October 25, 1995 version of the **EEPAC CANDIDATE ESA SELECTION CRITERIA: Application Guidelines**;

b) recommends changes to the wording of the criteria to clarify their definition;

c) recommends changes to the application guidelines to strengthen their interpretation and scientific credibility;

d) provides a standard by which the criteria can be applied and Candidate ESAs can be assessed in a consistent and ecologically defensible manner.

2.2 Background

In October of 1996 an ESA Evaluation Criteria Review Committee, consisting of London Development Institute environmental consultants, EEPAC representatives and City Planning Staff, was established to review the ESA evaluation criteria and application guidelines that were deferred by City Council upon the adoption of Official Plan Amendment No. 88.

This review took place in order to clarify the wording of a document drafted by the Environmental and Ecological Planning Advisory Committee October 25 1995(Candidate ESA Selection Criteria: Application Guidelines) which was used by EEPAC to recommend ESA's to Council during the City of London Subwatershed Studies. These application guidelines reflect a general consensus of the views of the ESA Evaluation Criteria Review Committee on the wording of criteria and application guidelines that are being used for the evaluation of ESAs in the two test Community Planning Areas (Sunningdale and River Bend).

2.3 Interpretation

The following interpretations of the application guidelines should be noted.

1. To qualify for designation as an Environmentally Significant Area, a natural area must fulfill at least 2 of the City of London Criteria.

2. The same feature cannot be used to satisfy more than one criterion for a given area. However, the feature should be listed under each of the criterion that it meets. For example, if a community is identified as rare or uncommon, it would meet Criterion 1. This community will likely also be the best representative example of that type and thus would by definition, meet Criterion 2. However, unless there were other representative communities identified within the ESA, Criterion 2 could not be counted.

3. "Regional level" refers to the lands covered by the City of London Subwatershed Studies (see attached Map- Figure 2),including Oxbow Creek Subwatershed, Dingman Creek Subwatershed and the Central Area.

4. "County" refers to Middlesex County.

5. In some cases appropriate expertise will be required to apply certain elements of criterion 1 (unusual landforms), Criterion 4 (significant hydrological processes), Criterion 5 (aspects of biodiversity), Criterion 6 (important wildlife habitat or linkage functions) and Criterion 7 (significant habitat). Each time a criterion is applied, the rationale and source of expertise on which the application is based should be documented.

6. The minimum data requirements that are required to apply certain measures of a criterion, such as diversity indices, are detailed in the application guidelines. A standardized approach to data collection will enable more consistent application of these indices. Some of these measures may be useful for long term management planning.

7. For documentation of rare community and species status, the most current working lists and authorities will be utilized. Lists of rare and unusual communities and species will be considered open-ended, since data collected from other natural areas inventories will result in additions and deletions.

8. For vegetation communities, the Ecological Land Classification for Southern Ontario (ELC) (Lee *et al.* 1996,1997) will be the standard used to differentiate natural vegetation communities within patches. This will replace the Canadian Vegetation Classification System (Strong *et al.* 1990) which was used to evaluate communities to Level VII during the Subwatershed Studies Life Science Inventories (Bowles *et al.* 1994). For communities that are not yet included in the draft ELC, descriptions will be made using the principles established by the ELC hierarchy.

9. The word "Area" in this document refers to patches or patch clusters (the combined area of contiguous patches).

10. The focus of each criterion is to identify features of significance for protection.

Figure 2: City of London Subwatershed Region
(note: shaded areas depict subwatersheds studied during the City of London Subwatershed Studies. Oxbow Creek, Dingman Creek and Central Area Subwatersheds are included in the regional level)

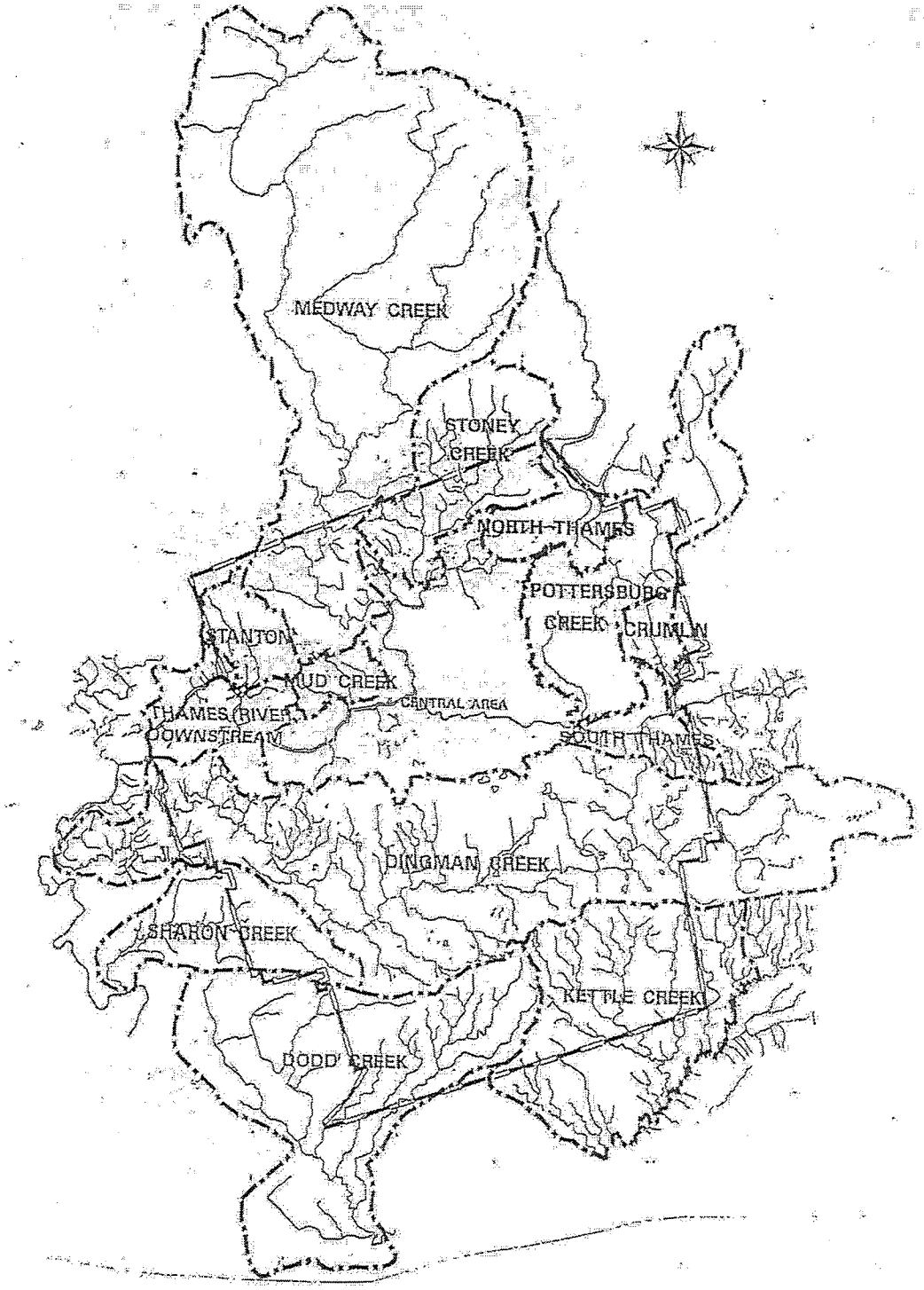
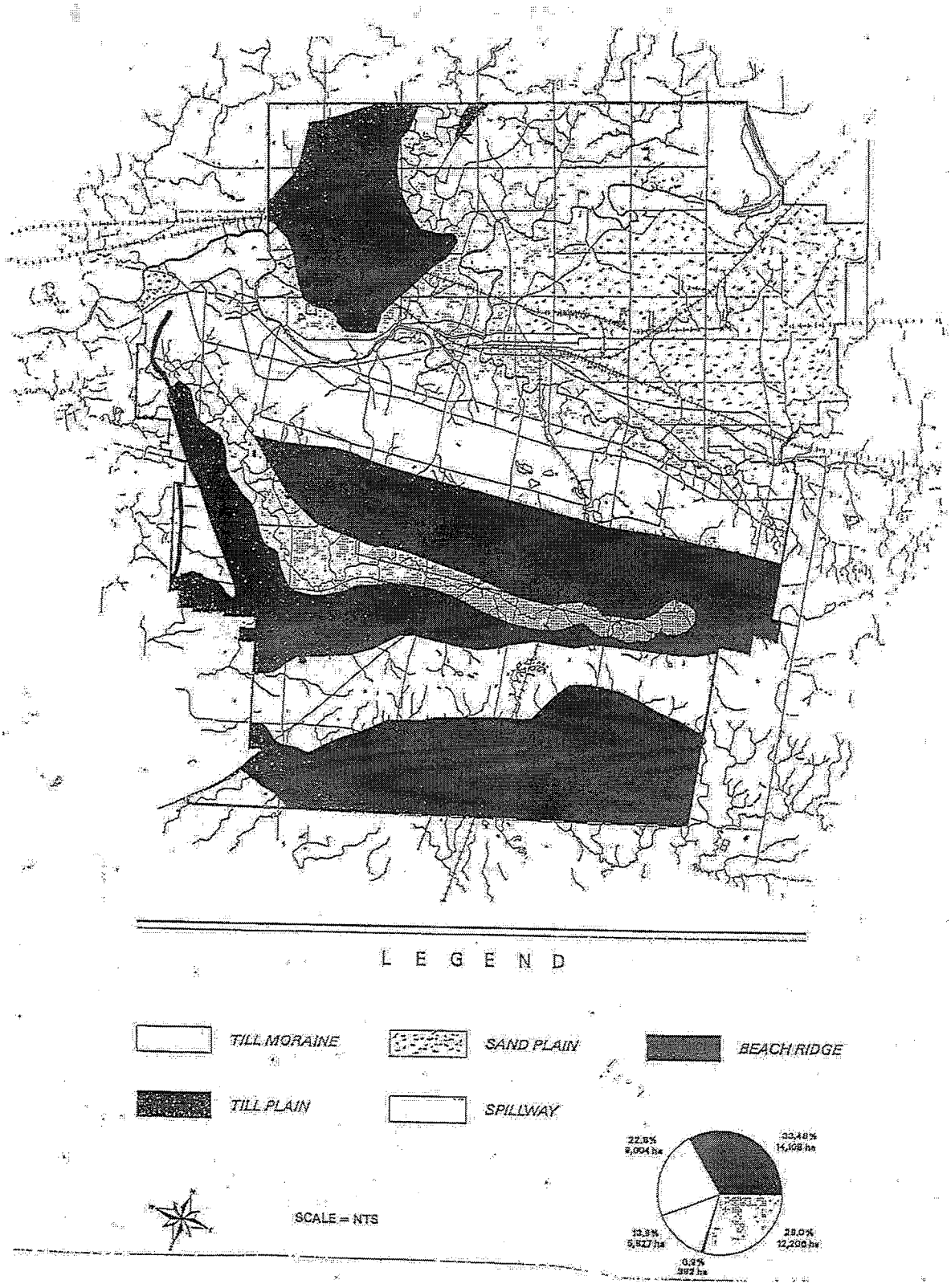


Figure 3: City of London Glacial Geomorphology of the dominant physiographic units



CRITERION 1: *The Area contains unusual landforms and/or rare to uncommon natural communities within the country, province or London subwatershed region.*

Background: Identification of landforms that reflect geological processes or features instrumental in forming London's landscape or communities that have limited occurrence, abundance or range (distribution) is important for the maintenance of biodiversity including ecosystem, landscape, species and genetic diversity.

Application:

Unusual Landforms

National level: Areas identified by recognized experts as geologically significant (e.g. Ontario Geological Survey)

Provincial level: Earth Science ANSIs

Regional level: Expert opinion (e.g.Dreimanis 1963, 1964) and data obtained through the Subwatershed Studies

Rare to Uncommon Natural Communities

National/Provincial level: Significance as interpreted from the Carolinian Zone community Subnational (Ontario) S-Ranks (Bakowsky 1996) or subsequent updates and/or amendments. Applied through existing data and data obtained from the Subwatershed Studies.

- communities listed with a provincial rank of S1 to S3

Regional level: Presence of vegetation communities which have been identified as rare to uncommon based on an analysis of the London Subwatershed Studies Life Science Inventories (Bowles *et al.* 1994) or the best available data. This list will be open-ended to incorporate any new data collected from the London subwatershed region. It will include communities or "species assemblages" that have limited distribution and occurrence within the region (e.g. fens, older growth forests, boreal species assemblages), or that are at the limits of their distributional ranges (e.g. bogs), or that are remnants of original habitat (e.g. prairie and oak savannah).

Source References: Bogs, fens (Riley 1989) or prairie/savannahs (Riley and Bakowsky 1993) may be identified through the presence of assemblages of indicator species. Older growth forests are evaluated in the context of the London subwatershed region, the top five percent of the oldest stage forests (climax and sub-climax) that are relatively undisturbed. Boreal indicator species will be defined by a specific list based on information obtained through the London Subwatershed Life Science Inventories (Bowles *et. al.* 1994).

There may be special cases where rare to uncommon vegetation communities are described by the presence of Nationally, Provincially or Regionally rare plant species, if they are abundant or dominant in one or more strata. In these situations, the presence of the rare plant would not be used to meet criterion 7 for rarity.

Glossary:

Species assemblages are considered to be a group of plant species or populations of plant species with similar habitat requirements.

Boreal species assemblages are defined by the presence of specific indicator species that attain their highest presence values in the boreal forest formation. In the London Subwatershed region these assemblages may be present as outliers in topographically favourable habitats (Larsen 1980). Boreal outliers have significant historic and ecological importance. They reflect both past vulnerability of vegetation to climate change and future potential for the vegetation to adapt to climate change.

Older growth forests are relatively old and relatively undisturbed by humans. The definition of older growth considers factors other than age, such as forest type, forest structure, forest development and the historical and current patterns of human disturbance.

Community is an assemblage of species or populations that live in a defined environment at a defined spatial-temporal scale, and interact with one another forming together a distinctive living system with its own composition, structure, environmental relations, development and function (Whittaker 1975).

CRITERION 2: *The Area contains high quality natural landform-vegetation communities that are representative of typical pre-settlement conditions of the dominant physiographic units within the London subwatershed region, and/or that have been classified as distinctive in the Province of Ontario.*

Background: The focus of this criterion is to identify representative examples of the full range of landform-vegetation types that occur on each of the 5 dominant physiographic units within the London subwatershed region (Figure 3). By representing all landform-vegetation associations in a protected areas system a significant portion of the biodiversity of an area will be maintained (Crins 1996). By capturing representative native vegetation in the Natural Heritage System, examples of pre-European settlement landscapes are also protected.

This criterion differs from Criterion 1 with the emphasis on representation, size and quality. The landform-vegetation communities do not have to be rare as long as they are the best examples of their type.

The dominant physiographic units are represented by the five glacial geomorphological features based on the Ontario Geological Survey Map P.2715 (Chapman & Putnam 1984).

The presence of disturbance indicators does not necessarily disqualify a site from meeting this criterion if other factors relevant to this criterion are satisfied or if it is the only representative example. Similarly, lack of disturbance does not necessarily qualify a site. Disturbance indicators are used as a relative measure to rank sites.

Application: Sites representing the same landform-vegetation types will be ranked in a relative manner to select the best examples. Priority should be given to designating the best examples, with respect to size and quality. In addition, similar landform-vegetation community types will be compared only within the same physiographic unit (e.g. till moraine; till plain; sand plain; spillway; beach ridge).

Distinctive and natural landform-vegetation communities are defined at Provincial or Regional levels:

Provincial level: Presence of Provincial ANSIs for Site District 7-6 (Hanna, 1984). Presence of Provincially Significant Wetlands (Class 1-3, or OMNR, 1993).

Regional level: Presence of regionally significant wetlands (Class 4-7) that are deemed to be significant by the City of London as identified by meeting a minimum number of key biological and special feature functions as recognized in the OMNR wetland evaluation system manuals (2nd or 3rd edition).

Presence of regionally significant ANSIs in Site District 7-6 (Hanna 1984).

Presence of Ecosite vegetation community types of high quality on distinctive topographic, landform or cultural features, applied through existing data and data obtained from the Subwatershed Studies. For example, but not limited to:

- Moist-Fresh Black Maple Deciduous Forest Type on bottomland
- Fresh Hemlock Coniferous Forest Type on valley slope
- Fresh Sugar Maple-Beech Deciduous Forest Type on tableland
- Fresh Sugar Maple-Beech Deciduous Forest Type on valley slope

Comments:

The Ecological Land Classification describes Ecosites by choosing one variable in each of eight fields that cover physical and environmental characters and vegetation characters. Not all variables are necessary for describing all Ecosites. The landform component or feature is an important variable to include in the Ecosite description for the assessment of landform-vegetation representation. Representation of high quality examples of the same ecosite vegetation type may be distinguished by the landform feature. Reference should be made to the landform type (e.g. floodplain/bottomland; terrace/valley slope/ravine; tableland/rolling upland).

High quality is evaluated by the maturity of communities, or the health of communities, or the degree of disturbance, or the presence of species that are vulnerable to disturbance.

1) High quality representative communities include, but are not limited to communities that exhibit:

- vegetation communities in a "climax" or "sub-climax" or "mid-age" stage of successional development;
- relatively healthy communities with respect to disease, fire, wind, or other natural processes;
- communities that are relatively unaffected by beaver activity;
- an absence of anthropogenic disturbance indicators. Indicators noted during the Subwatershed Studies include, but are not limited to:
    - recent or extensive timber harvesting which has substantially altered the structure or species composition or successional processes of a community.
    - ongoing grazing by livestock;
    - canopy blowdown or death resulting from the exposure of trees through drainage alteration, timber harvesting, or the creation of forest edge;
    - miscellaneous human use including extensive trail systems, cultivation for ornamental plants or crops, plantations, pruning or plant removal, mowing, building of structures, etc.;
    - cultural communities maintained in a "pioneer" or "early successional" condition as a result of human activity.

2) High quality at the species level can also be interpreted by:
- populations of native plant species with high (8-10) coefficient of conservatism (Oldham et al. 1995), or
- a low relative incidence of non-native plant species, or

• low numbers of invasive weedy species with weedines score of -3, (Oldham et al. 1995), or
• the presence of bird species considered to be good local indicators of undisturbed conditions (Hounsell 1989).

The presence of non-native species does not necessarily disqualify a site from meeting this criterion. This factor may be used as supporting evidence to differentiate between two or more areas that share representation of the same landform-vegetation community provided that the data collection efforts were consistent among sites being compared.

The low relative incidence of non-native plant species factor should be applied with caution and only used if the data collection protocol included all non-native elements.

Glossary:

Natural landform-vegetation communities are areas of naturalized vegetation associated with landform types (e.g. ravine, floodplain, tableland). The communities should represent typical pre-settlement vegetation conditions. For example; Yellow Birch deciduous swamp type on floodplain; or fresh Hemlock coniferous forest type on steep slope/ravine.

Naturalized vegetation is defined as species that have established a reproducing population in an area. It excludes those non-native species that are considered aggressive weeds or those species with the potential to become serious weeds (e.g. species with a weediness value of -3 such as purple loosestrife, garlic mustard, glossy and common buckthorns, scots pine, norway maple,)(Oldham et al. 1995) or persistent exotic species, found in old fields, that are known to retard or modify succession, such as honeysuckle, Kentucky bluegrass, hawkweed, reed canary grass, quack grass and smooth brome grass (Hiebert 1990 as cited in Geomatics 1995).

Distinctive areas are those that have been classified or identified by the Province of Ontario under other programs (e.g. Provincially Significant Wetlands; Provincially Significant ANSI's). Provincially Significant Wetlands (PSW's) are identified for their relative importance based on a numerical ranking of wetland values or functions. The highest scoring wetlands thus represent the most important areas for protection. Areas of Natural and Scientific Interest (ANSI's) are identified primarily for their contribution to representation of the range of landform-vegetation features that occur within a site district.

Pioneer communities have invaded disturbed or newly created sites, and represent the early stages of either primary or secondary succession (Strong *et al.* 1990).

Early successional communities have not undergone a series of natural thinnings. Dominant plants are essentially growing as independent individuals, rather than as members of a phytosociological community. It is floristically similar to mid-successional stands, but is juvenile in structural development (Strong *et al.* 1990).

Mid-successional communities have undergone natural thinnings as a result of species interaction, and may show evidence of invasion by climax species, but they are still dominated by seral species. They may include stands with an over mature understorey (Strong *et al.* 1990).

Sub-climax communities are successionally maturing communities dominated primarily by climax species, but significant remnants of earlier seral stages may be present (Strong *et al.* 1990).

Climax communities are self-perpetuating and composed of climax species. A successional stage with unevenly aged and multiple height classes (Strong *et al.* l990).

Cultural communities are those that have originated or are maintained by anthropogenic or culturally based disturbances, (e.g. abandoned agricultural fields and pastures, mowing, woodlot management or tree-cutting) often containing a large proportion of introduced species (Lee *et al.* 1997).

CRITERION 3: *The Area, due to its large size, provides habitat for species intolerant of disturbance or for species that require extensive blocks of suitable habitat.*

Background: The focus of this criterion is to identify large contiguous blocks of natural habitat and/or combined "patches" or "patch clusters" that cover an extensive area.

The presence of large contiguous blocks of forested habitat are used as an indicator of forest-interior conditions which are required by certain forest-interior and area-sensitive species. The size, shape and continuity of these forested areas are important factors for the identification of forest interior conditions

Large patches, or patch clusters are important for maintaining frequency of habitat across a landscape and genetic diversity of populations among interacting patches.

Application: This criterion can be met in any one of three ways:

1) the Area is greater than 150 ha. The minimum size limit is applied after the patches have been clustered or combined into one Area. The size of the Area is reviewed and compared relative to all other Areas so that only the largest Areas will qualify; or

2) the size of a forested patch is greater than 40 ha or the combined size of forested patches is greater than 40 ha and the patches are not interrupted by gaps wider than 40 m; or

3) the Area a) contains some interior forest habitat which is at least 200 m from all forest edges and is not interrupted by gaps wider than 40 m, OR b) there is confirmed presence of one or more "breeding birds" which are either forest-interior species or area-sensitive species.

Source References: Freemark and Collins (1992) and Sandilands (1997) for forest interior species; Magee (1996) updated from (Hounsell, 1989) for area-sensitive species.

Comments: For sites which straddle the city boundary, the size determination should be based on the whole site since this represents the ecological unit to which the criterion is applied.

The minimum size limit will result in the inclusion of only the largest Areas in the London subwatershed region, as determined through available data and data from the Subwatershed Studies. [Note: of 25 ESA's or Potential ESA's, 4 fell within the range of 150-500 ha and 2 were greater than 500 ha].

Glossary:

Areas are patches or the combined area of contiguous patches (patch cluster)

Patches are areas of woody vegetation generally larger than 4 ha. A patch may be bisected by a utility corridor or road if the right-of-way (ROW) is less than 40 m (City of London 1995).

Patch clusters are several patches that may be connected as one Area if certain criteria for connectivity and distance are met (EPPAC 1996)

Breeding birds are species present during the breeding season (June for most species, March to May for waterfowl, raptors and woodpeckers), and some indication of breeding status (pair present; territorial, display or anxiety behavior; nest, eggs, or young, etc.).

Forest-interior species are those that nest only within the interior of forests and rarely occur near the edge (Freemark and Collins 1992).

Area-sensitive species are those that require a forest to be a given size before they will inhabit it (Sandilands 1997).

CRITERION 4: *The Area, due to its hydrologic characteristics, contributes significantly to the healthy maintenance (quality or quantity) of a natural system beyond its boundaries.*

Background: The focus of this criterion is to identify natural areas that contribute significantly to the quantity and quality of groundwater and surface water resources in the region. Factors such as the magnitude of the area covered or volumes of water involved and the importance of the resource should be used to assess the significance.

Landscape position and terrain setting should also be used to evaluate the significance of recharge areas.

Application: Presence of indicators of hydrological processes noted during Subwatershed Studies include but are not limited to:
- water storage;
- water release (discharge);
- wetlands;
- water quality improvement;
- first order stream/ headwater;
- groundwater recharge areas identified on subwatershed maps as high potential;
- water conveyance (i.e. floodplain and overland flow paths).

Comments: For wetlands, those that meet three or more of five key hydrologic functions as identified in the hydrology section of the OMNR Wetland Evaluation System (2nd or 3rd edition manuals) would be considered significant by the City of London. [Rationale for the conditions was determined based upon a revi0ew of ten evaluated wetlands within the City of London].

For significant groundwater recharge, where large areas have been identified as high potential, it is not expected that the entire area identified would qualify for this criterion. To be considered for inclusion as part of an ESA, the recharge area must also be part of a vegetation patch as identified in the Subwatershed Studies or support naturally succeeding vegetation communities.

For permanent non-channelized first-order streams, those with Type I -II habitat (DFO 1994) would qualify for inclusion as part of the ESA.

Source References: Sources of information include but are not limited to wetland and hydrologic information presented by the UTRCA and by the Subwatershed Studies Aquatic Resources Management Reports for Vision '96 Subwatersheds (Beak Consultants 1995).

CRITERION 5: *The Area has a high biodiversity of biological communities and/or associated plant and animal species within the context of the London subwatershed region.*

Background: The focus of this criterion is to identify areas that demonstrate high variability and variety of plants, animals and communities or habitats. The primary attributes of "biodiversity" include "compositional", "structural" and "functional" diversity.

Application: For vegetation communities and species in the London subwatershed region, biodiversity can be measured in relative terms (e.g., based on analysis of the patches surveyed, the top percentage of patches that support the highest number of community types, or native species of plants, birds, mammals, herpetofauna, etc.).
Source Reference: Subwatershed Studies Life Science Inventories (Bowles *et al.*1994)

For "native species", "Species-Area Curves" may also be used to measure diversity. Areas where the actual number of species exceeds the expected number are considered diverse. Only native species will be used in the calculation.

Habitat diversity may also be used as supporting evidence of diversity (e.g., for herpetofauna the presence of vernal pools, woodland-pond interface, downed woody debris).

Comments: Evaluation of biodiversity should consider the variability of data obtained through different levels of field efforts.

Vegetation community classification will be based on *An Ecological Land Classification for Southern Ontario* (Lee *et al.* 1996, 1997).

Glossary: Biodiversity is the variety and variability of plants, animals and other organisms and the ecosystems in which they live.

Compositional diversity is the variety of elements in a collection, such as the species in a species list (species diversity), or the physical and biological factors of a site relative to its size (biophysical/landscape diversity). Attributes of biophysical diversity include slope, aspect, moisture, substrate, microclimate which support a variety of aquatic, wetland and terrestrial habitats.

Complexity is the number of species in the ecosystem and their relative abundances. Ecological communities and ecosystems are good examples of complex systems. They comprise large numbers of interacting entities, on many scales of observation, and their dynamics are often non-linear (causes are not proportional to consequences) – this leads to unpredictability and even apparent randomness.

Structural diversity is the physical organization of systems, from the pattern of patches or other elements in a landscape, to habitat complexity.

Functional diversity is the contribution made by each element to processes at work within the unit, such as energy transfer (food webs), nutrient cycling, predation, competition. For example, two communities with the same number of species may differ with respect to the number of levels of energy transfer. Functional diversity is not easily measured, since ecologists do not yet understand all of the organism-process relationships in ecosystems.

Species-area curve is a graphical relationship between habitat area and species richness (numbers). Both axes are commonly made logarithmic to arrive at a straight-line relationship between number of species and area.

Native species are those determined by the Natural Heritage Information Centre.

CRITERION 6: *The Area serves an important wildlife habitat or linkage function.*

Background: The focus of this criterion is to identify important "wildlife" habitats or "linkages" between significant natural features. This contributes to overall landscape richness and provides habitat for wildlife (City of London, 1995).

Application: Important wildlife habitat functions may include, but are not limited to:
- waterfowl staging or stopover areas;
- deer yarding areas;
- colonial bird nesting or roosting areas;
- herpetofaunal breeding ponds and/or hibernacula areas;
- fish spawning or nursery areas (Type I habitat);
- areas that provide a temporary refuge for migratory wildlife;
- areas that provide critical life cycle habitat;
- areas that have an important linkage with other natural communities;
- specialized habitat areas such as springs or seepage areas, sites with a high density of cavity trees/snags, perched wetlands.

Source References: OMNR files and maps; Subwatershed Studies; other data obtained through site specific field investigations; MNR (1997).

The site fulfills an external linkage or corridor function between two or more significant habitats. The value of a linkage or corridor will be based upon characteristics such as width, quality and length. Linkages may include, but are not limited to:
- early successional woodlands and plantations;
- water bodies, water courses and valley lands;
- riparian zones;
- steep slopes and ground water discharge areas;
- old fields;
- hydro and pipeline corridors;
- abandoned road and rail allowances;
- recreational greenway parks.

Source Reference: Riley and Mohr (1994)

Comments: Linkages should connect significant habitat areas for native species that will benefit from the presence of this linkage. Linear habitats (such as fencerows) that may have intrinsic habitat value, but do not connect larger protected areas, and those that are human imposed with no regard for the natural landscape system (such as channelized watercourses) should not be considered linkages (Harris and Scheck 1991). Linkages and corridors, while also providing habitat or wildlife value, are important because they connect more substantive patches of habitat.

Glossary: Wildlife is all wild organisms and their habitats - including wild plants, invertebrates, and microorganisms, as well as fishes (see Federal definition in OPA 88), amphibians, reptiles and the birds and mammals traditionally regarded as wildlife (WMCC 1996).

Linkages are naturally existing or restored native linear landscape connections between two or more significant areas. These connections are often referred to as wildlife corridors or dispersal corridors. They are defined by characteristics such as width (appropriate to the scale of the phenomenon being addressed), distance (a long corridor will need to be wider than a short one), quality (e.g. vegetative structure and distribution), species diversity, low non-native plant indices, etc.), type of corridor use (1. species in which individuals pass directly between two areas in discrete events of brief duration; or 2. species that need several days to several generations to pass through),importance within the landscape, as well as the functions being expected of the linkage. Corridor functions may include, but are not limited to avenues along which:

- wide-ranging animals can travel, migrate and meet mates;
- plants can propagate;
- genetic interchange can occur among native flora and fauna;
- populations can move in response to environmental changes and natural disasters;
- individuals can recolonize habitats from which populations have been locally extirpated (Beier and Loe 1992).

Type I habitat is defined by the Policy for the Management of Fish Habitat (DFO 1986), and by the Habitat Conservation and Protection Guidelines, first edition (DFO 1994).

CRITERION 7: *The Area provides significant habitat for rare, threatened, or endangered indigenous species of plants or animals that are rare within the country, province or county.*

Background: The focus of this criterion is to identify populations of rare, vulnerable, threatened or endangered species for protection.

Application of this criterion is based on several factors, such as the number of rare species found, consideration of ecological distribution of the species (e.g. the only record of a species in Middlesex County) and other characteristics of the species (sensitivity, habitat needs, etc.). Definitions of significant habitat are given under each of the categories of vascular plants and animals. The most current sources of rarity designations will be used. Lists of rare species are considered open-ended as new information will result in amendments over time. Data from the Subwatershed Studies Life Science Inventories were used to update Middlesex County status for plants.

Application:

Plant Species

Habitat for plant species should be indicated by the presence of a population. The presence of a single specimen of a rare plant will not qualify an area under this criterion.

National Level : COSEWIC Status reports
NHIC Global Ranks (GRANK) for Rare Vascular Plants (Oldham 1994a) and Mosses (Oldham 1994b).
• species listed with a global rank of G1 to G3
Rare Vascular Plants in Canada (Argus and Pryer 1990)

Provincial Level : NHIC Provincial Rank (SRANK) for Rare Vascular Plants (Oldham 1994a) and for Mosses (Oldham 1994b).
• species listed with a provincial rank of S1 to S3
MNR Species at Risk in Ontario (Bowman 1996)
Atlas of the Rare Vascular Plants of Ontario (Argus *et al.* 1982-1987)
COSSARO Status reports

County Level : Status of the Vascular Plants of Southwestern Ontario (Oldham 1993a)
• rare in SW Ontario
SWFLORA database for Subwatershed Life Science Inventories (Bowles *et al.* 1994)
• rare in Middlesex County
species recorded that have 1-4 records (stations) in Middlesex County.
NOTE plant records collected from the Subwatershed Studies were used to update the rare status at the county level.

Animal Species

Habitat for animal species should be interpreted to mean areas where one or more rare species are resident or breeding in the area, and/or making use of the area for a key component of their life cycle (e.g. terrritory, nesting, critical feeding grounds or wintering concentrations). Documentation of repeated (multi-year) use of an area by a species adds to the significance of the habitat. For breeding birds, the presence of suitable habitat for territory, nesting and feeding; for butterflies, the presence of suitable habitat including the host plants upon which they feed; for mammals, the presence of signs of active use of an area (e.g. dens, bedding areas, well-used trails, scat, etc.); for herpetofauna, the presence of suitable habitat for breeding (e.g. vernal pools, downed woody debris) and hibernating (presence of hibernacula).

National Level : COSEWIC Status reports
NHIC Global Ranks (GRANK) for Amphibians and Reptiles (Oldham 1996), Mammals (Sutherland 1994a), Birds (Sutherland 1994b), Butterflies (Sutherland 1994c) and Fishes (Sutherland 1994d)
• species listed with a global rank of G1 to G3

Provincial level : NHIC Provincial Rank (SRANK) for Amphibians and Reptiles (Oldham 1996), Mammals (Sutherland 1994a), Birds, Butterflies and Fishes (Sutherland 1994b, 1994c and 1994d respectively)
• species listed with a provincial rank of S1 to S3
MNR Species at Risk in Ontario (Bowman 1996)
COSSARO Status reports

County level : SW Ontario regional status based on records in provincial atlases:
• mammals (Dobbyn 1994)
• breeding birds (Cadman *et al.* 1987)
• butterflies (Holmes *et al.* 1991)
• herpetofauna (Weller 1994)
Middlesex County status of rarity is based upon the most recent existing county records:
• mammals - provincial mammal atlas and records from MNR District office
• breeding birds - open ended lists from the provincial bird atlas (Cadman *et al.* 1987) and best available county information;
• butterflies - best available county information;
• herpetofauna - Status of amphibians and reptiles in Middlesex County (Oldham 1993b); Amphibians of Middlesex County (Oldham 1989a); Reptiles of Middlesex County (Oldham 1989b)

Comments: Other non-vascular plant (e.g. Mosses) and faunal groups (e.g. Odonata) should be included where and when the information is available.

Glossary:

Significant as defined by the Provincial Policy Statement means:

- in regard to other features and areas in policy 2.3 (i.e. significant portions of the habitat of endangered and threatened species, and significant wildlife habitat) ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system. Criteria for determining significance may be recommended by the province, if requested by the City, but municipal approaches that achieve the same objective may also be used.

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3.0 Guidelines for Assessing Ecological Boundaries of Vegetation Patches

1. Purpose

1) To document and describe a repeatable process leading to a credible map which can be used for planning and monitoring;

2) To outline a consistent basis by which ecological boundaries for natural features can be determined;

3) To provide the basis for resolving variations between different scales and types of mapping; and

4) To develop a common understanding and approach between planners, consultants and the public regarding the ecological aspects boundary delineation for natural features and hazards.

2. Background

These guidelines and the accompanying figures are intended to outline a consistent basis for setting ecological boundaries for natural features during Phase I of the EIS. The guidelines are based strictly on ecological considerations. Broader planning considerations should be dealt with during Phase II of the EIS.

3. Boundary delineation of vegetation patches

A vegetation patch is defined as an area that contains natural vegetation and associated features and functions, that is generally free of permanent disturbance and that can be distinguished from the surrounding land use. A patch is an integrated ecological unit. All parts of it act as part of the unit, the whole of which supports and contributes to ecological performance. A patch may contain areas that have relative degrees of sensitivity and different ecological functions. These functions may change over time. Boundary delineation should not be used to separate a patch into specific parts that can be treated individually as having lesser or greater significance or contribution to ecological function. Most vegetation patches will be treed, either swamps or forests, but some may include untreed wetlands, prairies and other natural habitats.

4. Interpretation

The following interpretations apply to these guidelines.

4.1 The initial boundary will be drawn at the interface between naturalized vegetation and the adjacent lands, generally conforming to the patch outline. The natural heritage feature so mapped will be outside the development area.

4.2. Patch outlines will be refined through the application of these boundary guidelines. The guidelines are based upon ecological principles. In applying the boundary guidelines a number of natural heritage features, if they are present, must be included in the boundary. Other features that mainly provide buffer or linkage functions should be included within the boundary if certain conditions are met. These areas are regarded as Review Areas. Assessment of the Review Areas will be made during Phase II of the EIS and will be based upon an integration and review of all planning considerations for the area and detailed field studies completed for the EIS.

4.3. Application of these boundary delineation guidelines is best made at a map scale of about 1:10,000. Further boundary refinement during Phase II of the EIS will be made at a finer scale (1:5,000, or 1:2,000).

4.4 The diagrams and examples that form part of the conditions for boundary delineation are intended to convey the intent of the guidelines. While not drawn to scale, these diagrams do depict the relative sizes and distances of the areas shown. The legend precedes the diagrams.

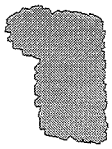
4.5 In the application of these guidelines, the most recent map sources, aerial photographs and references should be used to verify and update background information.

4.6. A patch may be bisected by a utility corridor or road if the right-of-way is less than 40 m.

Top of slope

Watercourse

Patch boundary



Vegetation patch

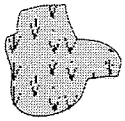
Cultural habitat

Plantation

Rare community

Habitat zone

Building



Wetland

GUIDELINE 1: Habitat zones **must be included within the patch boundary**

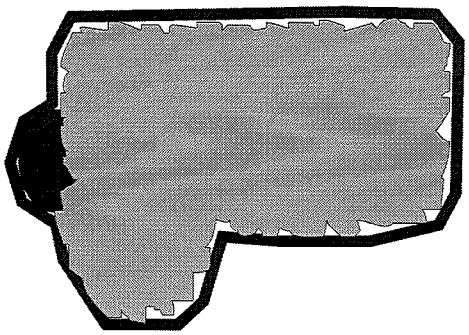


Figure 1. Habitat Zones

Conditions:
Habitat zone are requirements for species at risk, nationally, provincially or regionally rare species, forest-interior or area-sensitive species.

Rationale:
A habitat zone is a significant habitat feature used regularly for a key lifecycle requirement for a species that requires special protection. The vegetation in the habitat zone need not be naturalized. The critical habitat of a plant species may extend to areas in the immediate vicinity of population that have similar soil, moisture, exposure and community conditions. The critical habitat of a butterfly may extend to the habitat of plant species on which the butterfly depends. The forest-interior habitats of many birds, and the nesting and rearing sites of raptors may constitute critical habitat zones. Breeding ponds and hibernation sites may constitute significant habitat zones (MMA 1995).

GUIDELINE 2: Rare to uncommon natural communities **must be included within the boundary**

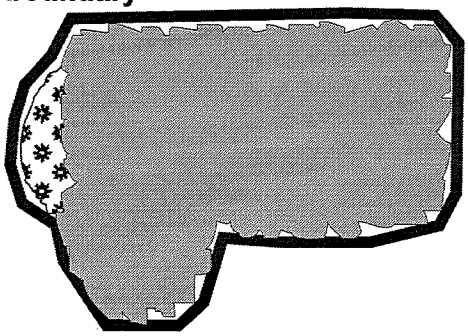


Figure 2. Rare or uncommon natural communities

Conditions:
Vegetation communities may be identified as rare to uncommon because of their limited distribution and occurrence within the country, province or region (e.g. fens, older growth/mature forests), or because they are at the limits of their distribution (e.g. bogs), or are remnants of original habitat (e.g. prairie and oak savannah).

Rationale:
Protection of significant vegetation communities are necessary to ensure its continued presence over time, including natural successional processes that may occur.

GUIDELINE 3: Projections of naturalized vegetation **less than thirty metres (30 m) wide that extend from the main body of the patch:**

a) **must** be included within the boundary if the projection includes a wooded ravine or valley with untreed or successional habitat below the top-of-slope

b) **should** be included within the boundary if the projection provides linkage with another patch less than 100 m away, or between two portions of the same patch

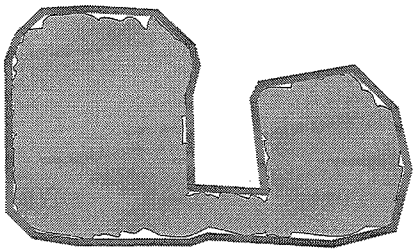


Figure 3b : Linkage

Conditions:

A vegetated projection meeting condition a) is included within the boundaries. A vegetated projection meeting condition b) is mapped as Review Area.

Rationale:

Ravine, valley and upland corridors are important components of the natural heritage system because they contain natural habitat, provide linkage, increase species richness and diversity and facilitate movement and dispersion. In general, connected patches are usually better than unconnected patches (MNR 1997).

GUIDELINE 4: Watercourses:

a) **must** be included within the boundary if the watercourse forms the boundary of the patch (Figure 4a); and

b) **must** be included within the boundary if the watercourse connects two or more patches within 85 meters (Figure 4b).

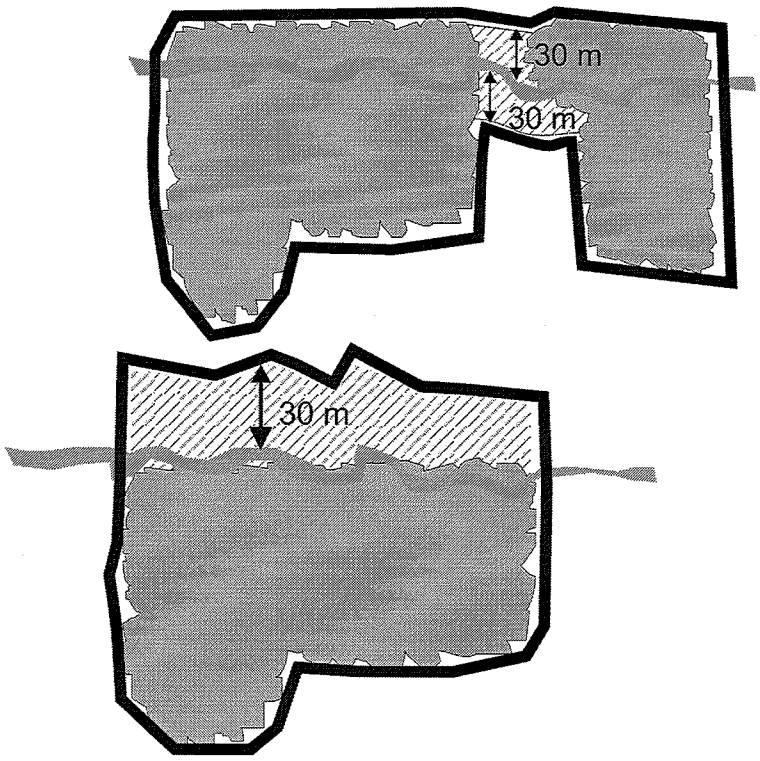


Figure 4. Watercourses

Conditions:

The connection **must** include a minimum corridor width of:

30 m on each side of the high water mark of small watercourses;
100 m on the side(s) of large rivers (Thames River, Medway Creek, Stoney Creek, Dingman Creek) where the patch occurs;
50 m on each side of coldwater streams.

Rationale:

Watercourses are important ecological habitats providing wildlife resources and functions as well as contributing substantially to connectivity within and between significant natural areas. Riparian buffers adjacent to watercourses are important for protecting the water quality and ecological health of aquatic habitats.

First order, headwater streams are recognized as indicators of hydrological processes. Stream corridors are one of the components of the natural heritage system.

GUIDELINE 5: Satellite woodlands **that are small less than 2 ha and have a round to square shape, and are located within 100 m of a larger woodland patch** (Figure 5):

a) **must** be included within the boundary if the satellite contains rare species or significant communities

b) **should** be included within the boundary if they contribute to biological diversity and ecological function of the larger patch.

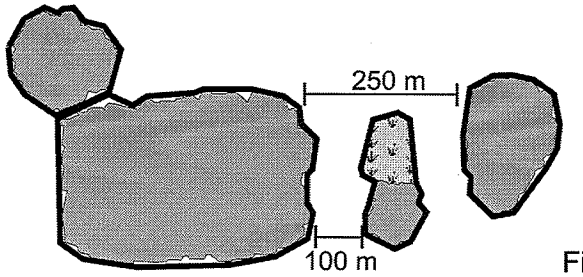


Figure 5

Conditions:

Contribution to ecological function may include, but is not limited to:

- the satellite supports natural conifer cover of species native to region; or
- the satellite is located adjacent to or contains a wetland that is considered locally significant based on hydrology, biology or special features; or
- the satellite is located between two larger patches that are within 250 metres of each other, where the land between the patches is absent of permanent barrier; or
- the satellite meets the habitat needs of one or more species that are not met by the larger patch; or
- the satellite contains a natural vegetation community type that is not already represented in the larger patch.

Rationale:

Woodlands are one of the components of the natural heritage system. While woodlands less than 4 ha are often regarded as having a low relative degree of importance, there are certain indicators that, if present, increase the relative importance of the woodland (Riley & Mohr 1994; Hilditch 1993; MNR 1997).

The presence of indigenous natural conifer cover of native species is considered important for wildlife shelter. The importance of a woodland increases if it is located adjacent to a wetland or it contains a wetland because the wetland helps to increase vegetation diversity, adds wildlife habitat values and contributes to hydrological functions (Riley & Mohr 1994; Hilditch 1993).

Small woodlands that are close enough in proximity to one another or interspersed amongst larger habitat patches, may have value for area-sensitive birds and species with low mobility (Riley and Mohr 1994). Small woodlands can also provide a foundation for creating new habitat, particularly by connecting woodlands through replanting or natural regeneration and providing linkages or corridors for movement between habitats (Austen and Francis, MNR 1997).

Clusters of patches that collectively meet several of the habitat needs of one or more species are generally more valuable than clusters of patches that meet fewer habitat needs (MNR 1997). Natural areas that consist of several patches containing a diversity of vegetation community types can sometimes provide better representation of the range of habitats than a single larger habitat patch (MNR 1997).

GUIDELINE 6: Marshes, Thicket Swamps or other Untreed Wetland communities contiguous with a patch and greater than 0.2 ha in size that are relatively undisturbed and dominated by native species that are obligate or facultative wetland species (coefficient of wetness values of -3 to -5) (Oldham et al 1995) **must** be included within boundary if:

a) the wetland strengthens a linkage between natural areas by filling in a bay or connecting two or more patches (Figure 6a); or

b) the wetland is located above the top-of-slope of a stream corridor or ravine (Figure 6b); or

c) the wetland connects a patch to a permanent natural watercourse (Figure 6c).

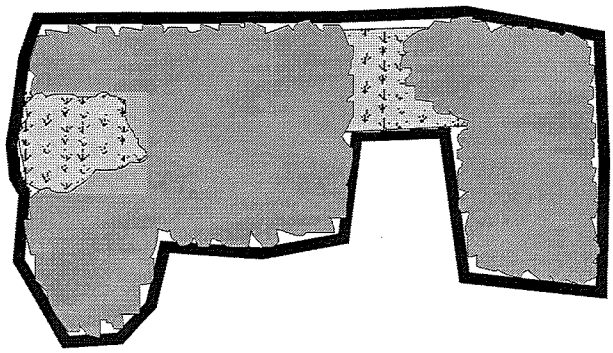
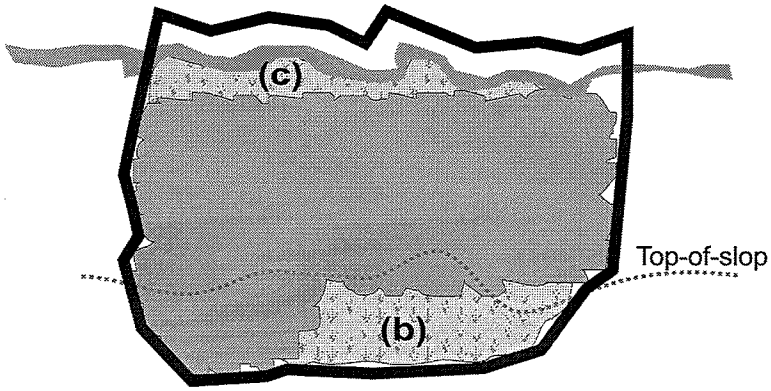


Figure 6a



Figures 6b and 6c

Conditions:

A marsh or thicket swamp or other untreed wetland meeting any one of the above conditions is included in the ESA Boundary. Locally or regionally significant wetlands are part of the natural heritage system and must be mapped as vegetation patches.

Rationale:

Wetlands are one of the components of the Natural Heritage System because they provide important habitat for plants, fish and wildlife. They also influence the quality and temperature of water flowing through them and some wetlands provide storage capacity to offset peak flows associated with storm events.

GUIDELINE 7: Cultural savannahs and woodland and old fields **must** be included within the ESA boundary if they:

a) minimize negative edge effects by forming a well-established mantel at the edge of the treed patches and as such protect adjacent communities from the effects of surrounding land use (Figure 7a); or

b) strengthen internal linkages in the patch by filling in "bays" (Figure 7b); or

c) connect a patch to a permanent natural watercourse (Figure7c); or

d) connect two or more patches (Figure 7d); or

e) are below the top-of-stable-slope in a stream corridor or ravine (Figure 7e).

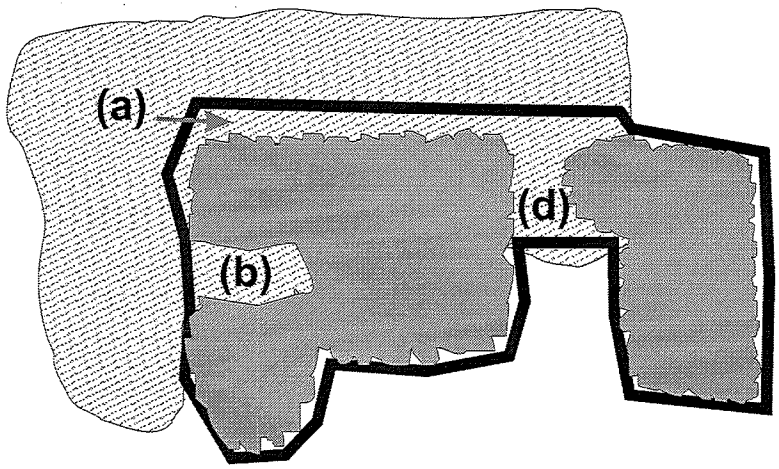


Figure 7

Condition:

A cultural habitat meeting any one of the above conditions is included in the ESA boundary. However, it is not intended that the cultural habitat will occupy a large proportion of the total area of the patch being delineated (Figure7a).

Rationale:

Cultural habitats may act as significant supporting habitat to the patch, where the loss of such communities would result in loss of ecological integrity of the whole patch. The inclusion of cultural habitats may increase the biological diversity of the area if the other similar cultural habitat is not already present.

Cultural habitats may provide: increased community and species diversity; important breeding and foraging wildlife habitat; landscape connections between naturalized areas; habitat for rare flora and fauna, and/or serve as buffers that protect more sensitive areas from adjacent land use. Cultural habitat adjacent to woodlands also has potential for rehabilitation and may contribute to a net gain in ecosystem health. Although cultural habitats are not pristine or unaffected by human activity, they have the potential to contribute natural values. This is especially so in landscapes that are still predominantly agricultural, such as southern Ontario (Geomatics 1995).

Criteria and guidelines for evaluating the ecological significance of cultural habitat areas are provided in the Geomatics (1995) report "Management options for old-field sites in southern Ontario". These criteria address a range of issues including rare and endangered species, wildlife habitat, site productivity, successional stage, soil characteristics, site history and the relationship of a particular site to the surrounding landscape.

GUIDELINE 8: Plantations contiguous with patches of natural vegetation must be included in the boundary if the plantation:

a) was originally established for the purposes of forest rehabilitation and/or has been managed towards a natural forest and/or has developed characteristics of a natural forest, such as natural regeneration of native species.

A plantation should be included in the boundary if it:

b) minimizes edge effects to natural heritage features by providing a buffer between the feature and the surrounding land use (Figure 8b); or

c) strengthens internal linkages or reduces edge to area ratios by filling in bays (Figure 8c); or

d) connects a patch to a permanent watercourse (Figure 8d); or

e) it connects two or more patches (Figure 8e); or

f) it is below the top-of-slope in a stream corridor or ravine (Figure 8f).

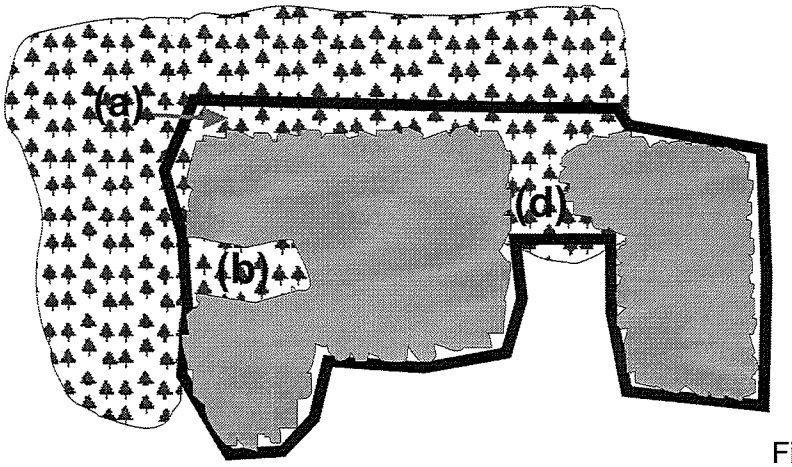


Figure 8a, 8b, 8d

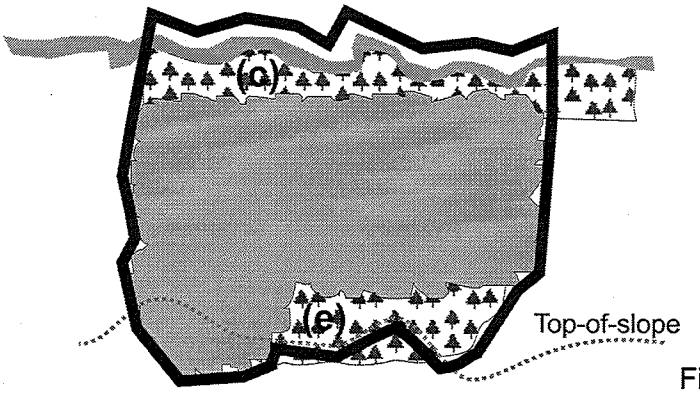


Figure 8c, 8e

Condition:

A plantation meeting condition a) is mapped as part of the patch. A plantation meeting conditions b) to f) is mapped as Review Area. It is not intended that the plantation will occupy a large proportion of the total area of a patch.

Rationale:

Plantations may provide significant supporting habitat to the naturalized vegetation of a patch. Plantations form connections between naturalized areas, provide wildlife habitat, provide buffers for sensitive areas and edges, protect and enhance stream environments, stabilize soils and have the potential for regeneration to natural habitats.

GUIDELINE 9: Existing land uses within or adjacent to a patch are subject to the following boundary considerations:

a) Existing land uses within a patch, such as bridle trails, recreational trails, livestock grazing areas and woodlot management areas are included in the patch

b) Existing heavily managed or manicured features that are surrounded on at least three sides by a patch or that form "islands" in patch are included in the patch if they are less than one hectare (1 ha) in total area (Figure 9). Such features include, but are not limited to agricultural croplands, □ntried active pasture, golf courses, lawns, ornamental treed lots, gardens, nurseries, orchards and Christmas tree plantations. Subsequent permanent abandonment or rehabilitation of "islands" larger than one hectare may qualify such areas for inclusion in the patch.

b) Existing heavily managed or manicured features adjacent to a patch are not included in a patch.

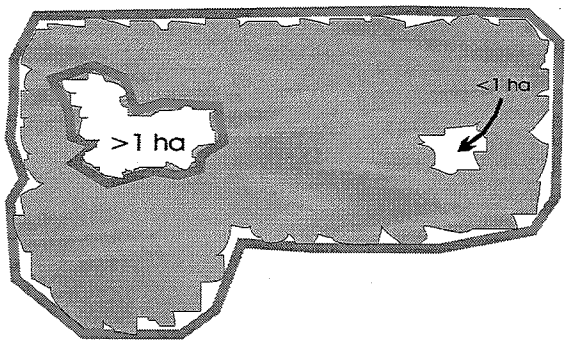


Figure 9

GUIDELINE 10): Residential sites and institutional areas within or adjacent to a patch are subject to the following boundary considerations:

a) Existing residential building envelopes and institutional building envelopes surrounded on at least three sides by a patch or forming "islands" within a patch are not affected by the protective designation. Building envelopes and access routes of existing structures within the patch must be determined on a site specific basis.

b) Existing residential building sites adjacent to a natural heritage feature are excluded from the patch.

3.0 Glossary

Bog is defined as an open or treed wetland area on deep (>40cm) peat almost entirely composed of Sphagnum species. The tree cover is less than 25%, scattered or clumped, and usually under 10 m in height. The wetland is dominated by graminoids and/or low ericaceous shrubs (Riley 1994 from Lee et al 1998).

Cultural habitat is defined as a community originating or maintained by anthropogenic or culturally based disturbances, such as agricultural fields (croplands) and pastures (grazing), mowing, woodlot management or tree cutting, etc., often containing a large proportion of introduced species (Lee et al. 1998), but are undergoing natural succession. Generally tree cover is <60%. Cultural habitat includes, but is not limited to, old field meadow, old field thicket, cultural savannah and cultural woodland ecosites (Lee et al. 1998).

Cultural savannahs and woodlands are areas where trees have been planted, or have resulted from first generation regeneration of a site originating or maintained by anthropogenic disturbances (Lee et al 1997). It does not include treed areas where the main stratum is dominated by native species and tree cover is >60%. Cultural savannahs are treed areas with 11-35% scattered or clumped tree cover and dominated by graminoids and forbs. Cultural woodlands have 36-60% scattered or clumped tree cover and dominated by graminoids and forbs.

Fen is defined as an open or treed wetland area on deep (>40cm) sedge and woody peat with a substantial component of brown moss. The tree cover is less than 25%, scattered or clumped. The wetland is dominated by graminoids and low non-ericaceous shrubs (Lee et al. 1998 from Riley 1994). Fens may also include seepage marl areas with <40 cm peat, and/or the presence of fen indicator species.

Habitat zone requirements are defined as the significant portions of the species' habitat that are critical to their life history or lifecycle requirement (e.g. territory, nesting, critical feeding grounds or wintering concentrations), as defined by documented use. The significant portions of habitat will have variable dimensions, based on the requirements of individual species (MMA 1995).

Marsh is defined as an open wetland area occurring on organic or mineral substrates with a water table that fluctuates seasonally or periodically at, near, or above the substrate surface; dominated by hydrophytic sedges, grasses, cattails, reeds, forbs or low shrubs with tree and tall shrub cover <25%; may include meadow marsh, shallow marsh, deep marsh or shrub marsh (Lee et al. 1998).

Mature Forests are dominated primarily by species which are replacing themselves and are likely to remain an important component of the community if it is not disturbed again. Significant remains of early seral stages may still be present (Lee et al 1998).

Natural watercourse is defined as one in which the dynamic morphological features, such as width, depth, velocity, discharge, slope, channel materials, sediment load and sediment size, operate within a given equilibrium (Aquafor Beech Limited 1994, p. 1.14). Excludes those sections of watercourses that have been cleared of 75% or more of their riparian cover and straightened or channelized for agricultural or other purposes (Aquafor Beech Limited 1994 p. 3.25).

Older Growth Forests are relatively old and relatively undisturbed by humans. The definition of older growth considers factors other than age, including forest type, forest structure, forest development and the historical and current patterns of human disturbance. Older growth forests are self-perpetuating communities composed primarily of late seral species which show uneven stand age distribution including large old trees without open-grown characteristics (Lee et al. 1998) .

Old fields are defined as open sites where agricultural practices have been abandoned (Geomatics 1995). These abandoned agricultural fields and pastures are generally dominated by forbs and grasses in their early stages of succession. It does not include native grasslands such as prairies (Geomatics 1995). Old fields have <10% tree cover. An old field meadow has <25% cover of shrub species while an old field thicket has >25% shrubs.

Permanent stream is defined as one which flows for nine or more consecutive months in a year (Marshall Macklin Monaghan Limited and Tarandus Associates 1993, p. 34).

Plantation is defined as a woodland where the dominant trees have been planted by humans as opposed to naturally regenerated. It includes treed communities dominated by non-native species in the main stratum.

Prairie and Oak Savannah is defined as open or treed areas that are dominated by unique native species assemblages of open-grown oak trees (<60% tree cover) along with a complement assemblage of grasses, sedges and forbs characteristic of the midwestern prairie biome. May include tallgrass prairie, tallgrass savannah or tallgrass woodland upland communities (Lee et al. 1998).

Ravine, valley, river and stream corridor is defined as a landform depression, usually with water flowing through or standing in it for some period of the year. Ravine, valley and river corridors are generally distinguished from stream corridors by having a distinct valley landform. Ravine and valley corridors may be defined locally by considerations such as their natural features or functions, minimum setbacks from the crest of the slope, top of ravine or valley bank or top of projected stable slope (MMA 1995).

Satellite Woodlands are small treed or forested areas located within 100 m of a larger area of significant woodland. The satellite may be part of a Patch or Patch Cluster. " Woodlands means treed areas that provide environmental and economic benefits such as erosion prevention, water retention, provision of habitat, recreation and the sustainable harvest of woodland products. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance" (MNR 1997).

Significant as defined by the Provincial Policy Statement means ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system. Criteria for determining significance may be recommended by the province, but municipal approaches that achieve the same objective may also be used.

Thicket Swamp is defined as a wooded wetland area occurring on organic or mineral substrates with a water table that seasonally drops below the substrate surface; dominated by small trees and shrubs where the tree cover is <25% and the small tree or tall shrub cover (shrubs defined by Soper and Hiemburger 1982) is >25% (Lee et al 1998).

Top-of-Slope is defined by the intersection of the top of a bank or valley slope with the table land.

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7.0 Other Planning Considerations for the Delineation of ESA Boundaries (Applied to ESA Review Areas Identified as Optional for Inclusion in the ESA)

Application of the Boundary Delineation Guidelines will result in the identification of areas that are critical for inclusion in the ESA, and areas that are optional for inclusion. Application of the Guidelines limit these optional areas to: cultural habitat or plantations, in the form of bays, or mantels of vegetation along the perimeter of the ESA, or connections between satellite wooded areas and the main body of the ESA; projections of untreed vegetation extending from the main body of the ESA; small satellite woodlands; marshes/carrs. These areas are considered optional for inclusion on the grounds that they are not always critical to the long-term health and integrity of the ESA and their exclusion would not reduce in any way the ability of the patch to meet the ESA criteria. The final delineation of the ESA boundary to include, exclude or transect such areas will have regard for an equitable evaluation of both ecological and other planning considerations. Guidelines on ecological considerations can be taken from the principles embodied in the ESA Criteria and Application Guidelines. In general, the intent will be to include the optional areas in the ESA where ecological benefits can be clearly demonstrated and, as determined through the review of other planning considerations, inclusion will not be onerous to the design and viability of community development. Other planning considerations will include the following:

1. The potential use of the optional area for required sewer or water services or stormwater management as identified through the Community Planning Background Studies.

2. The usability of the development envelope having regard for logical road patterns and lotting arrangements.

3. The potential for inclusion of the optional area as land to be retained in a natural state within a development block (multi-unit residential, institutional, school, private open space etc.). The area would be protected but still count towards density calculations or site area requirements.

4. The potential for inclusion of the area with a block of dedicated parkland, recognizing that parkland will be located and designed to meet overall community needs.

5. The impact on overall planning/management for the ESA as an integrated landscape unit; for example, maintenance, ownership and access.

6. The ability to use other protective measures that would permit a wider range of uses, such as other land use designations or other policies.

7. The potential to complete restoration and enhancement that would improve portions of the habitat for the net benefit of the ESA.

8. The need to have regard for other ongoing EA processes or study requirements.

9. The ability of the area to fulfill supportive social functions such as:
- aesthetic, historical, or accessible passive activity opportunities;
- scientific research or conservation education.

8.0 Community Planning Process

The community planning process is developed on the basis of the subwatershed plans at a more detailed planning level. An environmental component of the plan is required to provide for the implementation of the Natural Heritage System (environmental) policies of OPA 88.

Phase I of the Community Planning Process involves completion of more detailed background studies (to a mapped scale of 1:10,000) that assess and verify the natural heritage features and ecosystem functions. All Open Space (OS) and Environmental Review (ER) lands as mapped on Schedule A at 1:30,000 are included in the background study. Potential ESAs and vegetation patches as depicted on Schedule B at 1:30,000 will be evaluated using the boundary delineation guidelines and the ESA evaluation criteria. The boundary delineation guidelines will be applied to Areas that meet the criteria for significance. Ecological boundaries will be determined for these Areas at a scale of 1:10,000. The boundaries will show areas that **must** be included within the ESA, and areas that **should** be included in the ESA, based on ecological guidelines. The latter areas will be mapped as ESA Review Areas. Areas that do not meet any of the criteria for significance will be considered for other appropriate land uses. The ecological resources, hydrology, hydrogeology and geotechnical information collected in the inventory and analysis phase will be used to develop an Environmental Management Strategy (EMS). This strategy forms part of the supporting documentation for the development of the Community Plan.

Phase II of the Community Planning process involves the preparation of an interim community plan, outlining constraints, strategies and options. This plan will integrate the findings of all background studies. In the assessment of the ESA Review Areas, other planning considerations may be used to guide the boundary delineation (see section 3.6).

In the event that an area is removed from the ESA boundary based on other than ecological reasons, the exclusion of the area will not preclude its consideration for retention as an open-space feature or open-space related function through other means such as site planning, parks designation, or storm water management planning (see section 3.6).

Once the boundaries of the ESAs and other components of the Natural Heritage System have been determined, an Environmental Impact Study (EIS) will be undertaken to evaluate the impacts of the proposed land uses on the natural heritage areas recommended for protection in the EMS and will identify appropriate buffer measures to protect these areas. EISs are required to determine, whether, or the extent to which development will be permitted in areas within, or adjacent to, specific components of the Natural Heritage System. They may refine the boundaries of components of the Natural Heritage System, and may include conditions to ensure that development does not have a negative impact on the natural features and ecological functions for which the area is defined (Policy 15.5.1 and Table 15.1).

During the EIS process, the ESA boundaries will be refined to a scale of 1:5,000, using more detailed environmental data gathered from site specific investigations, geotechnical studies, etc. As part of the overall EMS for the lands within and adjacent to the ESA, a functional overlay approach may be used to define core and supporting areas, zones of sensitivity and appropriate uses within those zones in the ESA.

The final Phase III of the Community Planning process is the resolution of outstanding issues and completion of the final community plan and management plan. At the subdivision stage, after completion and approval of the Community Planning Study, the ESA boundaries will be identified as surveyed ESA boundaries. The land within these boundaries is zoned Open Space (OS). After all environmental issues are resolved through municipal, agency and public review process, the draft plans are finalized and the community plans recommended to Planning Committee.

4.0

GUIDELINE DOCUMENT FOR THE EVALUATION OF ECOLOGICALLY SIGNIFICANT WOODLANDS

March 2006
Approved by Council June 26, 2006

EXECUTIVE SUMMARY

The conservation and protection of woodlands has been identified as a priority for some time and has more recently been an issue of increasing public attention and concern (Larson et. al. 1999; OMNR 1993a; Hilts 1977; Upper Thames Valley Conservation Report 1952). Particular focus has been directed on the state of southern Ontario's landscape, woodlands being one component of the natural heritage of southern Ontario that is recognized in Natural Heritage section 2.1 of the Provincial Policy Statement (2005). This guideline document presents a methodology for evaluating the ecological significance of vegetation patches identified with woodland components within the boundaries of the City of London. The adoption by Council of this document pursuant to section 19.2.2., of the Official Plan will provide a consistent approach to the evaluation for significance based on criteria contained in section 15.4.5 of the Official Plan. The criteria in 15.4.5 recognize that significant Woodlands may be selected for ecological or socioeconomic benefits. This guideline document focuses on an evaluation of ecological values that discriminate high quality woodlands. Ecological values include features and conditions that are associated with mature woodlands, processes and functions that generate and maintain biodiversity and ecological integrity. The socioeconomic values of woodlands will be evaluated in a separate process.

CRITERIA FOR IDENTIFICATION OF SIGNIFICANT WOODLANDS

The criteria for identifying Woodlands, is outlined in Section 15.4.5. of the Official Plan (City of London):

> 15.4.5 Woodlands Woodlands are complex ecosystems of different tree species, shrubs, ground vegetation and soil complexes that provide habitat for many plants and animals. Woodlands is a general term which collectively refers to areas occupied by trees, treed areas, woodlots and forested areas. Woodlands identified through the Subwatershed planning Studies and located outside of the recognized Environmentally Significant Areas are shown as "Vegetation Patches" on Schedule "B".

The significance of Woodlands will be based on an evaluation of the following considerations:

(i) The Woodland contains natural features and ecological functions that are important to the environmental quality and integrity of the Natural Heritage System.

(ii) The Woodland provides important ecological functions and has an age, size, site quality, diversity of biological communities and associated species that is uncommon for the planning area.

(iii) The Woodland is important for the balanced distribution of open space amenities and passive recreational activities across the urban area.

(iv) The Woodland provides significant habitat for endangered or threatened species.

(v) The Woodland contains distinctive, unusual or high quality natural communities or landforms.

APPLICATION

These guidelines will apply to all vegetation patches outside ESA's and wetlands as identified on Schedule B and designated as Environmental Review on Schedule A. These patches, generally 4 ha in size or larger, were identified through the Subwatershed Planning Studies. The patch is the trigger for the application of these evaluation guidelines. The evaluation will identify those vegetation patches (lands) that meet and those that do not meet the criteria for significance as Woodland components of the Natural Heritage System. If the Woodland patch meets the criteria for significance, the lands determined to be significant shall be designated as Open Space on Schedule "A", and delineated on Schedule "B" according to the significant characteristics of the lands (8B.3. and 15.3.), in this case as a "Woodland". Future investigation, (Environmental Impact Statement) may result in a change (reduction or expansion) of the boundary of the significant woodland.

Boundaries of the woodland patch may be revised using principles for boundary delineation of Environmentally Significant Areas (City of London 1997). Non-woodland areas may have importance to the maintenance of long-term integrity and biodiversity values of the woodland either as contributing to the ecological significance of the whole patch, or as buffers for protection of more sensitive areas within the patch. These aspects and the refinement of patch boundaries would be explored in more detail as part of an Environmental Impact Study for development applications within 50 m of the Woodland patch. Not all areas of the patch may be carried forward or identified as "significant". The Subwatershed Studies Implementation Plan (MMM 1995) established the options for vegetation patches pending the results of more detailed studies: protection of the whole patch as significant and "no development and/or site alteration";

a) protection of portions of the patch that will maintain functions;
b) replacement or compensation of all or portions of the patch;
c) identification of the patch as not significant and development permitted without replacement or compensation.

This evaluation system is the first step to identification of patches in the last category (not significant/development permitted) and those falling in the first two categories (significant/no development or site alteration unless it has been demonstrated through an Environmental Impact Statement that there will be no negative impacts on the natural features or their ecological functions. The scoring sheets will clearly indicate woodland's ecological strengths and weaknesses relative to other woodlands. The degree of development permitted or not permitted will in part reflect the overall value of scores of each woodland; i.e. woodlands with more high scores are relatively more significant than those with one or no high and more medium scores. In the former instance, development may not be supported within any portions of the patch, while in the latter case some development may be permitted within a portion of the patch.

WOODLAND IDENTIFICATION AND EVALUATION

The City of London has completed a digital polygon layer of vegetation communities at the ELC Community Class and Community Series levels using airphoto interpretation and topographic layers in a GIS model. The basis for the classification was the original vegetation patch outlines from the subwatershed studies, inventory reports, aerial photographs and field inventory. Patches in the former City of London boundaries (prior to annexation) identified in the Remnant Woodlot Inventory For the City of London (1991) and/or that are currently designated Open Space as parks or within flood plain regulated lands were also identified and mapped (Bergsma & Boitson 2000). This mapping is linked to the terrestrial subwatershed database (Bowles et. al. 1994) and another database of audit and inventory information on patch characteristics.
This mapping will greatly facilitate the identification and evaluation of significant woodlands within the City of London.

Most potential Woodlands are shown as "Vegetation Patches outside of ESA's and Wetlands" on Schedule "B" of the Official Plan and as Environmental Review "ER" on Schedule "A". Patches that contain treed areas meeting the Ecological Land Classification (ELC) definitions for a Woodland, as given below, will be evaluated through an appropriate ecological inventory in accordance with the Draft City of London Data Collection Standards For Natural Areas (July 1997) and using the methodology described below and in the Woodland Patch Assessment Score Sheets.

Application of the evaluation guidelines will apply to the entire patch, regardless of community type, with some standards applied only to natural woodland communities within the patch. Woodlands will be evaluated for their significance using a recognized evaluation model (Smith & Theberge 1987) that meets several requirements:

a) Measurements are made on an ordinal scale (high-medium-low);
b) Minimum standards can be set for each criterion;
c) It recognizes that criteria are not independent;
d) It enables the use of information at different spatial scales and recognizes the relationships between criteria;
e) It is a simple and repeatable method that will support and highlight the choices being made without clouding important issues or concealing value judgements

This evaluation system ranks sites on the basis of whether they meet an acceptable minimum standard for any given criterion. It readily identifies the reason(s) why the site is "significant"without trying to weigh or compare criteria that are not comparable or are measured on different scales.

Each criterion will be rated using an ordinal ranked scale (high-medium-low). In general, the higher the rating for each standard, the more valuable or significant is the woodland.

The rationale behind the criteria are based on the key ecological concepts in natural heritage system planning as presented in the Natural Heritage Reference Manual for Policy 2.3 of the Provincial Policy Statement (OMNR 1999). There are 15 concepts presented as A-O and are based on the following factors:

- Representation
- Distribution
- Size
- Shape
- Fragmentation
- Connectedness
- Arrangement
- Proximity
- Habitat Diversity
- Complexity
- Community Diversity
- Species Diversity
- Species Rarity
- Naturalness and Disturbance
- Hydrologic and Related Values

ASSESSMENT FOR WOODLAND SIGNIFICANCE

A Woodland will be considered as a significant component of the Natural Heritage System based on the following categories:

- If one or more criteria meet the standard for High;
- If five or more criteria meet the standard for Medium.

WOODLAND DEFINITION

WOODLAND DEFINITION - The Provincial Policy Statement and the Official Plan policy definitions consider woodlands as areas containing trees. Thus, ***all vegetation patches containing treed areas may be defined as Woodlands***. Treed areas may include all communities with a tree cover of >10%. (ELC definition, Lee et. al. 1998)

Ecological Land Classification (ELC) Definitions

The Ontario Ministry of Natural Resources has developed a standardized classification system for vegetation communities across southern Ontario, entitled Ecological Land Classification for Southern Ontario - First Approximation and Its Application (Lee et. al. 1998). In this classification system, the term woodland has a specific definition based on percentage of treed cover and is thus not the only classification that meets the policy definition of a Woodland. In the ELC system, a treed area is any community with a tree cover >10%. Application of the ELC keys identifies the following ELC Community Classes and Series as Woodland:

FOREST - deciduous forest (FOD), mixed forest (FOM) or coniferous forest (FOC);
SWAMP - deciduous swamp (SWD), mixed swamp (SWM) or coniferous swamp (SWC);
BLUFF - treed bluffs (BLT);
TALLGRASS SAVANNA and WOODLAND - (TPS, TPW)
CULTURAL - cultural woodland (CUW), cultural savanna (CUS) or cultural plantation (CUP)

In keeping with Middlesex Natural Heritage Study, the presence of communities with shrub cover >25% will also qualify as woodland. This would include BLS, CUT, and SWT.

- Other communities that contribute to the biological diversity and ecological function of woodlands include old fields (CUM), open prairies (TPO) and open wetland communities (MAM, MAS, SAF, OAO, FEO, and BOG) as defined by the Ecological Land Classification. While these communities will not comprise entire woodland patches, they are important components and contribute to the ecological significance of the vegetation patch. As such they are included in the evaluation of significance for applicable criteria.

1. CRITERION 15.4.5 (i) The Woodland contains natural features and ecological functions that are important to the environmental quality and integrity of the Natural Heritage System.

1.1 Site Protection

a) Presence of hydrological features within or contiguous with the patch. Based on RULE "O": *Patches that contain waterbodies are generally more important than those that do not.* Based on other concepts developed for the London Subwatershed Studies to recognize: a) the linkage between protection of groundwater and vegetation on the surface; b) the interface between aquatic and terrestrial systems which is very rich and the focus of important activities and functions; and c) the important hydrological functions of wetlands that complement and enhance those provided by woodlands.

Includes groundwater recharge areas (Schedule B); headwater/ 1st order watercourses, 2nd, 3rd, and 4th or higher watercourses (includes flood plain regulated lands and river, stream and ravine corridors outside of flood plain regulated lands and rivers/streams (subwatershed studies category 1 patches and/or as mapped on Schedule B); wetlands (evaluated on Schedule B and unevaluated identified on the ELC digital layer).

☐ **HIGH** one or more hydrological features/functions located within or contiguous with the patch (category 1 patch / within ground water recharge area / contains a wetland >2 ha size.
☐ **MEDIUM** within 50 m of a watercourse or contains a wetland < 2 ha size.
☐ **LOW** no hydrological features present within or contiguous with the patch

b) Erosion and Slope Protection. Based on the need *to protect runoff processes, ground stability and aquatic habitat (erosion potential) for slopes > 10%* (MNR, Design Guidelines for Forest Management).

As mapped in the Slope Stability Mapping Project (UTRCA 1996) and also using the surface mapping for slope and aspect based on a TIN surface file generated by ArcView 3D Analyzer. Additionally, this criterion requires knowledge of the soil textures and types as described in the Ecological Land Classification manual (MNR 1998) based on the Ontario Institute of Pedology (1985) and Canadian Soil Classification System (1978).

☐ **HIGH** patch present on steep slopes >25% on any soil type, OR on a remnant slope associated with other features such as moraines or remnant valley slopes no longer continuous with the river system OR on moderate to steep slopes >10% - 25% with erodible soils (silty loam, sandy loam and loam, fine to coarse sands).
☐ **MEDIUM** patch present on moderate to steep slopes > 10% - 25% with less erodible soils (heavy clay and clay, silty clay)
☐ **LOW** patch present on gentle slopes < 10% with any soil type.

Score for criterion 1.1 based on the highest standard achieved for any one of the two standards

1.2 Landscape Integrity (Richness, Connectivity and Distribution)

a) Landscape Richness. The density of landscape fragmentation, or patchiness as measured by the total area of all patches per unit area of land. Based on the demonstration that *Native plant richness and flora quality are significantly related to local forest cover* (UTRCA 1997; Bowles and Bergsma 1999). Based generally on RULE "G": *Clustered patches are usually better than in-line patches of the same total area.*

Percent cover of vegetation (all habitat types) within a 2 km radius circle from patch centroid. Thresholds reflect cumulative frequency distribution of patches within London).

☐ **HIGH** > 10% local vegetation cover
☐ **MEDIUM** 7 – 10% local vegetation cover
☐ **LOW** < 7% local vegetation cover.

b) Landscape Connectivity (linkage and distance between patches not separated by permanent cultural barriers). Based on RULE "E": *Connected patches are usually better than unconnected patches* and RULE "N": *Patches that are relatively unaffected by human use are more valuable than more disturbed patches.*

☐ **HIGH** patches directly connected by:
- i) waterways or riparian habitat (generally primary or secondary aquatic corridors and streams with bridges and/or underpasses: include Thames, Dingman, Medway, Stoney, Pottersburg, Kettle, Dodd, Sharon, Oxbow, Kelly, Stanton, Crumlin);
- ii) Contiguous or semi-contiguous habitat.

☐ **MEDIUM** patches indirectly connected by:
- i) habitat gaps < 40 m;
- ii) areas identified as Anti-fragmentation, Terrestrial Corridor, Big Picture Corridor (to enhance the viability of isolated woodlands by re-connection, buffering, expanding OR to infill disturbed areas or replace abandoned fields (Riley & Mohr 1994);
- iii) abandoned rails, utility ROWs (hydro corridors, water/gas pipeline)
- iv) Open space greenways and golf courses
- v) Active agriculture or pasture;
- vi) Watercourses connected by culverts;
- vii) First or second order streams channelized.

☐ **LOW** patches not connected due to the presence of permanent cultural barriers:
- i) major roads and highways with no culverts;
- ii) urban or industrial development, large parking lots;
- iii) infrastructure;
- iv) dams, buried watercourses, channelized third or greater order watercourses
- v) very active recreational (campground, parks with major facilities – community centres, arenas).

c) Patch Distribution (isolation & arrangement of patches / patch clusters*). Based on RULE "C": *Large patches are usually better than clusters of smaller patches with the same total area* and RULE "F": *Closely clustered patches are usually better than less closely clustered patches.* The interaction or flow of organisms among patches appears to be influenced by the size of patches and the distance separating them – the "gravity model" theory**

☐ **HIGH** patch clusters with total area > 40 ha OR identified as a Meta Core in the Carolinian Canada Big Picture Project (2000) OR is an isolated patch > 20 ha size.

☐ **MEDIUM** patch clusters with total area 20 – 40 ha OR identified as an Island Core in the Carolinian Canada Big Picture Project (2000) OR is an isolated patch >10 to 20 ha size

☐ **LOW** patch clusters with total area < 20 ha OR is an isolated patch < 10 ha.

Score for criterion 1.2 based on the highest standard achieved for any one of the three standards

*Patch Clusters were defined by patches within 250 m of each other not separated by major roads, highways, railways or urban development.

** Gravity Model Theory – A Gravity Model can be used to predict the migration and interaction potential between populations or communities of species from nearby patches based on co-efficients for distance, habitat heterogeneity (or indices of patch similarity), and the dispersal behaviours of organisms. This was demonstrated in the Middlesex Natural Heritage Study (UTRCA 2003) in which a statistically significant negative relationship was shown between the number of native plant species to distance from a recognized natural heritage feature (ANSI and Wetland). In other words, the closer the distance between the woodland patch and a recognized natural heritage feature, the greater the number of native plant species in the woodland.

2. CRITERION 15.4.5 (ii) The Woodland provides important ecological functions and has an age, size, site quality, diversity of biological communities and associated species that is uncommon for the planning area.

2.1 Age and Site Quality

a) Community successional stage / seral age. Community age is based on definitions in the provincial Ecological Land Classification for Southern Ontario (Lee et. al. 1998). Seral age reflects the composition of the plant community (especially trees) with respect to light tolerance and moisture conditions). Generally, mature or advanced seral stage community types are under-represented in the London Subwatershed (Bowles 1995); Middlesex County (MNHS, 2003) and Oxford County (OCTES, 1997).

☐ **HIGH** patch contains one or more mature or older growth community
☐ **MEDIUM** patch contains one or more mid-aged community
☐ **LOW** patch contains only pioneer to young community

b) Mean Coefficient of Conservatism (MCC) of communities or whole patch. The MCC is based on the Floristic Quality Assessment System for Southern Ontario (Oldham et.al. 1995), analysis of distribution in the London Subwatershed area (Bowles & Bergsma 1999), results of the MNHS (UTRCA 2003) and OCTES (UTRCA 1997).

☐ **HIGH** one or more vegetation community with a MCC ≥ 4.6; OR MCC of patch > 4.5
☐ **MEDIUM** one or more vegetation community with a MCC 4.2 – 4.5; OR MCC of patch ≥ 4.0 – 4.5
☐ **LOW** all vegetation communities with a MCC < 4.2; OR MCC of patch < 4.0.

c) Disturbance related to Human Activity. Based on the assessment of vegetation patches to classify them as Excellent, Good, Fair, Poor for overall condition.

☐ **HIGH** One community in excellent condition; or All communities in Good condition.
☐ **MEDIUM** A combination of communities in Good, Fair and Poor condition
☐ **LOW** All communities in Poor condition

Score for criterion 2.1 based on the highest standard achieved for any one of the three standards

2.2 Size and Shape. These parameters influence the type of bird species "guilds" that a patch may be able to support. Guilds include "interior dependent" (forest interior species), "forest dependent" (forest interior-edge species), "area dependent" (area-sensitive species) and "generalists" (edge species). The number of native plant species has been found to be positively related to patch area, and negatively related to interior habitat (MNHS 2003) which means that patches with more interior had fewer native plant species than the same size patch with less interior.

a) Patch Size. Based on RULE "B": *Large patches are usually better than smaller patches.*

Thresholds derived from cumulative frequency curve distribution for London patches.

☐ **HIGH** Patch > 9.0 ha in size OR patch contains a woodland >4 ha.
☐ **MEDIUM** Patch 2.0 – 9.0 ha in size OR patch contains a woodland 2-4 ha.
☐ **LOW** Patch < 2.0 ha in size.

b) Patch Shape and Presence of Interior. Based on RULE "D": *A compact patch with a limited amount of edge is better than a narrow patch of the same area with more edge.*

Calculated as the presence of interior area based on a 100 m interior edge zone. Based on analysis of subwatershed studies patches and calculation of perimeter to area ratios.

☐ **HIGH** Patch contains interior habitat that is more than 100 m from the edge, or has a Perimeter:Area ratio <1.5 m/m².
☐ **MEDIUM** Patch contains no interior habitat but has a Perimeter:Area ratio 1.5 – 3.0 m/m².
☐ **LOW** Patch contains no interior and has a Perimeter:Area ratio > 3.0 m/m²

c) Conservative Bird Species – *Birds are indicators of habitat quality and the degree of forest fragmentation.*

Evaluated based on Southern Ontario Conservation Priorities Scores for Middlesex County (Couturier 1999). Presence of species with high Jurisdictional Responsibility, Preservation Responsibility and/or Area Sensitivity as identified for all three categories of forest, marsh and open country birds.

☐ **HIGH** Confirmed, probable, or possible breeding of one or more species at Level 1 or two or more at Level 2 or > five at Levels 2-4 in the patch.
☐ **MEDIUM** Confirmed, probable, or possible breeding of one species at Level 2 or two or more at Level 3 or four to five at Levels 3-4 in the patch
☐ **LOW** Confirmed, probable, or possible breeding of one to three species in Level 3-4; or no conservative bird species present in the patch.

Score for criterion 2.2 based on the highest standard achieved for any one of the three standards

2.3 Diversity of Communities, Landforms and Associated Species

a) ELC Community Diversity. Based on RULE "J": *Patches that contain more than one natural heritage feature or area may be more valuable than patches with a single natural heritage feature or area.* Native plant species diversity is related mainly to the number of communities in the patch, also to patch area and landscape richness (OCTES, 1997).

Applied at the patch level to all communities (including cultural) identified at the Community Series level in the City of London digital GIS layer. Thresholds derived from cumulative frequency distribution of London patches for a total of 23 community series categories.

☐ **HIGH** Patch contains 6 or more Community Series
☐ **MEDIUM** Patch contains 3-5 Community Series
☐ **LOW** Patch contains 1-2 Community Series

b) Community and Topographic Diversity (variation and heterogeneity). Based on the concept that vegetation structure and landform variability positively influences biodiversity.

Applied to all communities as defined by this study and based on ELC Community Tables (Lee et. al. 1998) and topographic feature description. There are 7 possible topographic feature categories for the City of London: riverine, bottomland, terrace, valley slope, tableland, rolling upland, bluff.

☐ **HIGH** Patch contains 3 or more Ecosites in one Community Series OR four or more Vegetation Types OR three or more topographic features (e.g tableland, rolling upland, valley slope, terrace, bottomland).
☐ **MEDIUM** Patch contains 2 or more Ecosites in one Community Series OR by three Vegetation Types OR two topographic features, or one Vegetation Type with inclusions or complexes.
☐ **LOW** Patch relatively homogenous; 1 Ecosite OR one to two Vegetation Types on one topographic feature.

c) Diversity (species and individuals) and Critical Habitat Components for Amphibians. Based on RULE "L" *Patches that contain a high diversity of species are usually more valuable than patches that contain fewer species.* Amphibians are indicators of healthy woodlands with well functioning processes (OMNR 1999, 2000).

Applied at the patch level, based on presence of amphibians and/or important habitat components including 1) unpolluted shallow water that remains wet for the breeding season (presence of vernal pools); 2) emergent and submergent aquatic vegetation (presence of aquatic ELC community types); 3) presence of instream logs and shoreline shrubs (fish habitat data); 4) closed canopy offering a shaded moist understorey environment (presence of forest or treed swamp communities); 5) abundance of coarse woody debris (deadfall/logs, firm or decayed in the 10-24, 25-50 or >50 cm size classes).

☐ **HIGH** 3 or more species of amphibians present in the patch, OR 1 species of amphibian that is abundant in one or more communities; OR 2 or more critical habitat components present in the patch.

☐ **MEDIUM** 1-2 species of amphibians present in the patch; OR 1 species of amphibian that is occasional in one or more communities; OR 1 critical habitat components present in the patch.

☐ **LOW** No species of amphibian present in the patch, OR no critical habitat components present in the patch.

d) Presence of Conifer Cover. Important for providing winter food and shelter for a variety of wildlife species (OMNR 1999, 2000). Conifer communities include FOC, FOM, SWC, SWM and CUP.

☐ **HIGH** Patch contains conifer communities that are > 4.0 ha in size.

☐ **MEDIUM** Patch contains conifer communities that are between 2.0 and 4.0 ha in size.

☐ **LOW** Patch contains conifer communities < 2.0 ha in size or no coniferous, mixed forest, swamp or plantation communities.

e) Fish Habitat Quality. The health of an aquatic habitat is determined by the health of the water body and surrounding land use practices. Even intermittent watercourses can provide critical habitat for many species. Fish provide an early warning of environmental problems.

☐ **HIGH** Dissolved oxygen > 8.0 mg/L or abundant instream woody debris and rocks and watercourse with a natural channel located within or contiguous with the patch.

☐ **MEDIUM** and Dissolved oxygen 5.0 – 8.0 mg/L or moderate amount of instream woody debris rocks and portions of channelized watercourses within or contiguous with the patch.

☐ **LOW** and Dissolved oxygen < 5.0 mg/L or no instream woody debris and sparse structure entire watercourse channelized within or contiguous with the patch.

Score for criterion 2.3 based on the highest standard achieved for any one of the five standards

3. CRITERION 15.4.5.(iv) The Woodland provides significant habitat for endangered or threatened species.
[Note: refer to Policy 15.4.4 re: Endangered and Threatened Species habitat]

Identification, evaluation and listing of provincially endangered or threatened species (species-at-risk (SAR) in Ontario designated by both COSEWIC/COSSARO) is the responsibility of the MNR. Planning Authorities may wish to have assessments of the significant portions of the habitat of SAR reviewed by the MNR. The MNR and Planning Authorities may take a co-operative approach on identification of the extent of habitat, with differing roles depending on the status of the species and if there is a recovery plan or not (OMNR 1999).

SAR present or previously identified ☐ YES ☐ NO

The presence of SAR will add one HIGH score to the over-all assessment

4. CRITERION 15.4.5 (v). The Woodland contains distinctive, unusual or high quality natural communities or landforms.

4.1 Distinctive, unusual or high quality communities. Applied at the patch level to all community types present.

a) ELC Community SRANK. Based on Bakowsky (1996) OR current status from NHIC web page (http:/www.mnr.gov.on.ca/MNR/nhic/veg/lists/commlist.html).

☐ **HIGH** One or more communities with an SRANK of S3/S4 or higher.
☐ **MEDIUM** No communities with an SRANK higher than S4.
☐ **LOW** No communities with an SRANK higher than S5.

b) Specialized or rare species presence/absence. Based on RULE "M": *Patches that contain rare species are generally more valuable than patches without rare species.*

See glossary for definitions and lists of species that qualify.

Type and Status of Species	HIGH	MEDIUM	LOW
Rare tree or shrub	1		
Rare herbaceous	1		
Northern and Specialized habitat tree/shrub	3	2	1
Carolinian tree/shrub	6	3-5	1-2
Regionally Rare plant	4	1-3	
Uncommon plant			1

c) Size and distribution of trees

☐ **HIGH** trees > 50 cm dbh abundant in one or more communities within the patch
☐ **MEDIUM** trees > 50 cm dbh rare or occassional in one or more communities within the patch
☐ **LOW** trees > 50 cm dbh not present in any communities within the patch

d) Basal Area

This criterion is being added to evaluate stand characteristics for total basal area, and basal area by tree species and size classes for each community. The post-logging provincial standard for tolerant hardwoods will be used as a measure of high quality woodlands (MNR 2000). It has been shown in other studies that 45% (MNHS 2003) to 73% (Bowles 2001) of forests had basal areas lower than the recommended for optimal vegetation community resiliency and stability (MNR 2000).

☐ **HIGH** Average basal area of trees for any community in the patch ≥ 16m ²/ha for trees >25 cm DBH; OR > 24 m²/ha for trees > 10 cm DBH; OR all diameter class sizes are represented in the stand (saplings < 10 cm; polewood 10-24 cm; small sawlog 26-36; medium sawlog 38-48 cm; large sawlogs 50-60 cm; x-large or veteran trees > 62 cm.
☐ **MEDIUM** Average basal area for any community in the patch 12 – 24 m²/ha of trees >10 cm DBH; OR missing one of polewood, small, medium, or large size classes.
☐ **LOW** Average basal area for all communities in the patch < 12 m²/ha for trees > 10 cm DBH; OR missing two or more of polewood, small, medium, or large size classes.

Score for criterion 4.1 based on the highest standard achieved for any one of the four standards

NOTE: 4.1c and 4.1d require site visits to conduct adequate field investigation. The list of rare and unusual species may also change, and will be based on the most up-to-date lists. It has been found in other natural heritage studies in Oxford County (OCTES 1997), City of London Subwatershed (1995) and Middlesex County (MNHS 2003) that unique species of plants and birds (i.e. where a species was recorded in only one vegetation patch) accounted for 14% to 20% of all patches. For the latter two studies, data also indicated that all physiographic types contained at least one species that was not found in any other physiographic type, suggesting the importance of all individual patches and physiographic types for maintaining species diversity.

4.2 Distinctive, Unusual or High Quality Landforms

a) Distinctive landform types. Based on RULE "A": *Natural heritage systems that include the full range of habitat-landform types are better than those that contain fewer habitat-landform types.*

As identified by the MNR (Earth Science ANSI) and City of London glacial geomorphology mapping (City of London GIS layer). Landform-vegetation representational significance was derived from calculating the proportion of all patches, including core areas, which are present and protected on each of the five major landform types.

☐ **HIGH** Patch located on an Earth Science ANSI OR on the Beach Ridge or Sand Plain physiographic landform units.
☐ **MEDIUM** Patch located on the Till Plain or Till Moraine physiographic landform unit.
☐ **LOW** Patch is located on the Spillway physiographic landform unit.

Score for criterion 4.2 (based on the highest standard achieved).

Beach Ridge landform is unusual and rare in the City with portions identified as Earth Science ANSI and Provincially Significant Wetland/ESA.
Sand Plain landform has very little protected areas present. It is considered high quality for the aggregate extraction industry.
Till Plain is the largest landform unit with the least amount of protected areas (No ESA's) and the highest amount of vegetation. Most of the land is considered high quality agricultural.
Till Moraine is the 3rd largest landform unit with fair amount of protected land. It accounts for the patches that fall on the heights of land (Westminster Ponds – Pond Mills ESA / Meadowlily Woods).
Spillway is the 2nd largest landform unit with the greatest proportion of protected areas and contains most of the ESA's. It is the most distinctive landform unit including the Thames River, Stoney Creek, Medway Valley and Dingman Creek.

Woodland Patch Assessment Score Sheet March 2006

Criterion	Factors for Evaluation	Score for each Factor HIGH-MEDIUM-LOW		
		Landscape Level	**Community Level**	**Species Level**
1.1 Site Protection	a) Presence of hydrological features			
	b) Erosion and slope protection			
Score for 1.1: Circle the highest standard achieved for any one of the two standards		**HIGH**	**MEDIUM**	**LOW**
1.2 Landscape Integrity	a) Landscape Richness			
	b) Landscape Connectivity			
	c) Patch Distribution			
Score for 1.2: Circle the highest standard achieved for any one of the three standards		**HIGH**	**MEDIUM**	**LOW**
2.1 Age and Site Quality	a) Community Successional Stage			
	b) Mean Coefficient of Conservatism of Communities			
	c) Disturbance related to Human Activity			
Score for 2.1 : Circle the highest standard achieved for any one of the three standards		**HIGH**	**MEDIUM**	**LOW**
2.2 Size and Shape	a) Patch Size			
	b) Patch Shape/Interior			
	c) Conservative Bird Species			
Score for 2.2: Circle the highest standard achieved for any one of the three categories		**HIGH**	**MEDIUM**	**LOW**
2.3 Diversity of Natural Communities and Associated Species	a) ELC Community Diversity			
	b) ELC Vegetation Type and Topographic Diversity (variation and heterogeneity)			
	c) Diversity (species and individuals) & Critical Habitat Components for Amphibians			
	d) Presence of Conifer Cover			
	e) Fish Habitat Quality			
Score for 2.3: Circle the highest standard achieved for any one of the five standards		**HIGH**	**MEDIUM**	**LOW**
3 Endangered and Threatened Species presence		**YES = HIGH**	**NO = no score**	

Criterion	Factors for Evaluation	Score for each Factor HIGH-MEDIUM-LOW		
		Landscape Level	**Community Level**	**Species Level**
4.1 Distinctive, Unusual or High Quality Natural Communities	a) ELC Community SRANK			
	b) Specialized or rare species presence/absence			
	c) Size and distribution of large trees			
	d) Basal Area			
Score for 4.1: Circle the highest standard achieved for any one of the four standards		**HIGH**	**MEDIUM**	**LOW**
4.2 Distinctive, Unusual, or High Quality Landforms	a) Distinctive Landforms			
Score for 4.2: Circle the highest standard achieved		**HIGH**	**MEDIUM**	**LOW**

Woodland Patch Evaluation Summary Score sheet March 2006

Assessment for Woodland Significance :

A woodland will be considered as a significant component of the Natural Heritage System and designated as open space based on the following categories:

If one or more criteria meet the standard for High;
If five criteria meet the standard for Medium. Proposed Threshold not yet approved

CRITERION	SCORE
CRITERION 1.1 Site Protection	
CRITERION 1.2 Landscape Integrity	
CRITERION 2.1 Age and Site Quality	
CRITERION 2.2 Size and Shape	
CRITERION 2.3 Diversity of Natural Communities and Associated Species	
CRITERION 3 Endangered and Threatened Species (TE Habitat)	
CRITERION 4.1 Distinctive, Unusual or High Quality Natural Communities	
CRITERION 4.2 Distinctive, Unusual or High Quality Landforms	
SUMMARY OF SIGNIFICANCE OF EIGHT ECOLOGICAL CRITERIA Number of High	
Number of Medium	
Number of Low	
Presence of habitat for Species at Risk	YES POSSIBLE NO

Patch Number: Subwatershed:

Woodland Patch is a Significant Component of the Natural Heritage System: ☐ YES ☐ NO

Refer to Official Plan Policy 15.4.5, Woodlands for the Council approved threshold of significance.

Prepared by:

Date:

Glossary of Terminology

Biodiversity totality of the richness of biological variation, ranging from within-species genetic variation, through subspecies and species, to communities and the patterns and dynamics of these on the landscape.

Carolinian Tree/Shrub Species includes Kentucky coffee tree, American chestnut, Tulip-tree, Pawpaw, Blue ash, Pumpkin ash, Honey locust, Sycamore, Cottonwood, Hackberry, Butternut, Red mulberry, Shagbark hickory, Sweet pignut hickory, Black walnut, Blue beech, Black willow, Swamp white oak, Chinquapin oak, Dwarf hackberry, Sassafras, Black maple, Eastern red cedar, Flowering dogwood, Wild crab, Wild plum, Canada plum and the following Hawthorn species: *Crataegus brainerdii, Crataegus calpodendron, Crataegus compacta, Crataegus dissona, Crataegus dodgei, Crataegus lumaria, Crataegus mollis, Crataegus schuetei*, (Reference: City of London Guide to Plant Selection for ESA's 1994).

Community is an assemblage of species or populations that live in a defined environment at a defined spatial-temporal scale, and interact with one another forming together a distinctive living system with its own composition, structure, environmental relations, development and function (Whittaker 1975). A community may be described and classified using the Ecological Land Classification for Southern Ontario (Lee et.al. 1998) or any other recognized system.

Complex pattern of two or more ecosites or vegetation types forming a mosaic that cannot be mapped at the level of resolution being employed.

Cover the absolute area of ground covered, or the relative proportion of coverage that a particular plant species, vegetation layer or plant form represents.

Cultural Barrier (permanent) includes roads (primary collector, arterial, highway as identified on Schedule 'C'), buildings and railroads, unless connected by a culvert or bridge that allows movement of wildlife.

Cultural Community a vegetation community originating from , or maintained by, anthropogenic influences and culturally based disturbances; after containing a large proportion of non-native species.

Cultural Corridor includes abandoned rail or roads, utility easements or right-of-ways, recreational greenway parks/open space, abandoned agricultural land.

ELC Community Series is the lowest level of classification using ELC that can be identified through maps, air-photo interpretation and other remote sensing techniques. Community series are distinguished on the type of vegetation cover (open, shrub, or treed) and/or the plant form that characterizes the community (ie. deciduous, coniferous, mixed).

ELC Ecosite is a part of an Ecosection that consists of a mappable area or land having a consistent set of environmental factors (hydrology, soils) and patterns of vegetation characteristics.

ELC Vegetation Type is the finest level of resolution in the ELC, identified through site and stand level research and inventory. Vegetation types are generated by grouping similar plant communities based on plant species composition and dominance, according to relative cover. The goal is to distill the natural diversity and variability of plant communities to a small number of relatively uniform vegetation units.

Ecosection A subdivision of an Ecodistrict based on distinctive assemblages of relief, geology, landforms, soils and vegetation. Canadian ecological land classification (ELC) system mapping unit, usually mapped at a scale of 1:250 000 to 1:50 000.

Forest a terrestrial vegetation community with at least 60% tree cover of coniferous or deciduous trees.

Indigenous Conifer Species includes white pine, hemlock, eastern white cedar, eastern red cedar, tamarack, black spruce, white spruce.

Landform is a topographic feature. The various slopes of the land surface resulting from a variety of actions such as deposition or sedimentation, erosion and movements of the earth crust.

Large as it refers to individual tree species; the age and size at which a species is considered to be old or overmature for the particular region and site, based on best available information.

Mature a seral stage in which a community is dominated primarily by species that are replacing themselves and are likely to remain an important component of the community if it is not disturbed again. Significant remnants of early seral stages may still be present.

Mean Coefficient of Conservatism (MCC) is calculated from the conservatism coefficients of all native species in a patch. MCC aids in measuring the overall quality of a site. The conservative coefficient describes the probability of finding a species in a particular habitat type or undisturbed habitat. Coefficients range from 0 (widespread) to 10 (found only in specialized habitats).

Mid-Aged a seral stage of a community that has undergone natural thinning and replacement as a result of species interaction; the community often contains examples of both early successional and late successional species.

Natural Corridor includes hedgerows, streams, drainage features, plantations, valley and stream corridors, riparian zones, thickets, woodlands. A corridor may be interrupted by some cultural features (such as bridges and culverts) which still allow movement of wildlife along the corridor.

Non-native Conifer Species include Jack pine, Norway spruce, European larch, Austrian pine, Scots pine.

Northern and Specialized Habitat Tree/Shrub Species Tamarack, Eastern hemlock, Eastern white cedar, Balsam poplar, Slender willow, Paper birch, Pin cherry, Dwarf hackberry, American mountain ash, Roundleaf Juneberry (*Amelanchier sanguinea),*Smooth serviceberry/juneberry (*A. laevis*).

Old Growth a self perpetuating community composed primarily of late sucessional species that usually show uneven age distribution, including large old trees without open-grown characteristics.

Phytosociological referring to a recognizable and repeatable community of interacting plant species that occurs across a landscape under the same conditions.

Pioneer a community that has invaded disturbed or newly created sites and represents the early stages of either primary or secondary succession.

Plantation a coniferous or deciduous treed community in which the majority of trees have been planted

Rare Herbaceous Species includes those with an element ranking of S1-S3 (For a complete listing of Ontario's rare plant species consult NHIC at www.mnr.gov.on.ca/MNR/nhic/nhic.html).

Rare Tree/Shrub Species includes Black spruce, Sweet pignut hickory (C), Blue ash (C), Pumpkin ash (C), Kentucky coffee tree (C), American chestnut (C), Black gum, Pawpaw (C), Red mulberry (C), Dwarf hackberry, American Mountain Ash, Juneberry (*Amelanchier sanguinea),* and the following Hawthorn species: *Crataegus apiomorpha, Crataegus brainerdii, Crataegus corusca, Crataegus dissona, Crataegus flabellata, Crataegus lumaria, Crataegus margaretta, Crataegus pedicellata, Crataegus perjucunda, Crataegus scabrida, Crataegus suborbiculata, Crataegus sylvestris.* Reference: City of London Guide to Plant Selection for ESA's, (1994) and City of London Tree Preservation Policies (1990).

Relative Abundance is the proportion of coverage a particular plant species, vegetation layer or plant form represents:

- **Rare** - a plant species that is represented, in the area of interest, by only one to a few individuals.
- **Occasional** - plants that are present as scattered individuals throughout a community or represented by one or more large clumps of many individuals. Most species will fall into this category.
- **Abundant** - a plant that is represented throughout the community by large numbers of individuals or clumps. Likely to be encountered anywhere in the community; usually forming >10% ground cover.
- **Dominant** - a plant with the greatest cover or biomass within a plant community and represented throughout the community by large numbers of individuals. Visually more abundant than other species in the same layer and forming >10% of the ground cover and >35% of the vegetation cover in any one layer.

Regionally Rare Species include species that are rare in SW Ontario based on SWFLORA database for the Subwatershed Life Science Inventories (Bowles et. al. 1994), and Status of the Vascular Plants of Southwestern Ontario (Oldham 1993). Species with 1-4 stations (records) in Middlesex County.

Savanna a treed community with 11 to 35% cover of coniferous or deciduous trees.

Seepage the slow movement of water near the soil surface, often occurring above an impermeable subsoil layer or at the boundary between bedrock and unconsolidated material that is exposed at ground surface. Usually occurs downslope of the recharge area.

Seral Age The stage in a vegetation chronosequence or succession at a given site.

SRANK ranking system that considers the provincial rank of an element (=species or community type) as a tool to prioritize protection efforts. SRANKS are assigned based on best available information on 3 factors; estimated number of occurrences, estimated areal extent and estimated range. S1 to S3 include extremely rare, very rare and rare to uncommon ranks.

Swamp a mineral-rich wetland community characterized by a cover of coniferous or deciduous trees.

Treed a community with tree cover of >10%.

Urban development includes areas of the landscape that have been converted to other permanent uses such as buildings and lots, roads, parking areas. It would exclude areas of open space such as treed boulevards, parks, cemeteries, quarries, storm water management facilities and other natural vegetated areas. Includes all draft approved OMNR 1993a. A Significant Woodlands Workshop Proceedings.

OMNR 1993b. Ontario Wetland Evaluation System Southern Manual - 3rd edition with 1994 updates and registered developments.

Watercourse is defined as having one or more of the following characteristics:

- a distinct channel in which water naturally flows at some time of the year (i.e. either permanent or intermittent flow)
- natural riparian vegetation
- Type I-IVaquatic habitat

Wetland as defined by the Ontario Wetland Evaluation System Southern Manual, 3rd edition (OMNR 1993b), with a minimum community size of 0.5 ha.

Woodland a treed community with 35 to 60% cover of coniferous or deciduous trees.

Young a seral stage of a plant community that has not yet undergone a series of natural thinnings and replacements. Plants are essentially growing as independent individuals rather than as members of a phytosociological community.

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5.0

GUIDELINES FOR DETERMINING SETBACKS AND ECOLOGICAL BUFFERS

Council Approved April 20, 2004

CITY OF LONDON GUIDELINE DOCUMENT FOR THE DETERMINATION OF ECOLOGICAL BUFFERS AND DEVELOPMENT SETBACKS

This document has been prepared to set out recommended criteria and parameters to facilitate the identification of Ecological Buffers (15.3.6.iv).

Impacts generally expected from urban development can often be avoided or mitigated if a very broad area of land is maintained in an undeveloped state or as green space. This area of land, called a ***setback*** is defined as the physical distance separation measured from a rear lot line or edge of developed area to an identifiable natural heritage feature. Examples of natural features include, but are not limited to, Environmentally Significant Areas, woodlands, wetlands, river, stream and ravine corridors, watercourses, aquifers and ground water recharge areas. The purpose of a setback is to separate two different land uses to minimize the impact of development on natural heritage features and functions, to protect individuals and property from natural hazards, and to control access and encroachment within adjacent natural areas. The ecological buffer is an important part of the setback (Figure 1).

Ecological buffers serve to protect the ecological function and integrity of the Natural Heritage System (15.3.6.i). The purpose of a buffer is to minimize impacts on natural heritage features and functions and to maximize the long term viability of native species and natural systems (Riley & Mohr, 1994). Other goals of buffers are:

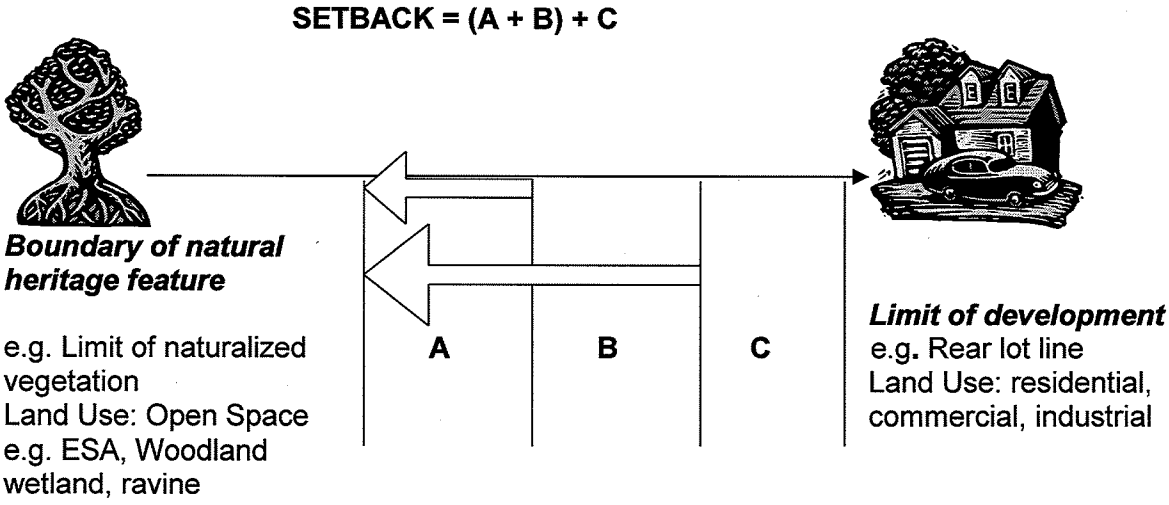
1) to achieve a reasonable balance between the needs of people living in a community and the needs of wildlife - based on ecological principles and the best scientific information available (Duerksen et al 1997); and

2) to acknowledge the natural limits on system functions and not try to exceed them; and to acknowledge that anthropogenic constraints on system functions are potentially preventable, modifiable or removable (Merriam, 1994).

Ecological Buffer zone is a planned and managed strip of land and vegetation between development sites and identifiable natural heritage features. Buffers are required and designed for the protection of natural heritage features and ecological functions. Key ecological functions may include, but are not limited to, acting as a filter to minimize impacts from adjacent land use, providing linkage as a wildlife corridor around or between habitats, functioning as a windbreak to protect sensitive habitat, and contributing to habitat and species diversity.

The location, width, composition and use of ecological buffers necessary to protect natural heritage areas from the impacts of development on adjacent lands is determined in general through subwatershed studies, area plans, comprehensive environmental impact statements and conservation master plans. The buffer can be a combination of topography, vegetation, sensitive wildlife, soil, drainage catchments area in a relatively narrow band of land. Establishment and maintenance of buffer zones may involve natural successional processes or require planting of native vegetation. Site-specific buffers and setbacks will be specified through an environmental impact study (15.3.6.ii) and will take into account the ecological buffer needs of the Natural Heritage System component, existing and future land uses, and other needs such as recreational corridors and rights-of-way, geotechnical setbacks for natural hazards, and edge effects. Table 1 lists some of the edge effects experienced at the boundary of natural areas (Figure1).

Figure 1 : Schematic representation of buffers and setbacks



A: Geotechnical Allowance
e.g. 6m from top of stable slope

B: Ecological Buffer Zone
Variable width
e.g. 15-30 m from a watercourse
Note: may include A

C: Additional setback
Variable width
e.g. 4m for a hiking trail

As there is no definitive word on what is an appropriate and realistic buffer for "urban situations" and differences in site specific requirements for setbacks and buffers, a standardized approach for determining appropriate buffers is not recommended. The direction taken in this document is to summarize the current thinking on buffers and how they are accommodated within the Environmental Impact Study process.

FIXED-WIDTH versus SITE SPECIFIC BUFFERS

	FIXED WIDTH	SITE-SPECIFIC VARIABLE WIDTH
Application	to protect specific functions e.g. riparian 30 m	to reflect site specific conditions e.g. variable topography and soils
Advantages	-easy to administer -does not require ecological expertise	- more flexible for varying site conditions and management practices - tailor made - may protect the environment more effectively without undue cost
Disadvantages	- results in arbitrary boundaries not reflective of site specific conditions	- requires expertise - can require significant effort and time to study - hard to connect the variable width boundaries in areas that grade together
Problems with both	- how to see the boundaries in the field - how to monitor and enforce	
Potential Solution	- recommend fixed width reasonable minimum buffers and determine site-specific variable width buffer prescriptions based on models	

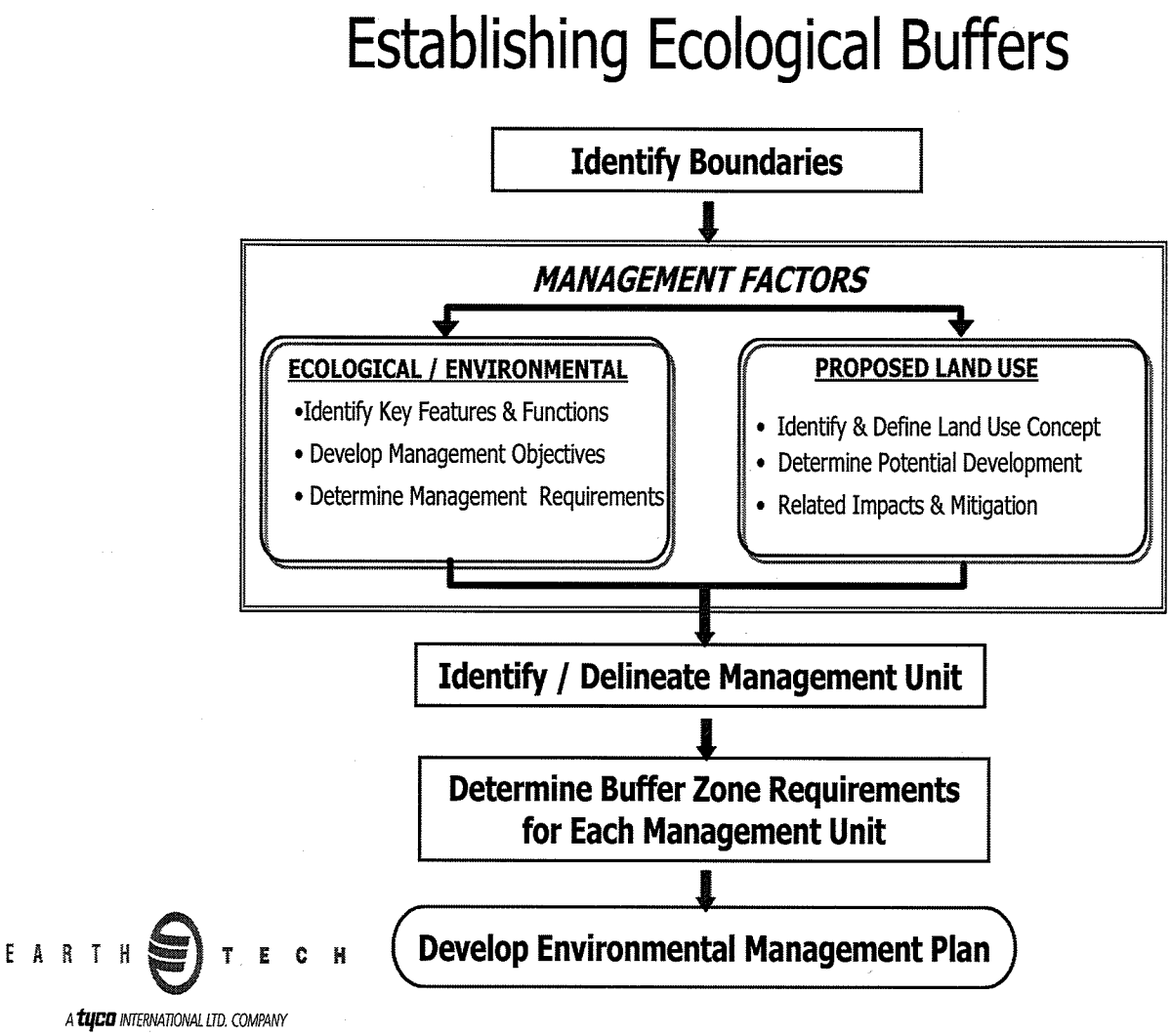
Process for Establishing Ecological Buffers

The process of establishing setbacks and buffers is outlined on Figure 2. In general it requires:

1) Classification of the natural area and its ecological boundaries;
2) Identification of the determining factors for key ecological and environmental features, functions and management requirements management;
3) Identification of the determining factors for the proposed land use concept as they relate to potential impacts and mitigation options;
4) Identification of ecological management units;
5) Determination of buffer zone and setback requirements for each management unit based on the determining factors identified;
6) Creating a buffer management plan and delineation of buffer zones.

Setback and buffer limits should be clearly marked on all plans used during construction and staked in the field. Silt or snow fence construction will normally be required at the boundary of the buffer to prevent entry of construction equipment or stockpiling. Contractors should be familiarized with the limits of disturbance during pre-construction consultation on site.

Figure 2 : Process for Establishing Ecological Buffers (based on flow chart prepared by Dr. Gary Epp, Earth Tech International)



Determination of buffer width

A buffer will be required whenever development occurs adjacent to a natural heritage feature. The width of the buffer will depend on the type and sensitivity of the feature. In general, the wider the buffer, the more protection it provides. An absolute minimum of 5 m buffer should be included to allow for variability along ecological edges. Best available information suggests the following minimum buffer widths are appropriate, and necessary to provide protection for natural features.

Feature	Minimum buffer width recommended
Woodlands	10 m beyond the drip line of trees (protects the rooting zone).
Wetlands	30 m for water quality benefits. Ratio of 3:1 of upland to wetland habitat area for protection of small wetlands.
Watercourses	
*Permanent	30 m from the high water mark; or 30 m + 0.5 m per 1% of slope.
*Intermittent	15 m from high water mark; or 15 m + 0.5 m per 1% slope
Valleylands/Ravines	10 m from top of bank in a topographically well-defined site

Buffer widths may be increased depending on the expected impacts from the development and the sensitivity of the features and functions being buffered. Table 2 outlines sensitivities of natural features and levels of impact expected.

An Ecological Buffer Assessment calculation has been derived from the review of tools and methodologies employed by practitioners in the U.S.A. and Canada. This model can be used to help gauge the range of buffer that needs to be considered. This Model is included as Appendix A.

Setbacks and buffer widths should be measured from the boundary of the natural feature. Guidelines for assessing and determining boundaries for woodland patches and other natural heritage features follow the same guidelines as the determination of buffers for ESA's. Boundaries for stream corridors Normally the edge of a natural feature will be determined and staked in the field during a site visit as part of the Initial Consultation stage of Phase I of the EIS process. Old field and other non-treed, cultural habitats that are not wetlands may be included in the buffer where they are present adjacent to a woodland patch and not included in the boundary of the patch. The effectiveness of the buffer will be enhanced if it contains a variety of habitat types.

At least the minimum buffer width should apply unless compelling evidence is provided that shows the natural heritage feature or function will be adequately protected by a narrower buffer. The geotechnical allowance (zone a) may be included in the buffer when appropriate except for slopes >25%, that must not be included in the buffer width. Any setback that is less than 30 m wide must be enhanced through a rehabilitation, enhancement and planting plan. Enhancement and rehabilitation is recommended for all ecological buffers.

The boundary of the buffer must be outside the development zone that is beyond rear lot lines and beyond areas of grading or fill. Septic tanks, stormwater management facilities, holding tanks and impervious surfaces are not permitted in the buffer. Permitted uses in a buffer should be similar to those in the adjacent natural heritage feature. Buffers are subject to extensive encroachment in urban areas. Part of the development agreement should include an information package about the purpose of buffers and permitted uses for adjacent property owners.

All planting that occurs within an ecological buffer must be of native species of local provenance.

Determination of additional setback

There is no minimum width for additional setbacks such as rights-of-way beyond the buffer and geotechnical allowance. Additional setbacks may be required for recreational trails, sewer lines, stormwater management facilities, access and so on. Grading, filling and the construction of trails may be permitted in the additional setback. Rehabilitation and enhancement of the additional setback should be done where possible. Plans for setback enhancement and management may be included as part of the buffer management or enhancement plan.

Determination of the setback should not take away all economically beneficial use of the property. Buffer averaging, density compensation, conservation easements and variances may be used to minimize negative economic impacts where necessary.

IMPLEMENTATION OF BUFFERS

From a planning perspective, zoning by-laws are the most effective and versatile regulatory tools that are used to implement the policies of an Official Plan.

Zoning, as a management tool for habitat protection, is used to differentiate between areas of development and areas of no development, or open space. In the zoning of land, a buffer is a transition zone between two land uses that separates and protects one from the other. The width of the buffer zone must be large enough to sustain the two land uses on either side without conflict or impact.

From an ecology perspective, drawing a hard line, or a zone boundary, on a map is contrary to the concept of ecosystem, because nature operates within fluxes and across gradients, not within lines (Riley & Mohr, 1994) and ecosystem boundaries are not fixed in time and space on the landscape.

In a fragmented landscape the boundaries of the remnant terrestrial patches are based only in part on ecological criteria, but are strongly influenced by ownership patterns and past land uses. Thus any boundary between natural vegetation and other land uses becomes our operational starting point. From there, defining an ecosystem boundary requires understanding of the constraints, both natural and anthropogenic or technological that the ecosystem is operating under. This is where buffers play an important role in the management of natural systems.

The natural area features and functions to be protected shall consist of a core area of existing naturalized vegetation important to the integrity of the area and sufficient supporting vegetation to accommodate shifts in the ecosystem over time. This may include reasonable amounts of shrub thickets, younger woodlands and plantations that add supporting habitat, diversity, connectivity, internal linkages, visual and spatial buffers, restoration opportunities and contribute to the ecological integrity of the whole patch.

The determination of buffers is done after the ecological boundaries have been delineated. All lands required for buffer are designated in the same open space zone as the patch. Other site management tools to reduce the size and intensity of the zone of disturbance to the natural area at the zone boundary are then included in the subdivision agreements or development agreements for site plans. These may include such things as: use restrictions, tree protection and retention plans, controls on fencing and access, development phasing, controls on construction activities, compatible uses such as passive recreational trails, vegetation restoration, stormwater management facilities and other softer development forms.

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TABLE 1: EDGE EFFECTS OF NATURAL AREAS

Definitions

Edge:
The portion of an ecosystem near its perimeter, where influences of the surroundings prevent the development of interior environmental conditions. Edge effect refers to the distinctive species composition or abundance in this outer portion.

Impaction:
The accumulation of materials on surfaces is higher at the forest edge (e.g. fog, mist aerosols, mineral nutrients, pesticides and toxins).

Edge width of a vegetation patch:
The edge width extends from the perimeter of a patch towards the centre to the point where there is no significant change on proceeding towards the centre. Microclimate used as a measure of edge width will give minimum value. Other variables used to determine edge width may include plants and/or animals (mammals, birds, insects) and measure cover, density, biomass, stratification, species richness, species composition etc.

Range of different edge widths measured:
(taken from Forman, R.T.T. 1995. Land mosaics: the ecology of landscapes and regions. Cambridge University Press and based on various sources)

Insects:	metres to tens of metres
Vegetation:	metres to tens of metres
Human effects in suburbans woods:	tens of metres
Microclimate:	tens of metres to hundreds of metres
Insectivorous birds:	tens of metres to hundreds of metres
Butterflies:	hundreds of metres
Small mammals:	hundreds of metres
Nest predators:	hundreds of metres
Large mammals:	thousands of metres

Edge microclimate:
Sun and wind are the overriding controls of the edge microclimate. They determine which plants survive and thrive as well as having a major impact on soil, insects and other animals. The ecological effects increase with the difference in vegetation height between adjacent ecosystems.

- South-facing edges are wider than north-facing edges.
- Windward edges are wider than leeward edges.
- The mantel plays an import role in determining forest edge width.
- New edges will be wider than older edges.

Table 1:

Definitions (continued)

Environmental factors affected by edge include light, evapotranspiration, temperature, temperature fluctuation, carbon dioxide levels and snow melt. Sand, silt, snow, seed and spiders accumulate at the forest edge because of the sudden drop in wind speed.

Wind speed:
Air velocity upwind of a forest is typically reduce for a distance of about 8h (8 times the height of the trees). Downwind the wind speed is reduce for 25h or more. Turbulence zones in these areas may be a source of erosion and dust.

Wind penetration into a forest increase for about 1h on the upwind side, but the elevated wind speed on the downwind forest edge is only about 0.5 h.

The effects of edge aspect:
Maximum light is experience in summer for N-facing edges and in spring and fall for S-facing edges.

Residential development and neotropical migrant birds:
The number of houses surrounding a forest seriously undermine its suitability for neotropical migrants. Neotropical migrants consistently decrease in diversity and abundance as the level of adjacent development increase, regardless of forest size.

"Current planning regulations generally permit housing right up to forest edges. This practice may prevent protection of ecological features within the forest."
Friesen, L., P.F.J. Eagles and R.J. Mackay. 1995. Conservation Biology 9(6):1408-1414.

Encroachment:
Encroachment always occurs when residential developments are built next to natural areas. Encroachment may include dumping garden refuse in the natural area, creating access, management and manicuring, building structures or other activities. Encroachment is usually more pronounced where the backyards are not fenced, especially when the rear lot line is within the natural area.

Table 2: Features of the natural heritage feature and proposed development to be considered when determining buffer and setback widths. Buffers should be greater where sensitivity is high, or where impacts are likely to be high.

Character of Natural Feature	Highest Sensitivity	Lowest Sensitivity
Aspect	South and West facing edges	North and East facing edges
Community maturity	Mature	Pioneer
Height of vegetation	Tall trees	Shrubs and non-woody plants
Edge type	New edge or no mantle	Well developed mantle
Slope	Steep slope, >10%	No slope, flat or undulating
Direction of slope	Development uphill	Development downhill
Substrate subject to erosion	Poor drainage, tills and clays	Open drainage, sands and gravel
Landscape cover	High forest cover in regional landscape (2 km radius) - metapopulations	Low forest cover in regional landscape (2 km radius) – metapopulations
Riparian vegetation	Little or no riparian buffer along length of watercourse	>75% of water course with vegetation buffer
Groundwater	Groundwater recharge or discharge area	Neither recharge or discharge area
Surface water	Headwater area	Downstream area
Species present	Priority birds, area sensitive species, interior species, highly conservative species, species at risk	Edge species, generalist species, adventive exotics
Existing land use in buffer	Trees or woody vegetation such as plantation or cultural thicket	Open area, active agricultural land
Scale of the development	Large, i.e. community plan	Single residence
Effects of infiltration	Hardened surfaces	Permeable surface retained, infiltration allowed
Land use practices	Conventional techniques	Best management practices employed
Buffer ownership and management	Private or individual ownership as in rear yard buffers	Public or conservation ownership and management
Fences and barriers	Unfenced or open	Fenced lot lines

APPENDIX A : Ecological Buffer Assessment Calculations:

EBA Calculations:	Size of development (ha):	Slope (%):	NHS Feature:	Adjacent land use:
Site-specific Data:	**(VALUE)**	**(VALUE)**	**(VALUE)**	**(VALUE)**
Weighted Value (from chart below):	**(VALUE)**	**(VALUE)**	**(VALUE)**	**(VALUE)**

Recommended Buffer Width: _____ m.
= [(size + slope)/2] + [(feature + adjacent land use)/1.5]
= round value to nearest whole number

Legend:

Size of parcel:
0-20 ha: 2-10m
21-50 ha: 5-15m
51-150 ha: 15-30m
150 ha +: 30m+

Slope (average):
0-10%: 2-5m
11-20%: 5-10m
21-25%: 10-20m
25%+: 20m+

NHS Feature (consider drip-line):
Zone A: 30m+
Zone B: 15-30m
Zone C: 2-15m

Adjacent land use (intensity):
Open space: 2-10m
Residential (low, medium, and high density): 5-25m
Commercial (light and heavy): 10-50m
Industrial (light and heavy): 30m+
Collector and/or Arterial Roads: 10-50m

- **Zone A:**
  - ESA (environmentally significant areas) and potential ESAs
  - PSW (provincially significant wetland)
  - ANSI (areas of natural and scientific interest)
  - VTE (vulnerable, threatened, and endangered species)
- **Zone B:**
  - Stream/ravine corridors (stream flood plain, valley wall, riparian vegetation, etc.)
  - Woodlands
  - LSW (locally significant wetland)
  - Fish habitat
  - Headwater recharge areas
  - Recharge and discharge areas
- **Zone C:**
  - Upland corridors
  - Naturalization areas
  - Open space

Other factors to consider:
(to be considered within the determination of the four main factors used in the calculation.)

Purpose:	**Minimum (m)**	**Maximum (m)**
Water quality	**10**	**50**
Bank stabilization	**10**	**30**
Scour erosion	**30**	**70**
Geomorphic stability	**30**	**70**
Natural communities	**10**	**50**
Wildlife habitat	**30**	**100**
Travel corridor	**10**	**30**

To change:	***To:***	***Multiply by:***
Acres	***Hectares***	***.4047***
Feet	***Metres***	***.3048***
Hectares	***Acres***	***2.4710***
Metres	***Feet***	***3.2808***

6.0

GUIDE TO PLANT SELECTION FOR NATURAL HERITAGE AREAS AND BUFFERS

Council Approved March 22, 1994

GUIDE TO PLANT SELECTION FOR NATURAL HERITAGE AREAS AND BUFFERS

Table of Contents

1.0 Purpose:

The purpose of this guide is to encourage more general use of native species and to discourage the use of non-recommended species. Only species native to a region and of derived from local populations should be used for planting as part of rehabilitation plans for projects in or near natural heritage areas. Species identified as Undesirable non-native species be prohibited from plantings. Only native woody species (shrubs, trees and vines) are covered by this document. Non-woody species should also be native species of local origin. Intermixing shrubs and trees be encouraged and monocultures avoided.

This document should be available to the public, and be distributed to nurseries, landscape architects, garden centres and development proponents.

2.0 Background:

2.1 NATIVE WOODY PLANTS

The following lists are intended as a guide for those involved in planting and rehabilitation projects in and adjacent to natural heritage areas and other natural areas. Only species **native to the region** should be used for rehabilitation projects.

Natural areas are irreplaceable as reservoirs of biological diversity, as objects of scientific interest and as fundamental components of natural heritage. They are the source of plant material for natural re-colonization of adjacent areas and for natural revegetation. Natural areas should be protected from disturbances such as introduction of non-native species and genetic contamination. Genetic make up of plants in adjacent areas should be controlled carefully, since close proximity might permit hybridization and generate non-adaptive gene complexes. If aliens or their derivatives are successful and invasive, they can out-compete native species.

In planting the native species, only plants derived from local populations should be used because particular physiological races may have evolved that are better adapted to existing local conditions such as climate, exposure, soil, moisture availability and so on. Nursery stock of uncertain origin should not be used.

The plant inventory for the natural heritage area should be consulted. A comprehensive inventory of adjacent natural areas should be the first step to determining which species are present. Species selected for planting should be reflective of the species composition at or near the site.

To broaden the genetic representation of each re-introduced species, seeds or other propagules should be derived from several individual plants. To increase diversity, several native species should be interplanted since a monoculture promotes the spread of disease, reduces the likelihood of successful rehabilitation and limits the richness of the biological community. Pioneer tree species that would normally be found in similar habitats should be used as well as a mixture of shrubs. It is understood that the art of revegetation of disturbed sites is still very poorly developed. There are few established methods for deliberately recreating most kinds of natural communities. Rehabilitation should not be regarded as a substitute for preservation and protection of natural areas.

Rare species pose special problems. While it may be desirable to increase the numbers of individuals of rare species, the reasons for rarity are sometime complex and usually not understood. Species near the edge of their natural rage often have a genetic make-up distinct from plants in the core of the range. It is important that introduced populations of such plants are not confused with natural occurrences. In general, rehabilitation of rare species should only be attempted under a species or habitat recovery plan.

To minimize confusion and to aid the development of the best methods of rehabilitation, the procedures followed and the results achieved in all rehabilitation projects should be fully documented. Anyone undertaking such a project is encouraged to deposit a report of their procedures and results with a responsible agency or public institution.

2.2 UNDESIRABLE ALIEN SPECIES

The problem of non native plant species invading natural areas in Canada, especially plants of Eurasian origin, dates back to the earliest days of European settlement. The problem has worsened over time as the area of natural vegetation shrinks. The greatest impacts occur where the landscape is most altered by human activity, especially in and around large cities. In southern Ontario about a third of all plant species are introduced. Many of the alien species that grow in southern Ontario do not pose a threat to natural areas. They may be short-lived garden escapes, urban weeds and contaminants of commercial seed mixtures. They may be restricted to urban areas, agricultural fields or other highly disturbed sites. Others grow in natural areas, but in such small numbers that they do not currently pose a threat to the native vegetation. The term "invasive" is used to describe plants that have moved into natural areas and have reproduced so aggressively that some of the original components of the vegetation community have been displaced. Disturbance in natural areas often provide the means by which these plants first become established.

2.3 LEGEND FOR PLANT TABLES

Plants are listed by family, and alphabetically by scientific name within each family. Scientific names follow Morton and Venn (1990), common names follow Oldham (1993). The list has been annotated as follows:

TYPE: Overall plant form.
T = tree; S = shrub; V = vine; G = ground cover.

DIST: Distribution of the species in Ontario.
C = species with a natural distribution in Ontario which is more or less confined to the limits of the Southern Deciduous Forest Region (Carolinian Zone); N = species whose natural distribution in Ontario is mainly to the north of southwestern Ontario; H = species whose natural distribution is restricted by very specific habitat requirements.

3.0 Planting Recommendations:

3.1 WOOD Y SPECIES RECOMMENDED FOR PLANTING

The following list includes tree, shrub, vine and woody ground cover species that are native to southwestern Ontario and that are recommended for planting in suitable habitats adjacent to natural areas. Species with a Carolinian distribution should only be planted within the Carolinian Life Zone, or where they occur naturally in an adjacent natural area.

SCIENTIFIC NAME	COMMON NAME	TYPE	DIST.	NOTES
TAXACEAE				
Taxus canadensis	American yew	S		
PINACEAE				
Larix laricina	Tamarack	T	N/H	
Pinus strobus	White pine	T		
Tsuga canadensis	Eastern hemlock	T	N/H	
CUPRESSACEAE				
Juniperus communis	Common juniper	S	H	
Juniperus virginiana	Eastern red cedar	T/S	C	
Thuja occidentalis	Eastern white cedar	T/S	N	
SALICACEAE				
Populus balsamifera	Balsam poplar	T	N	
Populus deltoides	Cottonwood	T	C	
Populus grandidentata	Large-tooth aspen	T		
Populus tremuloides	Trembling aspen	T		
Salix amygdaloides	Peach-leaved willow	T/S		
Salix bebbiana	Bebb's willow	S		
Salix discolor	Pussy willow	S		
Salix eriocephala	Heart-leaved willow	S		
Salix exigua	Sandbar willow	S		
Salix humilis	Upland willow	S		
Salix lucida	Shining willow	T/S		
Salix nigra	Black willow	T	C	NOT S. x rubens
Salix petiolaris	Slender willow	S	N	
Salix serissima	Autumn willow	S		
JUGLANDACEAE				
Carya cordiformis	Bitternut hickory	T		
Carya ovata	Shagbark hickory	T		C
Juglans cinerea	Butternut	T		
Juglans nigra	Black walnut	T		C

BETULACEAE			
Betula alleghaniensis	Yellow birch	T	
Betula papyrifera	Paper birch	T	N
Carpinus caroliniana	Blue-beech	T	C
Corylus americana	American hazel	S	C
Corylus cornuta	Beaked hazel	S	N
Ostrya virginiana	Hop-hornbeam	T	
Castanea dentata	American chestnut	T	C
Fagus grandifolia	American beech	T	
Quercus alba	White oak	T	
Quercus bicolor	Swamp white oak	T	C
Quercus macrocarpa	Bur oak	T	
Quercus muehlenbergii	Chinquapin oak	T	C
Quercus rubra	Red oak	T	
Quercus velutina	Black oak	T	
ULMACEAE			
Celtis occidentalis	Common hackberry	T	C
Ulmus americana	American elm	T	
Ulmus rubra	Slippery elm	T	
Ulmus thomasii	Rock elm	T	
MAGNOLIACEAE			
Liriodendron tulipifera	Tulip-tree	T	C
LAURACEAE			
Sassafras albidum	Sassafras	T	C
Lindera benzoin	Spicebush	S	C
GROSULARIACEAE			
Ribes americanum	Wild black currant	S	
Ribes cynosbati	Prickly gooseberry	S	
Ribes hirtellum	Swamp gooseberry	S	N
Ribes triste	Swamp red currant	S	N
HAMAMELIDACEAE			
Hamamelis virginiana	Witch hazel	S	C
PLATANACEAE			
Platanus occidentalis	Sycamore	T	C
ROSACEAE			
Amelanchier arborea	Juneberry	T/S	
Amelanchier laevis	Smooth juneberry	T/S	
Aronia melanocarpa	Chokeberry	S	
Crataegus calpodendron	Hawthorn	T/S	C
Crataegus chrysocarpa	Hawthorn	T/S	
Crataegus compacta	Compact hawthorn	T/S	C
Crataegus crus-galli	Cockspur hawthorn	T/S	
Crataegus dodgei	Hawthorn	T/S	C
Crataegus holmsiana	Holmes' hawthorn	T/S	
Crataegus macracantha	Hawthorn	T/S	
Crataegus macrosperma	Variable hawthorn	T/S	
Crataegus mollis	Downy hawthorn	T/S	C
Crataegus punctata	Dotted hawthorn	T/S	
Crataegus schuetei	Hawthorn	T/S	C
Crataegus tenax	Hawthorn	T/S	
Malus coronaria	Wild crab	T/S	C
Prunus americana	Wild plum	T/S	C
Prunus nigra	Canada plum	T/S	C
Prunus pensylvanica	Pin cherry	T/S	N
Prunus serotina	Black cherry	T	

Prunus virginiana	Choke cherry	S		
Rosa blanda	Smooth wild rose	S		
Rosa palustris	Swamp rose	S		
Rubus allegheniensis	Common blackberry	S		
Rubus idaeus ssp. melanolasius	Wild red raspberry	S		
Rubus occidentalis	Black raspberry	S		
Rubus pubescens	Dwarf raspberry		X	N
Spiraea alba	Meadowsweet	S		
RUTACEAE				
Zanthoxylem americanum	Prickly ash	S	C	
ANACARDIACEAE				
Rhus glabra	Smooth sumac	S	C	
Rhus radicans	Poison ivy	G/S/V		
Rhus typhina	Staghorn sumac	S		
AQUIFOLIACEAE				
Ilex verticillata	Winterberry	S	N	
Nemopanthus mucronata	Mountain holly	S	N	
CELASTRACEAE				
Celastrus scandens	Climbing bittersweet	V		
Euonymus obovatus	Running strawberry bush	G	C	
STAPHYLEACEAE				
Staphylea trifolia	Bladdernut	S	C	
ACERACEAE				
Acer negundo	Manitoba maple	T		
Acer rubrum	Red maple	T		
Acer saccharinum	ilver maple	T		
Acer saccharum ssp. nigrum	Black maple	T	C	
Acer saccharum ssp. saccharum	Sugar maple	T		
Acer spicatum	Mountain maple	S	N	
RHAMNACEAE				
Rhamnus alnifolia	Alder-leaved Buckthorn	S	H	
VITACEAE				
Parthenocissus inserta	Virginia creeper	V		
Parthenocissus quinquefolia	Virginia creeper	V	C	
Vitis aestivalis	Summer grape	V	C	
Vitis riparia	Riverbank grape	V		
TILIACEAE				
Tilia americana	Basswood	T		
THYMELAEACEAE				
Dirca palustris	Leatherwood	S		
CORNACEAE				
Cornus alternifolia	Alternate-leaved dogwood	S		
Cornus amomum	Silky dogwood	S		
Cornus florida	Flowering dogwood	T/S	C	
Cornus foemina	Grey dogwood	S		
Cornus rugosa	Round-leaved dogwood	S	N	
Cornus stolonifera	Red-osier dogwood	S		
ERICACEAE				
Gaultheria procumbens	Wintergreen	G	N	
Gaylussacia baccata	Black huckleberry	S	C	
Vaccinium angustifolium	Lowbush blueberry	S	N	
Vaccinium corymbosum	Highbush blueberry	S	C	
Vaccinium myrtilloides	Velvet-leaf blueberry	S	N	

OLEACEAE			
Fraxinus americana	White ash	T	
Fraxinus nigra	Black ash	T	
Fraxinus pennsylvanica	Red/Green ash	T	
Fraxinus profunda	Pumpkin Ash	T	H
RUBIACEAE			
Cephalanthus occidentalis	Buttonbush	S	
CAPRIFOLIACEAE			
Diervilla lonicera	Bush-honeysuckle	S	
Lonicera canadensis	Fly honeysuckle	S	N
Lonicera dioica	Wild honeysuckle	V	
Sambucus canadensis	Common elder	S	
Sambucus racemosa	Red-berried elder	S	N
Symphoricarpos albus	Snowberry	S	
Viburnum acerifolium	Maple-leaved viburnum	S	
Viburnum cassinoides	Wild-raisin	S	N
Viburnum lentago	Nannyberry	S	
Viburnum rafinesquianum	Downy arrow-wood	S	
Viburnum trilobum	Highbush-cranberry	S	

3.2 WOODY SPECIES NOT RECOMMENDED FOR PLANTING

The following species are native to southwestern Ontario, but are rare because they have very specific habitat requirements or may behave in unpredictable ways. These species should **NOT** be planted in restoration projects.

SCIENTIFIC NAME	COMMON NAME	TYPE	DIST.	NOTES
PINACEAE				
Picea mariana	Black spruce	T	N/H	
SALICACEAE				
Salix candida	Hoary willow	S	N/H	
Salix cordata	Heart-leaved willow	S	N/H	
Salix pyrifolia	Balsam willow	S	H	
MYRICACEAE				
Comptonia peregrina	Sweet fern	S	N/H	
ERICACEAE				
Andromeda polifolia	Bog-rosemary	S	N/H	
Chamaedaphne calyculata	Leatherleaf	S	N/H	
Gaultheria hispidula	Snowberry	G	N/H	
Kalmia polifolia	Bog-laurel	S	N/H	
Vaccinium macrocarpon	Large cranberry	G	N/H	
Vaccinium oxycoccus	Small cranberry	G	N/H	
Vaccinium pallidum	Dryland blueberry	S	C/H	

3.3 SPECIES RECOMMENDED ONLY FOR SPECIMEN PLANTING

The following species are native to southwestern Ontario, but are rare or of limited distribution. Several are restricted to the Carolinian Zone in Ontario. These species are not suitable for multiple plantings or use in most restoration projects. Their use should be restricted to specimen or demonstration plantings for educational and aesthetic purposes, or when sanctioned under a species recovery plan or when they occur naturally in adjacent areas. Planting of these species should only use local genetic material.

SCIENTIFIC NAME	COMMON NAME	TYPE	DIST.	NOTES
CUPRESSACEAE				
Juniperus horizontalis	Creeping juniper	G	N/H	
JUGLANDACEAE				
Carya glabra	Sweet pignut hickory	T	C	
FAGACEAE				
Quercus prinoides	Dwarf chinquapin oak	S	H	
ULMACEAE				
Celtis tenuifolia	Dwarf hackberry	T/S	H	
MORACEAE				
Morus rubra	Red mulberry	T/S	C	
MAGNOLIACEAE				
Magnolia acuminata	Cucumber magnolia	T	C	
ANNONACEAE				
Asimina triloba	Pawpaw	T/S	C	
ROSACEAE				
Amelanchier sanguinea	Juneberry	T/S	N	
Crataegus apiomorpha	Hawthorn	T/S		
Crataegus brainerdii	Hawthorn	T/S	C	
Crataegus corusca	Hawthorn	T/S		
Crataegus dissona	Hawthorn	T/S	C	
Crataegus flabellata	Hawthorn	T/S		
Crataegus lumaria	Hawthorn	T/S	C	
Crataegus margaretta	Hawthorn	T/S		
Crataegus pedicellata	Hawthorn	T/S		
Crataegus perjucunda	Hawthorn	T/S	C	Endemic to Middlesex
Crataegus scabrida	Hawthorn	T/S		
Crataegus suborbiculata	Hawthorn	T/S		
Crataegus sylvestris	Hawthorn	T/S		
Prunus pumila	Sand cherry	S/G	H	
Rosa acicularis	Prickly wild rose	S	N	
Rosa carolina	Carolina rose	S	C	
Rosa setigera	Prairie rose	S	C	
Rubus canadensis	Smooth blackberry	S		
Rubus odoratus	Purple-flowering raspberry	S	C	
Sorbus americana	American mountain ash	T/S	N	
LEGUMINOSAE				
Cercis canadensis	Redbud	T/S	C	
Gymnocladus dioicus	Kentucky coffee tree	T	C	
RUTACEAE				
Ptelea trifoliata	Hop tree	T/S	C	
ANACARDIACEAE				
Rhus aromatica	Fragrant sumac	S	C	
Rhus copallina	Shining sumac	S	C	
Rhus vernix	Poison sumac	S	C/H	

CELASTRACEAE			
Euonymus atropurpurea	Burning bush, Wahoo	S	C
HIPPOCASTANACEAE			
Aesculus glabra	Ohio buckeye	T	C
RHAMNACEAE			
Caenothus americanus	New Jersey tea	S	C
VITACEAE			
Vitis labrusca	Fox grape	V	C
ELAEAGNACEAE			
Shepherdia canadensis	Soapberry	S	
NYSSACEAE			
Nyssa sylvatica	Black-gum	T	C
PYROLACEAE			
Chimaphila umbellata	Pipsissewa	G	N
ERICACEAE			
Epigaea repens	Trailing arbutus	G	N
OLEACEAE			
Fraxinus quadrangulata	Blue ash	T	C
CAPRIFOLIACEAE			
Lonicera hirsuta	Hairy honeysuckle	V	N
Lonicera oblongifolia	Swamp fly-honeysuckle	S	N

4.0 **Undesirable Non-native Species**:

The problem of non native plant species invading natural areas in Canada, especially plants of Eurasian origin, dates back to the earliest days of European settlement. The problem has worsened over time as the area of natural vegetation shrinks. The greatest impacts occur where the landscape is most altered by human activity, especially in and around large cities. In southern Ontario about a third of all plant species are introduced. Many of the alien species which grow in southern Ontario do not pose a threat to natural areas. They may be short-lived garden escapes, urban weeds and contaminants of commercial seed mixtures. They may be restricted to urban areas, agricultural fields or other highly disturbed sites. Others grow in natural areas, but in such small numbers that they do not pose a threat currently to the native vegetation. The term "invasive" is used to describe plants that have moved into natural areas and have reproduced so aggressively that some of the original components of the vegetation community have been displaced. Disturbance in natural areas often provide the means by which these plants first become established.

The following lists are not intended to be exhaustive of all weedy plants occurring in southwestern Ontario, but include those species which are either invasive of natural areas, or could become invasive. Many are frequently planted for ornamental or herbal properties, used as ground covers, sold by nurseries or added to wildflower mixtures.

Because of their invasive tendencies, and the likelihood that they will spread into natural areas, the following plants should NOT be planted anywhere in southwestern Ontario.

4.1 TREES, SHRUBS AND VINES:

SCIENTIFIC NAME	COMMON NAME	TYPE	NOTES
PINACEAE			
Pinus sylvestris	Scots pine	T	
SALICACEAE			
Populus alba	White poplar	T	
Salix alba	White willow	T	
Salix x rubens			
S. fragilis X S. alba		T	
BETULACEAE			
Betula pendula	European birch	T	
Alnus glutinosa	Black alder	S	
ULMACEAE			
Ulmus pumila	Siberian elm	T	
MORACEAE			
Morus alba	White mulberry	T	
BERBERIDACEAE			
Berberis thunbergii	Japanese barberry	S	
Berberis vulgaris	Common barberry	S	
ROSACEAE			
Crataegus monogyna	English hawthorn	T/S	
Rosa multiflora	Multiflora rose	S	
LEGUMINOSAE			
Gleditsia triacanthos	Honey locust	T	
Robinia pseudo-acacia	Black locust	T	
SIMARAOUBACEAE			
Ailanthus altissima	Tree of heaven	T	
ACERACEAE			
Acer platanoides	Norway maple	T	
RHAMNACEAE			
Rhamnus cathartica	Common buckthorn	T/S	
Rhamnus frangula	Glossy buckthorn	S	
OLEACEAE			
Ligustrum vulgare	Privet	S	
Syringa vulgaris	Lilac	S	
ASCLEPIADACEAE			
Cynanchum rossicum	Dog-strangling vine	V	
CONVOLVULACEAE			
Ipomoea purpurea	Common morning glory	V	
CAPRIFOLIACEAE			
Lonicera tatarica	Tartarian honeysuckle	S	
Lonicera japonica	Japanese honeysuckle	S	
Lonicera maackii	Amur honeysuckle	S	

1.2 HERBACEOUS SPECIES

Because of the weedy and invasive nature of so many herbaceous plants, the following list has been confined to species that are often planted as ornamentals and ground cover, and those which are perceived as the worst invaders or potential invaders of natural terrestrial and wetland habitats in southwestern Ontario.

SCIENTIFIC NAME	COMMON NAME	NOTES
GRAMINAE		
Phalaris arundinacea	Reed canary grass	introduced varieties
Phragmites australis	Common reed	introduced varieties
BUTOMACEAE		
Butomus umbellatus	Flowering rush	
IRIDACEAE		
Iris pseudacorus	Yellow flag	
POLYGONACEAE		
Polygonum cuspidatum	Japanese knotweed	
CARYOPHYLLACEAE		
Saponaria officinalis	Bouncingbet	
CRUCIFERAE		
Alliaria petiolata	Garlic mustard	
Hesperis matronalis	Dame's-rocket	
CRASSULACEAE		
Sedum acre	Mossy stonecrop	
LEGUMINOSAE		
Coronilla varia	Crown vetch	
Melilotus alba	White sweet-clover	
Melilotus officinalis	Yellow sweet-clover	
EUPHORBIACEAE		
Euphorbia cyparissias	Cypress spurge	
MALVACEAE		
Malva moschata	Musk mallow	
GUTTIFERAE		
Hypericum perforatum	St. John's-wort	
LYTHRACEAE		
Lythrum salicaria	Purple loosestrife	
UMBELLIFERAE		
Aegopodium podagraria	Goutweed	
Heracleum mantegazzianum	Giant hogweed	
APOCYNACEAE		
Vinca minor	Periwinkle	
PRIMULACEAE		
Lysimachia nummularia	Moneywort	
BORAGINACEAE		
Echium vulgare	Blueweed	
LABIATAE		
Nepeta cataria	Catnip	
SOLANACEAE		
Datura stramonium	Jimsonweed	
SCROPHULARIACEAE		
Linaria vulgaris	Yellow toadflax	
Verbascum blattaria	Moth mullein	
Verbascum thapsus	Common mullein	
CAMPANULACEAE		
Campanula rapunculoides	Creeping bellflower	
COMPOSITAE		
Echinops sphaerocephalus	Globe thistle	

5.0 References:

Canadian Botanical Association n.d. Re-introduction to increase vegetational cover and native species. CBA Conservation Position Paper No. 3. 2 pp.

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Mulligan, G.A. 1992. Common and Botanical Names of Weeds in Canada. Publication No. 1397/B. Research Branch, Agriculture Canada. Ottawa, Canada.

Oldham, M.J., D. McLeod, W.G. Stewart and J.M. Bowles. 1991. Preliminary annotated checklist of the vascular plants of Elgin, Middlesex and Oxford Counties, Ontario. Ecology Program, Ontario Ministry of Natural Resources, Aylmer District, Aylmer, Ontario. 174 pp.

Oldham, M.J. 1993. Distribution and status of the vascular plants of southwestern Ontario (Draft). Ontario Ministry of Natural Resources, Aylmer District, Aylmer, Ontario. 150 pp.

Webster' Dictionary. 1991.

6.0 Glossary:

adaptive: showing or having a capacity for or tendency toward adaptation

alien: belonging to place; not native to the area.

disseminule: a mobile part or organ (as a seed or spore) of a plant that ensures propagation.

ecology: a branch of science concerned with the interrelationship of organisms and their environments

exotic: a plant that originated elsewhere.

hybridize: to interbreed and produce hybrids.

invasive: tending to spread; especially tending to invade healthy natural communities

non-native: used to refer to a plant that did not originate naturally in an area. Usually refers to plants that have been introduced to southwestern Ontario since European settlement. See alien

propagule: a structure (as a cutting, a seed, or a spore) that propagates a plant.

rehabilitate: to restore to a former capacity or bring (back) to a condition of health and function. Used to refer to vegetation communities that have been substantially altered or degraded.

restoration: a bringing back to a former condition, reconstruction of the original form. Used to refer to vegetation communities that have been removed.