APPENDIX B

GIS METHODOLOGY

GIS METHODOLOGY

The following appendix summarizes the general GIS methods used to characterize the Credit watershed for Phases 1 and 2 of TEEM (Terrestrial Ecosystem Enhancement Model). The methodology summarizes data sources/preparation, landscape characterization terminology, and spatial (GIS) methods used to characterize the landscape based on ecosystem functions.

DATA PREPARATION

Initially, a review of existing spatial data was conducted to assess the best ecological and non-ecological data available for the landscape characterization. The most detailed base layer for ecological data was the ELC (Ecological Land Classification) community series (OMNRSTU 1996, Lee et al. 1998, OMNR 1999) and land use layer. ELC layer was last updated in 2008. The layer is in the scale of 1:10,000. The base layer was used to develop two classifications; habitat patch, and ELC Community series, to describe the configuration and composition of natural patches in the landscape. Table 1 outlines the three hierarchical classifications.

TABLE 1: NATURAL FEATURE CLASSIFICATIONS

Habitat patch[2]	**Community type**	**ELC (Ecological Land Classification) Community series**[1]
Habitat patch	**Forest**	Coniferous forest (FOC) Deciduous forest (FOD) Mixed forest (FOM)
	Wetland	Coniferous swamp (SWC) Deciduous swamp (SWD) Mixed swamp (SWM) Marsh or Bog/Fen/[1] (MA or BO/FE) Thicket swamp (SWT)
	Successional	Cultural savannah (CUS) Cultural thicket (CUT) Cultural meadow (CUM)
	Cultural Forest	Coniferous plantation (CUP3) Deciduous plantation (CUP1) Mixed plantation (CUP2) Cultural woodland (CUW)
	Woodland[3]	Coniferous forest (FOC) Deciduous forest (FOD) Mixed forest (FOM) Coniferous swamp (SWC) Deciduous swamp (SWD) Mixed swamp (SWM) Coniferous plantation (CUP3) Deciduous plantation (CUP1) Mixed plantation (CUP2) Cultural woodland (CUW)

[1]Marshes and bogs/fens are ELC community classes. However, air photo interpretation does not permit distinction of these categories, nor classification of these wetlands to the community series layer. Therefore, non-forested wetland communities were classified as marshes in this analysis. For the sake of brevity and to minimize confusion, all the above ELC units are referred to as ELC community series in the text.

[2] The ELC categories of Beach/Bar (BB) and Bluff (BL) were also included in the delineation of a habitat patch, but because they were small in size (generally <=2ha), they were not analyzed in the landscape characterization except as they contributed to the area of a habitat patch.

[3] A fifth community type, namely **Woodland**, was created for part of the analysis involving the importance of wooded areas for species habitat. This patch was composed of a combination of other patch components with significant tree cover: coniferous/deciduous/mixed forest, coniferous/deciduous/mixed swamp, coniferous/deciduous/mixed plantation, and cultural woodland.

In addition to ecological landscape data (e.g. Habitat Patches) study boundary limits were defined. Generally, a landscape is defined as "an area of land containing a mosaic of patches or landscape elements" (McGarigal, 2001). Defining the study area is based on two key requirements: extent and grain (scale), which are strongly influenced by available coverage of data and mapping/digitizing guidelines for minimum mapable unit (MMU) size. In the case of the TEEM analysis, the study area boundary was limited by data availability and not guided by ecological principles or boundaries. The boundaries of the watershed define the limits of the hydrological boundary, but do not necessarily provide an ecological boundary. For the TEEM analysis, natural patches which overlapped the watershed boundary were clipped to the watershed for the overall landscape characterization. As a result, only those areas within the CVC jurisdiction were assessed in the landscape scale analysis.

Secondly, the grain (scale) used for features was defined based on the MMU for natural and non-natural features. The minimum unit size selected was 0.5 ha based on mapping methodology guidelines developed by NHP (Natural Heritage Project) (CVC, 1998), however, some exceptions were made in order to include some urban wetlands that are <=0.5 ha in size due to their overall scarcity in urban areas. Overall, original ELC and land use mapping contained features with the minimum threshold size. If some ELC series had a total area under the minimum threshold size (0.5 ha) but were linked to other natural areas (See Table 3) that would together constitute an area of 0.5 ha, they were included in the analysis. If the total size of interconnected MMU was less than the minimum threshold, they were not included in the analysis.

DATA SOURCES

The data used on these analyses come from a variety of sources. However, major data layers were created in-house by digitizing and updating data received from external sources (i.e. MNR). For the majority of the database, geo-rectified orthophotos from 2007 were used to verify and update the spatial accuracy; however some of the data sources might be at higher scale (lower resolution). GIS, as a tool, is not error-free. There can be variety of errors introduced from the conceptual phase of the databases, to digitizing and spatial output. Table 2 below shows the year of known data sources and their associated scales.

TABLE 2: BASE AND ANCILLARY DATA SOURCES

Base Data Source	Year	Scale
ELC Community Series and Land Use	2008	1:10,000
Ancillary Data Source	**Year**	**Scale**
Streams and Rivers	2008	1:10,000
Lake Ontario Shoreline	2008	1:50,000
Roads	2008	1:10,000
Crest of Slope	2005	1:10,000
Lake Ontario hazard	unknown	Unknown
Niagara Escarpment land use	unknown	Unknown
Oak Ridge Moraine land use	unknown	Unknown
Greenbelt Natural Heritage System	unknown	Unknown
Credit River Watershed	2008	1:10,000
Credit River Subwatershed	2008	1:10,000
Physiographic zone	unknown	Unknown
Orthophotos	2007	1:10,000

HARDWARE AND SOFT WARE REQUIREMENT

The accuracy and standardization of data collection and management play crucial roles in analyses and decision-making. In order to ensure a high standard in the process, it is important to be consistent with the software, hardware and the professionals involved in the projects wherever possible. A desktop computer with Intel(R) Core(TM) 2 Duo with 2.66 GHz of processor and 2 GB RAM was used as primary hardware for the analyses. The software products from Environmental Systems Research Institute (ESRI) 2006 and 2008 were used as primary software for the analyses. ArcGIS 9.2 and 9.3 were used as major platforms for the GIS analyses whereas ArcView 3.3 was used in order to carry out some other limited analyses (i.e. matrix analysis extension: developed in-house only for ArcView 3.3). For some of the analyses, Spatial Analyst extension for either ArcGIS 9x or 3x is required. Windows Picture and Fax Viewer, Microsoft Picture Managers, and Adobe Acrobat Readers are some other software used to view the exported maps. Professional skills in raster-, spatial-, and vector-analysis are required to complete the project.

LANDSCAPE CHARACTERIZATION TERMINOLOGY

The following section summarizes key terminology definitions developed for TEEM (landscape characterization). The definitions reflect the three scales of analysis: habitat patch, community types and ELC community series. The following descriptions demonstrate the hierarchical structure of the three classifications.

HABITAT PATCH

A habitat patch is a contiguous natural area delineated by tree lines, fencerows, roads and rivers to establish polygon boundaries (CVC, 1998) and corresponds to the coarsest scale of the hierarchical classification. A habitat patch is defined as a contiguous area, boundaries delineated by a >=2mm gap on a 1:10,000 air photo or a different landuse type that is not a part of the habitat patch (Table 1) (CVC 1998). The gap of >=2mm is normally a road, which is verified at higher resolution up to 1:2000. If the road is found to be non-existent at 1:10000 scale, then the gap is eliminated. However, it does not apply in case of other landuse type (i.e. agriculture). A habitat patch can include natural and semi-natural communities. Habitat patches were uniquely identified based on their Habitat ID. The minimum threshold size for a habitat patch is 0.5 ha (0.45 ha to 0.499 ha are rounded to 0.5 ha).

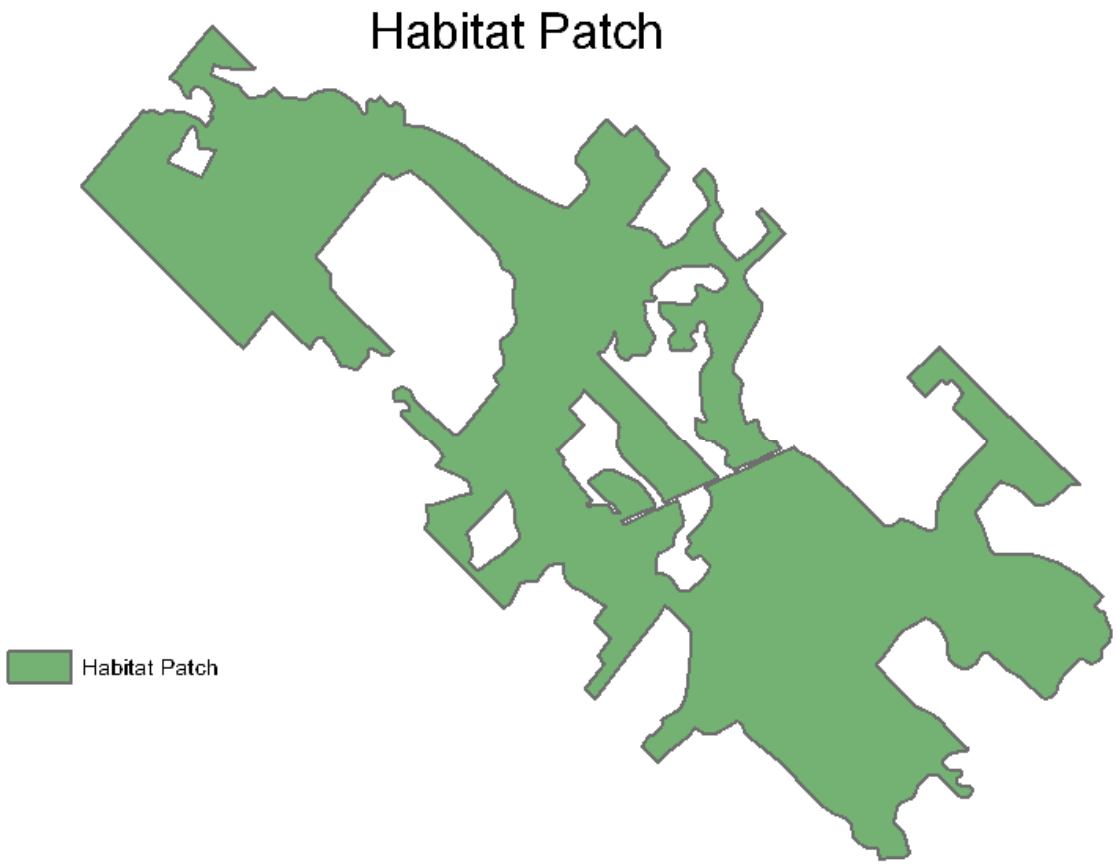

FIGURE I: HABITAT PATCH DIAGRAM

A single habitat patch is potentially comprised of natural (e.g. deciduous forest or marsh) and/or human disturbed communities, such as cultural meadow or plantation, but does not include agricultural or urban features or aquatic features. Table 1 summarizes ELC community series types which can comprise a habitat patch. An example illustrating the structure of a habitat patch is provided in Figure I.

COMMUNITY TYPES

A community is defined as a contiguous, relatively homogeneous area, boundaries delineated by a patch of a different landuse type or by a >=2mm gap on a 1:10,000 air photo (CVC 1998). A community consists of one of the following types: Forest, Wetland, Cultural Forest, or Successional. A fifth community type, Woodland, consists of a combination of Forest, Cultural Forest, and treed Wetland. Figure II illustrates the community types comprising the habitat patch shown in Figure I. Each community type is uniquely identified; however the woodland community type consists of all forest community types, treed wetland community types, and cultural woodlands (See Table 1).

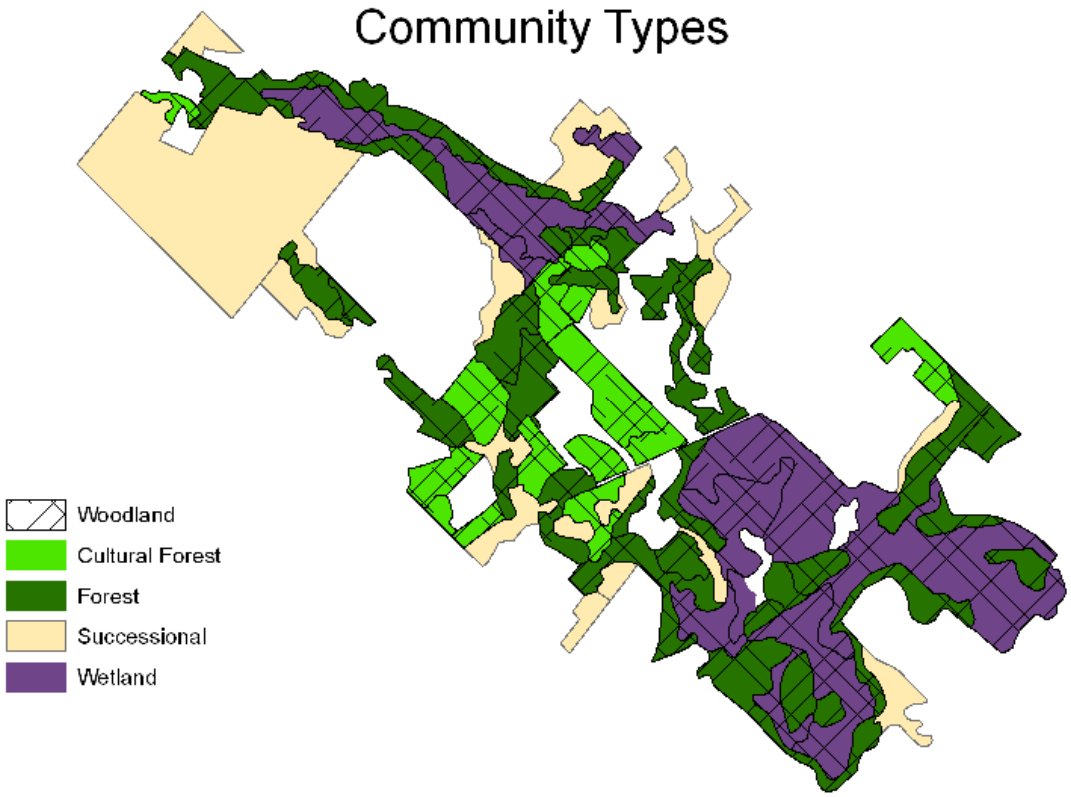

FIGURE II: COMMUNITY TYPE DIAGRAM

The following definitions summarize the community type classes: woodland, forest, cultural forest, successional and wetland.

WOODLAND

A woodland is defined as a single isolated or generally continuous grouping of natural or semi-natural tree and/or shrub dominated community(ies) which is greater than 0.5ha (0.45 ha to 0.499 ha are rounded to 0.5 ha) in size and with greater than 35% tree cover. The Provincial Policy Statement (PPS 2005) defines woodlands as follows:

"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".

The composition of the woodland community type is outlined in Table 1.

FOREST

A Forest is defined as a terrestrial vegetation community with at least 60% tree cover (Lee et al. 1998). In this analysis, the following ELC communities were defined as Forest: coniferous forest, deciduous forest, and mixed forest.

CULTURAL FOREST

A cultural forest is defined as a cultural community with >35% tree cover; this includes coniferous plantation, deciduous plantation, mixed plantation; and cultural woodland. The definition of plantation excludes areas that are managed for the production of fruits, nuts, Christmas trees or nursery stock (CVC 1998).

SUCCESSIONAL

A successional community type is a human-disturbed land dominated by native and non-native graminoid or shrub vegetation (CVC 1998). The following ELC communities were defined as successional: cultural meadow, cultural savannah, and cultural thicket. For the purposes of community type definitions, the ELC community series types included are shown in Table 1.

WETLAND

A wetland is defined as an area of land that is saturated with water long enough to promote hydric soils or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity that are adapted to wet environments (Lee et al. 1998). The following ELC communities were defined as Wetlands: coniferous swamp, deciduous swamp, mixed swamp; marsh; and thicket swamp.

ELC COMMUNITY SERIES

The ELC layer (spatial) is based on the Ontario Ministry of Natural Resources (OMNR) Ecological Land Classification System (ELC), which was developed to provide a comprehensive and consistent province-wide framework upon which ecosystems can be described, inventoried and managed (OMNR, 1996). The ELC layer contains the finest watershed-wide ecological data (spatial) available and is equivalent to community series type in the ELC manual (CVC, 1998). Figure III illustrates the ELC community series types or ELC units located within the boundaries of a habitat patch (see Figure I for comparison) Each ELC unit is uniquely identified based on their ELC ID and are linked to their associated Community types and Habitat IDs based on their spatial location.

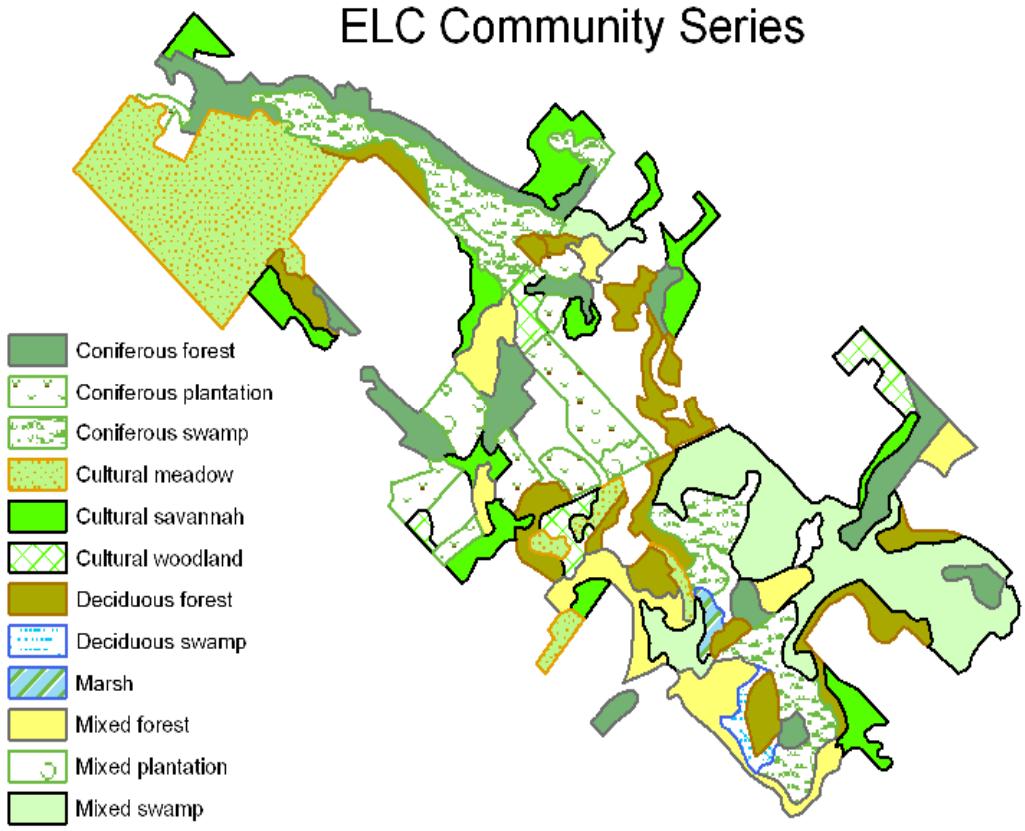

FIGURE III: ELC COMMUNITY SERIES DIAGRAM

LANDSCAPE CHARACTERIZATION

The following section describes the criteria and thresholds used to assess the relative importance of habitat patches with respect to ecosystem functioning within the Credit River Watershed. Habitat patches are given a score of one or zero on the following nine components: woodlands, wetlands, successional habitat, valleylands and riparian areas, habitat diversity, uncommon vegetation communities, ecological proximity, regional linkage and provincial linkage. Table 3 lists the criteria and thresholds used to score habitat patches (please see main report for details).

TABLE 3: CRITERIA AND THRESHOLDS USED TO IDENTIFY HABITAT PATCHES THAT ARE HIGH FUNCTIONING WITH RESPECT TO ECOSYSTEM FUNCTION COMPONENTS IN THE CREDIT RIVER WATERSHED.

#	Criterion	Threshold values for defining high functioning habitat patches, Credit watershed
A.	Woodlands	All habitat patches containing woodlands >=2ha in Lower Watershed and woodlands >=4ha in Middle and Upper Watersheds
B.	Wetlands	All habitat patches containing wetlands >0.5ha
C.	Meadow/successional habitat	All habitat patches containing >=10ha cultural meadows or cultural thickets or cultural savannah (or any combination of the three that adds up to 10ha or greater)
D.	Valleylands	i. All habitat patches containing or directly adjacent to watercourses and

#	Criterion	Threshold values for defining high functioning habitat patches, Credit watershed
	and riparian areas	their crest of slope *or* ii. All habitat patches within or intersecting the greater of: Lake Ontario Flood Hazard, Lake Ontario Erosion Hazard, Lake Ontario Dynamic Beach Hazard, or 30m from the Lake Ontario shoreline
E.	Habitat diversity	All habitat patches with ELC community series diversity >=4 (top quartile)
F.	Uncommon vegetation communities	All habitat patches containing locally rare ELC community series (community series <=5% area of all natural)
G.	Ecological proximity	All habitat patches with matrix quality within top quartile of habitat patches
H.	Regional linkage	i. All habitat patches within or intersecting 500m on each side of the Credit River up to 5km from the Lake Ontario shoreline and 300m on each side of the Credit River beyond 5km from the shoreline *or* ii. All habitat patches within or intersecting the greater of 100m on each side of main tributaries of the Credit River
I.	Provincial linkage	i. All habitat patches <=2km of the L. Ontario shoreline *or* ii. All habitat patches overlapping or intersecting areas classified as Escarpment Natural Area and Escarpment Protection Area within the Niagara Escarpment Plan Area *or* iii. All habitat patches overlapping or intersecting areas classified as Natural Core or Natural Linkage of the Oak Ridges Moraine Plan area *or* iv. All habitat patches overlapping or intersecting the Greenbelt Natural Heritage System

Table 3 shows the distribution of the criteria for the landscape scale analysis and the scoring methods used for TEEM. The details of the criteria and the GIS methodology used for the scoring system are discussed below:

A. WOODLANDS

In landscape ecology literature, area has been described as "perhaps the single most important and useful piece of information contained in the landscape and this information is the basis for many of the patch, class, and landscape indices, but patch area has a great deal of ecological utility in its own right" (McGarigal, 1995). A variety of measures provide information concerning landscape composition. For the landscape characterization, area was determined for habitat and community types within study area boundaries.

Specifically, woodland component calculates the total area of woodlands (see Table 1 for definition) using area calculation function in ArcGIS 9.3. In order to create a woodland, all qualifying ELC (Table 1) categories were aggregated, and then separated based on the outermost boundary that separates the woodland from other woodland because of either existing roads or other (non-qualifying) types of ELC. If there is any woodland in a habitat patch that meets the criteria (Table 3), the habitat patch receives a score of 1.

B. WETLANDS

Similar to the woodland criterion, this component also aggregates all qualifying ELC categories for wetlands. Those qualified ELC categories are then separated based on the outermost boundary that separates the wetland from other wetlands because of either exiting roads or other (non-qualifying) types of the ELC. If there is any wetland in a habitat patch that meets the criteria (Table 3), the habitat patch receives a score of 1.

C. MEADOW HABITAT

This component includes cultural meadow (CUM), cultural savannah (CUS) and cultural thicket (CUT). Those qualified ELC categories are then separated based on the outermost boundary that separates the wetland from other wetlands because of either exiting roads or other (non-qualifying) types of the ELC. If a total area of those ELC categories is >=10 ha in a habitat patch, the habitat patch receives a score of 1.

D. VALLEYLANDS AND RIPARIAN AREAS

D.i. RIPARIAN AREAS (WATERCOURSES AND THEIR CREST OF SLOPE)

Riparian areas contribute to the valley lands and riparian areas component. The base data used for the riparian areas were the hydrologic network and the crest of slope. First of all, all permanent and intermittent streams were selected from the hydrologic network layer. Using "River class and NHP codes" from hydrologic network layer, the following were included as permanent and intermittent streams:

-engineered watercourse
-intermittent watercourses
-watercourse not visible (if connected to visible watercourses)
-watercourse
-agricultural drain (stream order 2 or above)
-roadside ditch (included if it is a part of a stream, excluded if it is a stand alone)
-online ponds (all ponds from hydrologic layer were used since they were digitized if found online with a stream)
-swales (headwater swales were excluded. swales in-between watercourses (online swales), if any, were included).

Once those river classes were selected, a separate layer was created. In addition to the permanent or intermittent streams layer, crest of slope layer for those streams was also used to score habitat patches. Any habitat patch that intersects or contains those watercourses and their crest of slope receives the score of 1.

D.ii.LAKE ONTARIO HAZARD ZONE OR SHORELINE

All habitat patches that contained or intersected with the Lake Ontario Hazard zone or <= 30m from the Lake Ontario shoreline (whichever is greater) were selected for this criterion. First, a buffer zone of 30m from the Lake Ontario shoreline was created using ArcGIS 9.3, and habitat patches that intersected either the hazard zone layer or the buffered zone layer (or/and both) were selected and given a score of 1.

E. HABITAT DIVERSITY

The measurement of ELC community series diversity is calculated per habitat patch, not for the landscape as a whole (the case with traditional landscape metrics). Simply, community diversity measures the number of unique ELC community series within each habitat patch.

Values for community diversity were derived based on the following GIS approach: First, habitat patches and ELC category layers were converted from vector to raster to permit easier use of simple mathematical and zonal operations between two layers. Both

layers were converted into 10 m grids (to remain consistent with cell resolution of DEM). Basically, zonal statistics were performed because it "summarizes the values of a raster within the zones of another dataset and reports the results to a table" (ESRI, 2006). In the case of community diversity, the zones are represented by Habitat ID from the habitat patch and values summarized are the number of unique (variety) ELC community series types located within each habitat patch. The output table was joined to the original habitat patch layer based on Habitat ID to determine community diversity. If a habitat patch has a community diversity of >=4, it receives a score of 1.

F. UNCOMMON VEGETATION COMMUNITIES

The ELC community series that contained <=5% of the total area of all natural and cultural (semi-natural) areas in the watershed were defined as the locally rare or uncommon ELC community series. Based on their areas in the watershed, the following ELC community series were defined as uncommon community series:

a. Deciduous swamp
b. Mixed swamp
c. Thicket swamp
d. Marsh
e. Treed bog
f. Thicket bog
g. Shrub bog
h. Shrub bluff
i. Treed beach/bar
j. Open bluff
k. Open beach/bar

If a habitat patch contains one or more than one of these uncommon community series, the habitat patch is given a score of 1. A layer containing those locally rare community series was created. Using location based queries in ArcGIS 9.3, habitat patches were given a score of 1 if they intersected or contained any of these uncommon community series.

G. ECOLOGICAL PROXIMITY

The quality of the matrix, or area surrounding a habitat patch, has a strong influence on the ability of a species to move from one habitat patch to another. Natural areas that are closer together have a greater degree of species persistence because they favour persistence and movement of species and genes over the short and long term (Foreman and Gordon 1986, Andren 1994, OMNR 1999, Hames *et al.* 2001, Damschen *et al.* 2006). In general, matrix quality has been calculated based on the percent of natural, agriculture or urban area found within 2km of a natural area weighted by landuse. (Dunford and Freemark 2004, Henson *et al*. 2005, TRCA 2007). A weight of +1 was given to natural land uses, -1 given to urban and 0 was given to agriculture (TRCA 2007). The radius was chosen because a) the literature assumes this distance as a potential daily travel distance by predatory species with edge effects such as racoon and, b) genetic exchange among flora and fauna species as well as recreational use by humans either by

walking or bicycling also are expected to occur within this radius (Austen and Bradstreet 1996, Haddad 2000, Austen et al. 2001, Hames et al. 2001, TRCA 2007).

For the purposes of this Landscape Scale Analysis, matrix quality for a habitat patch was calculated for a 2km external buffer around the patch based upon the method identified by the Toronto and Region Conservation Authority: (proportion natural areas *(1)+ proportion agricultural area * (0) + proportion urban areas *(-1)). This formula recognizes the relative order or permeability of various land covers, with natural being the most permeable, agricultural being relatively neutral (permeable for some species and impermeable for others) and urban being relatively impermeable compared to natural and agricultural land cover. The values for matrix quality range from -1 to +1 where -1 represents a patch completely surrounded by urban land cover, while +1 represents a patch completely surrounded by natural land cover. A patch surrounded completely by agriculture would have a matrix quality score of 0, which is intermediate between that for a completely urban and completely natural matrix.

To measure the variable, an additional 2 km of ELC and land use data was mapped outside and adjacent to the watershed. The matrix influence extension was developed in-house at CVC for ArcView 3.3. The percent of urban, agriculture and natural within this radius was calculated. Table 3 shows the aggregation of urban, agriculture and natural land cover using ELC. From a biodiversity perspective, a perfect patch would be surrounded by 100 percent natural cover within the radius. If this were the case, the patch would get a matrix quality score of 1. Scores range from negative 1 to positive 1 depending on the presence of the urban and natural cover. The following formula (TRCA 2007) summarizes the scoring method under this component:

Matrix Quality = (% urban * -1) + (% agriculture * 0) + (% natural * 1)

For example, if a habitat patch has 70% urban, 20 % agriculture and 10% natural, the habitat patch would get a raw matrix quality score of:
(.70 * -1) + (.20 * 0) + (.10 * 1) = -.60 (raw matrix quality score)
Similarly, if a habitat patch has 10 % urban, 20 % agriculture and 70 % natural, the habitat patch would get a raw matrix quality score of: .60

Once the raw matrix quality scores were calculated, the habitat patches that contained the top quartile (75^{th} percentile) of the scores were selected and given a score of 1. The rest of the habitat patches were given a score of 0. Table 3 and 4 show the classifications used to calculate the percentages for agriculture, natural and urban, which excludes the area of the focal patch from the percentages.

TABLE 4: MATRIX QUALITY NATURAL CLASSES

Land Use Type	ELC Code	Matrix Class
Coniferous forest	FOC	**Natural**
Coniferous plantation	CUP3	
Coniferous swamp	SWC	
Cultural meadow	CUM	
Cultural savannah	CUS	
Cultural thicket	CUT	
Cultural woodland	CUW	
Deciduous forest	FOD	
Deciduous plantation	CUP1	
Deciduous swamp	SWD	
Marsh	MA	
Mixed forest	FOM	
Mixed plantation	CUP2	
Mixed swamp	SWM	
Open Aquatic	OAO	
Open Beach/Bar	BBO	
Open Bluff	BLO	
Shrub bluff	BLS	
Shrub bog	BOS	
Thicket swamp	SWT	
Treed beach/Bar	BBT	
Treed bog	BOT	

TABLE 5: MATRIX QUALITY NON-NATURAL CLASSES

Land Use Type	ELC Code	Matrix class
Commercial/Industrial Open Space	MOC	**Agriculture**
Educational/Institutional Open Space	MOI	
Inactive Aggregate	IA	
Intensive Agriculture	AGI	
Manicured Open Space	MOS	

Non-intensive Agriculture	AGN	
Other Open Space	MOO	
Private Open Space	MOP	
Recreational Open Space	MOR	
Wet Meadow	WET	
Active Aggregate	AA	**Urban**
Airport	TPA	
Collector	TPC	
Commercial/Industrial	CIC	
Construction	CON	
Educational/Institutional	CII	
High Density Residential	URH	
High Rise Residential	URR	
Highway	TPH	
Landfill	LF	
Low Density Residential	URL	
Medium Density Residential	URM	
Railway	TPX	
Regional Road	TPR	
Residential Estate	URE	
Rural Development	RD	
Urban	URB	
Mixed Residential	URX	

H. REGIONAL LINKAGE

H.i.CREDIT RIVER CORRIDOR

Any habitat patches within or intersecting 500m on each side of the Credit River up to 5 km from the Lake Ontario shoreline, and 300m on each side of the Credit River beyond 5 km from the Lake Ontario shoreline were selected as the Credit River corridor. A "Location Based Query" was used to verify the habitat patches that overlap or touch the boundary of the Credit river corridor (Figure IV).

H.ii.SUBWATERSHED CORRIDOR

Any habitat patches within or intersecting the greater of 300m on each side of major tributaries of the Credit (generally these consisted of 4^{th} and 5^{th} order streams) were selected as the subwatershed corridor. A "Location Based Query" was used to verify the habitat patches that overlap or touch the boundary of the subwatershed corridor (Figure IV).

If any of the habitat patches met one or more criteria discussed above (Credit river corridor and subwatershed corridor), they were given a score of 1. Habitat patches received a score of one even if they satisfied multiple criteria.

I. PROVINCIAL LINKAGE (NIAGARA ESCARPMENT, OAK RIDGE MORAINE AND GREENBELT NATURAL HERITAGE SYSTEM)

I.i.LAKE ONTARIO SHORELINE CORRIDOR

Any habitat patches within or intersecting the 2km buffer zone from the Lake Ontario shoreline were selected as the Lake Ontario shoreline corridor which is considered to be a part of a provincial linkage. "Intersect" method was used in ArcGIS 9.3 in order to determine the overlap. A "Location Based Query" was used to verify the habitat patches that overlap or touch the boundary of the Lake Ontario shoreline corridor (Figure IV).

I.ii.NIAGARA ESCARPMENT PLAN AREA

Any habitat patches that intersected or overlapped with areas classified as "Escarpment Natural Area" or "Escarpment Protection Area" within the Niagara Escarpment Plan area were considered to be a part of a provincial linkage. "Intersect" method was used in ArcGIS 9.3 in order to determine the overlap. A "Location Based Query" was used to verify the habitat patches that overlap or touch the boundary of Niagara Escarpment.

I.iii.OAK RIDGES MORAINE PLAN AREA

Any habitat patches that intersected or overlapped with the areas classified as "Natural Core" or "Natural Linkage" of Oak Ridges Moraine Plan area were considered to be a part of a provincial linkage. An approach similar to that of Niagara Escarpment plan area was used to verify the locational accuracy.

I.iv.GREENBELT NATURAL HERITAGE SYSTEM

Any habitat patches that intersected or overlapped with areas classified as Greenbelt Natural Heritage System were considered to be a part of a provincial linkage. An approach similar to that of Niagara Escarpment plan area was used to verify the location accuracy.

If any of the habitat patches met any of the above criteria (Lake Ontario shoreline corridor, Niagara Escarpment, Oak Ridge Moraine and Greenbelt Natural Heritage System), they were given a score of 1.

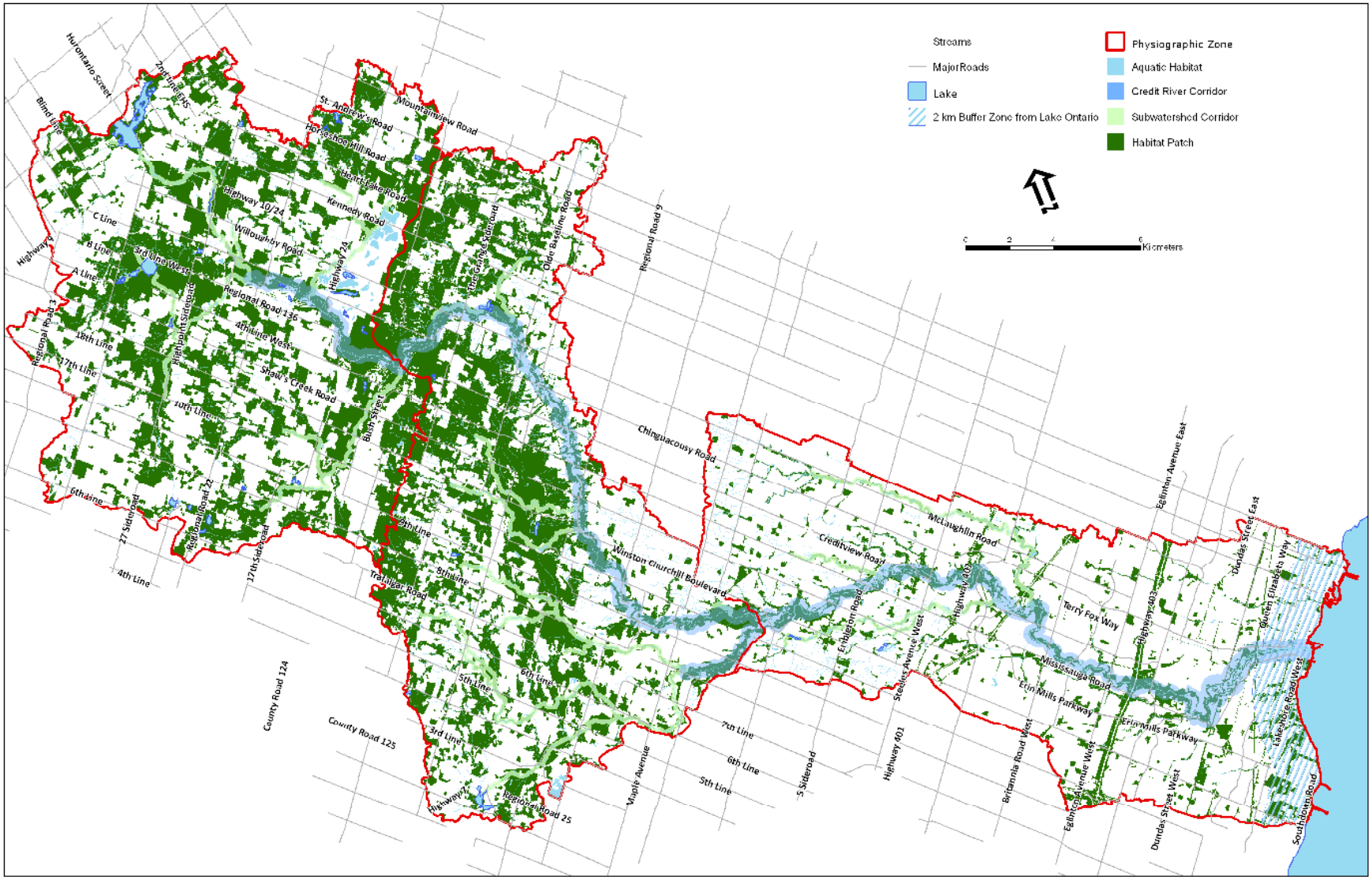

FIGURE IV: An example showing the data sources used for Regional Linkage Component

Once all those nine criteria were scored and quality control was completed, the total scores were calculated by simply adding the scores from those nine individual criteria. The total scores from the criteria reflect the relative importance of a particular habitat patch in relation to other patches in terms of ecological functioning in the watershed.

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