



District Municipality of Muskoka

Muskoka Official Plan Review Background Study: Urban Centres Natural Heritage Review

Prepared by:

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Ms. Samantha Hastings
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Planning and Economic Development Department
70 Pine Street
Bracebridge, ON P1L 1N3

Dear Ms. Hastings:

Project No: 60117271-108286-90151
Regarding: Muskoka Official Plan Review
Background Study: Urban Centres Natural Heritage Review

AECOM is pleased to submit this Final Report for the Muskoka Natural Heritage Strategy Background Study – Urban Centres Natural Heritage Review.

Thank you for the opportunity to conduct this interesting study.

Sincerely,
AECOM Canada Ltd.



James Kamstra, B.Sc., M.E.S.
Senior Terrestrial Ecologist

JK:mm
Encl.

Executive Summary

The District Municipality of Muskoka (DMM) is undergoing a Five-Year Review of its Official Plan. As part of the review, the DMM is developing a comprehensive Natural Heritage Strategy (NHS). Ultimately, this Strategy will combine a features-based and systems-based approach as directed and recommended by the Provincial Policy Statement (2005) and related reference manuals (e.g., Natural Heritage Reference Manual [1999 and 2010], Significant Wildlife Habitat Technical Guide [2000]). The DMM has completed a Growth Strategy that will direct anticipated growth within Muskoka, particularly within the urban centres. Within the urban centres it is the intent to direct development away from environmental features including significant natural heritage and adjust the location of urban boundaries if necessary.

A portion of Muskoka lies within an “ecotone” known as “The Land Between”, a hotspot of biodiversity in Ontario and the centre of distribution for several species threatened in the province. Northern species reach their most southerly distribution here; southern species reach their most northern limits; other species are almost entirely confined to this unique area of shallow soils over bedrock that arcs across the south of Muskoka and Haliburton across to the Frontenac Axis. Many of these species are at risk, and policies of the Provincial Policy Statement (2005) under the Planning Act and regulations of the Endangered Species Act (2007) apply.

This study is divided into two components:

1. The identification of potential Species at Risk (SAR) habitat throughout Muskoka; and,
2. A review of regionally significant natural heritage within urban centres in Muskoka.

The results of the modelling of SAR habitat are reported in “Species at Risk: Potentially Suitable Habitat”, by Glenside Ecological Services (2009). The purpose of this report is to build on the outcome of that report, refine the data and to identify significant natural heritage features and functions within the urban centres. The concluding chapter provides some insight into how this information may be used by Muskoka.

The goal of this background study is to conduct a more site specific review of natural heritage in Muskoka’s urban centres that is at a greater level of detail than the landscape level identification of potential habitat for SAR (Glenside 2009) with emphasis on the non-built areas. These results will provide valuable background information on which to build a Natural Heritage Strategy for Muskoka and provide input for lower tier municipal approaches to natural heritage protection as planning proceeds.

The objectives include:

- Identify natural heritage features and functions using air photo interpretation, SAR habitat models, expert local opinion and existing mapping;
- Integrate features and functions to identify pathways of connectivity and barriers to movement; and,
- Provide additional background relative to the outcomes of the Growth Strategy including the identification of significant natural heritage features and functions within the urban boundaries.

For each urban centre, a review was undertaken to identify potential natural heritage features. These potential areas are meant to help build a natural heritage system for Muskoka and represent the “preliminary natural heritage system” recommended for settlement areas in the Second Edition Natural Heritage Reference Manual (MNR, 2010). Several overlays were used to create maps that were then reviewed in the context of species autecology¹, probability of occurrence, landscape ecology principles and connectivity, and some basic assumptions about how

1. *The way in which the individual species relates to its immediate environment and in some cases modifies that environment.*

individual species use the landscape in Muskoka. The resulting maps illustrate potential areas of increased probability of occurrence of SAR and associated linkages and barriers.

Detailed accounts that summarize significant features are provided for each urban centre. For each urban centre, a map of interpreted² Ecological Land Classification is provided as well as mapping of the features reviewed that include environmentally significant areas (many already identified in the existing Official Plan(s)), wetlands, potential rich forests, potential significant wildlife habitat, potential SAR habitat and pathways of connectivity.

This report is the first step toward the development of a Natural Heritage Strategy for Muskoka. The relationship between growth and the management of a healthy, connected natural environment is clear. As planning exercises continue at the District and local levels, it will be important to identify a scope of investigations to ensure that growth does not occur at the expense of important natural heritage features and functions. Additional study at the site specific level by a qualified biologist is recommended to document the presence and condition of the features and functions identified for each urban centre, in addition to the screening for Species At Risk. It is important to note that no targeted field investigations were undertaken in support of this analysis, and site specific field study will likely contribute important information in the future to modify the precision and accuracy of the framework provided.

The local and District Councils are enabled by the Planning Act through the Provincial Policy Statement (PPS), to identify the natural heritage systems that reflect the local social, economic as well as environmental context of Muskoka. Additional guidance for refinement of the Preliminary Natural Heritage systems is provided in the Natural Heritage Reference Manual (MNR, 2010).

In summary the report recommends that:

- a) The Natural Heritage Review identifies the natural heritage interests of The District Municipality of Muskoka in the context of the Provincial Policy Statement in support of the DMM Official Plan Review. This report should be used as reference for ongoing local initiatives to refine natural heritage systems.
- b) Both the upper and lower tier Natural Heritage System processes would benefit greatly from focused field investigations to verify the locations and health of natural heritage features and functions, and to better understand significant pathways of connectivity for wildlife and vegetation.
- c) As DMM builds its Natural Heritage Strategy, the outcomes of studies at the lower tier should inform the regional Natural Heritage System and *vice versa*.
- d) The data provided in this report helps to focus where growth may occur in urban centres with minimal impact to SAR habitat and significant wildlife habitat.
- e) The framework should be used to identify the scope of environmental studies associated with land use change applications under the Planning Act with the objective of creating a sustainable natural heritage system for the District of Muskoka.
- f) The list of Species at Risk in Ontario is updated every year, consequently the most current list will need to be consulted to determine if any additional species to those mapped in this report will need to be considered for site specific development applications within the urban centres.

2. *i.e., no field investigations were undertaken in the preparation of this mapping. Sources are identified in the text.*

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 - Al Sinclair (Muskoka Field Naturalists)
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 - Jeremy Rouse, Ontario Ministry of Natural Resources

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Appendix A. User Guide

1. Introduction

1.1 Background

The District Municipality of Muskoka (DMM) is undergoing a Five-Year Review of the Official Plan. As part of the review, the DMM is developing a comprehensive Natural Heritage Strategy (NHS). Ultimately, this Strategy will combine a features-based and systems-based approach as directed and recommended by the Provincial Policy Statement (2005) and related reference manuals (e.g., Natural Heritage Reference Manual [1999 and 2010], Significant Wildlife Habitat Technical Guide [2000]). The DMM has completed a Growth Strategy that directs much of the anticipated growth within Muskoka to the urban centres. It is therefore important to identify significant natural heritage that may influence where development occurs within the urban centres.

A portion of Muskoka lies within an “ecotone” known as “The Land Between”, a hotspot of biodiversity in Ontario and the centre of distribution for several species threatened in the province. Northern species reach their most southerly distribution here; southern species reach their most northern limits; other species are almost entirely confined to this unique area of shallow soils over bedrock that arcs across the south of Muskoka and Haliburton across to the Frontenac Axis (Figure 1). Many of these species are at risk, and policies of the Provincial Policy Statement (2005) under the Planning Act and regulations of the Endangered Species Act (2007) apply.

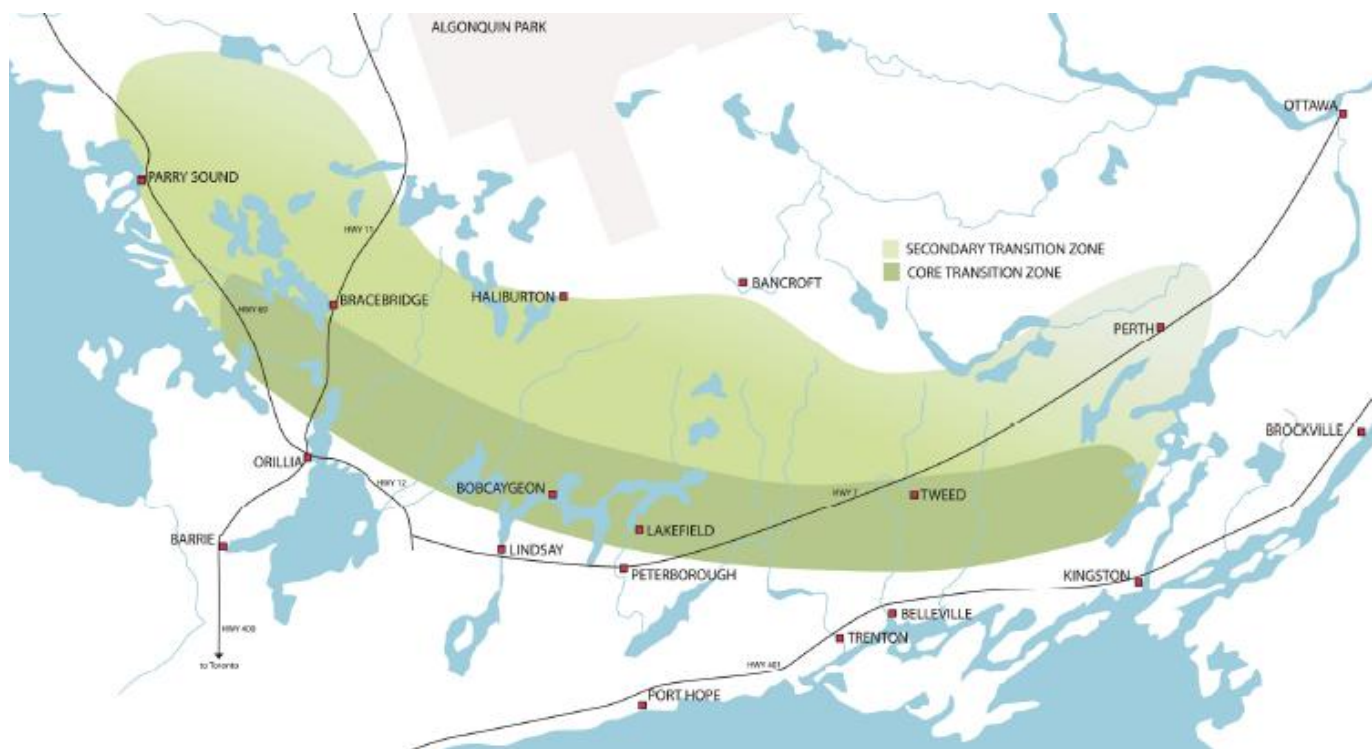


Figure 1. *The Land Between* (Land Between Collaborative 2009)

The PPS directs that “Natural features and areas shall be protected for the long term.” It is intended that “the diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and groundwater features. (Policy 2.1.2)

Specific to the scope of this study in Muskoka, the PPS goes on to state that:

- 2.1.3 *Development and site alteration shall not be permitted in:*
- a) *significant habitat of endangered species and threatened species;*
 - b) *significant wetlands in Ecoregions 5E...*
- 2.1.4 *Development and site alteration shall not be permitted in: ...*
- d) *significant wildlife habitat; and*
 - e) *significant areas of natural and scientific interest unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.*
- 2.1.5 *Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.*
- 2.1.6 *Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.*

The Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement (2005) Second Edition (2010) recommends that a natural heritage system be identified within Designated Growth Areas. Latitude is provided in that the system should be refined as development proceeds, recognizing the balance that must be struck between protecting natural heritage and meeting other needs for which these lands are designated. It is the intent of this document to identify the key functions and features that should be incorporated into a regionally significant natural heritage system.

The District of Muskoka Official Plan identifies all wetlands as being of significance regardless of whether they have been evaluated by the Ministry of Natural Resources. This is sanctioned by the Province in policy 4.6:

The policies of this Provincial Policy Statement represent minimum standards. This Provincial Policy Statement does not prevent planning authorities and decision-makers from going beyond the minimum standards established in specific policies, unless doing so would conflict with any policy of this Provincial Policy Statement.

In the context of the PPS, features that would need to be included in a natural heritage system in Muskoka include the following:

- Significant wetlands;
- Significant areas of natural and scientific interest;
- Significant wildlife habitat; and
- Significant habitat of threatened and endangered species, as well as the linkages among them and to other natural heritage features that support ecosystem integrity and native biodiversity.

AECOM and Glenside Ecological Services Limited were retained by the DMM in December 2008 to conduct a background study to provide insight into the distribution of Species At Risk (SAR) in the District, and in addition, to identify the important natural heritage features and functions within the urban centres. This study is divided into two components:

1. The identification of potential SAR habitat throughout Muskoka; and,
2. A review of regionally significant natural heritage within urban centres in Muskoka.

The results of the modelling of SAR habitat are reported in “Species at Risk: Potentially Suitable Habitat” report by Glenside Ecological Services (2009). The purpose of this AECOM report is to build on the outcome of that report, refine the data and to identify significant natural heritage features and functions within the urban centres. The concluding chapter provides some insight into how this information may be used by Muskoka.

Muskoka is fortunate to have a landscape that is still dominated by nature, and this presents both a unique opportunity and a challenge for natural heritage planning. The greatest opportunity lies in the fact that landscape functions in Muskoka remain relatively intact meaning that natural heritage planning can therefore emphasize maintaining existing functions rather than protecting fragments or restoring the last remaining functions, as is the case for most of southern Ontario. Established approaches and guidance documents that are appropriate for the highly fragmented landscapes of the south are not entirely applicable to the forested landscapes of Muskoka and other northern municipalities and planning authorities.

Established approaches to natural heritage system identification are based on the presumption that relatively discrete habitat patches exist on the landscape and that the matrix is either settlement or agriculture. In Muskoka, outside of the built areas, the matrix is composed of lakes and habitat in the form of natural regeneration including forests, wetlands, and rocklands. This makes identifying significant habitat more difficult than in other areas where habitat exists primarily in discrete patches and where linkages are largely confined to valleys and watercourses. In the face of severe fragmentation, these discrete patches are already significant at some level. In Muskoka, identification of significance is much more ambiguous.

Another assumption of other approaches is that the primary land use pressure is rural or urban development. In Muskoka, a significant land use pressure also includes recreational development, including individual cottages and resort developments which are largely associated with waterfront property. In addition, resource extraction, such as forestry and aggregate operations, occurs in rural areas of Muskoka. Fragmentation, particularly by roads and residential and recreational development, is the key threat to biodiversity and natural heritage in Muskoka.

1.2 Project Overview

1.2.1 Goals and Objectives

The goal of this portion of this background study is to conduct a more site specific review of natural heritage in Muskoka’s urban centres that is at a greater level of detail than the landscape level identification of potential habitat for SAR (Glenside 2009) with emphasis on the non-built areas. The results of this study will provide valuable background information on which to build a Natural Heritage Strategy for Muskoka and provide input for lower tier municipal approaches to natural heritage protection as planning proceeds.

Objectives:

- Identify natural heritage features and functions using air photo interpretation, SAR habitat models, expert local opinion and existing mapping;
- Integrate features and functions to identify pathways of connectivity and barriers to movement; and,
- Provide additional background relative to the outcomes of the Growth Strategy including the identification of significant natural heritage features and functions within the urban boundaries.

1.2.2 Approach

The identification of natural heritage features and landscape functions for the urban centres focused on those identified in the PPS that are relevant to Muskoka, as described in Section 1.1, as well as Muskoka Heritage Areas,

other non-provincially significant wetlands, and stream and river corridors. Air photo interpretation was the primary tool used to identify landscape patterns of vegetation and landforms. Natural heritage features and functions were derived from this information in combination with habitat models, expert local opinion and existing mapping of other resources such as terrain, soils and wetlands, as well as local official plan designations and zoning.

Table 1. Summary of Approaches Used to Identify PPS Components

Natural Heritage Feature ¹	Approach
Significant Habitat of Endangered and Threatened Species	Habitat models based on air photo interpretation results were used to identify potentially suitable habitat (Glenside 2009; expert opinion)
Significant Wildlife Habitat	Habitat models based on air photo interpretation results were used to identify potentially suitable habitat for Species of Special Concern (Glenside 2009; expert opinion, existing mapping of deer wintering grounds)
Significant Areas of Natural and Scientific Interest (ANSIs)	No ANSIs occur within urban boundaries, however existing mapping of Muskoka Heritage Areas ³ were treated with the same level of importance
Significant Wetlands	All wetlands identified through air photo interpretation of enhanced resolution DMM aerial photography.

Note: 1. As required in the PPS

2. Methodology

2.1 Air Photo Interpretation

In 2008, DMM acquired digital air photo coverage for the entire District at 30 x 30 cm resolution and 10 x 10 cm resolution for Muskoka's nine urban centres. This level of resolution for the urban centres allowed for detailed interpretation of natural and anthropogenic features to which Ecological Land Classification for Southern Ontario (ELC) (Lee *et al.* 1998) at the community class and series level (Table 2) was applied. ELC is a method of classifying the landscape into ecologically identifiable areas with distinct patterns of geology, soils, moisture regime and vegetation that has been developed by the Ontario Ministry of Natural Resources.

Glenside Ecological Services used Forest Resource Inventory (FRI) data (1987) to help delineate and classify initial polygons. They were then reviewed at a scale of 1:2000 and edited at 1:1000. Additional Community Series designations were included in the "Cultural"⁴ Community Class to reflect dominant land use in Muskoka's urban centres. These include urban residential and commercial development (UR), roads outside of defined UR areas (RD), manicured turf (TU) and active cropland (CR) (Table 2).

In addition, FRI data were used, where available and applicable for the forested community class, to identify Ecosites according to the Forest Ecosystems of Central Ontario (FEC) (Chambers *et al.* 1997). FEC complements ELC in that it is a forest classification system developed specifically for the Muskoka landscape and environs. Identification at the ecosite level was limited, especially within the older built up areas of the urban centres as the FRI data were originally designed to classify forest to facilitate timber resource management. Therefore, urban areas were usually left unclassified. In the non-built areas, FEC classification based on FRI data was possible in many cases. Also, because the FRI data were delineated for different objectives and at very coarse scale creating simplified forested polygons of similar features, FRI FEC classification is not always congruent with the more

3. *Muskoka's Heritage Areas are those areas of Muskoka's landscape that, on a local, district, provincial or national scale, exhibit entities of historical, geological, archaeological, scenic or biological value.* (Muskoka Watershed Council)

4. *Cultural in this sense is meant to indicate that there has been considerable human influence on the land in contrast to natural vegetation.*

detailed polygons interpreted from the 2008 imagery (Glenside 2009) and revisions to FEC classification were required. The following procedure was used to apply FEC classification to the detailed 2008 imagery interpretation (P. Heaven, *pers. comm.*):

- If edited polygons overlaid multiple FRI FEC classifications, the dominant FEC tag was used where applicable (based on ability to interpret canopy composition from 2008 air photos);
- If dominant FEC tag was not applicable, the sub-dominant FEC tag was considered;
- If neither dominant or sub-dominant FEC tags were applicable, no FEC classification was applied to the polygon; and
- If no FRI FEC tags were available (i.e., unclassified), no FEC classification was applied to the polygon.

Table 2. Community Classification (Lee *et al.* 1998) for 2008 Air Photo Interpretation

Community Class ⁵		Community Series	
Code	Description	Code	Description
CU	Cultural	CUM	Pastureland, grass, meadow
		CUT	Cultural thicket, includes rights-of-way
		CUP	Plantation
		CR	Active cropland
		TU	Manicured turf (e.g., golf courses)
		UR	Urban (developed or under development)
		RD	Road (>10 m in width and outside UR areas)
FO	Forested	FOD	Deciduous forest
		FOM	Mixed forest
		FOC	Coniferous forest
WT	Wetland	OAO	Open aquatic
		MA	Marsh
		SWT	Swamp thicket
		SWD	Deciduous swamp
		SWM	Mixed swamp
		SWC	Coniferous swamp
		FB	Fen/Bog
RB	Rock Barren	RBO	Open rock barren
		RBS	Shrub rock barren
		RBT	Treed rock barren
WA	Waterbody	LK	Lake (>8 ha)
		RI	River

2.2 Species at Risk Habitat Modelling

2.2.1 List of Species Relevant to Muskoka

A list of species relevant to Muskoka for modelling potential SAR habitat was identified to be used in both components of this study (landscape and urban centres). Through a combination of input from the Ministry of Natural Resources, Natural Heritage Information Centre and the technical advisory committee, the following final list was approved in February 2009 (Table 3). This list reflects the status of SAR as of February 2009 and does not include SAR that have been added since. A complete description of this process is documented in a report by Glenside Ecological Services (2009).

5. Community Class and Community Series are nested classifications within ELC.

Table 3. Summary of Status Ranks for SAR Used in This Project

	Common Name	Scientific Name	COSSARO Rank ¹	COSEWIC Rank ²
Plants	American Ginseng	<i>Panax quinquefolius</i>	Endangered	Endangered
	Branched Bartonia	<i>Bartonia paniculata</i> ssp. <i>paniculata</i>	Threatened	Threatened
	Broad Beech Fern	<i>Phegopteris hexagonoptera</i>	Special Concern	Special Concern
	Butternut	<i>Juglans cinerea</i>	Endangered	Endangered
	Forked Three-awned Grass	<i>Aristida basiramea</i>	Endangered	Endangered
Insects	Monarch Butterfly	<i>Danaus plexippus</i>	Special Concern	Special Concern
	West Virginia White	<i>Pieris virginiensis</i>	Special Concern	-
Birds	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Special Concern	-
	Cerulean Warbler	<i>Dendroica cerulean</i>	Special Concern	Special Concern
	Golden-winged Warbler	<i>Vermivora chrysoptera</i>	Special Concern	Threatened
	Kirtland's Warbler	<i>Dendroica kirtlandii</i>	Endangered	Endangered
	Least Bittern	<i>Ixobrychus exilis</i>	Threatened	Threatened
	Peregrine Falcon	<i>Falco peregrinus anatum</i>	Threatened	Special Concern
	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	Special Concern	Threatened
	Yellow Rail	<i>Coturnicops noveboracensis</i>	Special Concern	Special Concern
Reptiles	Blanding's Turtle	<i>Emydoidea blandingii</i>	Threatened	Threatened
	Northern Map Turtle	<i>Graptemys geographica</i>	Special Concern	Special Concern
	Spotted Turtle	<i>Clemmys guttata</i>	Endangered	Endangered
	Eastern Musk Turtle	<i>Sternotherus odourata</i>	Threatened	Threatened
	Five-lined Skink	<i>Eumeces fasciatus</i>	Special Concern	Special Concern
	Eastern Foxsnake	<i>Elaphe gloydi</i>	Threatened	Endangered (in part)
	Eastern Hog-nosed Snake	<i>Heterodon platirhinos</i>	Threatened	Threatened
	Massasauga Rattlesnake	<i>Sistrurus catenatus</i>	Threatened	Threatened
	Milksnake	<i>Lampropeltis triangulum</i>	Special Concern	Special Concern
	Eastern Ribbonsnake	<i>Thamnophis sauritus</i>	Special Concern	Special Concern
Mammals	Eastern Cougar	<i>Puma concolor cougar</i>	Endangered	Insufficient data

Notes: 1. As of September 2009 COSSARO = Committee on the Status of Species at Risk in Ontario
2. As of August 2009 COSEWIC = Committee on the Status of Endangered Wildlife in Canada

Note that Englemann's Quillwort (*Isoetes englemanni*), an Endangered Species which in Muskoka is only known to occur in the lower Severn River, has not been included since it does not occur in any of the urban areas. Only two fish species at risk are currently known from the vicinity of Muskoka: the Threatened Lake Sturgeon (*Acipenser fulvescens*) and the Special Concern Northern Brook Lamprey (*Ichthyomyzon fossor*). Lake Sturgeon may occur in deep waters of Georgian Bay and Northern Brook Lamprey has been recorded from creeks on the south side of Severn Sound (COSEWIC 2007) but not on the Muskoka side. It is highly unlikely that either species is present in any urban areas and therefore they were not included in the models.

The provincial list of Species at Risk is likely to change over time and this report may become outdated as new species are added and some are downlisted. Overall the list is likely to grow as more species status' are assessed. In Ontario, species that may be at risk are reviewed by a team of experts known as the Committee on the Status of Species at Risk in Ontario (COSSARO). COSSARO may include people with expertise in certain scientific disciplines, or Aboriginal Traditional Knowledge. The committee's responsibilities include: maintaining assessment criteria, classifying species at risk, and reporting classifications to the Minister of Natural Resources.

COSSARO is an independent body made up of up to 11 members from both the public and private sectors. At least 5 members must be from outside of the Ontario Government. COSSARO is a legally recognized committee. Species Status Reports and COSSARO Evaluations are an important part of the assessment process. COSSARO reviews these detailed technical documents that contain information such as the habitat needs of a species, population size, and threats to the species.

COSSARO submits reports to the Minister of Natural Resources, classifying species as: "Endangered", "Threatened", "Special Concern" or "Not at Risk". COSSARO meets two times per year and will assess or reassess a number of

species at each meeting. Consequently statuses of some species may change twice annually and it will be important to check the species list, and determine which ones apply to Muskoka. The current Species at Risk list can be accessed on the MNR website as: <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276722.html>

2.2.2 Model Development

Urban centre SAR habitat models were based on the landscape models developed in the report by Glenside Ecological Services (2009). A thorough description of each SAR and its habitat preferences is provided in that report and will not be repeated in this study. The landscape models were refined for the urban centres by translating landscape habitat parameters into the ELC classification terminology described in Section 2.1. When making these refinements, it was important to acknowledge that the urban areas are focus areas for growth in Muskoka and therefore habitat models needed to be more precise so as to provide flexibility for natural heritage approaches at lower tier scales. Emphasis within the urban centre models was on natural habitat components within the urban centres and not on cultural features, such as manicured turf (TU).

For certain species, landscape models could not be translated into ELC Community Classes or Series because the model was based on other parameters such as slope or the availability of continuous shoreline. In these cases the landscape model was directly overlaid on each urban centre. Also, similar to findings in the report by Glenside Ecological Services (2009), certain species were not suitable for habitat modelling, primarily because these species were either too widespread or mobile (e.g., Blanding's Turtle) or they were constrained by microhabitats that could not be modelled at this scale (e.g., Monarch Butterfly). In some cases species are at risk due to factors other than habitat (e.g., the risk to Butternut is due to disease, not habitat loss) and therefore applications for land use change should generally be reviewed for potential impacts on these species. For any species not modelled but relevant to Muskoka's urban centres, general habitat parameters are provided for guidance. Section 3.1 provides specific model and habitat parameter details. All decisions regarding which SAR should be modelled were vetted through the project team and a group of local experts.

2.3 Identification of Potential Areas for Species at Risk Occurrence

2.3.1 Identification of SAR by Urban Centre

The first step to identifying potential SAR occurrence involved the development of a short list of SAR relevant to each urban centre. A combination of resources was used including landscape model results, published range maps, georeferenced NHIC observations, development application reports and expert opinion. Table 4 describes how the resources were used. Each SAR species from the list of species relevant to Muskoka (Section 2.2.1) was assigned either high or low potential for each urban centre. These results are presented in Section 3.

Table 4. Criteria for Determination of Potential SAR Areas

Resource	Use
Landscape Models	Determined which urban centres contained potential habitat for individual species modelled in Glenside 2009. Note that some species could not be modelled because their habitat requirements are very broad and could not be focussed through this study.
Published Range Maps	Determined which urban centres fell within ranges published on Royal Ontario Museum Species at Risk site (http://www.rom.on.ca/ontario/risk.php)*
NHIC	Acquired georeferenced NHIC observations in Muskoka and within 25 km of Muskoka.
Expert Opinion	Met with local and provincial experts (Dec 2009) and presented other resources.
Development Application Reports (Environmental Impact Studies; Environmental Assessments, etc.)	Vegetation descriptions were used to classify ELC layer; wildlife reports were used to verify the habitat model and calibrate the range maps.

Note: * Note that range maps often include large areas where the species in question has not been observed.

2.3.2 SAR Potential Areas Map Creation

SAR occurrences were mapped to identify areas with the potential for the highest concentration of SAR within the urban centres. Only high potential species where a habitat model was produced were used for each urban centre (See Table 6). Potential areas were mapped by overlaying individual species models and identifying polygons where one or more species had the potential to occur.

2.4 Natural Heritage Review

For each urban centre, an analysis of natural heritage features was conducted to identify potential significant areas based on ecology. These potential areas, together with potential linkages and corridors, are meant to help build a natural heritage system for Muskoka and represent the “preliminary natural heritage system” recommended for settlement areas in the Second Edition Natural Heritage Reference Manual (MNR, 2010). Several overlays were used to create maps that were then reviewed in the context of species autecology⁶, probability of occurrence, landscape ecology principles and connectivity, and some basic assumptions about how individual species use the landscape in Muskoka. The resulting maps illustrate potential areas of increased probability of occurrence of SAR and associated linkages and barriers. Further details are provided below.

2.4.1 Overlays

Overlays which show the Natural Heritage Review for each urban centre included the SAR potential areas maps described in Section 2.3, ELC classification described in Section 2.1, additional local knowledge acquired at the local experts meeting in December 2009 and other natural heritage features based on existing background mapping. Table 5 describes these other natural heritage features.

Table 5. Input to Natural Heritage Review

Natural Heritage Feature	Description
Significant Wildlife Habitat	Deer wintering grounds
Environmentally Significant Areas	Muskoka Heritage Areas
Wetlands	Wetlands not included in SAR potential areas maps based on air photo interpretation and ELC classification
Potential Rich Forests (<i>underlain by calcareous soils or calcareous bedrock</i>)	FEC ecosites 24 and 26 based on air photo interpretation and ELC classification (FRI data)

6. *The way in which the individual species relates to its immediate environment and in some cases modifies that environment.*

3. Findings

3.1 Species At Risk Habitat Modelling

3.1.1 Model Suitability at Urban Centre Scale

Of the 26 species on the initial list of SAR relevant to Muskoka, only 11 are suitable for habitat modelling at the urban centre scale. The other species were not modelled primarily due to microhabitat constraints, being outside of the published range, being too widespread, and/or having too general habitat requirements. Table 6 summarizes which species were not modelled and the associated rationale.

Table 6. SAR Species Included in Urban Study

	Common Name	Scientific Name	Included in Urban Centre Model?	Rationale for Exclusion
Plants	American Ginseng	<i>Panax quinquefolius</i>	N	<ul style="list-style-type: none"> Limited by presence of calcareous soils Appropriate scale of soil data not available
	Branched Bartonia	<i>Bartonia paniculata</i>	Y	
	Broad Beech Fern	<i>Phegopteris hexagonoptera</i>	N	<ul style="list-style-type: none"> Published range for species is limited to southern Ontario Two NHIC observations are considered to be outliers
	Butternut	<i>Juglans cinerea</i>	N	<ul style="list-style-type: none"> Microhabitat constraints – shade intolerant and soils generally not optimal Limited to forest openings and edges
	Forked Three-awned Grass	<i>Aristida basiramea</i>	N	<ul style="list-style-type: none"> Muskoka occurrences limited to Beausoleil Island Limited to sandy barrens which do not occur within any urban centres
Insects	Monarch Butterfly	<i>Danaus plexippus</i>	N	<ul style="list-style-type: none"> At risk due to factors unrelated to habitat availability in Muskoka Microhabitat constraints – milkweed cannot be modelled
	West Virginia White	<i>Pieris virginiensis</i>	N	<ul style="list-style-type: none"> No records in Muskoka Can only model for host plant High uncertainty and narrow window to field verify (2 weeks)
Birds	Bald Eagle	<i>Haliaeetus leucocephalus</i>	N	<ul style="list-style-type: none"> Nesting sites are very conspicuous Microhabitat constraints – super-canopy trees cannot be modelled
	Cerulean Warbler	<i>Dendroica cerulean</i>	N	<ul style="list-style-type: none"> Considered to be a Carolinian species and rare visitor to Muskoka
	Golden-winged Warbler	<i>Vermivora chrysoptera</i>	Y	
	Kirtland's Warbler	<i>Dendroica kirtlandii</i>	N	<ul style="list-style-type: none"> Very specific habitat – Jack Pine >30 ha and fire regime (unmanaged forests are unlikely to provide suitable habitat)
	Least Bittern	<i>Ixobrychus exilis</i>	Y	
	Peregrine Falcon	<i>Falco peregrinus anatum</i>	Y	
	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	N	<ul style="list-style-type: none"> Microhabitat constraints – large snags
	Yellow Rail	<i>Coturnicops noveboracensis</i>	N	<ul style="list-style-type: none"> No NHIC records in Muskoka Absent from Muskoka in both editions of Breeding Bird Atlas
Reptiles	Blanding's Turtle	<i>Emydoidea blandingii</i>	N	<ul style="list-style-type: none"> Too widespread and mobile No habitat fidelity At risk primarily due to roads and fragmentation
	Northern Map Turtle	<i>Graptemys geographica</i>	N	<ul style="list-style-type: none"> Limited to larger waterbodies
	Spotted Turtle	<i>Clemmys guttata</i>	Y	
	Eastern Musk Turtle	<i>Sternotherus odourata</i>	Y	
	Five-lined Skink	<i>Eumeces fasciatus</i>	Y	
	Eastern Foxsnake	<i>Elaphe gloydi</i>	Y	

	Common Name	Scientific Name	Included in Urban Centre Model?	Rationale for Exclusion
	Eastern Hog-nosed Snake	<i>Heterodon platirhinos</i>	N	<ul style="list-style-type: none"> • Too widespread and mobile • No habitat fidelity • Very general habitat requirements • At risk primarily due to roads and fragmentation
	Massasauga Rattlesnake	<i>Sistrurus catenatus</i>	Y	
	Milksnake	<i>Lampropeltis triangulum</i>	Y	
	Eastern Ribbonsnake	<i>Thamnophis sauritus</i>	Y	
Mammals	Eastern Cougar	<i>Puma concolor cougar</i>	N	<ul style="list-style-type: none"> • Insufficient data; extremely large, non-specific habitat

3.1.2 Landscape Model Translation

Of the 11 species suitable for habitat modelling at the urban centre scale, nine could be modelled using the ELC classification that provided greater precision than the regional model. The habitat preferences for Peregrine Falcon and Eastern Musk Turtle are not tightly linked to ELC communities but are more closely linked to physical conditions. For example, Peregrine Falcon requires cliffs of 50 to 200 m in height for nesting sites and therefore its landscape model was based on elevation. Eastern Musk Turtles are highly aquatic and require shallow slow-moving water associated with continuous shorelines and marshes of larger waterbodies. Therefore, the urban centre models for Peregrine Falcon and Eastern Musk Turtle were simply clipped from the landscape models and overlaid on each urban centre. All other nine species' models were developed using ELC Community Classes or Community Series (Refer to Table 2 for illustration of how these two levels in the classification hierarchy are nested). For those species with seasonal habitats such as many of the snakes and turtles, only critical or limiting habitat was modelled. Table 7 provides a summary of the model translation. Complete descriptions of habitat preferences can be found in the report by Glenside Ecological Services (2009). Maps of these models have not been included in this report but digital layers are provided.

Table 7. Correlation Between Species and Vegetation Classification

Taxa	Species	ELC Model Parameters*
Plants	Branched Bartonia	Series: FB
	Golden-winged Warbler	Series: CUT and SWT
Birds	Least Bittern	Series: MA and SWT where > 5 ha and adjacent to LK, RI or OAO
	Peregrine Falcon	Use Landscape model
Reptiles	Spotted Turtle	Series: All FB and only OAO and MA within 600 m of FB
	Eastern Musk Turtle	Use Landscape model
	Five-lined Skink	Class: RB
	Eastern Foxsnake	Series: MA, FB, RB within 1,100 m for Port Severn outlier
	Massasauga Rattlesnake	Series: SWT, SWM, SWC, FB – Hibernation habitat only
	Milksnake	Series: CUT and RB - Upland habitat only
	Eastern Ribbonsnake	Series: OAO, MA, SWT, FB

Note: * Refer to Table 2 for interpretation of codes

3.1.3 Results of SAR Urban Centre Occurrences

Table 8 summarizes the results of the analysis of the potential for individual SAR to occur in each urban centre. Overall, urban centres west of Lakes Muskoka, Joseph and Rosseau (e.g., Bala, Mactier, Port Carling and Port Severn) had high potential for the largest number of SAR. This likely reflects the location of these urban centres within the core of the Land Between and/or their proximity to Georgian Bay. Huntsville and Hidden Valley had the least number of high potential SAR but were the only urban centres with high potential for Peregrine Falcon.

Table 8. Summary of Potential for SAR to Occur Within Each Urban Centre

Taxa	Species	High Potential	Low Potential
Plants	American Ginseng		ALL
	Branched Bartonia	Bala, Baysville, Bracebridge, Huntsville, Mactier, Port Severn	Gravenhurst, Port Carling
	Broad Beech Fern		ALL
	Butternut	Bracebridge	Bala, Gravenhurst, Port Severn
	Forked Three-Awned Grass		ALL
Insects	Monarch	ALL	
	West Virginia White		ALL
Birds	Bald Eagle	ALL	
	Cerulean Warbler		Bala, Gravenhurst, Mactier, Port Carling, Port Severn
	Golden-winged Warbler	ALL	
	Kirtland's Warbler		ALL
	Least Bittern	Bala, Bracebridge, Gravenhurst, Mactier, Port Carling, Port Severn	
	Peregrine Falcon	Hidden Valley, Huntsville	
	Red-headed Woodpecker		ALL
Reptiles	Yellow Rail		ALL
	Blanding's Turtle	ALL	
	Northern Map Turtle	Port Severn	Bala, Mactier, Port Carling, Bracebridge, Gravenhurst
	Spotted Turtle	Bala, Mactier, Port Carling, Port Severn	Gravenhurst
	Eastern Musk Turtle	Bala, Gravenhurst, Mactier, Port Carling, Port Severn	
	Five-lined Skink	Bala, Bracebridge, Gravenhurst, Mactier, Port Carling, Port Severn	
	Eastern Foxsnake	Port Severn	
	Eastern Hog-nosed Snake	ALL	
	Massasauga Rattlesnake	Bala, Gravenhurst, Mactier, Port Carling, Port Severn	
	Milksnake	Bala, Bracebridge, Gravenhurst, Mactier, Port Carling, Port Severn	
Mammals	Eastern Cougar	ALL	ALL

3.2 Urban Centres Natural Heritage Review

3.2.1 ELC and Natural Heritage Overview

Table 9 summarizes the results of the air photo interpretation and provides an overview of the other natural features used to complete the natural heritage review of each urban centre. Percent area is provided for each ELC Community Class and the presence or absence of the other natural heritage features described in Table 5 is noted.

Table 9. Summary of Air Photo ELC Interpretation Results and Other Natural Heritage Features

		% area								
		Bala	Baysville	Brace- bridge	Graven- hurst	Hidden Valley	Hunts- ville	Mactier	Port Carling	Port Severn
ELC Summary	Cultural	39	33	43	48	37	51	24	40	41
	Forest	24	40	46	31	46	38	36	37	16
	Rock Barren	2	0	4	8	1	1	13	3	7
	Waterbodies	29	19	2	9	7	5	6	13	21
	Wetland	6	8	5	4	9	4	21	7	16
Features Overview	Deer Wintering	No	No	Yes	Yes	No	Yes	No	Yes	Yes
	Muskoka Heritage Areas	No	No	Yes	Yes	No	Yes	No	No	Yes
	Potential Rich Forests	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes

Further details and mapping for each urban centre is provided below. This analysis is based on several key assumptions, both general and species specific. The following assumptions were used:

- Forest is not limiting and therefore forest species, while important to natural heritage, may be under-represented by this approach. The Species at Risk identified tend to occupy non-forested sites where habitat loss is a reason for rarity (*i.e.*, forest species are less likely to be SAR due to the extensive forested habitat). A methodology for the identification of important woodlands in DMM has yet to be developed and is not likely to apply within urban boundaries. However, the identification of pathways of connectivity will include forested areas recommended for protection for reasons other than forest significance *per se* and should mitigate concerns respecting under-representation.
- Golden-winged Warbler habitat is not limiting therefore this will be an issue for all urban centres because the centre of this species' distribution in Ontario includes Muskoka.
- Ginseng is rare due to lack of calcareous soils in Muskoka and public collection pressure. Although the potential for new sites is considered to be low, it should be screened for throughout.
- Peregrine Falcon is limited by nesting sites.
- Screening for Butternut should occur in all studies
- Blanding's Turtle and Hog-nosed Snake are species with poor habitat fidelity therefore they may be encountered in any habitat within their range and screening must always be undertaken.

The following tables (Tables 10 through 18) focus on each individual urban centre. The intent is to identify the specific natural heritage features, functions and pathways of connectivity that may form the basis of a regional natural heritage system. The key attributes are identified in the first column. These are the general categories that may provide habitat for Species at Risk and/or Significant Wildlife Habitat. The middle column describes specifically the locations within each urban area that provides the greatest probability that SAR will occur. The last column provides the rationale for inclusion in a Natural Heritage System for that urban centre.

Following each table are two maps. The first provides a general overview of the air photo interpretation results at the Community Class level in ELC. The second is the Natural Heritage Review showing the integration of all of the natural heritage features.

3.2.2 Town of Bracebridge

The Town is dominated by its watercourses, proximity to Lake Muskoka and the high ridge parallel to Highway 118. It is the only urban centre with a broad floodplain which provides unique natural heritage functions including habitat for Butternut.

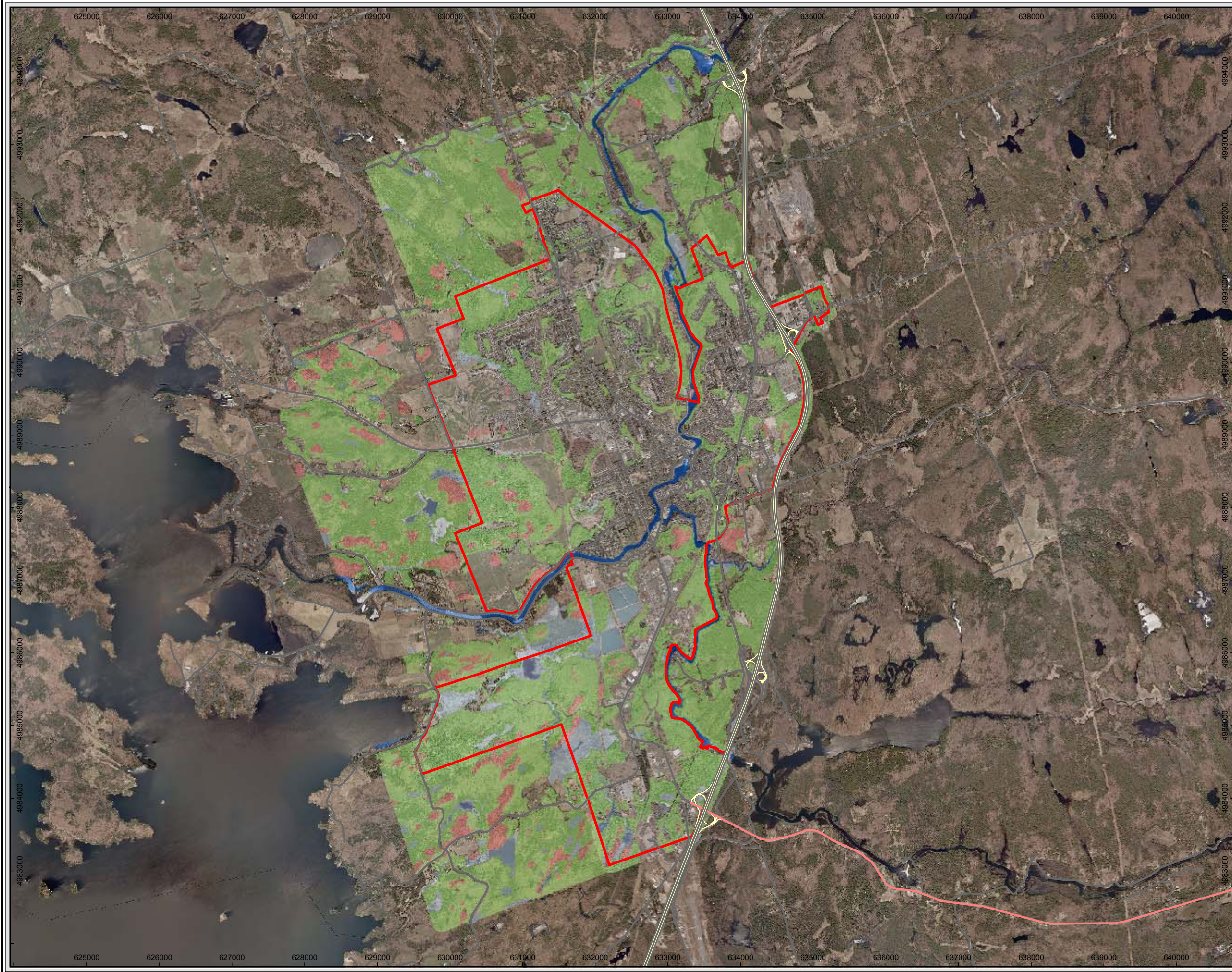
Table 10. Key Natural Heritage Features and Functions

Key Attributes	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Wetlands	<ul style="list-style-type: none"> Henry Marsh; fen in south; swamp with potential for Least Bittern north of Muskoka River; Potential for Blanding's Turtle; Eastern Ribbonsnake to occur. 	<ul style="list-style-type: none"> Natural depression (possible glacial spillway) connects sewage lagoons through wetlands to Lake Muskoka; connection through Henry Marsh to Muskoka River (residences a barrier at the River) should be incorporated into the NHS; emphasis on maintaining water balance to wetlands and watercourses.
Rare Species	<ul style="list-style-type: none"> Floodplain adjacent to River is unique due to depth of soils and agricultural opportunity. Butternut occurs here. 	<ul style="list-style-type: none"> Localities should be included in the NHS. Stewardship required.
Rock Barrens	<ul style="list-style-type: none"> Common in west side of Town; Potential for Eastern Hog-nosed Snake; Five-lined Skink; Milksnake to occur. 	<ul style="list-style-type: none"> Opportunities to include in two linkages east to west.
"Escarpment"	<ul style="list-style-type: none"> At Golden Beach Road. 	<ul style="list-style-type: none"> Unique feature that could be included in the E-W corridor north of the Muskoka River. Designated EP.
Watercourses	<ul style="list-style-type: none"> Beaver Creek; confluence of North and South Branches of the Muskoka River; Sharp's Creek Canyon and Smith Falls Canyon Heritage areas; Unique in Muskoka urban areas. 	<ul style="list-style-type: none"> Environmental Protection designation shadows all watercourses; emphasis on stewardship and management; focus on softening shorelines if possible.
Pathways of Connectivity	<ul style="list-style-type: none"> Key features include watercourses; marshes; barrens and canyons. 	<ul style="list-style-type: none"> Five primary corridors possible: <ol style="list-style-type: none"> East-west across Royal Muskoka that follows wetlands, rock barrens and fen and links to the following. East-west connects sewage lagoons through wetlands to Lake Muskoka with side branch connection through Henry Marsh to Muskoka River (residences a barrier at the River). East-west from Muskoka River across to Beaver Creek which includes the Least Bittern wetland, and could include the escarpment. North-south following Beaver Creek from Heritage Area in NW to Muskoka River. East-west along Sharpe's Creek under Highway 11 towards east.

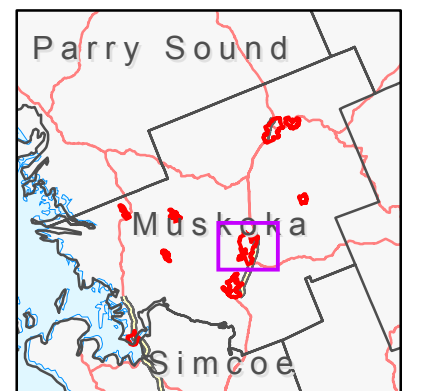
Note: Need to screen for Butternut, Ginseng, Bald Eagle (throughout) and Cerulean Warbler (forest). Deer wintering areas patchy. Include as consideration in analysis for land use change.

The maps for Bracebridge show natural heritage outside the urban boundary. This additional area coincides with the "Near Urban Area" currently designated in the Town's Official Plan. This area is currently "Rural" in the Muskoka Official Plan. This additional natural heritage has been included in this report in recognition that the Town of Bracebridge is currently reviewing its Official Plan.

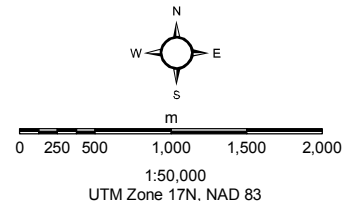
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- Legend**
- Urban Boundaries
 - Wetland
 - Open Water
 - Forest
 - Rock Barren



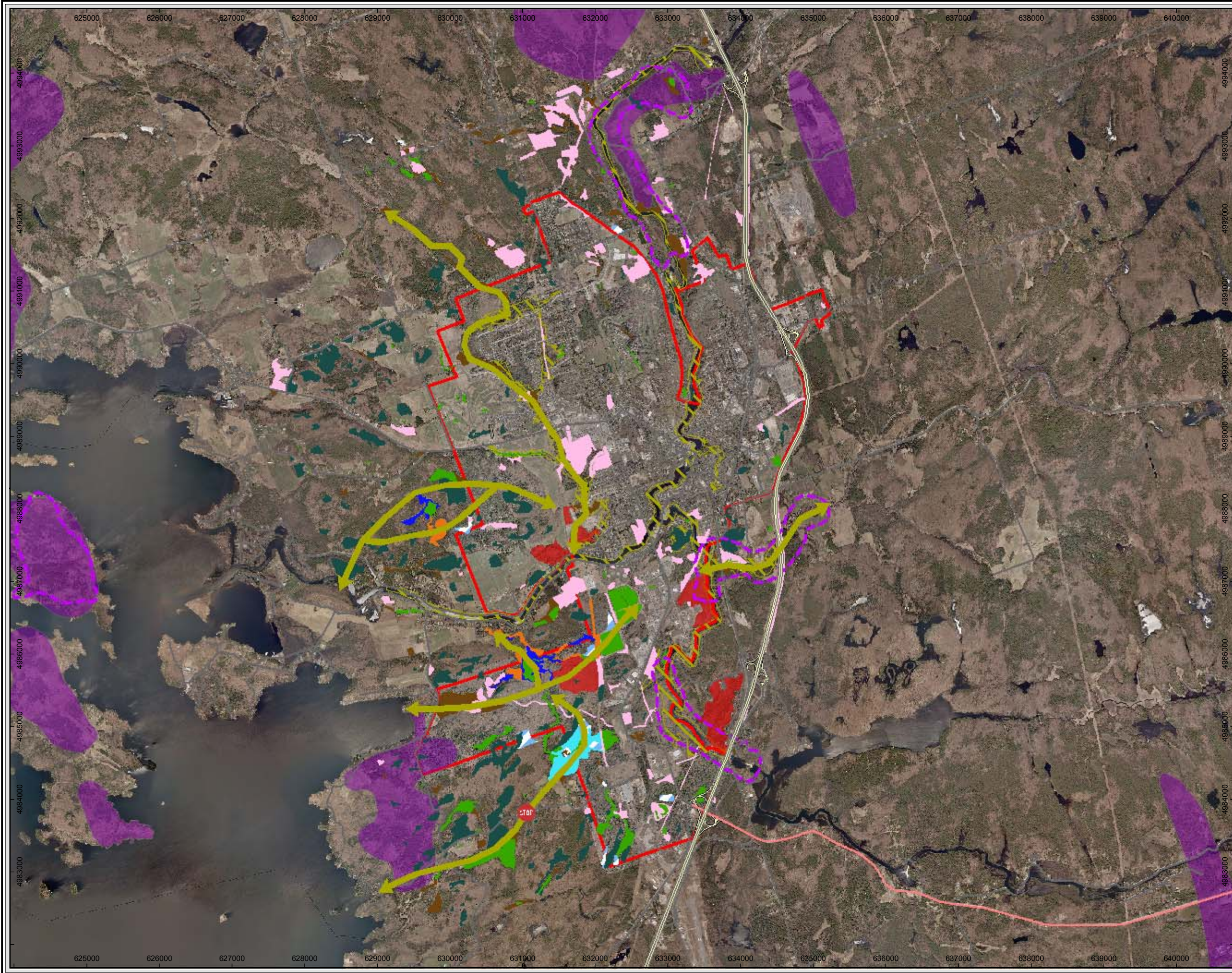
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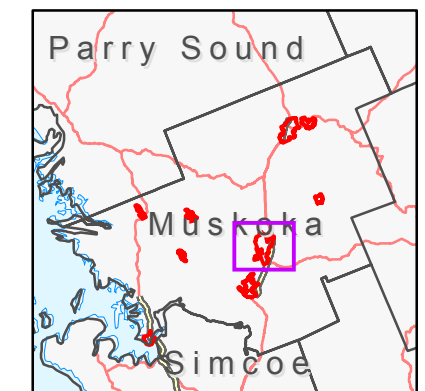
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Muskoka Natural Heritage Review
**Vegetation Classification
Bracebridge**
December 2010
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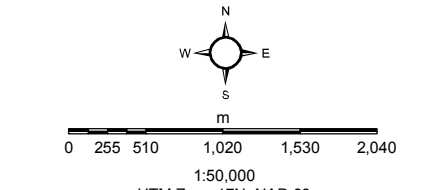
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- Legend**
- Primary Linkages
 - Secondary Linkages
 - Wildlife Movement Barrier
 - Deer Wintering Area
 - Wetland
 - Potential Rich Forest (Ecosite 24 and 26)
 - Muskoka Heritage Area
 - Environmental Protection
- Potential Habitat Concentrations**
- Ribbonsnake
 - Golden-winged Warbler, Milksnake
 - Five-lined Skink, Milksnake
 - Ribbonsnake, Least Bittern
 - Ribbonsnake, Golden-winged Warbler
 - Ribbonsnake, Branched Bartonica
 - Ribbonsnake, Golden-winged Warbler, Least Bittern



Basemapping from Ontario Ministry of Natural Resources Orthophotography: 2008



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Muskoka Natural Heritage Review

**Natural Heritage Review
Bracebridge**

January 2011
Project 108286

3.2.3 Town of Gravenhurst

Although outside of the Gravenhurst urban centre, occurrences of Massassauga Rattlesnake, Branched Bartonia and Whip-poor-will⁷ were reported to occur in the forest/wetlands just west of the Town limits by members of the expert advisory committee. Torrance Barrens and Loon Lake Wetland Complex occur to the southwest. Barriers to movement for these species through the urban centre should be removed where possible.

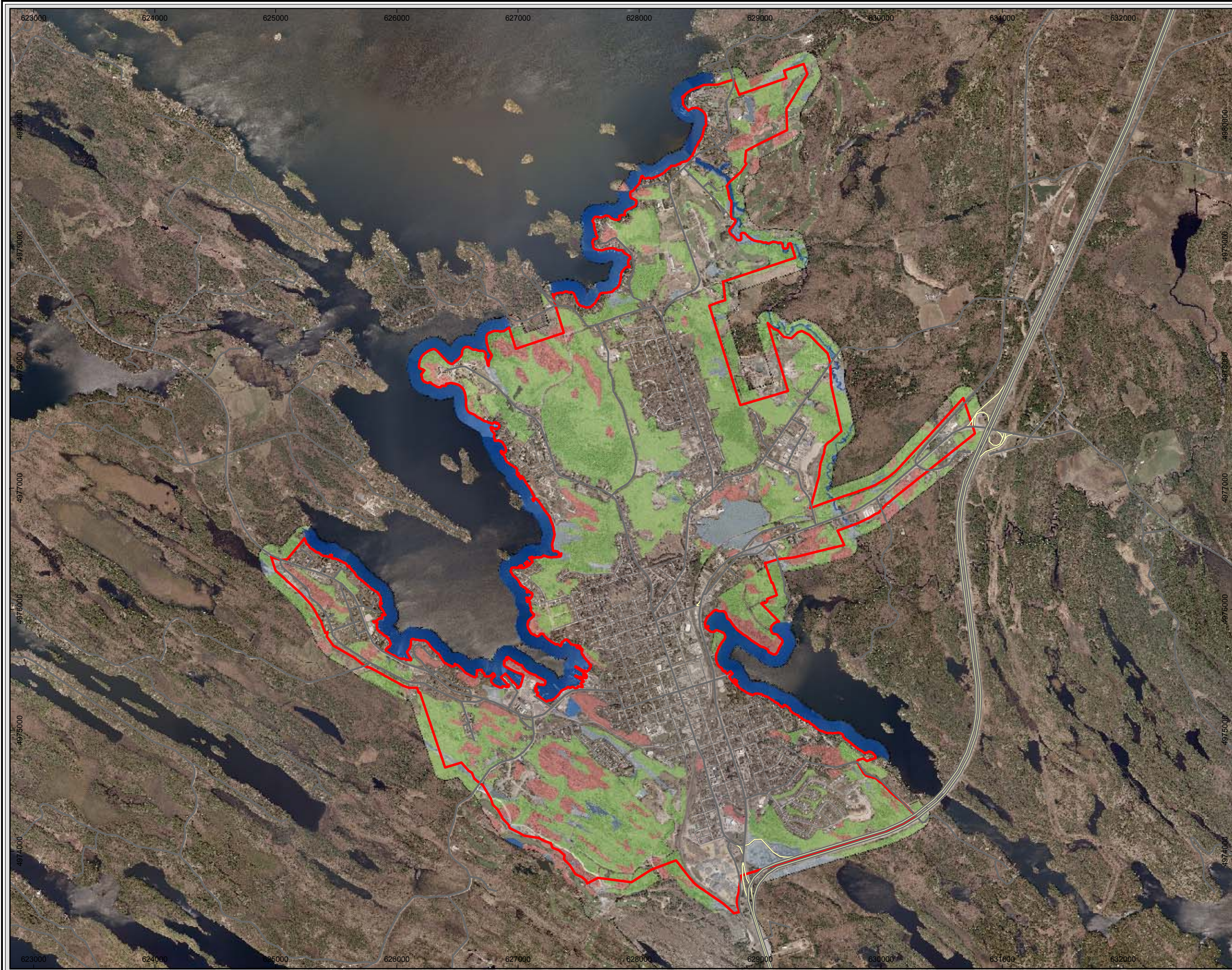
Table 11. Key Natural Heritage Features and Functions

Key Attributes	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Wetlands	<ul style="list-style-type: none"> Massassauga Rattlesnake and Blanding's Turtle identified in wetlands in SE; Potential for Eastern Ribbonsnake and Least Bittern to occur. 	<ul style="list-style-type: none"> Southern complex forms E-W linkage with one barrier at Highway 118.
Lakeshore (aquatic)	<ul style="list-style-type: none"> Northern Map Turtles have been found in Gull Lake as well as Eastern Musk and Northern Map Turtles in Lake Muskoka. Low potential for Spotted Turtle. 	<ul style="list-style-type: none"> Gravenhurst divides the Northern Map Turtle population, therefore connectivity would be desired across the town.
Rock Barrens	<ul style="list-style-type: none"> Located mainly in SW connected to Torrance Barrens; also in northwest and on Jones Road; Potential for Eastern Hog-nosed Snake; Five-lined Skink; Milksnake to occur. 	<ul style="list-style-type: none"> Opportunities to include in linkages E-W and SE-NW.
Pathways of Connectivity	<ul style="list-style-type: none"> Key features include the divided Northern Map Turtle populations; wetlands (Blanding's Turtle); rock barrens; potential rich forest (screen for Ginseng); Low probability of Northern Map Turtles actually using this terrestrial corridor as they are primarily aquatic, however if no corridor is protected, the probability is zero. Corridor also provides connectivity for many other species and therefore is important. 	<ul style="list-style-type: none"> Existing road network creates many barriers therefore there is no primary pathway. Secondary pathway connects Gull Lake to Lake Muskoka but crosses four barriers. Connectivity to north parallel to Chamberlain Drive provides another opportunity to connect water bodies that is not barriered.
Muskoka Heritage Areas	<ul style="list-style-type: none"> Jevins Lake southeast of urban centre. 	<ul style="list-style-type: none"> Highway 11 creates barrier from Gravenhurst, however proximity of important functions should be recognized and water balance maintained.

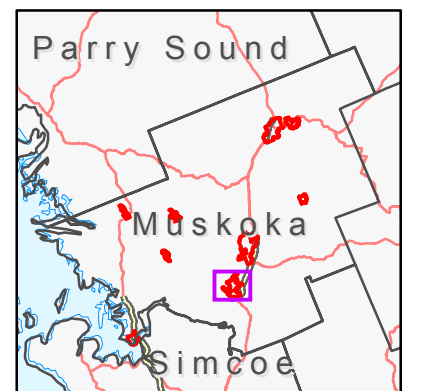
Note: Need to screen for Butternut, Ginseng, Bald Eagle (throughout) and Cerulean Warbler (forest). Deer wintering areas patchy. Include as consideration in analysis for land use change.

7. Whip-poor-will has been added to the SAR list after finalization of the scope of this investigation.

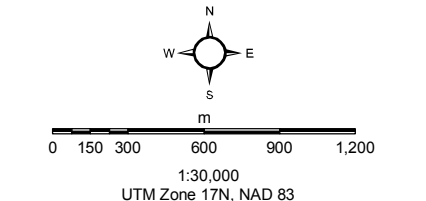
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- Legend**
- Urban Boundaries
 - Wetland
 - Open Water
 - Forest
 - Rock Barren



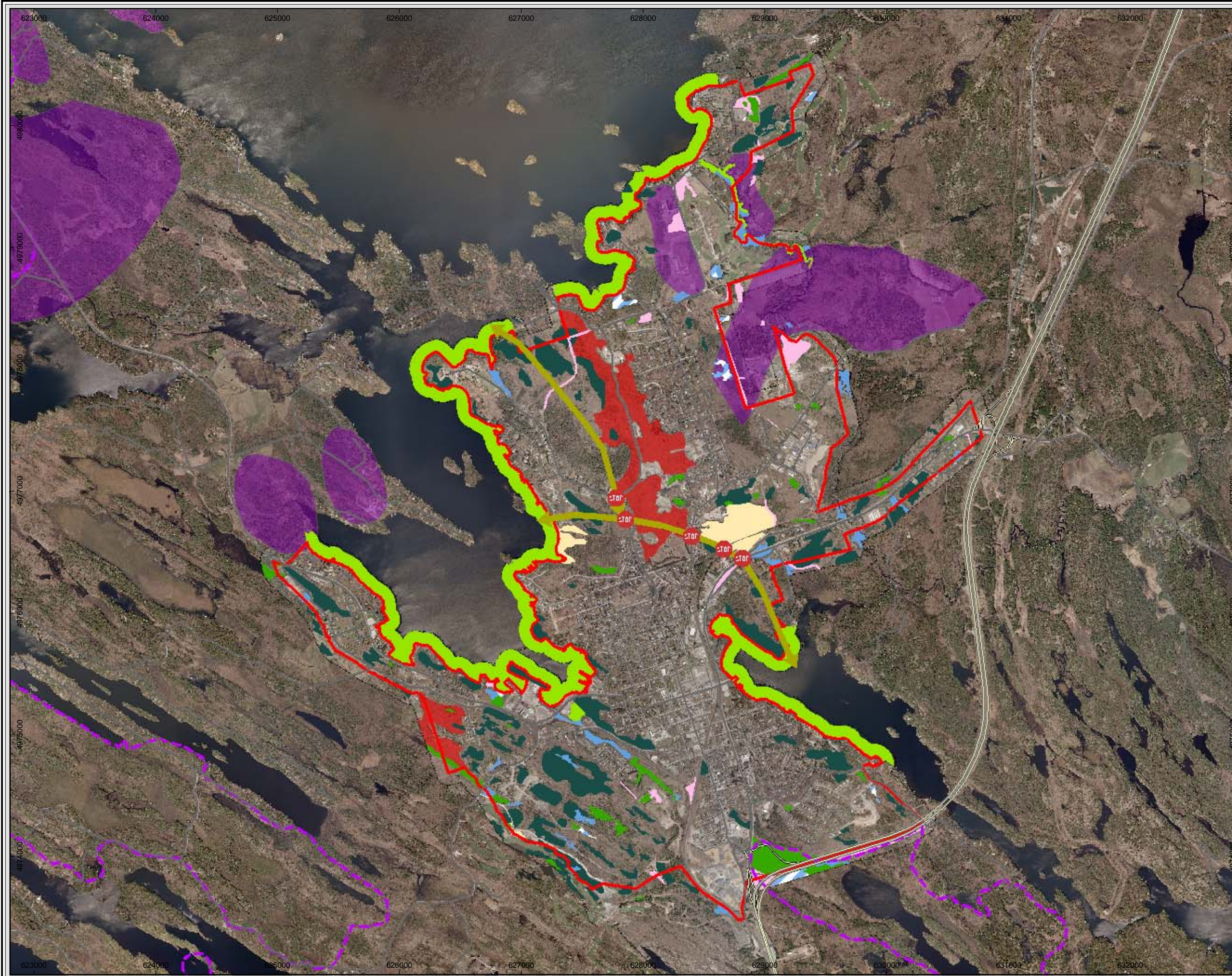
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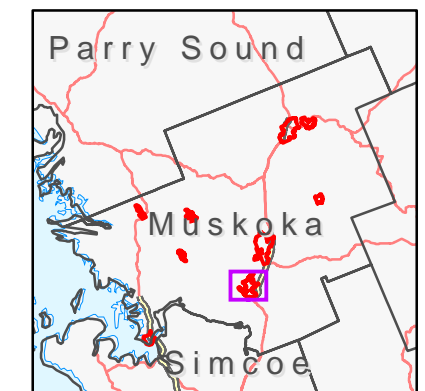
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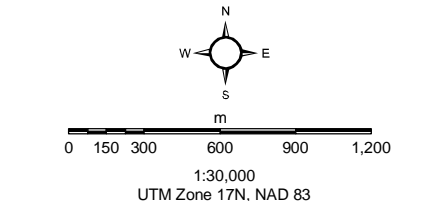
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- Legend**
- Primary Linkages
 - Secondary Linkages
 - Wildlife Movement Barrier
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 - Massassauga, Least Bittern
 - Ribbonsnake
 - Five-lined Skink, Milksnake
 - Golden-winged Warbler, Milksnake
 - Massassauga, Ribbonsnake, Golden-winged Warbler



Basemapping from Ontario Ministry of Natural Resources
 Orthophotography: 2008



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Muskoka Natural Heritage Review

**Natural Heritage Review
 Gravenhurst**

January 2011
 Project 108286

3.2.4 Town of Huntsville

3.2.4.1 Hidden Valley

The roadless wilderness to the north is a unique feature with respect to this urban centre that occupies the gap between two lakes. Big East River Muskoka Heritage Areas occur to the northwest to which connectivity should be maintained through the settlement area to the south.

Table 12. Key Natural Heritage Features and Functions

Key Attributes	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Wetlands	<ul style="list-style-type: none"> Wetlands patchy throughout the Town, connected by drainage corridors. Blanding’s Turtle reported from wetland in east, north of Highway 60. Potential for Eastern Ribbonsnake; Eastern Hog-nosed Snake to occur. 	<ul style="list-style-type: none"> E-W linkage north of Highway 60, and another parallel to the north.
Pathways of Connectivity	<ul style="list-style-type: none"> Key features include the wetlands, watercourses and Peninsula and Fairy Lakes. 	<ul style="list-style-type: none"> The southern E-W corridor has major barriers at Highway 60 plus at least 3 minor barriers. Follows major wetlands and a small creek in the west. Northern corridor branches to follow two topographic lows and wetlands and connects to Huntsville. Due to wilderness to the north there is excellent connectivity outside of Town to the north.

Note: Need to screen for Bald Eagle (throughout) and Peregrine Falcon. Deer wintering area outside of Town to the northeast.

3.2.4.2 Huntsville

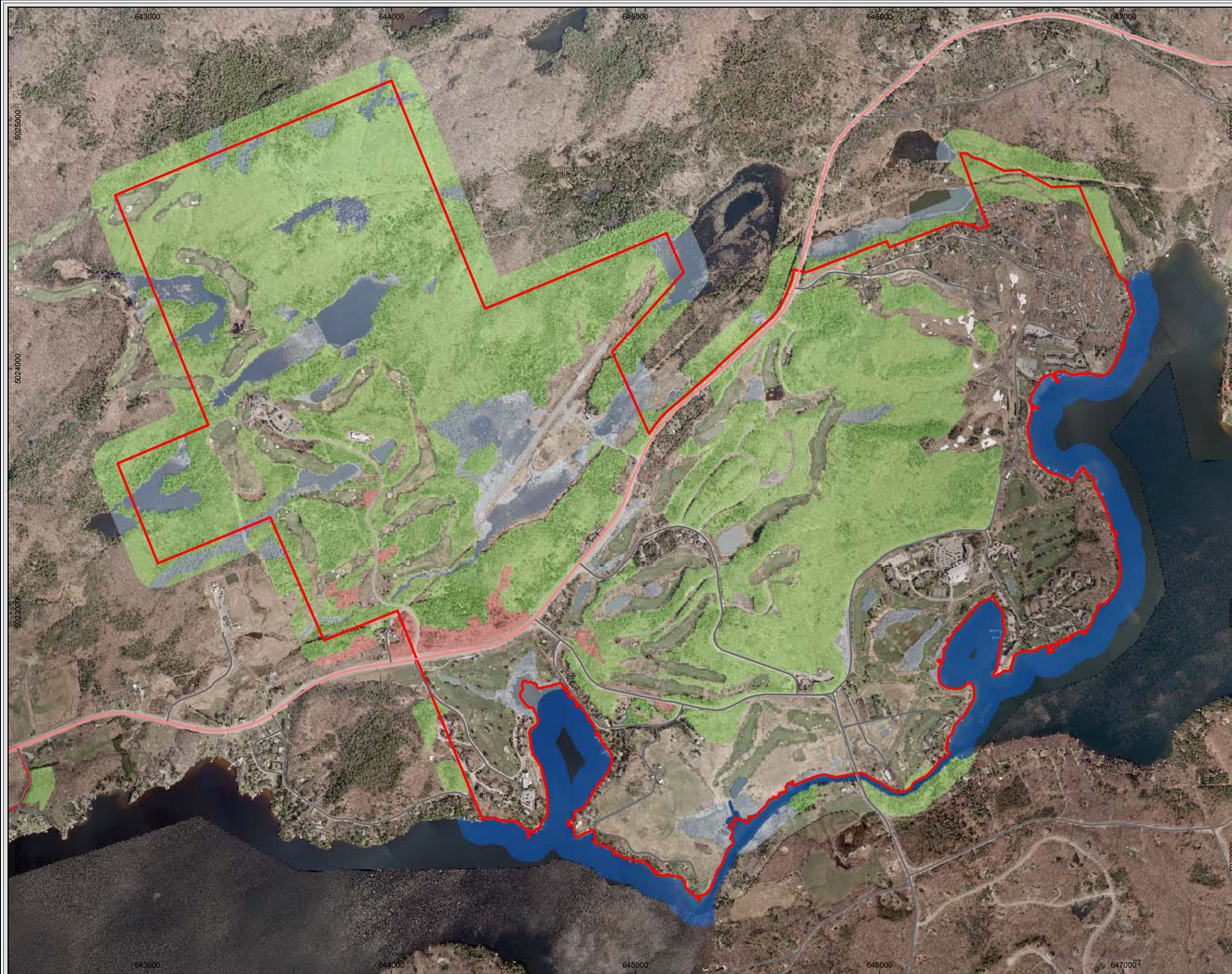
Major Muskoka Heritage Area/Environmentally Significant Area (ESA) associated with the Big East River occurs to the northwest. Lake Vernon and Fairy Lake are connected through the Town via drainage although a terrestrial connection is weak due to the settlement.






Table 13. Key Natural Heritage Features and Functions

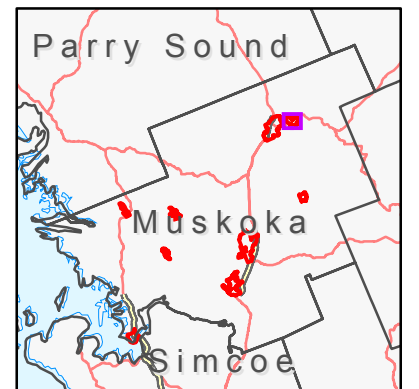
Key Attributes	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Wetlands	<ul style="list-style-type: none"> Some in “Huntsville Highlands” near deer wintering area and cliff. Connects south to Chub Lake. Marsh west of Fairy Lake reported to contain Blanding’s Turtle and Eastern Ribbonsnake. Screen for Branched Bartonian; Hog-nosed Snake. 	<ul style="list-style-type: none"> Southern complex forms E-W linkage with one barrier at Highway 11.
Steep Slopes	<ul style="list-style-type: none"> Mapped in SW corner of town. 	<ul style="list-style-type: none"> Impediments to or funnels for terrestrial wildlife movement. Opportunity for cliff-nesting species.
Pathways of Connectivity	<ul style="list-style-type: none"> Key features include the ESA, lakes and wetlands. 	<ul style="list-style-type: none"> Although there are opportunities to connect the ESA to Fairy Lake north of town, and then Fairy Lake to Chub Lake, Corridors through Town can be identified that provide a protected linkage. The north ESA – Fairy lake linkage must cross the mighty Highway 11 corridor creating a major barrier. However the link picks up drainage corridors the link to Hidden Valley. The north Fairy Lake to Chub Lake picks up wetlands (Eastern Ribbonsnake) and Forest; minor barriers in at least three places.

Note: Need to screen for Bald Eagle (throughout).

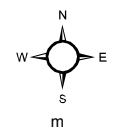
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- Legend**
-  Urban Boundaries
 -  Wetland
 -  Open Water
 -  Forest
 -  Rock Barren



Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2008



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UTM Zone 17N, NAD 83

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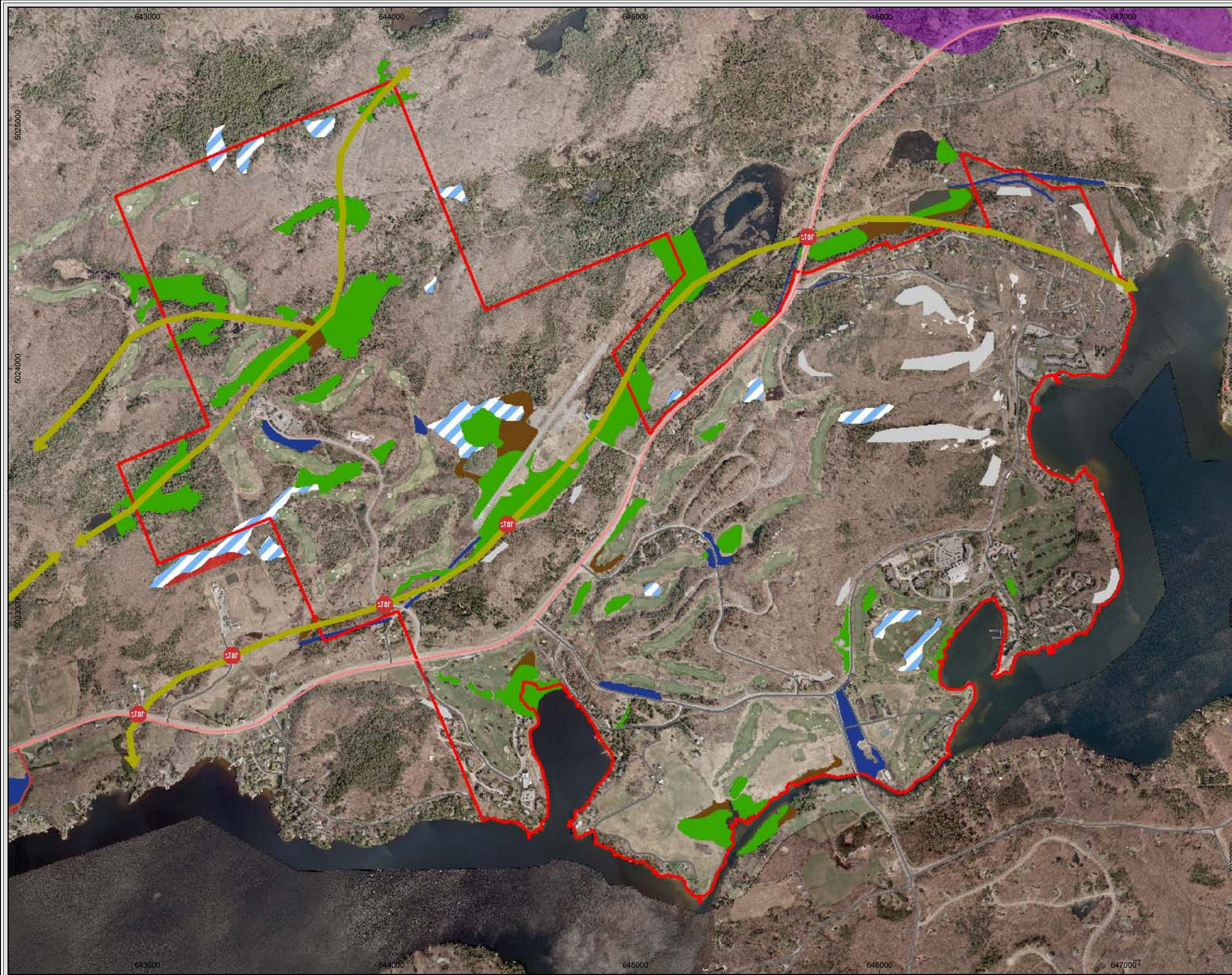
Muskoka Natural Heritage Review

**Vegetation Classification
Hidden Valley**

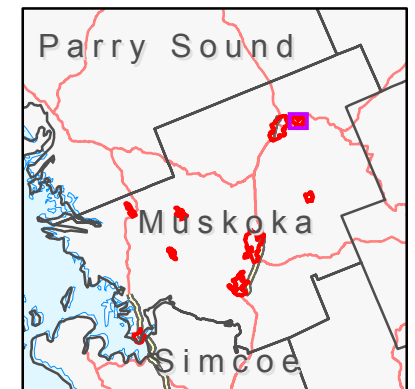
December 2010
Project 108286

AECOM

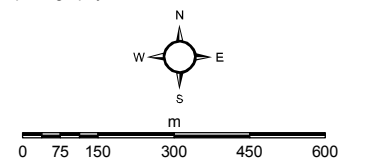
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- Legend**
- Primary Linkages
 - Secondary Linkages
 - Wildlife Movement Barrier
 - Wintering Area
 - Wetland
 - Potential Rich Forest (Ecosite 24 and 26)
- Potential Habitat Concentrations**
- Golden-winged Warbler
 - Peregrine Falcon
 - Ribbonsnake
 - Ribbonsnake, Golden-winged Warbler



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**Natural Heritage Review
Hidden Valley**

January 2011
Project 108286

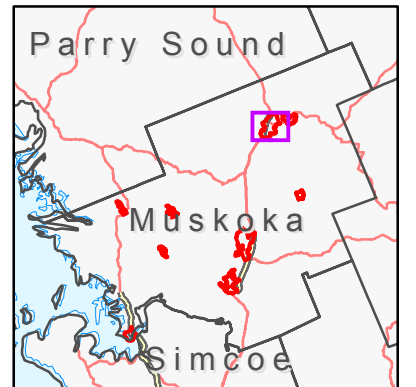


Figure 7

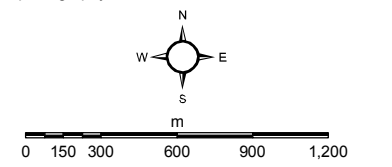
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- Legend**
- Urban Boundaries
 - Wetland
 - Open Water
 - Forest
 - Rock Barren



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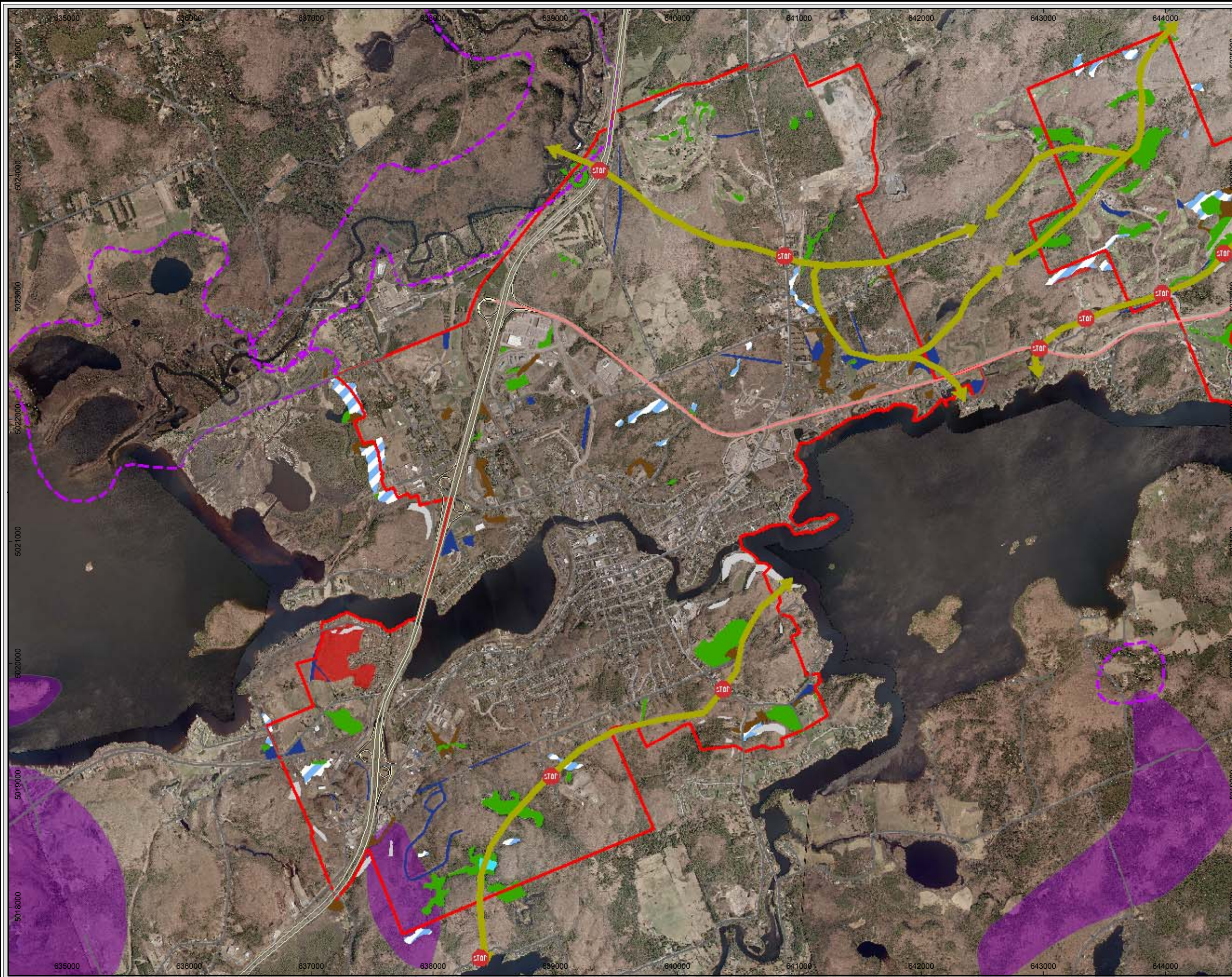
**Vegetation Classification
Huntsville**

December 2010
Project 108286

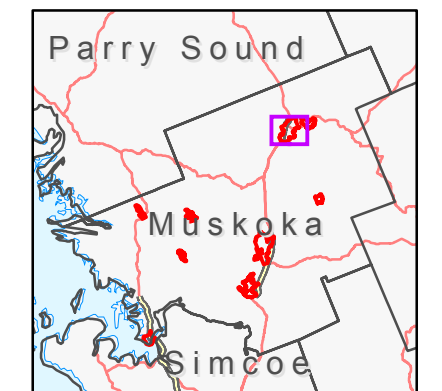


Figure 8

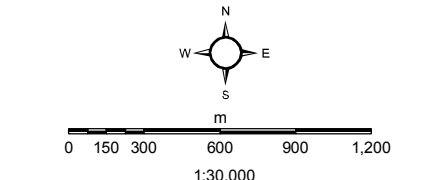
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- Legend**
- Primary Linkages
 - Secondary Linkages
 - Wildlife Movement Barrier
 - Deer Wintering Area
 - Wetland
 - Potential Rich Forest (Ecosite 24 and 26)
 - Muskoka Heritage Area
- Potential Habitat Concentrations**
- Golden-winged Warbler
 - Peregrine Falcon
 - Ribbonsnake
 - Ribbonsnake, Golden-winged Warbler
 - Ribbonsnake, Branched Bartonia



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Muskoka Natural Heritage Review

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Huntsville**

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3.2.5 Township of Georgian Bay

3.2.5.1 Mactier

Major settlement roads (Highways 69, 169 and District Roads) plus the railroad represent major barriers to connectivity. This urban centre is surrounded with high quality peat wetlands that provide for the second highest potential biodiversity in Muskoka.

Table 14. Key Natural Heritage Features and Functions

Key Attributes	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Wetlands	<ul style="list-style-type: none"> Potential for Blanding's Turtle; Massassauga; Branched Bartonina; Least Bittern; Spotted Turtle; Eastern Ribbonsnake to occur; MNR identified known hibernacula; known sites for Hog-nosed Snake to the west of the urban centre. 	<ul style="list-style-type: none"> Townsite provides a barrier to movement on a NE to SW axis therefore efforts should be made to maintain connectivity (permeable transportation corridors).
Lakeshore (aquatic)	<ul style="list-style-type: none"> Potential for Eastern Musk and Northern Map Turtles at lakeshore. 	<ul style="list-style-type: none"> Redevelopment projects and new applications should screen for these species.
Rock Barrens	<ul style="list-style-type: none"> Potential for Eastern Hog-nosed Snake; Five-lined Skink; Massassauga Rattlesnake; Milksnake. 	<ul style="list-style-type: none"> Higher potential for species occurrence when rock barrens are connected to forested or wetland habitat and barriers do not occur.
Pathways of Connectivity	<ul style="list-style-type: none"> Features are focused in a linear pattern on the west side of Mactier, but the town is surrounded by Provincially Significant Wetlands⁸. 	<ul style="list-style-type: none"> Highest quality pathway is the western corridor; pathways to the east and southeast impeded by roads, but should be recognized.

Note: Massassauga Recovery Team recommends corridor widths of 250 m.

3.2.5.2 Port Severn

As a coastal community, the opportunities for habitat niches in this area are reflected in the fact that the highest number of potential SAR habitats in any urban centre occurs here. The flat topography and shallow soils further complicate efforts to provide passageways under roads, therefore opportunities concurrent with drainage or other sources of relief are important. Note that the Georgian Bay Biosphere Reserve meets the coast and extends north from Port Severn.

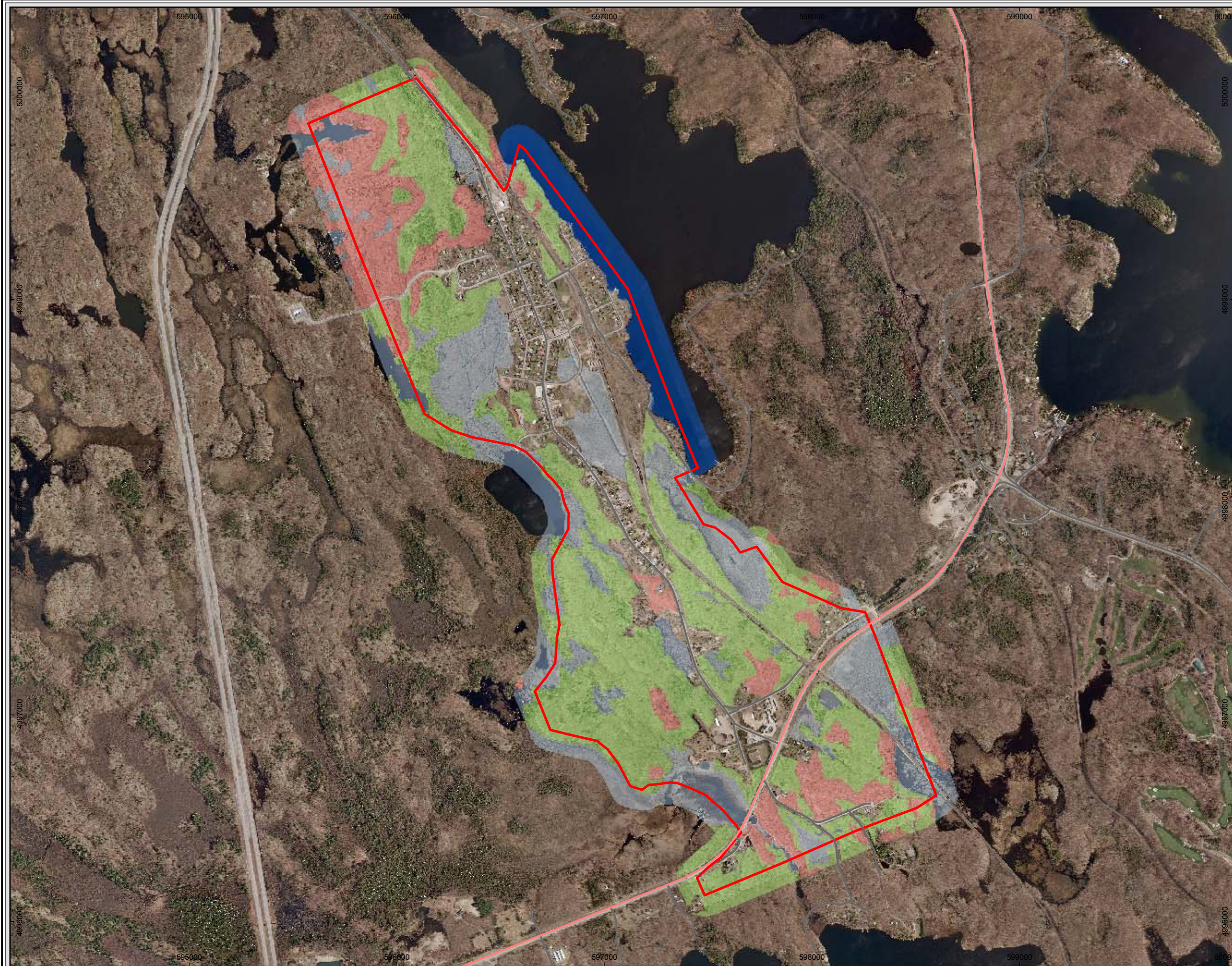
Table 15. Key Natural Heritage Features and Functions

Key Attributes	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Wetlands	<ul style="list-style-type: none"> Well documented Potato Island PSW/Eastern Georgian Bay Biosphere Reserve; fen north of M.R.5 (Spotted Turtle); Potential for Blanding's Turtle; Massassauga; Branched Bartonina possible in small fen; Least Bittern; Spotted Turtle; Eastern Ribbonsnake; Eastern Foxsnake. 	<ul style="list-style-type: none"> Most wetland associated with the coast, well-connected and site alteration will be controlled via PPS.
Lakeshore (aquatic)	<ul style="list-style-type: none"> Eastern Musk and Northern Map Turtles common. 	
Rock Barrens – Includes the Port Severn Outlier (Eastern Foxsnake Hibernaculum)	<ul style="list-style-type: none"> Potential for Eastern Foxsnake; Eastern Hog-nosed Snake; Five-lined Skink; Massassauga Rattlesnake; Milksnake; Port Severn Outlier Muskoka Natural Area noted as Environmental Protection. 	<ul style="list-style-type: none"> Higher potential for species occurrence when rock barrens are connected to forested or wetland habitat and barriers do not occur.
Pathways of Connectivity	<ul style="list-style-type: none"> Key features include the PSW, fen, outlier and habitat for Eastern Foxsnake. 	<ul style="list-style-type: none"> Two high quality pathways. One crosses E-W and includes the outlier, but significant barriers are posed by M.R. 5; Second pathway follows Georgian Bay Coast and should be a minimum of 150 m wide. Check Eastern Foxsnake recovery plan when it becomes available.

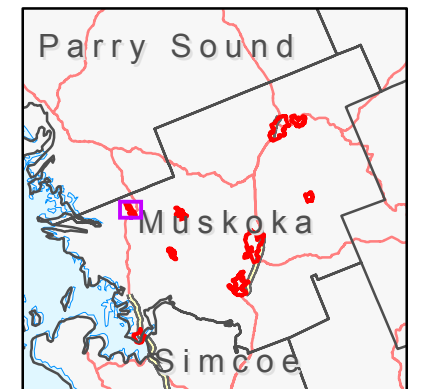
Note: Eastern Foxsnake is most likely to occur in identified pathways and also within 150 m of coast. Need to screen for Butternut due to southern location. Need to screen for Bald Eagle (throughout) and Cerulean Warbler (forest).

8. Assumed PSW based on the presence of an Endangered or Threatened species that would immediately score 250 points in a wetland evaluation, which qualifies the wetland as PSW.

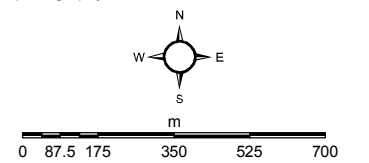
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- Legend**
- Urban Boundaries
 - Wetland
 - Open Water
 - Forest
 - Rock Barren



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Orthophotography: 2008



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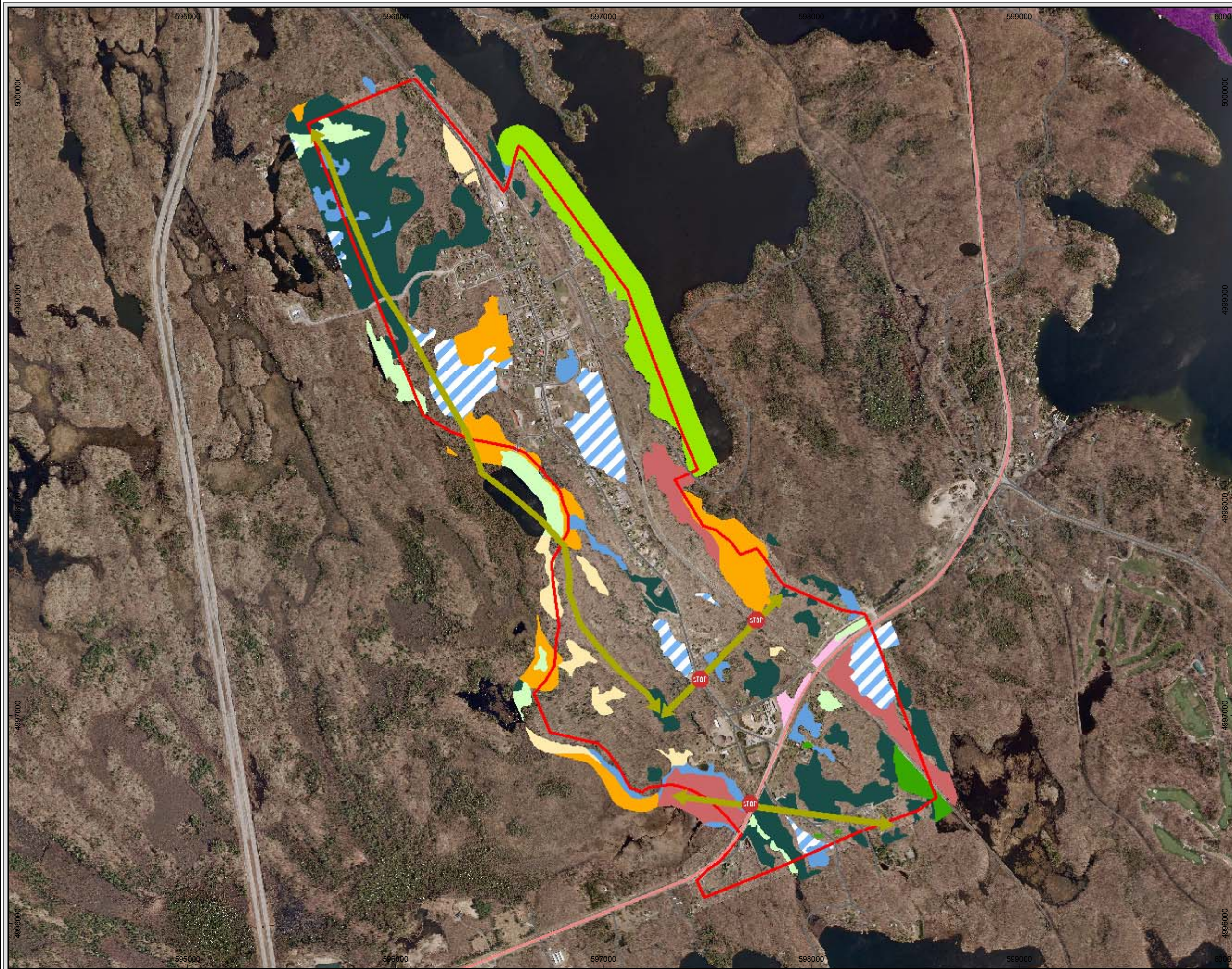
**Vegetation Classification
Mactier**

December 2010
Project 108286



Figure 10

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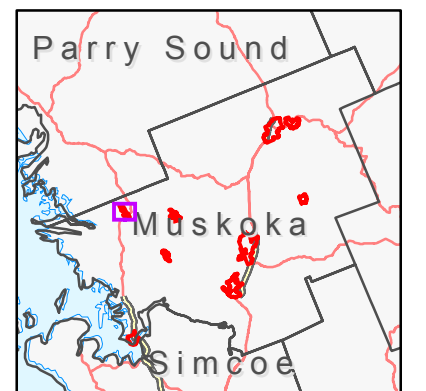


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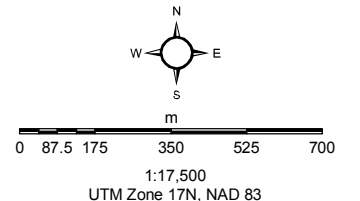
- Primary Linkages
- Secondary Linkages
- Wildlife Movement Barrier
- Deer Wintering Area
- Wetland

Potential Habitat Concentrations

- Spotted Turtle
- Eastern Musk Turtle
- Massassauga
- Ribbonsnake
- Five-lined Skink, Milksnake
- Golden-winged Warbler, Milksnake
- Ribbonsnake, Least Bittern, Spotted Turtle
- Massassauga, Ribbonsnake, Golden-winged Warbler
- Massassauga, Ribbonsnake, Bartonina, Spotted Turtle



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Muskoka Natural Heritage Review

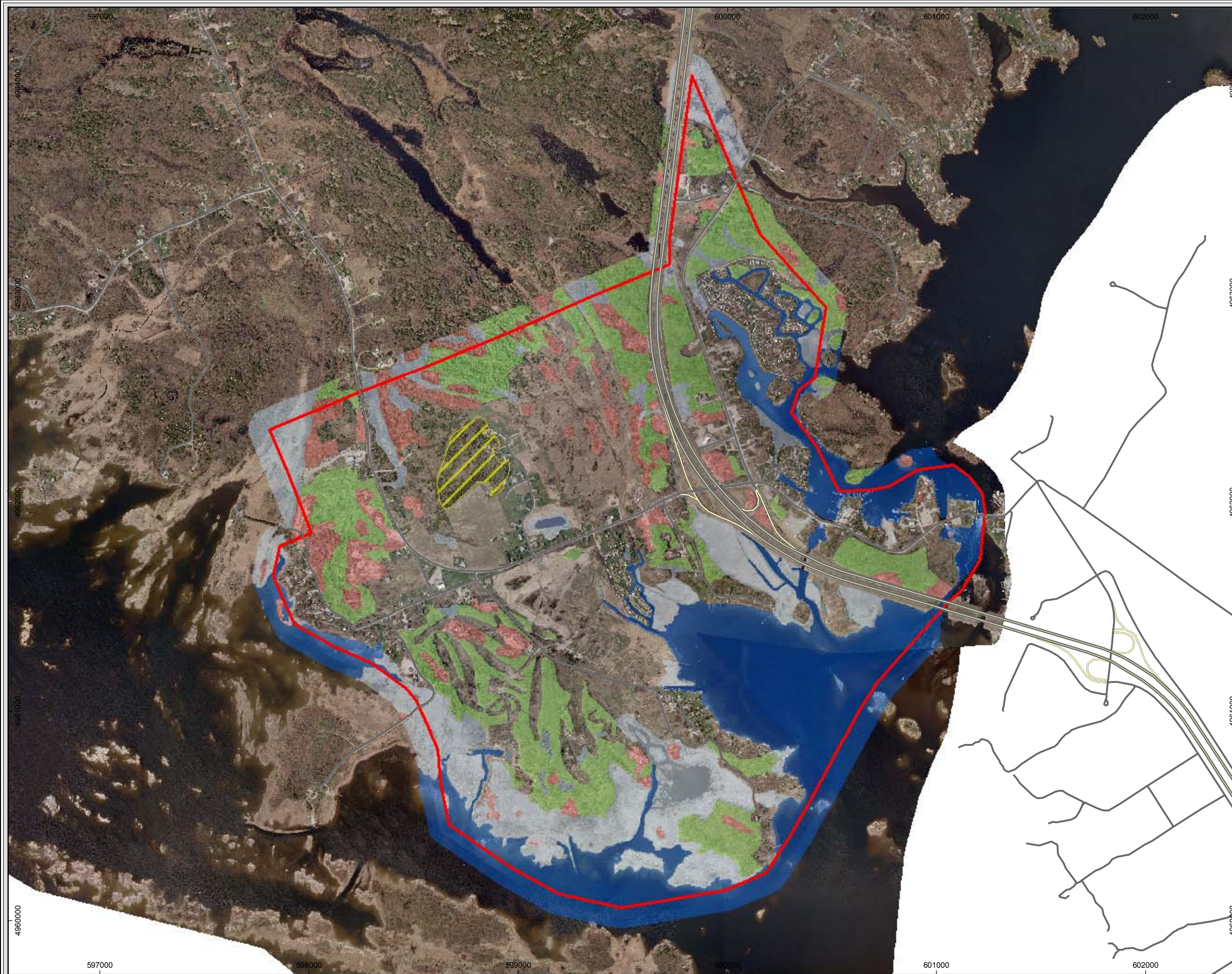
Natural Heritage Review

Mactier

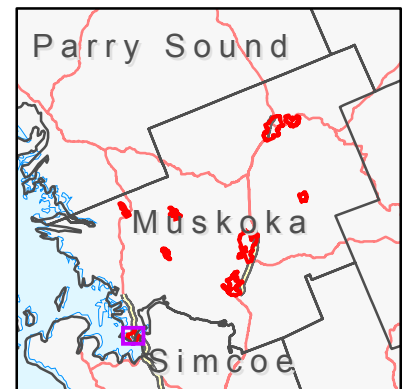
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Figure 11

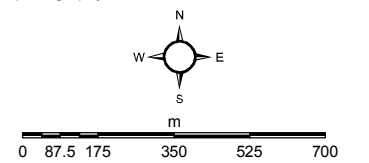
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- Legend**
- Urban Boundaries
 - Wetland
 - Open Water
 - Forest
 - Rock Barren
 - Limestone Outlier



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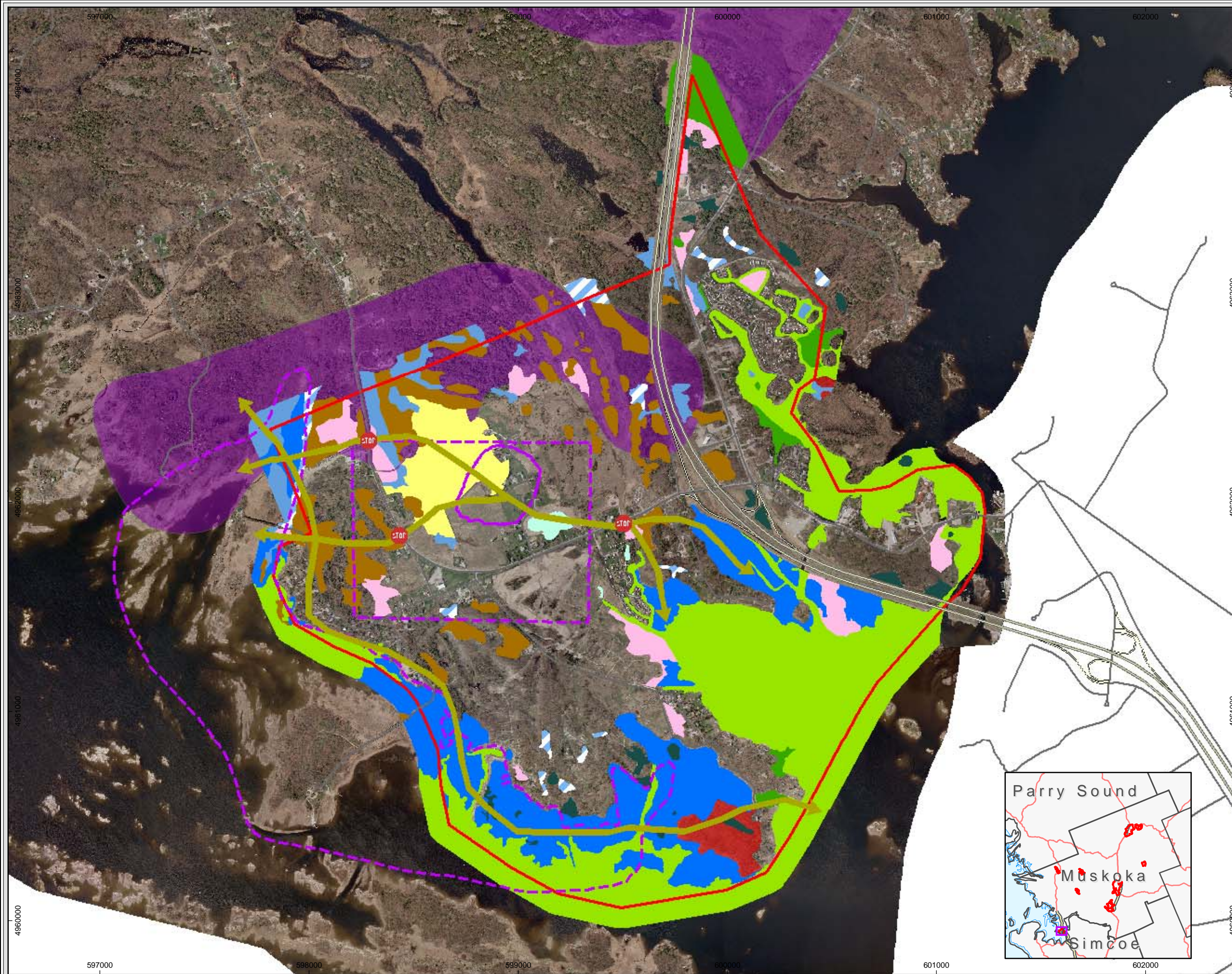
Muskoka Natural Heritage Review

**Vegetation Classification
Port Severn**

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Project 108286



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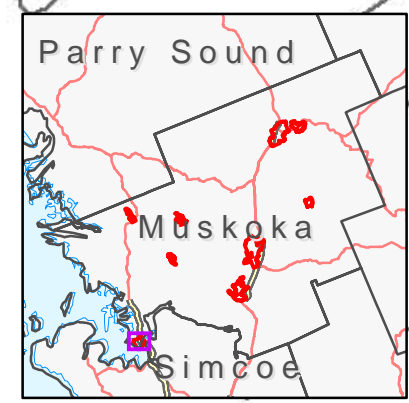


- Legend**
- Primary Linkages
 - Secondary Linkages
 - Wildlife Movement Barrier
 - Deer Wintering Area
 - Wetland
 - Potential Rich Forest (Ecosite 24 and 26)
 - Muskoka Heritage Area
- Potential Habitat Concentrations**
- Eastern Musk Turtle
 - Ribbonsnake
 - Golden-winged Warbler, Milksnake
 - Golden-winged Warbler, Milksnake, Eastern Foxsnake
 - Five-lined Skink, Milksnake
 - Five-lined Skink, Milksnake, Eastern Foxsnake
 - Massasauga, Ribbonsnake, Golden-winged Warbler
 - Ribbonsnake, Least Bittern, Spotted Turtle, Eastern Foxsnake
 - Ribbonsnake, Branched Bartonnia, Spotted Turtle, Eastern Foxsnake

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 Orthophotography: 2008

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Muskoka Natural Heritage Review

**Natural Heritage Review
 Port Severn**

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Figure 13

3.2.6 Township of Lake of Bays

3.2.6.1 Baysville

Extensive forest and wetland remains within the urban boundary. Highway 117 provides a major barrier to wildlife movement as does Brunel Road to a lesser extent.

Table 16. Key Natural Heritage Features and Functions

Key Attributes	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Lakes	<ul style="list-style-type: none"> Blanding's Turtle identified on waterfront basking on stumps. 	<ul style="list-style-type: none"> Recommend Stewardship initiatives to maintain in-lake structure and soften shorelines.
Wetlands	<ul style="list-style-type: none"> Swamps adjacent to shoreline; all EP; Potential for Blanding's Turtle; Eastern Ribbonsnake; Eastern Hog-nosed Snake. 	<ul style="list-style-type: none"> Important to maintain connection to the lake.
Pathways of Connectivity	<ul style="list-style-type: none"> Key features include the lake and associated natural features. 	<ul style="list-style-type: none"> Three pathways with a barrier; fourth that links Baysville to Dickie Lake along watercourse.

Note: Need to screen for Five-lined Skink (suggested by committee), Ginseng, Bald Eagle. No identified Deer wintering areas.

3.2.7 Township of Muskoka Lakes

3.2.7.1 Bala

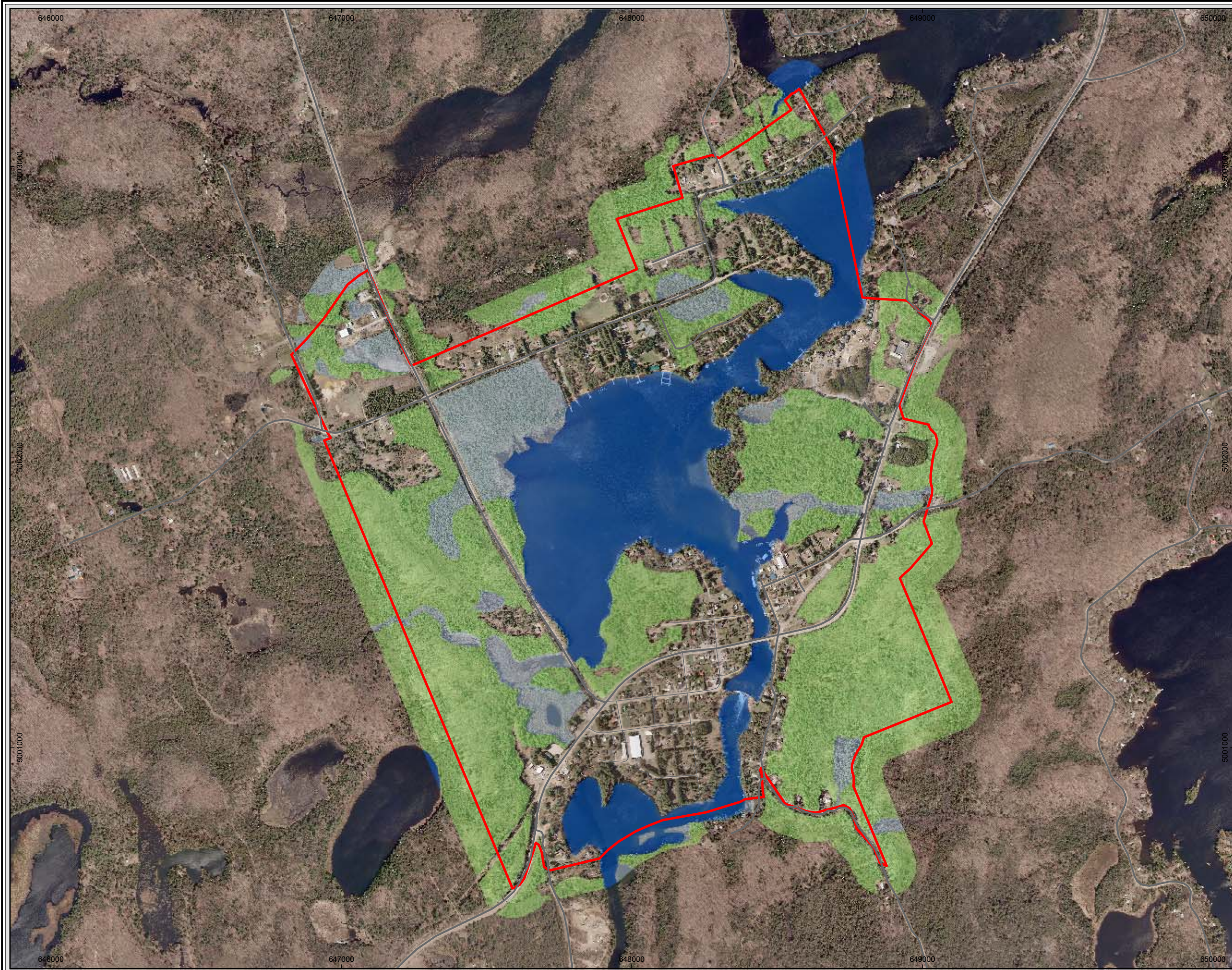
The position of the settlement crossed by Highway 169, District Road 38 and the railroad provides a major impediment to wildlife movement in an area with important potential habitat for at least 15 SAR species. An inventory of the western wetland would help to understand the importance of the western linkage.

Table 17. Key Natural Heritage Features and Functions

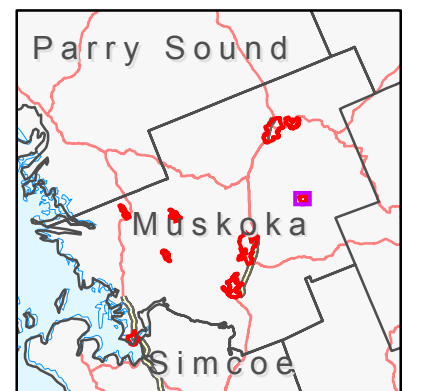
Key Attributes	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Wetlands	<ul style="list-style-type: none"> Blanding's Turtle (recorded); Potential for Massassauga; Branched Bartonian; Spotted Turtle; Eastern Ribbonsnake. 	<ul style="list-style-type: none"> Key wetland in the west; smaller isolated units could have Eastern Ribbonsnake.
Lakeshore (aquatic)	<ul style="list-style-type: none"> Potential for Eastern Musk and Northern Map Turtles. 	
Rock Barrens	<ul style="list-style-type: none"> Located mainly in north adjacent to rail line; Potential for Eastern Hog-nosed Snake; Five-lined Skink; Massassauga Rattlesnake; Milksnake. 	<ul style="list-style-type: none"> Higher potential for species occurrence when rock barrens are connected to forested or wetland habitat however barriers occur at rail line and Highway 169.
Pathways of Connectivity	<ul style="list-style-type: none"> Key features include the western wetland (with Blanding's Turtle); rock barrens in the east. 	<ul style="list-style-type: none"> Primary pathway in the west contains minor barrier of local road; secondary pathway in east connects the rock barrens with the coast and large forest to the north but with major barriers.

Note: Need to screen for Butternut, Bald Eagle (throughout) and Cerulean Warbler (forest). Deer wintering area in the north. Include as consideration in analysis for land use change.

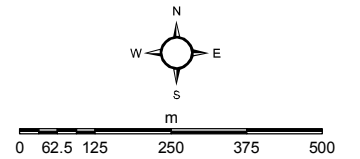
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- Legend**
- Urban Boundaries
 - Wetland
 - Open Water
 - Forest
 - Rock Barren



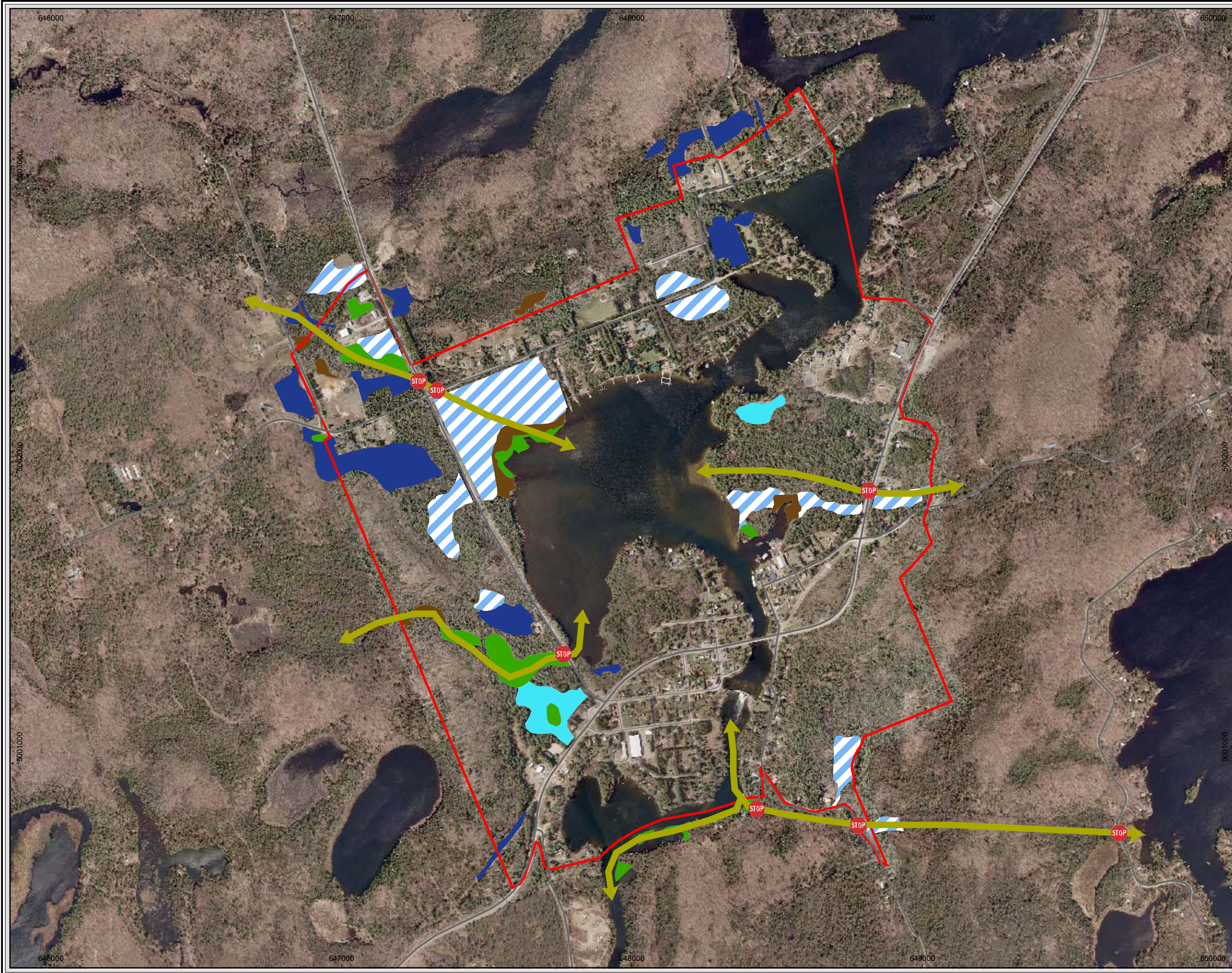
Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2008



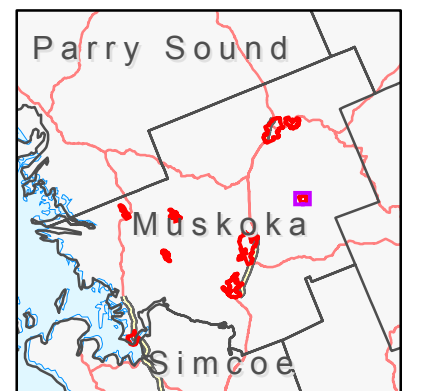
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Muskoka Natural Heritage Review
Vegetation Classification
Baysville
December 2010
Project 108286

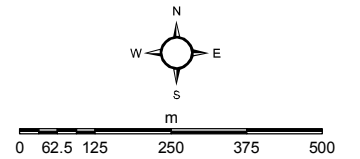
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- Legend**
- Primary Linkages
 - Secondary Linkages
 - Wildlife Movement Barrier
 - Wetland
- Potential Habitat Concentrations**
- Golden-winged Warbler
 - Ribbonsnake
 - Ribbonsnake, Golden-winged Warbler
 - Ribbonsnake, Branched Bartonia



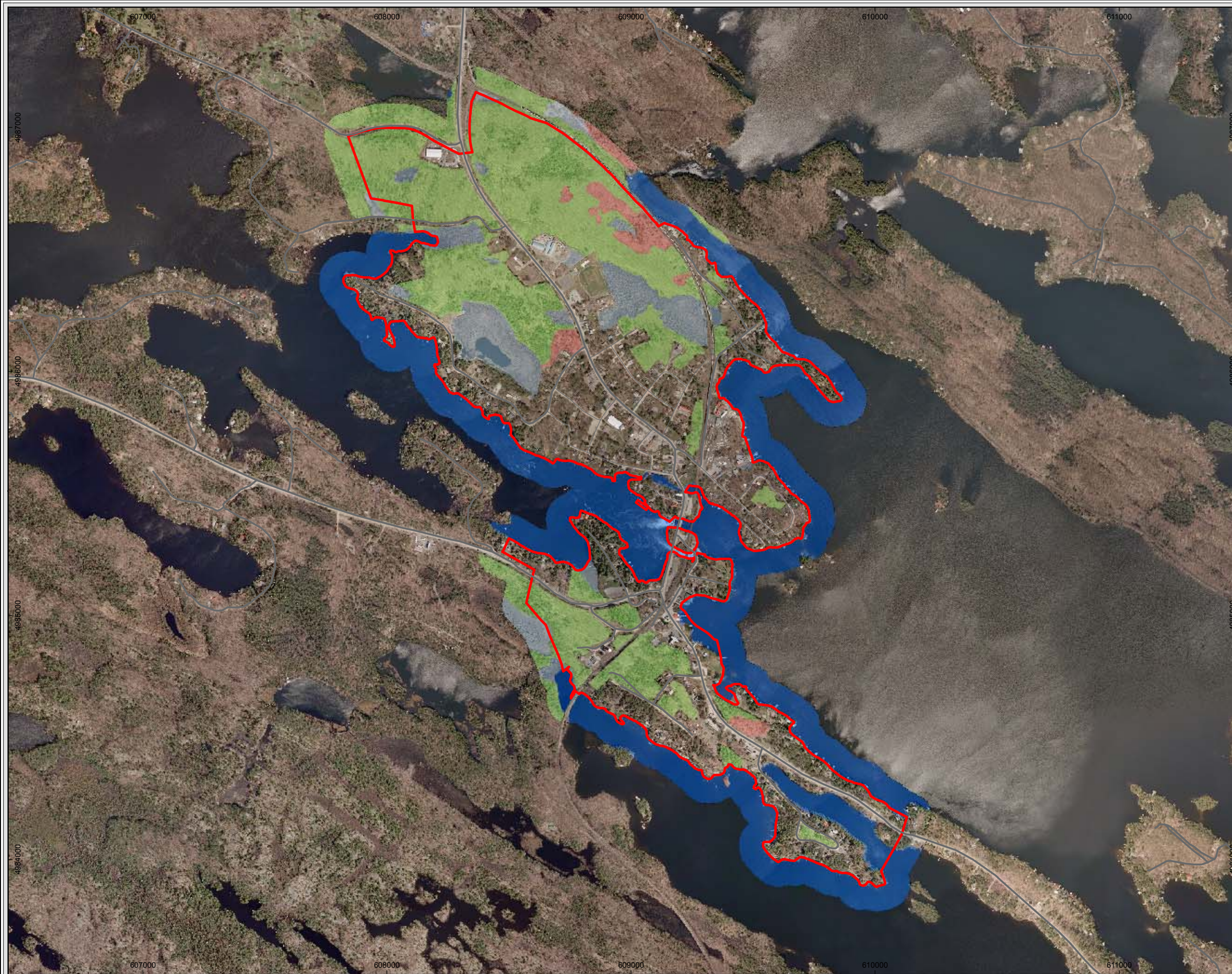
Basemapping from Ontario Ministry of Natural Resources Orthophotography: 2008



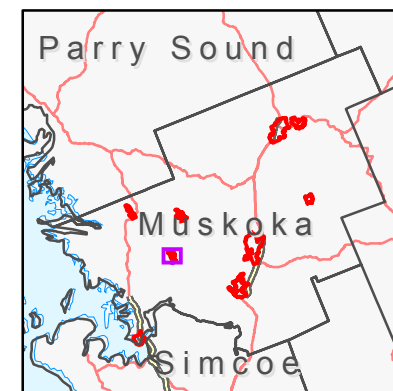
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Muskoka Natural Heritage Review
Natural Heritage Review
Baysville
January 2011
Project 108286

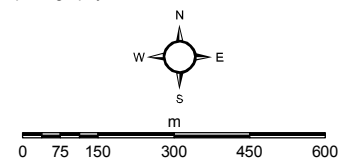
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- Legend**
- Urban Boundaries
 - Wetland
 - Open Water
 - Forest
 - Rock Barren



Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2008



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UTM Zone 17N, NAD 83

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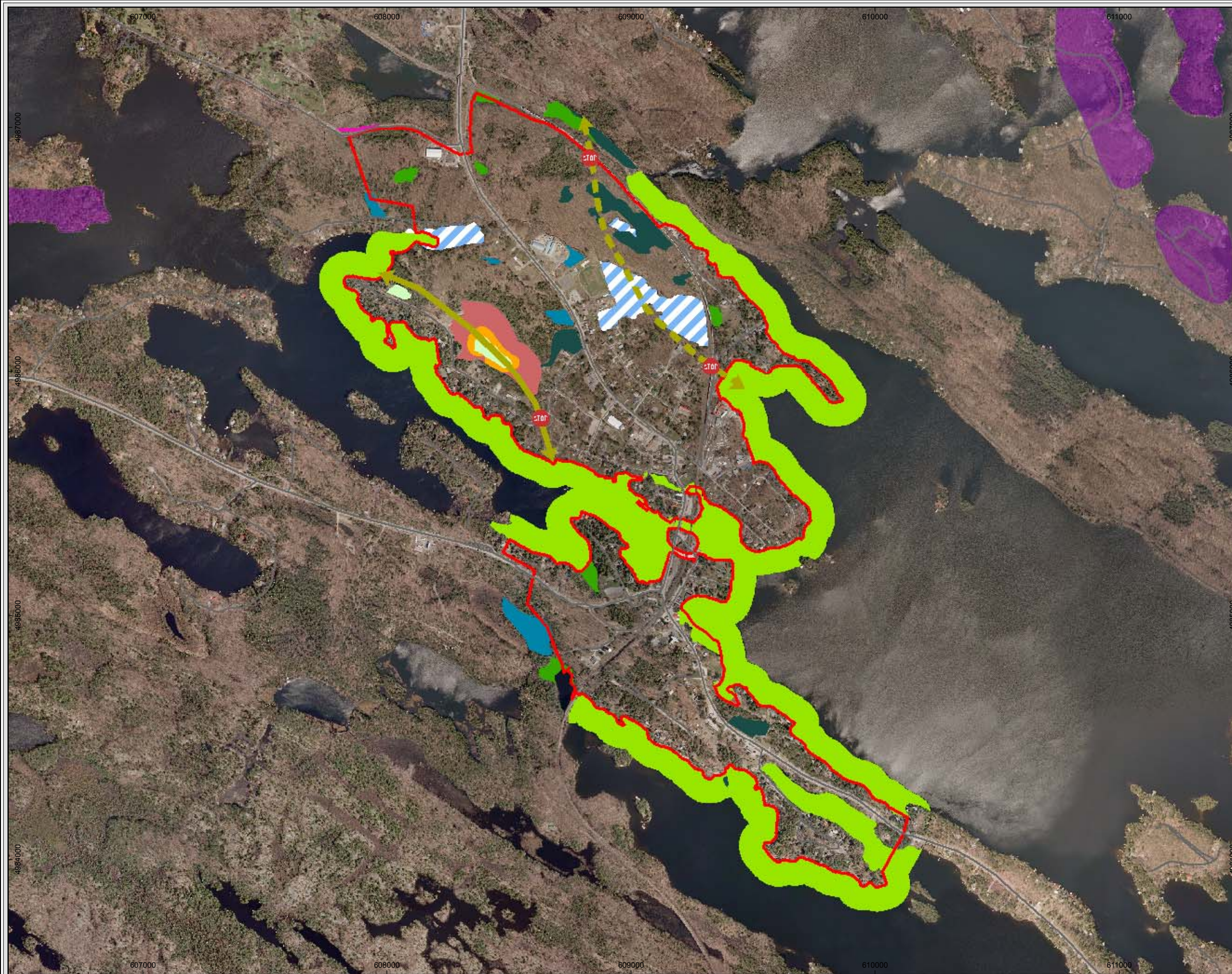
Muskoka Natural Heritage Review

**Vegetation Classification
Bala**

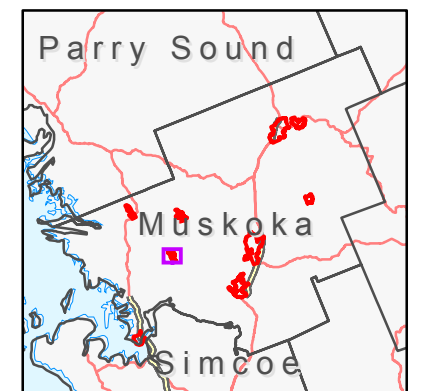
December 2010
Project 108286



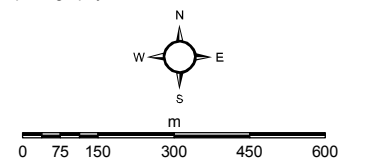
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- Legend**
- Primary Linkages
 - Secondary Linkages
 - Wildlife Movement Barrier
 - Deer Wintering Area
 - Wetland
- Potential Habitat Concentrations**
- Spotted Turtle
 - Eastern Musk Turtle
 - Ribbonsnake
 - Golden-winged Warbler, Milksnake
 - Five-lined Skink, Milksnake
 - Ribbonsnake, Least Bittern, Spotted Turtle
 - Massassauga, Ribbonsnake, Golden-winged Warbler
 - Massassauga, Ribbonsnake, Branched Bartonian, Spotted Turtle



Basemapping from Ontario Ministry of Natural Resources Orthophotography: 2008



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UTM Zone 17N, NAD 83

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Muskoka Natural Heritage Review

Natural Heritage Review
Bala

January 2011
Project 108286

AECOM

Figure 17

3.2.7.2 Port Carling

The curve of Highway 118 through the settlement provides a unique challenge to linking the deer wintering yards to the east and west. While aquatic linkages are well maintained, the intensity of shoreline development may limit habitat and migratory routes for SAR even though the potential exists for many SAR species.

Table 18. Key Natural Heritage Features and Functions

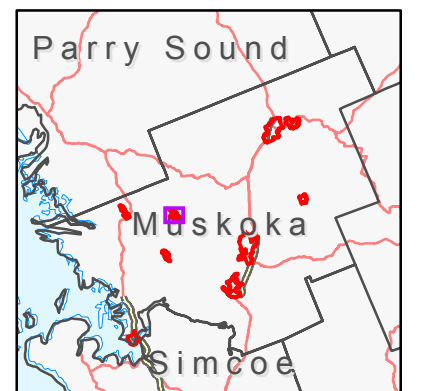
Key Attribute	Detailed Description and Potential Habitat	Potential Inclusion in NHS
Wetlands	<ul style="list-style-type: none"> Bog (Branched Bartonnia; Massassauga Rattlesnake) being filled in east of Highway 118. Connected complex in south. Must screen central-south wetland. Blanding’s Turtle recorded; Potential for Whip-poor-will. Least Bittern; Eastern Ribbonsnake. 	<ul style="list-style-type: none"> Southern complex forms linkage with one barrier at Highway 118.
Lakeshore (aquatic)	<ul style="list-style-type: none"> Potential for Eastern Musk and Northern Map Turtles. 	
Rock Barrens	<ul style="list-style-type: none"> Located mainly in north; Potential for Eastern Hog-nosed Snake; Five-lined Skink; Milksnake. 	
Pathways of Connectivity	<ul style="list-style-type: none"> Key features include the wetlands (Blanding’s Turtle, rare plants); rock barrens. 	<ul style="list-style-type: none"> Primary pathway follows drainage/wetlands in south with a parallel secondary corridor just to the north connecting Mirror Lake (on Indian River).; Highway 118 forms a significant barrier (need for ecopassages), as well as development on bay; another primary pathway occurs E-W in the north that links forest, rock barrens and wetland (Movement for Massassauga Rattlesnake; Eastern Ribbonsnake).

Note: Need to screen for Ginseng, Bald Eagle (throughout) and Cerulean Warbler (forest). Deer wintering areas flanking the Town. Include as consideration in analysis for land use change.

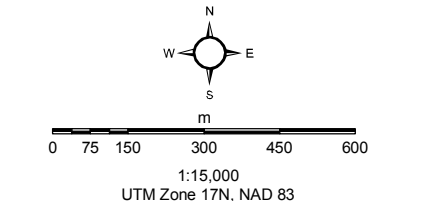
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- Legend**
- Urban Boundaries
 - Wetland
 - Open Water
 - Forest
 - Rock Barren



Basemapping from Ontario Ministry of Natural Resources
Orthophotography: 2008



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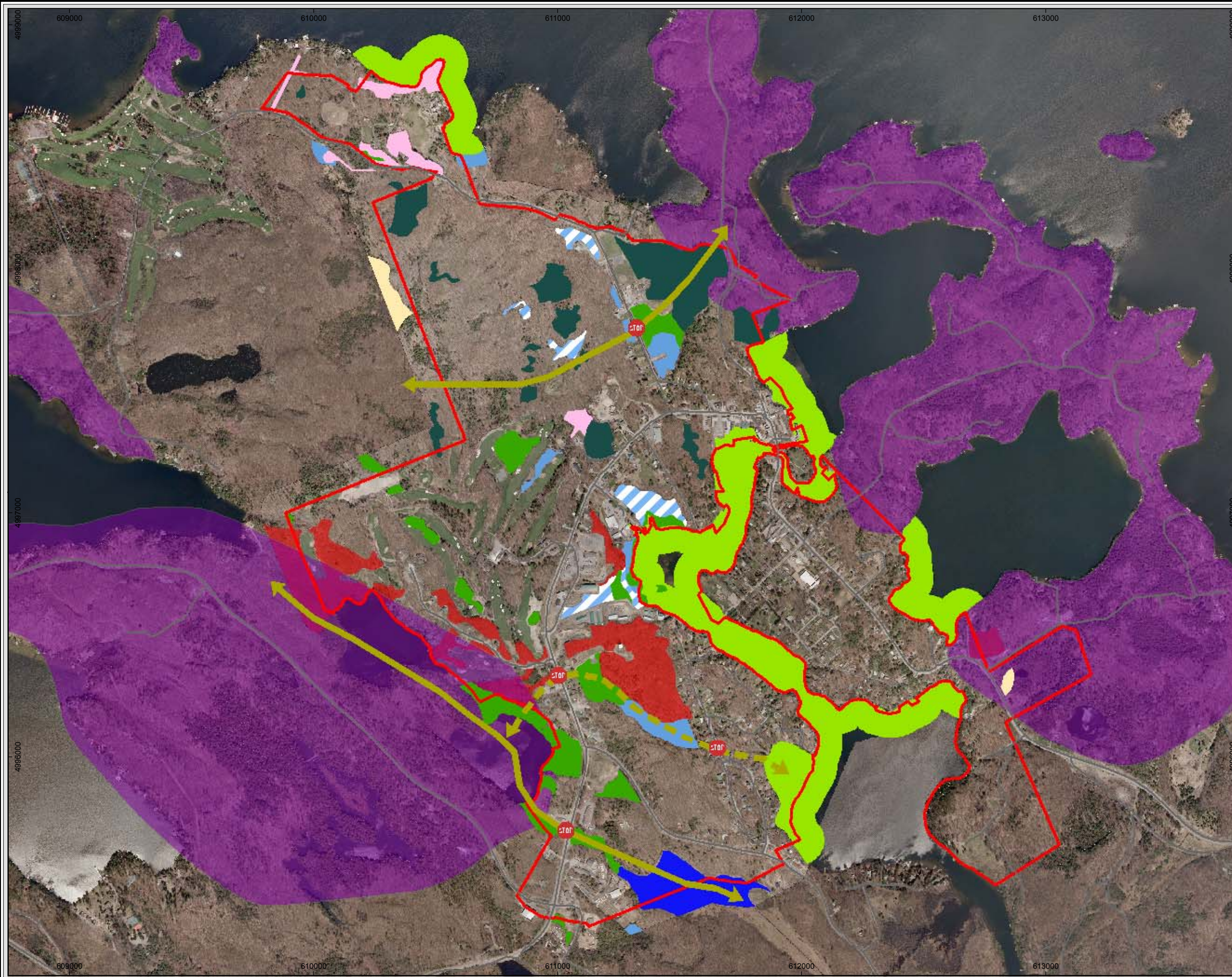
Muskoka Natural Heritage Review

**Vegetation Classification
Port Carling**

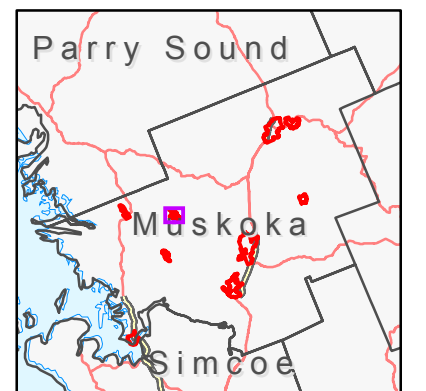
December 2010
Project 108286



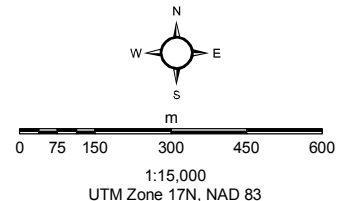
Map Document: (N:\projects\2009\901 612009\Final\GIS\Spatial\MXDs\NearUrbanCenterModels_FINAL_MAPS_May2010\NaturalHeritagePriority9015\NHPA_PortCarling.mxd) 01/28/2011 11:02:19 AM



- Legend**
- Primary Linkages
 - Secondary Linkages
 - Wildlife Movement Barrier
 - Deer Wintering Area
 - Wetland
 - Potential Rich Forest (Ecosite 24 and 26)
- Potential Habitat Concentrations**
- Eastern Musk Turtle
 - Massassauga
 - Ribbonsnake
 - Golden-winged Warbler, Milksnake
 - Five-lined Skink, Milksnake
 - Ribbonsnake, Least Bittern
 - Massassauga, Ribbonsnake, Golden-winged Warbler



Basemapping from Ontario Ministry of Natural Resources Orthophotography: 2008



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Muskoka Natural Heritage Review
**Preliminary Natural Heritage System
Port Carling**
January 2011
Project 108286

4. Considerations in Natural Heritage Planning for Urban Centres in Muskoka

Tables 10 through 18 provide a framework for the identification of Natural Heritage Systems within the urban centres for species that have been identified as being at risk, and incorporating Significant Wildlife Habitat through the inclusion of Muskoka Heritage Areas, Provincially Significant and other wetlands, wildlife concentration areas, watercourses and advice from the technical advisory committee. The associated Natural Heritage Review Mapping identifies the areas recommended to be of interest to the DMM as the basis for a natural heritage system in the context of the Provincial Policy Statement. In addition to the specific features, it is important to recognize that pathways of connectivity need to be identified as part of ongoing planning at the local scale, that are expected to include forested areas.

A User's Guide (Appendix A) has been prepared to assist in evaluating the potential for SAR in the urban centres. These provide some additional information on suggested survey approaches, preferred habitats and the potential for occurrence.

Six species could not be modelled at the urban centre scale but may occur within the urban centres (Table 8), Table 19 describes the screening parameters for these species that should be investigated at a site specific scale. Field investigations should be undertaken to determine whether these conditions occur within the urban centres, and to determine whether the species is present. When refining the Natural Heritage Systems (NHS) at the local scale, care should be taken to ensure that resiliency is built into the NHS by including these features and corridors that will constitute the final NHS.

Table 19. Additional Potential SAR Habitat to be Assessed at a Site Specific Scale

Species	Characteristics	Comments
Butternut	<ul style="list-style-type: none"> Forest openings, along forest edges, particularly stream banks and on calcareous soils and/or bedrock 	<ul style="list-style-type: none"> Any trees found must then be assessed by an MNR certified Butternut Assessor
Bald Eagle	<ul style="list-style-type: none"> Active nesting sites, particularly in super-canopy trees adjacent to large waterbodies 	<ul style="list-style-type: none"> Active nest sites should be very conspicuous to a field biologist
Cerulean Warbler	<ul style="list-style-type: none"> Large deciduous forest areas (>10 ha) dominated by Sugar Maple associated with Red Oak that are relatively open 	<ul style="list-style-type: none"> Higher potential west of large Muskoka lakes
Blanding's Turtle	<ul style="list-style-type: none"> Wetlands 	<ul style="list-style-type: none"> Blanding's Turtle are the most widespread SAR in Muskoka and may be found on dispersal almost anywhere in Muskoka. All site investigations should include incidental observations of this species regardless of habitat.
Northern Map Turtle	<ul style="list-style-type: none"> Shorelines of large lakes and rivers with basking sites 	<ul style="list-style-type: none"> Frequent along shorelines of Port Severn but probably not present in other urban areas.
Eastern Hog-nosed Snake	<ul style="list-style-type: none"> Forested areas in proximity to wetlands, also forest openings and rock barrens 	<ul style="list-style-type: none"> Very wide ranging and can occur in almost any habitat within range.

5. Discussion: NHS and Relationship to Development Review

Muskoka has identified, through the Muskoka Strategic Priorities 2008, that it has an interest in managing the legacy of a healthy Muskoka by sustaining a functioning natural environment, recognizing the need for a vibrant economy together with a caring community conscience supporting those in need.

This report is the first step toward the development of a Natural Heritage Strategy for Muskoka. The relationship between Growth and the management of a healthy, connected natural environment is clear. As planning exercises continue at the District and local levels, it will be important to identify a scope of investigations to ensure that Growth does not occur at the expense of important natural heritage features and functions. Additional study at the site specific level by a qualified biologist is recommended to document the presence and condition of the features and functions identified for each urban centre, in addition to the screening for species listed in Table 19 at a minimum. It is important to note that no targeted field investigations were undertaken in support of this analysis, and site specific field study will likely contribute important information in the future to modify the precision and accuracy of the framework provided.

6. Recommendations

- a) The Natural Heritage Review of Muskoka's urban centres identifies regionally significant natural heritage within the nine urban centres and could inform further efforts to identify a natural heritage system for Muskoka. Efforts to identify a regionally significant Natural Heritage System would benefit greatly from focused field investigations to verify the locations and health of natural heritage features and functions, and to better understand significant pathways of connectivity for wildlife and vegetation.
- b) As DMM builds its Natural Heritage Strategy, the outcomes of studies at the lower tier should inform the Regional Natural Heritage System and *vice versa*.
- c) The data provided in this report will assist the DMM and the Area Municipalities in identifying areas that are suitable for development within the urban centres.
- d) The framework should be used to identify the scope of environmental studies associated with land use change applications under the Planning Act with the objective of creating a sustainable natural heritage system for the District of Muskoka and for the urban centres.
- e) The list of Species at Risk in Ontario is updated every year, consequently the most current list will need to be consulted to determine if any additional species to those mapped in this report will need to be considered for site specific development applications within the urban centres. The list can be accessed on OMNR website at <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276722.html>.

7. References

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Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray, 1998:

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Natural Heritage Reference Manual for Policy 2.3 of the Provincial Policy Statement. OMNR, Ontario.

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Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp.

Appendix A

User Guide

User Guide

Introduction

This guide has been prepared to provide a summary of the Species at Risk (SAR) information and findings contained in the technical reports for the 2008-2010 completed by AECOM and Glenside Ecological Services Limited, namely Muskoka *Official Plan Review Background Study: Urban Centres Natural Heritage Review* and *Species at Risk: Potentially Suitable Habitat Mapping*. The aim is to help planners understand and apply this information to planning applications.

Assessments of potential suitable habitat for SAR were conducted at two different scales:

- For the entire District Municipality of Muskoka (landscape-level); and,
- For each urban centre.

As discussed in the source documents, some SAR do not have well defined habitats, therefore prediction of their occurrence is not possible. For species with more discriminating habitat preferences, habitat models were created to identify potential suitable habitat sensitive to the scale at which they may be applied.

The goal of this user's guide is to provide a user-friendly summary of the source documents that will help to identify the probability of encountering SAR at a specific site and therefore suitable study should be undertaken if land use change is proposed¹, and, to determine whether sufficient effort has been made in environmental studies to detect SAR during the report review phase. For the urban centres, the screening also includes wetlands and significant environmental features and landscape connectivity.

A summary page has been created for each SAR species addressed in the technical reports mentioned above. Information contained in each summary includes:

- Species scientific and common names
- Status (as of September 2009)
- Primary threats
- Availability of habitat model at each scale
- Key habitat requirements
- Ecological Land Classification (ELC) codes used in background mapping
- Recommended approach for site-specific surveys
- Potential for occurrence within District and urban centres

For planning applications within an urban centre, the following steps are recommended for determining what SAR should be addressed within the environmental studies:

1. *Consult Table 1 for which species have high potential in the urban centre and Potential for Occurrence summary information.*
2. *Look up ELC codes in summary sheets.*

1. *If it is anticipated that SAR could be encountered then the terms of reference for an Environmental Impact Study for the site should include appropriate methods to search for SAR and undertake required actions.*

3. Consult ELC background mapping and compare to relevant ELC codes listed in each summary sheet.
4. Compile suggested list of SAR for Terms of Reference for environmental studies.
5. Check the most current list of SAR since new species are added each year and some of the current species could be downlisted.

For planning applications outside of the urban centres, the following steps are recommended for determining what SAR should be addressed within the environmental studies:

1. Consult Potential for Occurrence summary information to determine general area of Muskoka where species is likely to occur.
2. Consult individual models in Species at Risk: Potentially Suitable Habitat Mapping (Glenside 2009) to determine if potentially suitable habitat exists in the vicinity of the proposed application.
3. Compile suggested list of SAR for Terms of Reference or scope.
4. Check the most current list of SAR since new species are added each year and some of the current species could be downlisted.

Table 1: Potential for SAR Occurrence for Urban Centres

Taxa	Species	High Potential	Low Potential
Plants	American Ginseng		ALL
	Branched Bartonia	Bala, Baysville, Bracebridge, Huntsville, Mactier, Port Severn	Gravenhurst, Port Carling
	Broad Beech Fern		ALL
	Butternut	Bracebridge	Bala, Gravenhurst, Port Severn
	Forked Three-Awned Grass		ALL
Insects	Monarch	ALL	
	West Virginia White		ALL
Birds	Bald Eagle	ALL	
	Cerulean Warbler		Bala, Gravenhurst, Mactier, Port Carling, Port Severn
	Golden-winged Warbler	ALL	
	Kirtland's Warbler		ALL
	Least Bittern	Bala, Bracebridge, Gravenhurst, Mactier, Port Carling, Port Severn	
	Peregrine Falcon	Hidden Valley, Huntsville	
	Red-headed Woodpecker		ALL
	Yellow Rail		ALL
Reptiles	Blanding's Turtle	ALL	
	Northern Map Turtle	Port Severn	Bala, Mactier, Port Carling, Bracebridge, Gravenhurst
	Spotted Turtle	Bala, Mactier, Port Carling, Port Severn	Gravenhurst,
	Eastern Musk Turtle	Bala, Gravenhurst, Mactier, Port Carling, Port Severn	
	Five-lined Skink	Bala, Bracebridge, Gravenhurst, Mactier, Port Carling, Port Severn	
	Eastern Foxsnake	Port Severn	
	Eastern Hog-nosed Snake	ALL	
	Massassauga Rattlesnake	Bala, Gravenhurst, Mactier, Port Carling, Port Severn	
	Milksnake	Bala, Bracebridge, Gravenhurst, Mactier, Port Carling, Port Severn	
Eastern Ribbonsnake	ALL		
Mammals	Puma		ALL

American Ginseng

Panax quinquefolius

COSSARO: END

COSEWIC: END

Primary threats:

- Loss of rich forests through forestry and development
- Harvesting for ginseng trade

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Calcareous soils
- Deciduous forest dominated by Sugar Maple
 - Rich
 - Moist
 - Undisturbed
 - Relatively mature

Background ELC Mapping:

Community class: Forested - FO

Community series: Deciduous forest – FOD

FEC ecosite (if available): 24 or 26

Recommended approach for site-specific survey:

- Difficult to observe
- Inventory by experienced plant taxonomist
- Most likely to be observed when in flower or when bright red berries are present during August and September
- Recommend fall botanical inventory (if potential for rich forests exist – spring or summer site visit should establish this)

Potential for occurrence:

- Low potential for all urban centres
- Low potential for calcareous soils throughout Muskoka
- Higher potential to occur where Potential Rich Forests have been identified (Ecosites 24 and 26 for urban centres) and Glenside model for district
- Higher potential in east Muskoka in proximity to Haliburton County where more records have been reported
- Has been reported from Wahta Mohawk Territory

Branched Bartononia

Bartonia paniculata ssp. *paniculata*

COSSARO: THR

COSEWIC: THR

Primary threats:

- Wetland loss and degradation

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Bogs and fens
 - Typically low shrub shore fens and poor fens
 - Older, well-established

Background ELC Mapping:

Community class: Wetland - WT

Community series: Fen/Bog - FB

Recommended approach for site-specific survey:

- Difficult to observe
- Inventory by experienced plant taxonomist
- If no alteration proposed for fens or bogs, site-specific survey not required

Potential for occurrence:

- Known Canadian range limited to Muskoka and Parry Sound
- High potential wherever fen and bogs occur throughout Muskoka
- High potential in Bala, Baysville, Bracebridge, Huntsville, MacTier and Port Severn;
- Low potential for Gravenhurst and Port Carling

Broad Beech Fern

Phegopteris hexagonoptera

COSSARO: SC

COSEWIC: SC

Primary threats: Loss of Carolinian forest in Southern Ontario

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Calcareous soils
- Deciduous forest dominated by Sugar Maple
 - Rich
 - Moist
 - Undisturbed
 - Mature

Background ELC Mapping:

Community class: Forested - FO

Community series: Deciduous forest – FOD

FEC ecosite (if available): 24 or 26

Recommended approach for site-specific survey:

- Difficult to distinguish between similar species
- Inventory by experienced plant taxonomist

Potential for occurrence:

- Muskoka observations are outliers from expected range (typically found in Carolinian forest)
- Low potential for calcareous soils throughout Muskoka
- Low potential for Muskoka and urban centres

Butternut

Juglans cinerea

COSSARO: END

COSEWIC: END

Primary threats: Butternut canker – fungal disease. This species is unique in that it has been designated endangered due to precipitous declines due to the pathogen, and yet remains a fairly common tree in southern Ontario.

Landscape model: NO

Urban centre model: NO

Key Habitat Requirements:

- Forest openings or edges
 - Particularly on floodplains with deeper soil in Muskoka
- Rich soils
- This tree is not tolerant of shading therefore is most frequently found on edges or in areas where the canopy is patchy.

Background ELC Mapping:

Community class: Forested - FO

Community series: Deciduous forest – FOD

Recommended approach for site-specific survey:

- During ecological classification, search for Butternut in forest openings and along forest edges, particularly stream banks
- Any Butternuts found should be reported to the Butternut Recovery Team; MNR-Certified Butternut Assessor to undertake Butternut Health Assessment if land use changes within 25 m of the tree(s).

Potential for occurrence:

- Occurs at low densities throughout range in Ontario
- High potential in south Muskoka, southern edge of Shield
- Reported from Bracebridge;
- Low potential in Bala, Gravenhurst and Port Severn

Forked Three-awned Grass

Aristida basiramea

COSSARO: END

COSEWIC: END

Primary threats:

- Cottage development
- Forestry

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Sand barrens
 - Dry
 - Open

Background ELC Mapping:

N/A

Recommended approach for site-specific survey:

- Difficult to observe
- Inventory by experienced plant taxonomist
- If suitable conditions are identified on site, survey grasses occurring in open, dry sandy areas

Potential for occurrence:

- At edge of northern range
- Likely always low numbers in Ontario
- Not likely to occur in any urban centres
- Most likely to occur along Georgian Bay coastline and islands

Monarch

Danaus plexippus

COSSARO: SC

COSEWIC: SC

Primary threats:

- Loss of wintering grounds in Mexico through deforestation
- Losses on migration
- Pesticide and herbicide use

Landscape model: NO

Urban centre model: NO

Key Habitat Requirements:

- Presence of milkweed, the host plant for larval stages.

Background ELC Mapping:

N/A

Recommended approach for site-specific survey:

- Site specific survey not recommended
- Refer to local Muskoka Field Naturalists Butterfly Count data for trends (see below). Still considered to be Common.

Potential for occurrence:

- Occurs throughout Ontario including Muskoka and all urban centres
- Habitat loss in Ontario not a significant threat

West Virginia White

Pieris virginiensis

COSSARO: SC

COSEWIC: N/A

Primary threats:

- Loss of forests containing host plant (Toothwort - *Cardamine diphylla*; *Cardamine maxima*)

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Presence of toothwort
 - Associated with rich forests

Background ELC Mapping:

N/A

Recommended approach for site-specific survey:

- Site specific survey not recommended

Potential for occurrence:

- Occurs at low density throughout range in Ontario
- Low potential throughout Muskoka and urban centres

Bald Eagle

Haliaeetus leucocephalus

COSSARO: SC

COSEWIC: N/A

Primary threats:

- Historical loss due to effect of organochlorine (e.g. DDT) pesticides on reproductive success
- Current threats include poaching, trapping, poisoning and electrocution

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Nesting sites
 - Super-canopy trees
 - Adjacent to large waterbodies

Background ELC Mapping:

N/A

Recommended approach for site-specific survey:

- Nests are very conspicuous and should not go unnoticed by a biologist conducting a site investigation
- Include on breeding bird surveys

Potential for occurrence:

- High potential throughout Muskoka including urban centres

Cerulean Warbler

Dendroica cerulea

COSSARO: SC

COSEWIC: SC

Primary threats:

- Forest fragmentation and degradation

Landscape model: NO

Urban centre model: NO

Key Habitat Requirements:

- Large area of deciduous forest
 - Dominated by Sugar Maple, associated with Red Oak
 - Open
 - Forest patch size exceeding 10 ha

Background ELC Mapping:

- Community class: Forested - FO
- Community series: Deciduous forest – FOD

Recommended approach for site-specific survey:

- Breeding bird survey

Potential for occurrence:

- Area-sensitive species – requires large forest patches or high percent forest cover
- Primarily a Carolinian species
- Muskoka is at northern edge of range
- Higher potential west of lakes

Golden-winged Warbler

Vermivora chrysoptera

COSSARO: SC

COSEWIC: THR

Primary threats:

- Hybridization with Blue-winged Warbler where ranges overlap

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Early successional forest and thickets

Background ELC Mapping:

- Community class: Forested - FO
- Community series: Deciduous forest – FOD

Recommended approach for site-specific survey:

- Breeding bird survey

Potential for occurrence:

- Muskoka lies north of Blue-winged Warbler range and represents area where Golden-winged Warblers do not overlap with Blue-winged Warblers
- Early successional habitat is generally not limited in Muskoka but is not permanent as forests mature
- High potential throughout Muskoka and urban centres

Kirtland's Warbler

Dendroica kirtlandii

COSSARO: END

COSEWIC: END

Primary threats:

- Loss of habitat through forest fire suppression

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Jack Pine forests
 - Early successional
 - Forest patch size exceeding 30 ha preferred

Background ELC Mapping:

- Community class: Forested - FO
- Community series: Deciduous forest – FOC

Recommended approach for site-specific survey:

- Breeding bird survey if suitable stands of Jack Pine located on site

Potential for occurrence:

- Area-sensitive species – requires large forest patches or high percent forest cover
- First breeding record in Ontario in 2007 near Petawawa
- Low potential throughout Muskoka and urban centres

Least Bittern

Ixobrychus exilis

COSSARO: THR

COSEWIC: THR

Primary threats:

- Loss of wetland habitat through agriculture and development
- Wetland degradation: this species is a visual hunter therefore impacts that create turbidity would lead to habitat loss.

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Marsh or thickets adjacent to open water
 - Habitat patch size exceeding 5 ha

Background ELC Mapping:

- Community class: Wetland - WT
- Community series: Marsh – MA or Thicket – SWT
- Habitat patch size exceeding 5 ha

Recommended approach for site-specific survey:

- Breeding bird survey – only if suitable wetland habitat is present on site
- Cautious use of Least Bittern call playback to detect presence. Generally this technique is not used to avoid disturbance: MNR should be consulted with respect to appropriate permits and methods.

Potential for occurrence:

- Secretive species; requires quiet habitat
- Mostly in The Land Between
- High potential west of Bracebridge
- High potential for Bala, Bracebridge, Gravenhurst, Mactier, Port Carling and Port Severn

Peregrine Falcon

Falco peregrinus anatum

COSSARO: THR

COSEWIC: SC

Primary threats:

- Historical loss due to effect of organochlorine (e.g. DDT) pesticides on reproductive success
- Current threats include poaching, trapping, poisoning and electrocution

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Cliffs: 50 – 200 m

Background ELC Mapping:

- N/A

Recommended approach for site-specific survey:

- Survey potential cliffs for evidence of nesting (using binoculars or scope) and/or observation of adults hunting. Any nest observations should be checked in the breeding season to rule out Common Raven.
- Interview local experts

Potential for occurrence:

- Suitable cliffs generally limited to northeastern Muskoka
- High potential in Hidden Valley and Huntsville

Red-headed Woodpecker

Melanerpes erythrocephalus

COSSARO: SC

COSEWIC: THR

Primary threats:

- Lack of standing snags (deadwood) for nesting cavities
- Nest site competition with European Starling
- The population increased rapidly following the Dutch Elm Disease epidemic that made nest sites common. With the removal/decay of these dead snags, competition for nest sites has become intense.

Landscape model: NO

Urban centre model: NO

Key Habitat Requirements:

- Nest sites in large dead trees (snags) and tend to favour open woods and edges.

Background ELC Mapping:

- N/A

Recommended approach for site-specific survey:

- Call playback survey (during breeding season) where potential nest sites occur, with caution.

Potential for occurrence:

- Low potential throughout Muskoka and urban centres

Yellow Rail

Coturnicops noveboracensis

COSSARO: SC

COSEWIC: SC

Primary threats:

- Loss of wetland habitat through agriculture and development

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Shallow marshes

Background ELC Mapping:

- Community class: Wetland - WT
- Community series: Marsh – MA

Recommended approach for site-specific survey:

- Breeding bird survey – only if suitable wetland habitat is present on site
- Call playback survey (during breeding season) where potential nest sites occur, with caution

Potential for occurrence:

- No observations in Muskoka
- Low potential throughout Muskoka and urban centres

Blanding's Turtle

Emydoidea blandingii

COSSARO: THR

COSEWIC: THR

Primary threats:

- Road mortality
- Nest predation

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Wetlands
 - Multiple small wetlands in proximity to each other

Background ELC Mapping:

- Community class: Wetland - WT

Recommended approach for site-specific survey:

- Search for basking turtles in wetlands and waterbodies
- Casual encounters crossing roads

Potential for occurrence:

- Highly mobile when dispersing from hibernacula in spring and in late summer
- High potential throughout Muskoka and urban centres

Northern Map Turtle

Graptemys geographica

COSSARO: SC

COSEWIC: SC

Primary threats:

- Shoreline development
- Loss of prey species due to Zebra Mussel establishment

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Shorelines of large lakes and rivers
 - With basking sites

Background ELC Mapping:

- N/A

Recommended approach for site-specific survey:

- Search for basking turtles along shorelines
- Snorkelling up to 6 m depth – easily detected when present.

Potential for occurrence:

- Highly aquatic
- Highest along Georgian Bay, big lakes and Severn River
- Low potential along Muskoka River and Bala, Bracebridge, Gravenhurst, Mactier, Port Carling
- Frequent occurrences at Port Severn

Spotted Turtle

Clemmys guttata

COSSARO: END

COSEWIC: END

Primary threats:

- Wetland loss and habitat alteration and destruction
- Nest predation

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Sphagnum bogs for hibernation

Background ELC Mapping:

- Community class: Wetland – WT
- Community series: Fen and bog - FB

Recommended approach for site-specific survey:

- Inventory by experienced herpetologist
- Search for congregations of turtles in spring and fall

Potential for occurrence:

- Highest potential west of lakes
- High potential in Bala, Mactier, Port Carling, Port Severn
- Low potential in Gravenhurst,

Eastern Musk Turtle

Sternotherus odoratus

COSSARO: THR

COSEWIC: THR

Primary threats:

- Shoreline development
- Nest predation

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Shallow water with a soft substrate

Background ELC Mapping:

- N/A

Recommended approach for site-specific survey:

- Nocturnal surveys in shallow quiet waters

Potential for occurrence:

- Highly aquatic – bask at water surface, feed at night
- Highest potential west of lakes and Severn River
- High potential in Bala, Gravenhurst, Mactier, Port Carling, Port Severn

Five-lined Skink

Eumeces fasciatus

COSSARO: SC

COSEWIC: SC

Primary threats:

- Habitat alteration and destruction
- Predation
- Road mortality

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Rock barrens
 - Near forests

Background ELC Mapping:

- Community Class: Rock Barrens - RB

Recommended approach for site-specific survey:

- Search under rocks and logs

Potential for occurrence:

- Tightly associated with The Land Between
- Highest potential west and south of lakes
- High potential in Bala, Bracebridge, Gravenhurst, Mactier, Port Carling, Port Severn

Eastern Foxsnake

Elaphe gloydi

COSSARO: THR

COSEWIC: END

Primary threats:

- Habitat alteration and destruction
- Road mortality

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Within 1 kilometre of Georgian Bay coastline
 - Wetlands and rock barrens

Background ELC Mapping:

- Community Class: Wetland – WT Rock Barrens – RB
- Community Series: Marsh – MA, Fen and bog – FB, all Rock Barrens – RBO, RBS, RBT

Recommended approach for site-specific survey:

- Through literature review and engagement with stakeholders in high risk areas may provide sufficient information.
- Any work that has the potential to disturb the species requires discussions with MNR. Use of snake boards is questionable for this species therefore capture and radio-telemetry may be the only alternative requiring permits under the Fish and Game Conservation Act as well as the Endangered Species Act.

Potential for occurrence:

- Restricted to within 1 km of Georgian Bay coastline
- Confirmed at Port Severn, no potential in other urban centres

Eastern Hog-nosed Snake

Heterodon platirhinos

COSSARO: THR

COSEWIC: THR

Primary threats:

- Road mortality, especially on sunny, but cool days when snakes are looking to increase body temperatures
- Persecution
- Relatively slow-moving snake that tends to play dead rather than escape threats making it vulnerable.

Landscape model: YES

Urban centre model: NO

Key Habitat Requirements:

- Large roadless areas
 - Wetlands and upland forests

Background ELC Mapping:

- N/A

Recommended approach for site-specific survey:

- Through literature review and engagement with stakeholders in high risk areas may provide sufficient information.
- Any work that has the potential to disturb the species requires discussions with MNR. Possible use of snake boards or capture and radio-telemetry may be the best alternatives requiring permits under the Fish and Game Conservation Act as well as the Endangered Species Act.

Potential for occurrence:

- High potential throughout Muskoka and all urban centres

Massasauga Rattlesnake

Sistrurus catenatus

COSSARO: THR

COSEWIC: THR

Primary threats:

- Road mortality, especially on sunny, but cool days when snakes are looking to increase body temperatures
- Persecution

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Hibernation sites
 - Swamps and fens and bogs
- Gestation sites

Background ELC Mapping:

- N/A

Recommended approach for site-specific survey:

- Inventory by experienced herpetologist
- Through literature review and engagement with stakeholders in high risk areas may provide sufficient information.
- Any work that has the potential to disturb the species requires discussions with MNR. Possible use of snake boards or capture and radio-telemetry may be the best alternatives requiring permits under the Fish and Game Conservation Act as well as the Endangered Species Act.
- Search for potential gestation sites

Potential for occurrence:

- Highest potential within 25 km of Georgian Bay coastline
- High potential in Bala, Gravenhurst, Mactier, Port Carling, Port Severn

Eastern Ribbonsnake

Thamnophis sauritus

COSSARO: SC

COSEWIC: SC

Primary threats:

- Loss of wetland habitat

Landscape model: YES

Urban centre model: YES

Key Habitat Requirements:

- Wetland specialist

Background ELC Mapping:

- Community Class: Wetland – WT
- Community Series: Open water aquatic – OAO, Marsh – MA, Swamp thicket – SWT, Fen and bog - FB

Recommended approach for site-specific survey:

- Through literature review and engagement with stakeholders in high risk areas may provide sufficient information.
- Any work that has the potential to disturb the species requires discussions with MNR. Possible use of snake boards or capture and radio-telemetry may be the best alternatives requiring permits under the Fish and Game Conservation Act as well as the Endangered Species Act.
- Use of snake covers
- Inventory by experienced herpetologist

Potential for occurrence:

- Lowest potential in northeast Muskoka
- High potential in all urban centres