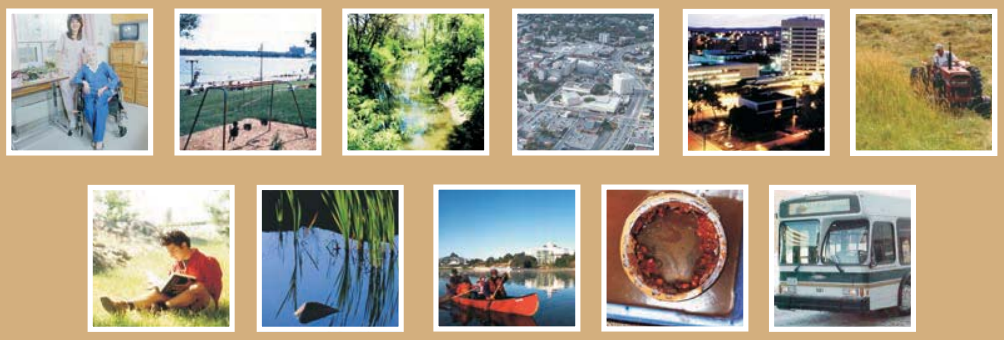

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Greater Sudbury
Natural Heritage Report

May 2013
Revised and Updated from 2005 Edition

Stephen Monet, Ph.D.

Cartography: David Grieve, Krista Carré

Environmental Planning Initiatives
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The Natural Heritage Report, first released in 2005, involved the contribution of numerous individuals from a variety of organizations in the community. This revised version benefits greatly from the initial contributions as well as some follow-ups. The City of Greater Sudbury greatly appreciates the contributions of the individuals and organizations listed below. Without their ongoing support and expertise, this document would not have been possible. Particular thanks is due to Edward Morris with Ontario Parks for his enthusiastic response to our numerous queries and his willingness to share his information and his knowledge of the natural heritage of the Greater Sudbury area. The ideas, approaches and information contained in this document, however, do not bind or limit the ability of these individuals or organizations to express opinions or adopt positions that differ from those found in this document.

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Table of Contents

1. INTRODUCTION

The City of Greater Sudbury (henceforth referred to as the 'City') was formed on January 1, 2001 and today consists of the towns and cities which comprised the former Regional Municipality of Sudbury (Sudbury, Capreol, Nickel Centre, Onaping Falls, Rayside-Balfour, Valley East and Walden), as well as several unincorporated townships (Fraleck, Parkin, Aylmer, Mackelcan, Rathbun, Scadding, Dryden, Cleland and Dill).

A requirement of the amalgamation was that an Official Plan be developed for the City for which several background studies were prepared in 2004 and 2005. One of these background studies is the Natural Heritage Background Study that was released in 2005. The City's Official Plan was approved by the Minister of Municipal Affairs and Housing on March 7th, 2007.

Now, several years later, a review of the Official Plan is underway in fulfillment of the Planning Act that requires Official Plans to be reviewed every five years.

This report updates and replaces the Natural Heritage Background Study that was prepared in 2005 for the existing City of Greater Sudbury Official Plan. The principal objective of this report is to ensure that the natural heritage data and information identified in the previous study are still valid and to ensure that the proposed policies reflect the current Provincial direction on these matters.

The Provincial Policy Statement (PPS), issued under the Planning Act, is the statement of the Province's policies concerning land use planning. The PPS provides policy for all of Ontario on matters of provincial interest in land use planning and development. The Planning Act requires that decisions on land use planning matters made by municipalities, the Province, the Ontario Municipal Board and other decision-makers "shall be consistent with" the PPS. Implementation of the PPS is accomplished primarily through municipal official plan policies and through municipal decisions on other planning matters.

The current PPS came into effect on March 1, 2005. The Planning Act states that the PPS must be reviewed every five years from the date that the PPS came into effect, to determine whether revisions are needed.

The five-year review of the PPS, which began on March 1, 2010, involved extensive consultation across Ontario with members of the public, municipalities, Aboriginal communities and organizations, and stakeholders. As part of the PPS review, the Province released a Draft Polices in September, 2012 (MMAH, 2012). These Draft Policies do not substantially affect the current natural heritage policies and water policies in the City's Official Plan. As such, the City's Official Plan, having been approved by the Minister of Municipal Affairs and Housing, is fully consistent with the Draft Policies (September, 2012) relating to natural heritage (Section 2.1 of the PPS) and water (Section 2.2 of the PPS). The Draft Policies are expected to be finalized over the coming months and were not available in their final form at the time that this report was

being prepared. Any changes to Draft Policies that would substantially affect natural heritage and water policies in the City's Official Plan will be reflected accordingly in the Official Plan policies.

1.1 Purpose

The principal objective of this Natural Heritage Report (henceforth referred to as the 'Report') is to ensure that the recommended Official Plan policies reflect current legislation, regulations and policies in Ontario relating to natural heritage and to ensure that natural heritage features and areas identified in the Official Plan are current.

The Natural Heritage Report should also fulfill a number of other purposes, including:

- heighten awareness of natural heritage as the foundation of Greater Sudbury's past, present and future;
- serve as an educational tool for the Greater Sudbury community; and,
- serve as a "spring-board" for future studies and/or initiatives involving natural heritage features and areas within the City.

1.2 Approach

This Report integrates disparate information available on Greater Sudbury's natural heritage and provides recommendations for natural heritage policy direction to be considered in developing the City's Official Plan. Guidance for establishing the scope of the Report is provided mainly by the Provincial Policy Statement (PPS; Ministry of Municipal Affairs and Housing, 2005) and associated interpretive documents prepared by the Ontario Ministry of Natural Resources (OMNR). Proposed policy changes to the Natural Heritage section of the PPS (MMAH, 2012) are reflected in this report's recommended policy directions.

The PPS (2005) defines natural heritage features and areas as:

> *"… including significant wetlands, signficant coastal wetlands, fish habitat, significant woodlands south and east of the Canadian Shield, significant valleylands south and east of the Canadian Shield, habitat of endangered species and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest, which are important for their environmental and social values as a legacy of the natural landscapes of an area".*

This definition, which remains unchanged in the PPS (draft 2012), establishes that, as matters of provincial interest, only certain natural heritage features and areas are applicable to the City due to it being located in the Canadian Shield. The applicable natural heritage features and areas listed in the definition will be discussed individually in this report.

Other natural heritage features, areas, and ecological functions not present in the definition are

also considered in this report due to their importance to the Greater Sudbury situation specifically as will be discussed later. These features and areas include the following:

- Watersheds and subwatersheds to serve as integrative frameworks for environmental planning (included in Section 2.2 of the PPS);
- Sites of Geological Interest that reflect the importance of geology to the Greater Sudbury area; and,
- Ecological recovery of thousands of hectares of land that were severely impacted by past mining activities in the Greater Sudbury area.

This report relies heavily on existing information to identify natural heritage features and areas (see Section 2). It also relies on Provincial guidance on matters of natural heritage as outlined in the second edition of the Natural Heritage Reference Manual (OMNR, 2010).

1.3 Considerations

Natural heritage studies have been conducted in many southern Ontario municipalities for land-use planning purposes, many using the framework described in Riley and Mohr (1994) and the OMNR's Natural Heritage Reference Manual. There are several differences, however, that make a direct transfer of the southern Ontario natural heritage 'model' to Greater Sudbury problematic.

First, the landscape matrix (dominant landscape cover type) of the City is principally forest, scrubland over bedrock and wetland (totaling over 75% cover) with smaller patches of agricultural and urban land cover intermixed. A landscape matrix is defined as the most extensive and most connected element type present in a landscape. The context in southern Ontario is the opposite: an agricultural and/or urban matrix with intermixed patches of remnant forest and wetlands. As such, concepts of wildlife corridors and core areas, while still relevant to Greater Sudbury's wildlife, are less evident and likely less critical as will be discussed in Section 4.7.

Second, approximately 82,000 hectares of land have been affected by mine-related smelting in Greater Sudbury. This land is undergoing some degree of recovery now that sulphur dioxide levels have been substantially reduced. Much of the area is still ecologically limited, however, due to two factors. First, the large distances between seed sources of native plants and the central portions of the impacted zone limits speed of natural plant colonization in these latter areas. Second, elevated levels of metals in the soil, especially nickel and copper, effectively prevent growth of many plant species. The extent of the impacted area, which is without parallel in Ontario, has profound implications for Greater Sudbury's natural heritage. Since 1978, the municipality has been committed to reclaiming these industrially affected lands. Although thousands of hectares have been reclaimed, thousands more are in need of reclamation. Moreover, even those lands that have been reclaimed are very low in plant diversity and are far from being self-sustaining and fully functional forest ecosystems (see Section 4.10).

Third, about 42% of the City is Crown Land. Use for much of this land is determined under a forest management plan for the Sudbury Forest and is not within the purview of the City's Official

Plan. As a point of interest, Figure 1 shows the Crown Land in the City along with Ontario Living Legacy Land Use Strategy Land Use Designations and Enhanced Management Areas as they appear on the Ontario Crown Land Use Policy Atlas (Ontario Ministry of Natural Resources website – April 5, 2013).

Fourth, the City is a geologically important area containing numerous geological features that have yet to become 'of provincial interest' through formal ANSI designation. These features still require some degree of consideration during land-use planning so as to ensure their continued local presence for future generations and for possible economic development opportunities through ecotourism (see Section 4.9).

Finally, the City contains hundreds of lakes, many of which have cottages and/or permanent residences along the shoreline. These lakes and their associated watersheds represent important natural heritage features. Many of the lake watersheds are independent of one another and thus require individual assessments of environmental features and functions. In contrast, southern Ontario watersheds are linked to one of the Great Lakes either directly or through stream or river systems. Relatively small and hydrologically independent lakes are not common features. This report considers watersheds as the principal spatial unit for integrating, to some extent, environmental and land-use planning in Sudbury (see Section 4.1).

While guidance is provided mainly by the PPS and accompanying Provincial guidance documents, this Study has regard to the Greater Sudbury context in addressing matters of natural heritage.

In this Study, the following terms are defined as in the PPS: 'adjacent lands', 'development', 'ecological functions', 'fish habitat', 'negative impacts', 'natural heritage features and areas', 'significant', and 'site alteration'.

Figure 1

Ontario Crown Land Use Atlas - Greater Sudbury

Legend

Primary Land Use

- Provincial Park
- Recommended Provincial Park
- Conservation Reserve
- Recommended Conservation Reserve
- Forest Reserve
- Wilderness Area
- Enhanced Management Area
- General Use Area
- Provincial Wildlife Area

- Private Land
- Indian Reserve
- Other Federal Land
- National Park
- Overlay Area
- Lake / River
- Highways
- Ontario Boundary
- Small Crown Parcel

Map centre: 46° 37' 39.7" N, 81° 00' 14.9" W

Map created: April 5, 2013

0 10 20 30 40 km

Scale: 1:840,000

Ontario

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources (OMNR) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

This map was produced automatically by the Crown Land Use Policy Atlas, a Ministry of Natural Resources website.

1. METHODS

Existing information on natural heritage features and areas was gathered from various sources. A major source of information was OMNR's Natural Resources and Values Information System (NRVIS), which includes various natural heritage features and areas that are of Provincial interest. A variety of agencies and groups with interest in natural heritage were contacted for input into the Study and as sources of information. These agencies and groups included: OMNR Sudbury District, Ontario Parks (Northeast Zone), Natural Heritage Information Centre, Cooperative Freshwater Ecology Unit, Nickel District Conservation Authority, Sudbury Naturalists, Sudbury Ornithological Society, Laurentian University, Collège Boréal, Cambrian College, the City's Lake Water Quality Program, VETAC - the City's Regreening Advisory Panel, the Green Space Advisory Panel, Junction Creek Stewardship Committee, and the Sudbury Horticultural Society.

Open Houses were held on March 29, 30, and 31 and on June 1 and 2, 2004, at various locations in the City to obtain public input into the original Natural Heritage Study.

All information gathered was then evaluated in order to determine whether it was relevant, current and comprehensive in terms of spatial coverage. Gaps in the information were identified and filled through aerial photo interpretation and a very limited field work.

Maps showing natural heritage features and areas of interest in the Greater Sudbury area were created by direct import of digital data from NRVIS or by digitization from 2003 ortho-rectified digital air photos commissioned by the City. Additional details on source information related matters are discussed for each section of natural heritage features.

Representatives from various organizations that were originally contacted in 2004 were re-contacted in 2013 to determine whether information gathered for the original study had changed. Public input that was part of the current Official Plan review process resulted in submissions on matters relating to natural heritage from a variety of agencies and groups, including the Sudbury & District Health Unit, Nickel District Conservation Authority, Greater Sudbury Source Protection Authority, Vale Living with Lakes Centre, Lakes Advisory Panel, Green Space Advisory Panel, Junction Creek Stewardship Committee, Greater Sudbury Watershed Alliance, Coalition for a Liveable Sudbury, Minnow Lake Community Action Network, Minnow Lake Restoration Group, Ramsey Lake Stewardship Committee, and the Vermilion River Stewardship. These submissions and other relevant submissions received from individuals were thoroughly reviewed prior to the finalization of this report.

3. AN OVERVIEW OF SUDBURY'S NATURAL HERITAGE

3.1 Aquatic Natural Heritage Features

Approximately 13 % of Greater Sudbury is covered by water. Aquatic natural heritage features in the City include 330 lakes over 10 ha in size, hundreds of smaller lakes, major river systems (e.g., Vermilion River and Wanapitei River), and numerous other watercourses. Many lakes and the major rivers are used as drinking water sources as well as for water-based recreation. From a natural heritage standpoint, an important value of the aquatic features is in the fish habitat that they provide. This aspect is discussed in section 4.3.

3.2 Vegetation

A vegetation cover map of the City was developed for this Study using data from the OMNR's Forest Resource Inventory (FRI) based on 1989 and 1990 aerial photography interpretation (Figure 2 - back pocket). Stands were reclassified based on FRI data in an attempt to approximate as much as possible the ecosites defined by the Forest Ecosystem Classification (Chambers et al, 1997). Where the latter was not possible or desirable, an ecologically meaningful category was used (see Appendix E).

Figure 2 clearly shows that forests cover most of Greater Sudbury and that a variety of other vegetation types are present as well. Table 1 lists the various vegetation cover types by total area and percent. Roughly 60 % of the City is covered by forests, including forested wetlands. Forests range from pine-dominated stands in the northern part of the City to mixed and deciduous stands in the south to early stage forests in the central portion reflecting some recovery from impacts by past mining activities. Wetlands cover 9 % of the City representing several wetland types from conifer and deciduous swamps to marshes. The 'Valley' offers relatively large expanses of fields associated with the current and past agricultural activities occurring there. Exposed bedrock covers about 8 % of the City but this amount is expected to be less now since additional forest recovery has occurred on previously damaged land since 1989/1990, the years in which the data were gathered.

Table 1. Vegetation cover types by total area and percent of the City.

Vegetation Cover Type	Total Area (hectares)	Percent of City Area
FOREST (Total)	**209077**	**57.6**
Red Pine/White Pine	9537	2.6
Jack Pine and/or Black Spruce (upland)	25760	7.1
Shade Tolerant Mixed	277	0.08
Shade Tolerant Deciduous	5280	1.5
Shade Tolerant Coniferous	75	0.02
Shade Intolerant Coniferous	20130	5.5
Shade Intolerant Mixed	46255	12.7
Shade Intolerant Deciduous	101763	28
WETLAND (Total)	**33144**	**9.1**
Lowland Coniferous[1]	4991	1.4
Lowland Deciduous[1]	540	0.15
Swamp[2]	4820	1.3
Open Wetland[3]	15087	4.2
Thicket Swamp	7706	2.1
Rock	30546	8.4
Developed Agricultural Land	7280	2
Field	5547	1.55
Developed Land[4]	30408	8.4
Water	47044	13
TOTAL	**363046**	**100**

[1] Including lowland forest types as wetlands is assumed to be reasonable in most cases given the species listed in the stand information of the Forest Resources Inventory (FRI).
[2] Swamp is an FRI class termed 'Treed Muskeg' that is likely conifer swamps in most cases.
[3] Open Wetland is an FRI class termed 'Open Muskeg' that includes various marsh types.
[4] Developed Land includes urban areas, mine and mine waste areas, and rights-of-way for electrical power distribution.

3.3 Wildlife

The City of Greater Sudbury is home to numerous species of wildlife that are either year-round residents, use habitat in the City during spring and fall migration or inhabit the area only during the winter months.

3.3.1 Amphibians and Reptiles

According to the Ontario Herpetological Summary Atlas (Oldham and Weller, 2000) and Ontario's Reptile and Amphibian Atlas (Ontario Nature, 2012), 13 species of amphibians (includes one salamander species complex) and 9 species of reptiles have been recorded in the City (Appendix A).

3.3.2 Birds

The Sudbury Ornithological Society reports that 306 species of birds have been recorded thus far in the Greater Sudbury area (Blomme, 2013), including birds breeding in the area, those simply passing through during migration, and 'accidental' birds far from their normal range.

Breeding birds are representative of the quality and quantity of available habitat in an area. Information on Greater Sudbury's breeding birds was obtained from the Ontario Breeding Bird Atlas website (http://www.birdsontario.org/atlas/atlasmain.html) in February 2013. The Breeding Bird Atlas is based on breeding evidence codes assigned to bird sightings in individual 10 x 10 km squares of the National Topographic System (NTS). The Ontario Breeding Bird Atlas is divided into two periods: 1) 1st Atlas period - 1981 to 1985 and 2) 2nd Atlas period - 2001 to 2005.

Lists of birds associated with the forty-five (45) 10 x 10 km squares that roughly cover the City of Greater Sudbury were downloaded from the above website and arranged in a spreadsheet. Bird species were arranged in a list for both Atlas periods based on decreasing number of squares in which they have been recorded and assigned the breeding codes of 'Possible', 'Probable', or 'Confirmed' (all considered as 'breeding' in this Study). The Atlas data for a given area represents a measure of frequency of occurrence of the species across that area, but does not reflect how abundant the species is. For this Report, the greater the number of squares that a species is recorded as breeding, the more widely distributed the species is assumed to be within the City.

Based on the Ontario Breeding Bird Atlas, 183 species of birds have been recorded as breeding in the City (Appendix B). Of these, 11 species were recorded as breeding in the 1st Atlas period only.

Given the large extent of forest cover in the City, forest birds are expected to be frequent breeders. The thirty most widespread breeding species across the City, recorded in over 89% of the 45 squares, include several forest bird species like the Broad-winged Hawk, Red-eyed Vireo, Chestnut-sided Warbler, Least Flycatcher, White-throated Sparrow, Veery, Hermit Thrush, Ovenbird and Yellow-rumped Warbler. Several area-sensitive forest bird species (i.e., those birds requiring relatively large and undisturbed forest stands) occur in over fifty percent of the 45 squares that cover the City. These area-sensitive species include the Ovenbird, Broad-winged Hawk, Veery, Hermit Thrush, Canada Warbler, Black-throated Blue Warbler and several others. Based on relative abundance maps prepared by the Ontario Breeding Bird Atlas, a large portion of the City occurs in one of the zones of greatest relative abundance in Ontario for moderately to highly area-sensitive forest bird species such as the Broad-winged Hawk, Hermit Thrush, Veery, Red-eyed Vireo, American Redstart, Chestnut-sided Warbler, and Canada Warbler, (Bird Studies Canada, 2013). Clearly, the City's forests are large enough to support a diverse and representative bird community.

The relatively large cover of wetlands and lakes in the City are reflected by the widespread breeding records (i.e., > 60% of squares) for wetland birds such as the Alder Flycatcher, Common Yellowthroat, Swamp Sparrow, Red-winged Blackbird, Eastern Phoebe and American Bittern and lake specialists like the Common Loon.

Grassland bird species are also well-represented in the City due to the agricultural land in the 'Valley'. Of particular interest is the presence of area-sensitive grassland species, such as Upland Sandpiper and Bobolink, that require relatively large patches of suitable field habitats for nesting (Dechant et al, 1999a,b).

3.3.3 Mammals

According to the Atlas of the Mammals of Ontario (Dobbyn, 1994), 46 mammals have been recorded in the City (Appendix C). All of these species are broadly distributed over Ontario and other parts of Canada. The occurrences of Hairy-tailed Mole, Gray Squirrel and Long-tailed Weasel in the City appear to be at the northern extent of their range in Ontario.

Several mammals species occurring in Greater Sudbury are important commercial species for hunting and trapping. Wapiti or 'Elk', which were reintroduced to the Burwash/French River area during the first half of the previous century and again in the 1990s and 2000s, have been sighted in the southern portion of the City. Elk restoration in Ontario is an OMNR initiative that is overseen by the Provincial Elk Restoration Advisory Committee.

3.3.4 Species At Risk

Twenty (20) wildlife species that inhabit Greater Sudbury during the breeding season are considered as Species at Risk in Ontario by the MNR. The list below identifies the species along with their OMNR assessed status.

ENDANGERED

Northern Myotis	END (a species of bat)

THREATENED

Lake Sturgeon	THR (historical record)
Barn Swallow	THR
Blanding's Turtle	THR
Bobolink	THR
Chimney Swift	THR
Eastern Whip-poor-will	THR
Eastern Meadowlark	THR

SPECIAL CONCERN

Bald Eagle	SC
Black Tern	SC
Canada Warbler	SC
Common Nighthawk	SC
Eastern Wolf	SC
Golden-winged Warbler	SC
Milksnake	SC
Monarch	SC
Olive-sided Flycatcher	SC
Peregrine Falcon	SC
Short-eared Owl	SC
Snapping Turtle	SC

END – Endangered; THR – Threatened; SC – Special Concern

Based on OMNR's Species at Risk in Ontario list (revised April 22, 2013)

This list represents known species and the absence of other Species at Risk on the list does not infer the absence of other Species at Risk in the area.

4. SPECIFIC NATURAL HERITAGE FEATURES AND AREAS

The following sections discuss the specific natural heritage features and areas identified in the City through this Study as well as the environmental impact study process.

4.1 Watersheds and Watershed-based Planning

4.1.1 Background

A watershed is the land area that drains to a single body of water such as a lake, a stream or a wetland. The concept of watersheds is not new. In Ontario, for example, the Conservation Authorities Act was legislated in 1946 in response to earlier land, water and forestry practices that resulted in environmental problems, such as loss of topsoil and floods. The Conservation Authorities Act provided the means by which the province and the municipalities of Ontario could join together to form a Conservation Authority within a specified watershed to undertake programs for natural resource management. The watershed concept is now recognized as one of the most appropriate ecosystem units on which to manage resources (Revenga et al, 1998 and US EPA, 2001b).

4.1.2 Planning and Regulatory Context

In Ontario, the notion of watersheds as appropriate resource planning units came to the fore following Justice O'Connor's Report of the Walkerton Inquiry in which he stated that protecting and enhancing natural systems is one of the most effective and efficient means of protecting the safety of Ontario's drinking water. The Report's 22 recommendations lead to Ontario's *Clean Water Act* and the watershed-based source protection planning framework under the Ontario Ministry of the Environment.

The Proposed Greater Sudbury Source Protection Plan, as required by the *Clean Water Act*, has been prepared by the Greater Sudbury Source Protection Committee and is expected to receive approval by the Minister of the Environment in 2013. This Plan has taken several years to prepare and, as mentioned earlier, is meant to protect municipal drinking water sources. The plan outlines existing and future threats (as defined in Ontario Regulation 287/07) to these sources and prescribes policies, actions and programs to reduce or eliminate these threats. As per Section 40 of the *Clean Water Act*, the City's Official Plan must be in conformity with the policies of the Source Protection Plan.

The PPS's Water Section refers often to the term 'watershed' in its policies:

> *2.2.1 Planning authorities shall protect, improve or restore the quality and quantity of water by:*
>
> *a) using the watershed as the ecologically meaningful scale for planning;*
> *b) minimizing potential negative impacts, including cross-jurisdictional and cross-watershed impacts;*
> *c) identifying surface water features, ground water features, hydrologic functions and natural heritage features and areas which are necessary for the ecological and hydrological integrity of the watershed;*
> *d) implementing necessary restrictions on development and site alteration to:*
> *1. protect all municipal drinking water supplies and designated*

vulnerable areas; and

2. protect, improve or restore vulnerable surface and ground water, sensitive surface water features and sensitive ground water features, and their hydrologic functions;

e) Maintaining linkages and related functions among surface water features, ground water features, hydrologic functions and natural heritage features and areas;

f) Promoting efficient and sustainable use of water resources, including practices for water conservation and sustaining water quality; and

g) Ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

2.2.2 Development and site alteration shall be restricted in or near sensitive surface water features and sensitive ground water features such that these features and their related hydrologic functions will be protected, improved or restored.

Mitigative measures and/or alternative development approaches may be required in order to protect, improve or restore sensitive surface and groundwater features, and their hydrologic functions.

The PPS defines surface water features as:

> *…water-related features on the earth's surface, including headwaters, rivers, stream channels, inland lakes, seepage areas, recharge/discharge areas, springs, wetlands, and associated riparian lands that can be defined by their soil moisture, soil type, vegetation and topographic characteristics.*

Ground water features in the PPS are defined as:

> *…water-related feature's on the earth's subsurface, including recharge/discharge areas, water tables, aquifers and unsaturated zones that can be defined by surface and subsurface hydrogeologic investigations.*

In regard to surface water features and ground water features, 'sensitive' in the PPS means:

> *areas that are particularly susceptible to impacts from activities or events including, but not limited to, water withdrawals, and additions of pollutants.*

As stated previously, watersheds are especially relevant in the City with its large percentage of water cover and its numerous, hydrologically independent and socially important lakes. The City's watersheds are important natural heritage features that should provide the integrative framework for planning in Greater Sudbury. Watershed plans as defined here are intended to be complementary to the Greater Sudbury Source Protection Plan and are not intended to interfere

with or replace the policies of this Plan.

4.1.3 Implications of Policy Changes as per PPS Draft Policies – September 2012
The PPS Draft Policies (MMAH, 2012) proposes two modifications to Section 2.2 (Water) of the PPS:

> a) Using watershed as the ecologically meaningful scale for integrated and long-term planning, which can be a foundation for considering cumulative impacts of development;
> f) planning for efficient and sustainable use of water resources, through volumes and contaminant conservation and sustaining water quality.

These modifications serve to elaborate on the points made in the existing PPS and do not have substantial implications for policy implementation.

4.1.4 Recommended Policy Direction
Given the above discussion, the following points should be considered in the development of the Official Plan:

1. The Official Plan should recognize watersheds as a basic unit of planning in the City. As such, watershed plans should be developed using individual lakes, clustered hydrologically connected lakes, or individual streams (e.g., Junction Creek) as the appropriate spatial watershed level. Subwatersheds would then be understood as the division of the watershed into smaller, hydrologically relevant units.
2. Watershed plans should address ecological and social aspects, such as sensitive ecological features, ecological connectivity, stressors on natural systems, and recreation use and should propose measures to mitigate environmental stresses and enhance natural systems. Watershed plans provide recommendations on strategies for management, implementation, and monitoring to address the preservation and enhancement of the ecological and recreational features of the lake.
3. Watershed plans should also address matters such as stormwater quantity and quality through modeling under different land-cover scenarios.
4. Watershed plan recommendations should be implemented through a variety of means, including zoning by-law, infrastructure upgrade, development approval conditions, stormwater site management plans, property stewardship, tree planting, etc.

4.2 Significant Habitat of Endangered Species and Threatened Species

4.2.1 Background
The PPS defines an endangered species and threatened species as follows:

> *Endangered species means a species that is listed or categorized as an "Endangered Species" on the Ontario Ministry of Natural Resources' official species at risk list, as updated and amended from time to time.*

Threatened species means a species that is listed or categorized as an "Endangered Species" on the Ontario Ministry of Natural Resources' official species at risk list, as updated and amended from time to time.

Based on the most recent update to the Species at Risk in Ontario (SARO) list (April 22, 2013), the City is inhabited by one (1) endangered species and seven (7) threatened species.

4.2.2 Planning and Regulatory Context

Policy 2.1.1 of the PPS states:

Natural heritage features and areas will be protected for the long term.
2.1.3 a) Development and site alteration will not be permitted in:
...
- *significant habitat of endangered species and threatened species.*

In addition, the PPS includes section 2.1.6, which addresses 'adjacent lands':

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… 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 PPS policy relating to endangered species and threatened species reflects a broader concern internationally, nationally and provincially over the increasing loss of species due to human activity. The federal Species at Risk Act and the provincial Endangered Species Act were enacted to afford protection to species faced with the possibility of extinction or extirpation. The policies and legislation all hinge on a clear and effective process for assigning categories of extinction risk to species.

In Canada, there are five categories of risk that are assigned to species by the national Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Committee on the Status of Species at Risk in Ontario (COSSARO) reviews status reports and assesses the level of risk for each species in Ontario and recommends designations to the OMNR. The work of COSSARO integrates with and complements the work of COSEWIC. In addition to being responsible for assigning the categories of 'Extinct', 'Extirpated', Endangered', 'Threatened' and 'Special Concern' to species at risk, the OMNR also manages the records of occurrence of these species in the province through the Natural Heritage Information Centre (NHIC).

The NHIC has expressed concern over the potential misuse of species occurrence records and discourages the identity and precise location of sensitive records being made broadly available to the public. Given the sensitivities associated with the data, the Official Plan should identify the known locations of 'Endangered' and 'Threatened' species only in a broad way (e.g., a one-kilometre circle placed off-centre of a sensitive occurrence record). The species associated with

these records should not be revealed within the Official Plan document.

The OMNR may be consulted in establishing the potential for significant habitat of endangered species or threatened species to occur on a specific property. OMNR may also be consulted in establishing the need for and scope of an Environmental Impact Study (EIS) to demonstrate whether or not a proposed development on lands adjacent to the significant habitat would create negative impacts on the natural features or on the ecological functions of the habitat of the endangered species or threatened species. The EIS, which would be undertaken by a qualified expert working on behalf of the development proponent, would outline all potential impacts and measures to be integrated into the development to prevent or mitigate the impacts.

4.2.3 Implications of Policy Changes as per PPS Draft Policies – September 2012

The PPS Draft Policies (MMAH, 2012) add a specific policy for endangered species and threatened species but policy for the adjacent lands remains unchanged:

> *2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.*
> *2.1.8 Development and site alteration will not be permitted on adjacent lands to 2.1.4, 2.1.5, and 2.1.6 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 the ecological functions for which the area is identified.*

There are no implications relating to the proposed policy changes outlined in the PPS Draft Policies – September 2012.

4.2.4 Recommended Official Plan Policy Direction

Based on the above discussion, the following points should be considered in the development of the Official Plan:

1. The general location of an occurrence record of an endangered species or threatened species should be shown on an environmental features overlay. The species should not be identified.
2. Provisions should be included for the identification of more precise location of the record associated with the endangered species or threatened species by the City or the OMNR during review of new development.
3. A specific policy should be included for undertaking a preliminary ecological site assessment when new development is proposed near the location record of an endangered species or threatened species unless detailed habitat mapping is available from the OMNR. The purpose of the preliminary ecological site assessment is to determine, based on existing information from agencies or on preliminary field investigations, if significant habitat of endangered species and/or threatened species is present on the subject property or on lands adjacent to it. If habitat is present, a detailed ecological site assessment would then be required to confirm the presence of the endangered species or threatened species on the subject property. Delineation of the

significant habitat of endangered species and threatened species and the 'adjacent lands' (i.e., 120 m from the delineated habitat boundary) would also be conducted during the detailed ecological site assessment.

4. Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.
5. Development and site alteration shall not be permitted on the adjacent lands of habitat of endangered species and threatened species 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.

4.3 Fish Habitat

4.3.1 Background

The PPS defines fish and fish habitat as follows:

> *Fish means fish, which as defined in S.2 of the Fisheries Act, c. F-14, as amended, includes fish, shellfish, crustaceans, and marine animals, at all stages of their life cycles.*
>
> *Fish habitat as defined by the Fisheries Act, c. F-14, means spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes.*

For this report, fish habitat information was obtained from OMNR's NRVIS and from the Cooperative Freshwater Ecology Unit. Included in this information are locations of spawning areas for various species and locations of cold water and warm water streams and lakes where known. Information on lake trout lakes was obtained from Inland Ontario Lakes Designated for Lake Trout Management (OMNR, 2006).

With about 13% water cover and 330 lakes over 10 ha in size within its boundaries (Pearson et al, 2002), the City of Greater Sudbury is host to considerable fish habitat. Thousands of lakes in northeastern Ontario have been affected by over a century of atmospheric depositions from the metal smelting operations in Sudbury. The general trend indicates recovery of these lakes but many closest to the smelters are still impaired due to relatively high acidity and concentrations of certain metals (Keller et al, 2004). Urbanization and shoreline development for seasonal residences and recreation also continue to impact fish habitat on lakes and major watercourses.

Of the approximately 30 species of fish present in the City (Keller et al, 2004), several provide sports fishing opportunities, walleye likely being the most prized. Other sport fish include warm water species, such as Largemouth Bass and Smallmouth Bass and cold water species, such as Lake Trout and Brook Trout. Spawning habitat for the two latter species and Walleye is particularly sensitive to human disturbance and is generally not particularly abundant at any given lake. For these reasons, the spawning habitat for these three species is considered 'sensitive spawning habitat' for the purposes of this Report and specific policies are recommended.

All known sensitive fish spawning areas (i.e., for brook trout, lake trout, and walleye) are shown on Figure 3 along with known cold water and warm water features.

4.3.2 Planning and Regulatory Context

The Department of Fisheries and Oceans has developed a "Policy for the Management of Fish Habitat". The Policy applies to all projects and activities, large and small, in or near the water, that could "*alter, disrupt or destroy*" fish habitats, by chemical, physical or biological means. The Policy is guided by the principle of "no net loss" such that unavoidable habitat losses are balanced with habitat replacement on a project-by-project basis so that further reductions to Canada's fisheries resources due to habitat loss or damage may be prevented. The harmful alteration, disruption or destruction of fish habitat is prohibited unless authorized by the DFO pursuant to Section 35(2) of the Fisheries Act. In keeping with DFO's Policy for the Management of Fish Habitat, no such authorizations are issued unless acceptable measures for the habitat loss are developed and implemented by the proponent. In Ontario, the Policy for the Management of Fish Habitat is generally implemented through agreements with Conservation Authorities.

The PPS recognizes the federal and provincial jurisdiction on matters of fish habitat in Policy 2.1.5 (PPS: 2005) and Policy 2.1.6 (PPS Draft Policies: 2012), which states:

> *Development and site alteration will not be permitted in fish habitat, except in accordance with provincial and federal requirements.*

Accordingly the PPS (existing and proposed draft) makes mention of adjacent lands to fish habitat:

> *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 (i.e., fish habitat) 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 (OMNR, 2010) suggests a general adjacent land width of 120 m. North Bay's Official Plan, however, includes recent modifications by the Ministry of Municipal Affairs and Housing indicating an adjacent land width of 30 m (City of North Bay, 2012), which is consistent with the City of Greater Sudbury's Official Plan.

The municipality also has the ability to establish measures to protect fish habitat through shoreline policies. One common measure is through the use of vegetated shoreline buffers.

4.3.3 Riparian, Shoreline and Wetland Buffers

Strips of natural vegetation separating streams (or rivers), lakes and wetlands from adjacent land-uses that could act as non-point pollution sources or sources of other ecological disturbances are known respectively as riparian, shoreline and wetland buffers. These buffers serve a number of important functions, including the following (from Wenger and Fowler, 2000):

- Maintaining habitat for fish and other aquatic organisms;
- Trapping and removing sediment from runoff;
- Stabilizing stream banks and reducing channel erosion;
- Trapping and removing nutrients and contaminants;
- Storing floodwaters, thereby reducing property damage;
- Providing terrestrial habitat;
- Maintaining good water quality;
- Improving aesthetics, thereby increasing property values;
- Offering educational and recreational opportunities.

Vegetated buffers along streams and lakes also contribute to the aquatic food web through organic matter export (Szkokan-Emilson et al, 2010 and Wesolek et al, 2010).

Ideally, buffers are composed of multilayered vegetation, from groundcover to tree canopy. Complex vegetation layering increases the benefits offered by the buffer by increasing its pollution filtering capabilities, habitat types, and visual screening abilities. The width of the buffer is also a critical factor in determining its effectiveness. While the literature on this topic is extensive, there are no clearly established standard buffer widths (Castelle et al, 1992; Fischer and Fischenich, 2000; Palone and Todd, 1998; Wenger, 1999; Wenger and Fowler, 2000). What is clear from the literature is that the wider the buffer, the greater the types and degree of ecological and environmental benefits derived from the buffer. Also, the greater the slope of the shoreline or streambank, the greater the width of buffer required to achieve benefits. Relatively narrow buffers (e.g, 5 m) provide some sediment and phosphorus control along with limited wildlife habitat (Wenger, 1999). Greater buffer widths (15 to 30 m) remove additional levels of pollutants and create wildlife habitat for an increasing number of species. Protecting diverse terrestrial riparian wildlife communities requires forested buffers of at least 100 m (Fischer, 2000).

Buffer guidelines and by-laws have been developed for numerous jurisdictions in North America (Fischer, 2000; Fischer and Fischenich, 2000; US EPA, 2001a; Wenger and Fowler, 2000). Two approaches are typically proposed: 1) a standard buffer width applied to all situations and 2) a flexible buffer width that is determined based on site-specific conditions such as slope. The standard buffer width approach is easier to implement but, since it does not respect site-specific conditions, can result in varying degrees of environmental and ecological benefits. Conversely, the flexible buffer width approach is more site-specific but much more difficult to implement since it requires site data collection and technical expertise.

Regardless of the buffer width approach that is adopted, Wenger (1999) recommends eliminating all major sources of contamination from buffers such as construction activities resulting in major land disturbances, impervious surfaces, mining activities, septic tank drain fields, clear cutting of forests, waste disposal sites, etc. As well, application of pesticides and fertilizers should be prohibited, except as may be needed for buffer restoration.

4.3.4 Recommended Policy Direction

Based on the above discussion, the following points should be considered in the development of the Official Plan:

1. A general policy to protect fish habitat from harmful alteration, disruption or destruction should be included.
2. A general policy to encourage restoration, enhancement or creation of fish habitat should be included.
3. 'Sensitive' fish spawning areas (i.e., for brook trout, lake trout, and walleye) should be identified during watershed planning unless otherwise known.
4. Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.
5. Development and site alterations shall not be permitted on lands within 30 m of fish habitat 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 fish habitat or its ecological functions.
6. Development and site alterations shall not be permitted on lands within 120 m of lake trout lakes or 'sensitive' fish spawning areas 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 lake trout or 'sensitive' fish spawning areas or on their ecological functions.
7. Setbacks between all buildings, except boathouses and floatplane hangars, and the shoreline of all lakes should be applied.
8. Natural vegetated buffers should be maintained adjacent to the shoreline and banks of all lakes, rivers and streams. Coldwater streams may require greater buffer widths than warmwater streams. Appropriate buffer widths also depend on the characteristics of the buffer, terrain conditions, and the desired buffer function(s).
9. All construction activities should be mitigated for potential impacts to surface water runoff.
10. New lots should be discouraged where the entire shoreline abuts 'sensitive' spawning habitat.
11. Boathouses or float plane hangars should discouraged in 'sensitive' spawning habitat (although permission to build would be established through the DFO permitting process).
12. The Official Plan should allow for minor adjustments to be made to the boundaries of 'sensitive' fish spawning areas as shown on the schedule without an Official Plan amendment.

4.4 Wetlands

4.4.1 Background

The PPS defines a wetland as:

> *"lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case the presence of abundant water has caused the formation of hydric soils and has*

favoured the dominance of either hydrophytic plants or water tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens. Periodically soaked or wet lands being used for agricultural purposes which no longer exhibit wetland characteristics are not considered to be wetlands for the purposes of this definition."

Wetlands of various types cover approximately 9 % of the City (Figure 3). Slightly less than half of these wetlands are categorized as "open wetlands", which include marshes, fens and treeless bogs. The rest include thicket swamps and various forested wetlands (i.e., swamps).

Wetland distribution information was obtained from OMNR FRI data (as per Table 1) except for the area around the Sudbury urban area (outlined by the box on Figure 3) in which wetlands were digitized from the 2003 aerial photos by City staff.

4.4.2 Planning and Regulatory Context

Policy 2.1.3 of the PPS states:

Development and site alteration shall not be permitted in: …

b) significant wetlands in Ecoregions 5E, 6E and 7E;…

Significant wetland is defined by the PPS as:

…an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the Province, as amended from time to time.

Ecoregion 5E covers roughly the southern two-thirds of the City of Greater Sudbury. One wetland in the City, the Vermilion River Wetland Complex, is considered provincially significant (Figure 3) and is located entirely in Ecoregion 5E. The boundary of this wetland complex was obtained from OMNR's NRVIS.

As stated previously, wetlands cover almost 10% of Greater Sudbury. These important ecosystems provide a number of ecological functions, including:

1. nutrient removal and transformation;
2. sediment and toxicant retention;
3. shoreline stabilization;
4. floodflow alteration;
5. ground water recharge;
6. organic matter production and export;
7. aquatic diversity and abundance; and,
8. habitat for wildlife (Marble, 1991).

Wetlands can provide several of the functions listed above, even if the individual wetlands are not evaluated as being provincially significant. Wetland loss can have negative consequences including rapid degradation of stream and lake water quality in hydrologically connected systems. The relative sensitivity of wetland features and functions provided by individual wetlands should be evaluated based on the watershed or catchment within which they are located. The importance of watershed-based assessment of wetlands is heightened on the Canadian Shield, where watersheds of individual lakes can be small. As such, loss of even relatively small wetlands within these watersheds could have negative effects on the quality of the lake. Therefore, sensitive wetland features and functions within watersheds should be protected from incompatible development.

The PPS includes wetlands, whether provincially significant or not, in its definition of surface water features. Furthermore, it contains a policy aimed at protecting the hydrologic functions of sensitive surface water features. Therefore, the PPS currently provides the means to extend some degree of protection or planning consideration for wetlands that are not provincially significant.

Buffers should be considered for the protection of wetland features and functions (see Section 4.2.3.

4.4.3 Implications of Policy Changes as per PPS Draft Policies – September 2012

Proposed changes to the PPS do not affect the policies related to wetlands, whether these are identified as 'significant wetlands' or 'sensitive surface water features'.

4.4.4 Recommended Policy Direction

The following points should be considered in the development of the Official Plan.

Provincially Significant Wetlands

The PPS clearly states that development and site alteration are not permitted in significant wetlands (i.e., as evaluated through the Ontario Wetland Evaluation System and approved by the MNR) in Ecoregion 5E. In the Canadian Shield north of Ecoregion 5E, development and site alteration shall not be permitted in significant wetlands unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

For lands adjacent to the significant wetlands, the PPS states that:

- "*Development and site alteration shall not be permitted on adjacent lands to the* (significant wetlands) *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* (significant wetlands) *or their ecological functions*".

The means of demonstrating 'no negative impacts' would be through an environmental impact study prepared by a qualified expert retained by the development's proponent.

All Wetlands (i.e., except provincially significant wetlands)

1. To the extent possible, all wetlands should be identified on an Official Plan schedule (i.e., wetlands shown on Figure 3).

2. Wetlands can provide several environmental functions, some more critical than others. Ideally, development and site alteration should be directed away from wetlands. Wetland loss can have environmental consequences including rapid degradation of stream and lake water quality in hydrologically connected systems. The relative sensitivity of wetlands should be evaluated based on the watershed or catchment within which they are located. Sensitive wetlands should be protected from incompatible development or site alteration, including peat extraction.

   The sensitivity of individual wetlands should be determined through the development of watershed plans. Development and site alteration should not be permitted in a sensitive wetland or lands within 50 metres of a sensitive wetland unless it has been demonstrated that there will be no negative impacts to these natural features or on their ecological functions.

3. In areas without a watershed or subwatershed plan, development and site alteration should not be permitted in a wetland unless it can be demonstrated that there will be no impacts to the quality and quantity of surface water features that are hydrologically linked to the wetland and that losses of significant wetland features and functions will not occur.

4. Wetlands should be delineated through field investigations undertaken by a qualified person during the site planning stage, or during an EIS, if such a study is determined to be necessary. The O.P. should allow for the minor modification of wetland boundaries as depicted on the O.P. schedule without an O.P. amendment.

5. The O.P. should allow for the identification of additional wetlands to those on the O.P. schedule.

6. Natural vegetated buffers should be maintained adjacent to the edges of wetlands to protect and enhance the hydrological and ecological functions provided by the wetlands. Appropriate buffer widths depend on the characteristics of the buffer, terrain conditions, wetland functions, and the desired buffer function(s) and should be determined at the watershed level.

4.5 Significant Wildlife Habitat

4.5.1 Background

Information on significant wildlife habitat was obtained from OMNR's NRVIS and from the

OMNR's FRI data.

Section 2.1.4 of the PPS identifies *significant wildlife habitat* as a natural heritage feature, and thus "shall be protected for the long term". The PPS defines 'wildlife habitat' as:

> *areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter, and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual life cycle; and areas which are important to migratory or non-migratory species.*

Wildlife habitat is considered *significant* where it is

> *ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system.*
>
> *Criteria for determining significance… are recommended by the Province, but municipal approaches that achieve or exceed the same objective may also be used.*

Significant wildlife habitat differs from other natural heritage features/areas in that it falls upon the municipality to identify and protect this feature. The OMNR offers considerable technical guidance on the identification, description and prioritisation of significant wildlife habitat through its Significant Wildlife Habitat Technical Guide (OMNR, 2000). In February 2012, the OMNR also released a draft Significant Wildlife Habitat Ecoregion 5E Criterion Schedule designed to provide the recommended criteria for identifying SWH within the ecoregion.

Based on guidance provided by the Significant Wildlife Habitat Technical Guide (OMNR, 2000), the following significant wildlife habitats have been retained for this Report:

- moose late wintering areas;
- colonial bird nesting sites;
- specialized raptor nesting habitat;
- old-growth forest stands; and
- habitats of species designated by the OMNR as 'Special Concern', where appropriate.

Information was obtained from OMNR's NRVIS, but is limited since comprehensive inventories have not been undertaken by the OMNR in the City. Additional significant wildlife habitat may be identified as appropriate during watershed planning, since the focus would be on a smaller geographic area. Additional significant wildlife habitat may take into account OMNR's draft Ecoregion 5E Criterion Schedule once it is finalized. Many of the habitat features listed therein are more suited to being identified at a finer-scale planning area such as that offered by the lake-specific watershed.

Late winter is often a critical period for moose in the north when the habitat is responsible for carrying these animals through the final stages of winter. Figure 3 shows the known moose late winter habitat in the City. Other late winter habitat may also exist in the City in areas not surveyed by the OMNR.

Nesting colonies of great blue herons (colonial bird nesting sites) and osprey nesting sites (specialized raptor nesting habitat) represent important wildlife features that require protection. Heronries and osprey nests require considerable effort to establish on the part of the birds and are generally used for several years. General locations of known heronries and osprey nests in the City are identified on Figure 3.

Old-growth forest stands occur at various locations in the City. The most extensive occurs on Crown Land in the Wolf Lake Old Growth Forest Reserve in the northeastern corner of the City. The Wolf Lake site represents the largest contiguous area of red pine working group stands older than 140 years in Site Region 4E (Southern Boreal Site Region) of Ontario (Arbex Forest Dev. Co. Ltd.,1991).

Twelve (12) species designated as 'Special Concern' by the OMNR occur in the City (Table 2).

Table 2. List of species designated as 'Special Concern' by the OMNR that occur in the City of Greater Sudbury (from website information information updated by OMNR on January 24, 2013).

Invertebrate
Monarch
Reptiles
Milksnake
Snapping Turtle
Birds
Bald Eagle
Black Tern
Canada Warbler
Common Nighthawk
Golden-winged Warbler
Olive-sided Flycatcher
Peregrine Falcon
Short-eared Owl
Mammals
Eastern Wolf

Exact locations of sightings of species of 'Special Concern' were not identified in any of the background information reviewed. City staff will work with the OMNR in determining more specifically the expectations and extent of habitat to be protected for the special concern

species.

4.5.2 Recommend Policy Direction

The following points should be considered in the development of the Official Plan:

1. Development and site alteration shall not be permitted in significant wildlife habitat unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.
2. Development and site alteration shall not be permitted on lands within 120 m of significant wildlife habitat 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.

4.6 Areas of Natural and Scientific Interest (ANSIs)

4.6.1 Background

The PPS describes *areas of natural and scientific interest (ANSIs)* as "*areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study, or education*".

A *significant area of natural and scientific interest* is defined within the same policy as "*an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the province, as amended from time to time*".

There are two types of ANSIs (OMNR 2010):

1. Life science ANSIs–significant representative segments of Ontario's biodiversity and natural landscapes including specific types of forests, valleys, prairies, savannahs, alvars and wetlands, their native plants and animals, and their supporting environments. They contain relatively undisturbed vegetation and landforms, and their associated species and communities. Provincially significant life science ANSIs include the most significant and best examples of the natural heritage features in the province and many will correspond with other significant features and areas such as wetlands, valleylands and woodlands.
2. Earth science ANSIs–consist of some of the most significant representative examples of the bedrock, fossil and landforms in Ontario, and include examples of ongoing geological processes.

There are five (5) factors used by the Province to evaluate potential ANSIs:

1. Representation of geological themes or of the landform-vegetation features in an ecodistrict;
2. Condition – existing and past land uses, which are used to assess the degree of human-induced disturbance;
3. Diversity – the number of high-quality, representative features that exist within a

site;
4. Other ecological considerations – ecological and hydrological functions, connectivity, size, shape, proximity to other important areas, and so on; and
5. Special features – for example, populations of species at risk, special habitats, unusual geological or life science features, and educational or scientific value.

According to the Natural Heritage Reference Manual (OMNR, 2010):

> *The OMNR ranks ANSIs as being provincially, regionally or locally significant. For the purposes of the policies 2.1.4.(e) and 2.1.6 of the PPS, significant ANSIs include only ANSIs identified as provincially significant…Provincial-level ANSIs that MNR has identified and recommended for protection but that have not been formally confirmed through a confirmation procedure are referred to as "candidate ANSIs". For the purposes of the PPS, an ANSI is not considered provincially significant until it has been confirmed… Planning authorities may choose to protect candidate ANSIs as locally or regionally significant natural heritage features and areas as per the PPS definition for "significant".*

According to Scott Dingwall (personal communication, 2013), district planner with the OMNR, there is only one provincially significant ANSI in the City - the Vermilion River and Delta (Life Science ANSI). This ANSI is also considered a part of the Vermilion River Wetland Complex, a provincially significant wetland, and its protection is addressed by the recommended policy direction outlined in Section 4.4. In addition, there are several candidate provincially significant Earth Science ANSIs that occur in the City that are currently being considered for full status.

4.6.2 Planning and Regulatory Context

Policy 2.1.4 e) of the PPS states that "*development and site alteration may be permitted in .... 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*".

OMNR (2010) recommends that land 120 metres from a Life Science ANSI boundary be considered as 'adjacent lands'. As per Policy 2.1.6 of the PPS, "(d)*evelopment and site alteration may be permitted on adjacent lands ...(*to significant ANSIs*)... 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 function*".

The proposed changes to the PPS to do not modify the existing PPS's policies relating to ANSIs.

4.6.3 Recommended Policy Direction

1. Development and site alteration shall not be permitted in 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. Development and site alteration shall not be permitted on adjacent lands to significant areas of natural and scientific interest 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.

3. Adjacent lands should follow provincial recommendations (OMNR, 2010):

    - Significant areas of natural and scientific interest – life science: 120 m
    - Significant areas of natural and scientific interest – earth science: 50 m.

4. Candidate Earth Science ANSIs should be included as Geological Sites of Interest as discussed in Section 4.9 until such a time as these are given full status.

4.7 Environmental Impact Studies

4.7.1 Background

For several policies in the PPS, development is conditional on demonstrating that no negative impacts on certain features will result from the development. In the PPS, 'negative impacts' means:

a) in regard to policy 2.2, degradation to the quality and quantity of water, sensitive surface water features and sensitive groundwater features, and their related hydrologic functions, due to single, multiple or successive development or site alteration activities;

b) in regard to fish habitat, the harmful alteration, disruption or destruction of fish habitat, except where, in conjunction with the appropriate authorities, it has been authorized under the Fisheries Act, using the guiding principle of no net loss of productive capacity; and

c) in regard to other natural heritage features and areas, degradation that threatens the health and integrity of the natural features or ecological functions for which an area is identified due to single, multiple or successive development or site alteration activities.

Environmental Impact Studies (EIS), also known as Environmental Assessments, are the most common means of assessing the impacts of proposed developments on natural features and ecosystem functions. The environmental impact assessment process is used world-wide at all levels of government and for the full range of development projects. Due to the expertise required, EISs should be undertaken by qualified environmental professionals on behalf of development proponents. The Natural Heritage Reference Manual (OMNR, 2010) describes the environmental impact study process suggested to demonstrate that there will be no negative impacts on the natural features or ecological functions for which an area is identified.

The EIS process generally begins with an initial assessment based on consultation with the planning authority. The proponent initially outlines the proposed development project and

activities to the municipal staff involved in the development application review. An Ecological Site Assessment is sometimes recommended as a first step to determine if certain types of natural features are present on the proposed property to be developed. This is especially useful for species at risk if there are no records of such species on the site but there is some indication that they may inhabit the area. Ecological Site Assessments essentially determine the natural features, if any, to be addressed through an EIS based on the particular conditions of the site.

Municipal staff examine the project scope, site conditions, background information, policy direction, and applicable regulations and determine the best approach to assess whether or not negative environmental impacts would result from the project. The proposed development may, for example, be subject to environmental impact assessment processes under other legislation, including the *Environmental Assessment Act,* the *Ontario Energy Board Act,* and the *Ontario Water Resources Act*. In this case, satisfying the impact assessment requirements under these Acts should also satisfy any municipal requirements for EISs, thus avoiding duplication of effort. Assessing development impacts may also be incorporated into other approval requirements such as permits under the *Public Lands Act, Lakes and Rivers Improvement Act, Conservation Authorities Act*, etc. Again duplication should be avoided by having one EIS satisfy all requirements for impact assessment.

Importantly, municipal staff also determine if an EIS is required, and if so, if the EIS will be a scoped-site EIS or a full-site EIS.

The scoped-site EIS addresses the EIS requirements in an abbreviated report form or checklist prepared by the development proponent or an environmental professional. The scoped-site EIS is applied to minor developments, such as applications for single-lot severances, or in situations where mitigation measures are well-established or where negative impacts are known to be minor based on experience with local conditions. The scoped-site EIS would include some of the same elements as the full-site EIS depending on the development proposal, but in brief form (e.g., yes-no checkboxes, brief descriptions, schematic drawing of proposal, etc.). The exact requirements of the scoped-site EIS would be established in consultation with municipal staff.

The full-site EIS addresses the EIS requirements at a level of detail appropriate to the scope of the proposed development. A qualified professional is typically retained by the proponent to prepare the full-site EIS.

Environmental Impact Studies typically include the following:

a) A map showing the location of the Study Area, including the location and extent of the natural heritage features of interest and the location of the proposed development.
b) A description of the natural heritage features and ecological functions in the Study Area that could be affected by the proposed development and their sensitivity to development.
c) A description of the proposed development.
d) A description of the proposed development’s potential impacts to the natural

heritage features and ecological functions, if any. Impact evaluation should consider all phases of the proposed development, including post-construction.

e) A description of the actions that may be reasonably required to prevent, change, minimize or mitigate impacts on the natural heritage features and functions as a result of the proposed development. Identification, where appropriate, of opportunities for ecological restoration and enhancement of the natural features and functions.
f) An evaluation of cumulative effects that the proposed development, in light of existing development and activities in the area, may have after mitigation on natural heritage features and ecological functions.
g) A professional opinion as to whether or not the proposed developments will have negative impacts on natural heritage features and ecological functions.
h) A description of monitoring activities to be undertaken to ensure that the mitigative measures are having the desired effect. Identification of the parties responsible for assessing the monitoring needs and conducting the monitoring activities.

4.7.2 Recommended Policy Direction

The following points should be considered in the development of the Official Plan:

1. The typical EIS as outlined in section 4.7.1 should be the means by which to demonstrate that there will be no negative impacts from the proposed development on the natural features or ecological functions for which an area is identified.
2. Proponents should be strongly encouraged to discuss development proposals early in the process with municipal staff to ensure that the appropriate level of environmental assessment is applied to the development.
3. The scoped-site EIS should be used in some situations (e.g., minor developments, well-established mitigation measures, etc.).
4. The full-site EIS should be used for development proposals where the scoped-site EIS is insufficient to address potential impacts.

4.8 Natural Heritage Features - Diversity and Connectivity

4.8.1 Background

Along with the specific natural heritage features, the PPS includes a policy addressing broader ecosystem components such as diversity and connectivity. Policy 2.1.2 states:

> "*The diversity and connectivity of natural features in an area, and the long-term ecological function 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 ground water features*".

The PPS Draft Policies (MMAH, 2012) proposes a modification that would see the addition of a policy requiring the identification of natural heritage systems in southern and eastern Ontario only:

> *" Natural heritage systems shall be identified in Ecoregions 6E & 7E, recognizing that considerations in planning for natural heritage systems in settlement areas, rural areas, and prime agricultural areas may vary*".

A natural heritage system is defined in the PPS as:

> "*a system made up of natural heritage features and areas, and linkages intended to provide connectivity (at the regional and site level) and support natural processes which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems*. These systems can include: natural heritage features and areas; federal and provincial parks and conservation reserves, other natural heritage features, lands that have been restored or have the potential to be restored to a natural state, areas that support hydrologic functions, and working landscapes that enable ecological functions to continue. The Province has a recommended approach for identifying natural heritage systems, but municipal approaches that achieve or exceed the same objective may also be used."

4.8.2 Diversity

In the context of Policy 2.1.2, 'diversity' is apparently intended to apply to the *natural heritage features and areas* as defined in Sections 3 and 4 of this report. As outlined in this report, the City contains a considerable number of natural heritage features and areas, the most significant features of which are shown on Figure 3.

Maintenance and improvement of the diversity of natural features should be achieved through the Ontario Living Legacy Land Use Strategy for Crown Lands and through the adoption in the Official Plan of the policy directions recommended in this report.

4.8.3 Connectivity

Connectivity (connections) between natural features is also mentioned as an important ecological property of an area. Perhaps the most well-known expression of connectivity, and certainly the one intended by the PPS (as per the definition of *natural heritage system* above), is the wildlife or conservation corridor. In a recent review of corridors, Beier and Noss (1998) define a corridor as "*a linear habitat in a dissimilar matrix, that connects two or more larger blocks of habitat and that is proposed for conservation on the grounds that it will enhance or maintain viability of specific wildlife populations in the habitat blocks*". The matrix is defined as the dominant patch type in a landscape and is characterized by extensive cover, high connectivity, and/or major control over dynamics.

Connectivity and corridors are not synonymous (Lindenmeyer and Franklin, 2002). Moreover, corridors are not universally agreed on as being beneficial to conservation or on whether they function in ways in which they were intended (Groves, 2003). Lindenmeyer and Franklin (2002) emphasize that "*wildlife corridors should not automatically be assumed to be an essential component of all conservation strategies... the best general strategy to facilitate connectivity for*

some biota may be to improve structural conditions throughout the matrix". Even if applied in conservation plans, most agree that functional corridors must be designed with specific species, landscapes, and ecological processes in mind, and that the goals of any corridor must be explicitly stated and analyzed (Groves, 2003). Also, the concept of wildlife corridors is inseparable from the notion of ecological scale; some corridors might operate at regional or continental scales while others, such as fencerows in an agricultural landscape, are functional only locally (Noss, 1991).

Most studies of wildlife corridors have been conducted in agricultural landscapes where corridors create a stark and often permanent contrast with the surrounding fields (Lindenmeyer and Franklin, 2002). Likewise, application of the corridor concept as a conservation planning strategy, including the recommended provincial approach (Riley and Mohr, 1994), is most often done in agricultural, urban or urbanizing settings (e.g., Arnold, 1995). Lindenmeyer and Franklin (2002), however, point out that extrapolation from agricultural to managed forest landscapes is problematic because potential corridors are less evident as distinct physical features and can be dynamic due to forest regeneration and development.

4.8.4 Recommended Policy Direction

As stated previously, the City is located within a vast forest matrix and is itself composed mainly of forest cover, much of it managed through a provincially approved forest management plan. This Report considers both diversity of natural heritage features and high connectivity between natural heritage features as inherent properties of the forest matrix that dominates the City land cover and within which the City itself is embedded. These properties will be maintained overall since the forest matrix in and around the City is not about to be converted to another land cover given the relatively modest population growth projections for Greater Sudbury. Furthermore, on Crown land, the forest management plan for the Sudbury Forest provides landscape-level management to maintain a shifting mosaic of forest stands of various ages and compositions.

At a finer scale, diversity and connectivity will be enhanced through ecosystem recovery occurring throughout much of the City's industrially damaged landscape as a result of continued land reclamation efforts (see Section 4.10). Overall, these efforts initiate and enhance the recovery of the forest matrix in damaged areas. At these scales, diversity and connectivity will also be addressed through the application of the policy direction proposed for using watersheds as the basic unit of planning in the City (see Section 4.1).

At a finer scale still, connectivity is afforded in the agricultural and urban area through 1) the numerous residual woodlots and second-growth on abandoned fields, 2) the forested riparian corridors along stream corridors, such as along the Whitson River, and 3) the relatively close proximity of the surrounding forest matrix. Recommended policy direction for protecting vegetated buffers around lakes, rivers and streams, if applied, will also have the effect of maintaining connectivity, to some extent, at this scale.

4.9 Sites of Geological Interest

4.9.1 Background

Greater Sudbury is a geologically important area whose bedrock is one of the most intensely studied on Earth (Rousell et al, 2002). Along with having the world's largest nickel-copper-platinum group elements mineral deposit (Rousell et al, 2002), the City contains a number of other important geological and geomorphological features (e.g., in Bajc and Barnett, 1999). The City has the most physically varied and economically important urban geology of any locality in Canada (Saarinen and Tanos, 2002). Although the PPS does not address geological features, except if these features are designated as provincially significant ANSIs (see Section 4.6), the important role of geology in Greater Sudbury warrants special consideration in the development of the Official Plan.

This Report identifies Sites of Geological Interest (Figure 3) that are representative of the rich geological heritage of the Sudbury area and should be protected for future generations. These features could also contribute to the development of the ecotourism and geotourism industry in the City.

Sites of Geological Interest identified in this Report include candidate Earth Sciences ANSIs as defined by the Ministry of Natural Resources (Kor, 2004b), sites recommended for ANSI designation by Gallie et al (1995), sites identified in the OMNR's Natural Resources Values Information System (OMNR, 1997), and sites identified in Northeastern Region Sensitive Area Report (OMNR, 1975). While these sources capture the breadth of the significant geological and geomorphological features in the City, the list is not necessarily exhaustive. Policies in the Official Plan should facilitate the addition of future Sites of Geological Interest.

4.9.2 Recommended Policy Direction

The following points should be considered in the development of the Official Plan:

1. Sites of Geological Interest should be identified on an Official Plan schedule.
2. Sites of Geological Interest should be protected from incompatible development, including planning and construction associated with infrastructure (e.g., new road construction and road widening).
3. Whenever possible, public access to the geological feature should be integrated into the site plan for the development.
4. Future additions to the list of Sites of Geological Interest should be facilitated.

4.10 Ecosystem Recovery

4.10.1 Background

Greater Sudbury's mining legacy has had profound environmental impacts (Wren, 2012). After a century of mining in the area, over 80,000 hectares of land were left either completely devoid of vegetation or in semi-barren state, with only a few stunted birches and a few grasses. Numerous lakes were rendered too acidic and too high in certain metals to support any life except a few tolerant organisms. Large reductions in local air pollution due to improved smelting technologies and practices have allowed some of these areas to begin to recover somewhat through natural

plant colonization. Water quality in lakes also improved with the resultant enhancement of ecosystem function. The City's Land Reclamation Program has succeeded in liming thousands of hectares to reduce metal toxicity to plants thereby allowing millions of trees to be planted on formerly barren hillsides (City of Greater Sudbury, 2013). Thousands more hectares, however, remain to be limed and planted to initiate ecosystem recovery and plant diversity remains low even in areas that have been treated and planted.

Similarly, numerous urban areas within the City are deficient in tree canopy cover and subsequently could be improved from an aesthetic, environmental and livability standpoint by planting additional trees and shrubs.

4.10.2 Recommended Policy Direction

The following points should be considered in the development of the Official Plan:

1. A statement should be included in the general principles or goals that affirm Council's support for the continued recovery of indigenous, self-sustaining terrestrial, aquatic and wetland ecosystems in areas of the City impaired by past smelting.

2. A statement should be included in the general principles or goals that affirms Council's support for the increase in tree canopy cover, specifically in the City's urban areas, so as to enhance the City's appearance, enhance local watersheds to help protect water quality of streams and lakes, enhance air quality, and enhance the amount of shade to protect against certain sun-related diseases and to help reduce energy use in buildings.

3. Areas that have been regreened should be protected from development and site alteration wherever possible. Where development and site alteration cannot avoid the removal of trees and shrubs planted by the City's Regreening Program, the equal amount of trees and shrubs should be replaced as seedlings by the proponent.

4. A landscape plan, identifying the species and sizes of existing trees and the measures that will be taken to protect the trees during development and site alteration, should be required of the proponent as part of the development application in areas that have been regreened.

5. CONCLUSIONS

The principal objective of the previous Natural Heritage Background Study was to conduct an inventory and assessment of significant natural heritage features and areas within the City and to provide recommendations for policies on matters of natural heritage in the Official Plan. The principal objective of this current report is to ensure that the natural heritage data and information identified in the previous study are still valid and to ensure that the proposed policies reflect the current Provincial direction on these matters.

This report integrates disparate information available on Greater Sudbury's natural heritage and provides recommendations for natural heritage policy direction to be considered in developing the City's Official Plan. Guidance for establishing the scope of the Report is provided mainly by the PPS and associated interpretive documents prepared by the OMNR. Proposed policy changes to the PPS (MMAH, 2012) are reflected in this Report's recommended policy directions. Proposed changes to the PPS (September, 2012 draft) do not substantially affect the natural heritage policies in the City's current Official Plan.

The recommended policy directions developed through this Report are outlined in Table 3 for each natural heritage feature.

Table 3. Recommended policy direction for natural heritage features

Watersheds and Watershed-based Planning 1. The Official Plan should recognize watersheds as a basic unit of planning in the City. As such, watershed plans should be developed using individual lakes, clustered hydrologically connected lakes, or individual streams (e.g., Junction Creek) as the appropriate spatial watershed level. Subwatersheds would then be understood as the division of the watershed into smaller, hydrologically relevant units. 2. Watershed plans should address ecological and social aspects, such as sensitive ecological features, ecological connectivity, stressors on natural systems, and recreation use and should propose measures to mitigate environmental stresses and enhance natural systems. Watershed plans provide recommendations on strategies for management, implementation, and monitoring to address the preservation and enhancement of the ecological and recreational features of the lake. 3. Watershed plans should also address matters such as stormwater quantity and quality through modeling under different land-cover scenarios. 4. Watershed plan recommendations could be implemented through a variety of means, including zoning by-law, infrastructure upgrade, development approval conditions, stormwater site management plans, property stewardship, tree planting, etc.
Significant Habitat of Endangered Species and Threatened Species 1. The general location of a record of an endangered species or threatened species should be shown on an environmental features overlay. The species should not be identified. 2. Provisions should be included for the identification of more precise location of the record associated with the endangered species or threatened species by the City or the OMNR during review of new development.

3. A specific policy should be included for undertaking a preliminary ecological site assessment when new development is proposed near the location record of an endangered species or threatened species unless detailed habitat mapping is available from the OMNR. The purpose of the preliminary ecological site assessment is to determine, based on existing information from agencies or on preliminary field investigations, if significant habitat of endangered species and/or threatened species is present on the subject property or on lands adjacent to it. If habitat is present, a detailed ecological site assessment would then be required to confirm the presence of the endangered species or threatened species on the subject property. Delineation of the significant habitat of endangered species and threatened species and the 'adjacent lands' (i.e., 120 m from the delineated habitat boundary) would also be conducted during the detailed ecological site assessment.
4. Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.
5. Development and site alteration shall not be permitted on the adjacent lands of habitat of endangered species and threatened species 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.

Fish Habitat

1. A general policy to protect fish habitat from harmful alteration, disruption or destruction should be included.
2. A general policy to encourage restoration, enhancement or creation of fish habitat should be included.
3. 'Sensitive' fish spawning areas (i.e., for brook trout, lake trout, and walleye) should be identified during watershed planning unless otherwise known.
4. Development or site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.
5. Development and site alterations shall not be permitted on lands within 30 m of fish habitat 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 fish habitat or its ecological functions.
6. Development and site alterations shall not be permitted on lands within 120 m of lake trout lakes or 'sensitive' fish spawning areas 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 lake trout or 'sensitive' fish spawning areas or on their ecological functions.
7. Setbacks between all buildings, except boathouses and floatplane hangars, and the shoreline of all lakes should be applied.

8. Natural vegetated buffers should be maintained adjacent to the shoreline and banks of all lakes, rivers, and streams. Coldwater streams may require greater buffer widths than warmwater streams. Appropriate buffer widths also depend on the characteristics of the buffer, terrain conditions, and the desired buffer function(s).
9. All construction activities should be mitigated for potential impacts to surface water runoff.
10. New lots should be discouraged where the entire shoreline abuts 'sensitive' spawning habitat.
11. Boathouses or float plane hangars should discouraged in 'sensitive' spawning habitat (although permission to build would be established through the DFO permitting process).
12. The Official Plan should allow for minor adjustments to be made to the boundaries of 'sensitive' fish spawning areas as shown on the schedule without an Official Plan amendment.

Wetlands

Provincially Significant Wetlands

The PPS clearly states that development and site alteration are not permitted in significant wetlands (i.e., as evaluated through the Ontario Wetland Evaluation System and approved by the MNR) in Ecoregion 5E. In the Canadian Shield north of Ecoregion 5E, development and site alteration shall not be permitted in significant wetlands unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

For lands adjacent to the significant wetlands, the PPS states that:

- "*Development and site alteration shall not be permitted on adjacent lands to the* (significant wetlands) *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* (significant wetlands) *or their ecological functions*".

The means of demonstrating 'no negative impacts' would be through an environmental impact study prepared by a qualified expert retained by the development's proponent.

All Wetlands (i.e., except provincially significant wetlands)

1. To the extent possible, all wetlands should be identified on an Official Plan schedule (i.e., wetlands shown on Figure 3).

2. Wetlands can provide several environmental functions, some more critical than others. Ideally, development and site alteration should be directed away from wetlands. Wetland loss can have environmental consequences including rapid degradation of stream and lake water quality in hydrologically connected systems. The relative sensitivity of wetlands should be evaluated based on the watershed or catchment within which they are located. Sensitive wetlands should be protected from incompatible development or site alteration, including peat extraction.

   The sensitivity of individual wetlands should be determined through the development of watershed plans. Development and site alteration should not be permitted in a sensitive wetland or lands within 50 metres of a sensitive wetland unless it has been demonstrated that there will be no negative impacts to these natural features or on their ecological functions.

3. In areas without a watershed or subwatershed plan, development and site alteration should not be permitted in a wetland unless it can be demonstrated that there will be no impacts to the quality and quantity of surface water features that are hydrologically linked to the wetland and that losses of significant wetland features and functions will not occur.

4. Wetlands should be delineated through field investigations undertaken by a qualified person during the site planning stage, or during an EIS, if such a study is determined to be necessary. The O.P. should allow for the minor modification of wetland boundaries as depicted on the O.P. schedule without an O.P. amendment.

5. The O.P. should allow for the identification of additional wetlands to those on the O.P. schedule.

6. Natural vegetated buffers should be maintained adjacent to the edges of wetlands to protect and enhance the hydrological and ecological functions provided by the wetlands. Appropriate buffer widths depend on the characteristics of the buffer, terrain conditions, wetland functions, and the desired buffer function(s) and should be determined at the watershed level.

Significant Wildlife Habitat

1. Development and site alteration shall not be permitted in significant wildlife habitat unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.
2. Development and site alteration shall not be permitted on lands within 120 m of significant wildlife habitat 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.

Areas of Natural and Scientific Interest (ANSIs)

1. Development and site alteration shall not be permitted in 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. Development and site alteration shall not be permitted on adjacent lands to significant areas of natural and scientific interest 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.
3. Adjacent lands should follow provincial recommendations (OMNR, 2010):

    - Significant areas of natural and scientific interest – life science: 120 m
    - Significant areas of natural and scientific interest – earth science: 50 m.

4. Candidate Earth Science ANSIs should be included as Geological Sites of Interest as discussed in Section 4.9 until such a time as these are given full status.

Environmental Impact Studies

1. The typical EIS as outlined in section 4.7.1 should be the means by which to demonstrate that there will be no negative impacts from the proposed development on the natural features or ecological functions for which an area is identified.
2. Proponents should be strongly encouraged to discuss development proposals early in the process with municipal staff to ensure that the appropriate level of environmental assessment is applied to the development.
3. The scoped-site EIS should be used in some situations (e.g., minor developments, well-established mitigation measures, etc.).
4. The full-site EIS should be used for development proposals where the scoped-site EIS is insufficient to address potential impacts.

Natural Heritage Features - Diversity and Connectivity

Addressed through other recommended policies and by the nature of the City's landscapes.

Sites of Geological Interest

1. Sites of Geological Interest should be identified on an Official Plan schedule.
2. Sites of Geological Interest should be protected from incompatible development, including planning and construction associated with infrastructure (e.g., new road construction and road widening).
3. Whenever possible, public access to the geological feature should be integrated into the site plan for the development.

4. Future additions to the list of Sites of Geological Interest should be facilitated.

Ecosystem Recovery

1. A statement should be included in the general principles or goals that affirm Council's support for the continued recovery of indigenous, self-sustaining terrestrial, aquatic and wetland ecosystems in areas of the City impaired by past smelting.

2. A statement should be included in the general principles or goals that affirms Council's support for the increase in tree canopy cover, specifically in the City's urban areas, so as to enhance the City's appearance, enhance local watersheds to help protect water quality of streams and lakes, enhance air quality, and enhance the amount of shade to protect against certain sun-related diseases and to help reduce energy use in buildings.

3. Areas that have been regreened should be protected from development and site alteration wherever possible. Where development and site alteration cannot avoid the removal of trees and shrubs planted by the City's Regreening Program, the equal amount of trees and shrubs should be replaced as seedlings by the proponent.

4. A landscape plan, identifying the species and sizes of existing trees and the measures that will be taken to protect the trees during development and site alteration, should be required of the proponent as part of the development application in areas that have been regreened.

6. REFERENCES

Arbex Forest Dev. Co. Ltd. 1991. Life Sciences Resource Features of Selected Areas Contained Old White and Red Pine in Site Region 4E in Ontario. Volume 1. Report prepared for the Ontario Ministry of Natural Resources. 136 p.

Bajc, A.F. and P.J. Barnett. 1999. Quaternary Geology and Geomorphology of the Sudbury Region. Field Trip A5 Guidebook. Geological Association of Canada and Mineralogical Association of Canada Joint Annual Meeting. May 26 - 28, 1999. Laurentian University, Sudbury, Ontario. 68 p.

Beier, P. and R.F. Noss. 1998. Do habitat corridors provide connectivity? Conservation Biology 12:1241-1252.

Bird Studies Canada, Environment Canada's Canadian Wildlife Service, Ontario Nature, Ontario Field Ornithologists and Ontario Ministry of Natural Resources. 2006. Ontario Breeding Bird Atlas Website. http://www.birdsontario.org/atlas/index.jsp

Blomme, Chris. 2013. Personal communication. Department of Biology, Laurentian University and Sudbury Ornithological Society.

Castelle, A.J., C. Conolly, M. Emers, E.D. Metz, S. Meyer, M. Witter, S. Mauermann, T. Erickson, S.S. Cooke. 1992. Wetland Buffers: Use and Effectiveness. Adolfson Associates, Inc., Shorelands and Coastal Zone Management Program, Washington Department of Ecology, Olympia, Pub. No. 92-10.

Chambers, B., B. Naylor, J. Nieppola, B. Merchant, and P. Uhlig. 1997. Field Guide to Forest Ecosystems of Central Ontario. SCSS Field Guide FG-01. Ministry of Natural Resources. 200 p.

City of Greater Sudbury. 2013. Greater Sudbury Regreening Program – 2012 Annual Report. 30 p.

City of North Bay. 2012. City of North Bay Official Plan. Office Consolidation, Version 1.0 – January, 2012.

Dechant, J. A., M. F. Dinkins, D. H. Johnson, L. D. Igl, C. M. Goldade, B. D. Parkin, and B. R. Euliss. 1999 a. (revised 2002). Effects of management practices on grassland birds: Upland Sandpiper. Northern Prairie Wildlife Research Center, Jamestown, ND. 34 pages.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, A. L. Zimmerman, and B. R. Euliss. 1999 b. (revised 2001). Effects of management practices on grassland birds: Bobolink. Northern Prairie Wildlife Research Center, Jamestown, ND. 24 pages.

Dingwall, S. 2004. Personal Communication. District Planner, Sudbury District. Ontario Ministry of Natural Resources. Sudbury, Ontario.

Dingwall, S. 2013. Personal Communication. District Planner, Sudbury District. Ontario Ministry of Natural Resources. Sudbury, Ontario.

Dobbyn, J. 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists. 115 p.

Fischer, R.A. 2000. Width of riparian zones for birds. EMRRP Technical Notes Collection (TN EMRRP-SI-09), U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Fischer, R.A. and J.C. Fischenich. 2000. Design recommendations for riparian corridors and vegetated buffer strips. EMRRP Technical Notes Collection (ERDC TN-EMRRP-SR-24), U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Gallie, E.A., A. Lampinen, and K. Rukholm. 1995. A Study of Selected Glacial Landforms of the Sudbury Basin. Report for the Ontario Ministry of Natural Resources, Parks Ontario, Central Region, Sudbury, Ontario. Centre in Mining and Mineral Exploration Research, Laurentian University, Sudbury, Ontario. 44 p. + maps.

Groves, C.R. 2003. Drafting a Conservation Blueprint: a practitioner's guide to planning for biodiversity. The Nature Conservancy. Island Press, Washington. 457p.

Hernandez, D., W. Reynolds, and L. Hajjar. (no date). Vegetated Riparian Buffers and Buffer Ordinances. Ocean and Coastal Resource Management. South Carolina Department of Health and Environmental Control.

Keller, W., J. Heneberry, J.M. Gunn, E. Snucins, G. Morgan, and J. Leduc. 2004. Recovery of Acid and Metal-damaged Lakes Near Sudbury Ontario: trends and status. Cooperative Freshwater Ecology Unit, Department of Biology, Laurentian University, Sudbury, Ontario. Supporting report for the Ecological Risk Assessment component of the Sudbury Soils Study.

Kor, P. 2004a. Personal Communication. Senior Conservation Geologist. Ontario Parks. Peterborough, Ontario. From emails received between December 2003 and May 2004.

Kor, P. 2004b. Personal Communication. Senior Conservation Geologist. Ontario Parks. Peterborough, Ontario. From an email with attached maps received December 8, 2003 and from an email with attached information sheets received April 15, 2004. Information sheets included selections from Ontario Nature Reserve Program Environmental Data Cards, Earth Science Inventory Checklist and Natural Area Database.

Marble, A.D. 1991. A Guide to Wetland Functional Design. Lewis Publishers, Boca Raton. 221 p.

Lindenmeyer, D.B. and J.F. Franklin. 2002. Conserving Forest Biodiversity: a comprehensive multiscaled approach. Island Press, Washington. 351 p.

MMAH (Ministry of Municipal Affairs and Housing). 2012. Provincial Policy Statement Review Under the Planning Act. Draft Policies. September 2012. 52p.

MOE (Ontario Ministry of Natural Resources). 2004. White Paper on Watershed-based Source Protection Planning. Integrated Environmental Planning Division, Strategic Policy Branch, MOE. 46 p.

Noss, R.F. 1991. Landscape Connectivity: different functions at different scales. IN Landscape Linkages and Biodiversity. W.E. Hudson. Defenders of Wildlife. Island Press, Washington, D.C. Pages 27 - 39.

Oldham, M.J. and W.F. Weller. 2000. Ontario Herpetofaunal Atlas. Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

http://www.mnr.gov.on.ca/MNR/nhic/herps/ohs.html (updated 15-01-2001).

OMNR (Ontario Ministry of Natural Resources). 1975. Northeastern Region - Sensitive Area Report.

OMNR (Ontario Ministry of Natural Resources). 1997. Natural Resources Values Maps and Accompanying Information for Determining Application of the Provincial Policy Statement under the Planning Act. Sudbury District OMNR. Unpublished.

OMNR (Ontario Ministry of Natural Resources). 2000. Significant Wildlife Habitat: Technical Guide. Fish and Wildlife Branch, Wildlife Section. 360 p.

OMNR (Ontario Ministry of Natural Resources). 2006. Inland Ontario Lakes Designated for Lake Trout Management. Fisheries Section. Fish and Wildlife Branch. 53 p.

OMNR (Ontario Ministry of Natural Resources). 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 p.

OMNR (Ontario Ministry of Natural Resources). 2013. Species at Risk in Ontario (SARO) List. Revised April 22, 2013.
http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276722.html

Ontario Nature. 2013. Ontario's Reptile and Amphibian Atlas (updated January 13, 2013).
http://www.ontarionature.org/protect/species/herpetofaunal_atlas.php

Ontario Wildlife Working Group. 1991. Looking ahead: a wild life strategy for Ontario. Ontario Ministry of Natural Resources, Queen's Printers, Toronto. 172 p.

Palone, R.S. and A.H. Todd. 1998 (revised). Chesapeake Bay Riparian Handbook: a guide for establishing and maintaining riparian forest buffers.

Pearson, D.A.B., J.M. Gunn, and W. Keller. 2002. The past, present and future of Sudbury's lakes. IN The Physical Environment of the City of Greater Sudbury. Ontario Geological Survey, Special Volume 6. D.H. Rousell and K.J. Jansons (editors). Pages 195 - 215.

Revenga, C., S. Murray, J. Abramovitz and A. Hammond. 1998. Watersheds of the World: ecological value and vulnerability. World Resources Institute, Washington, D.C. 200 p.

Riley, J.L. and P. Mohr. 1994. The Natural Heritage of Southern Ontario's Settled Landscapes: A review of conservation and restoration ecology for land-use and landscape planning. Ontario Ministry of Natural Resources, Southern Region. Aurora, Science and Technology Transfer, Technical Report TR-001. 78 p.

Rousell, D.H., W. Meyer, and S.A. Prevec. 2002. Bedrock Geology and Mineral Deposits. IN

The Physical Environment of the City of Greater Sudbury. D.H. Rousell and K.J. Jansons, editors. Ontario Geological Survey, Special Volume 6. Pages 21-55.

Saarinen, O.W. and W.A. Tanos. 2002. The Physical Environment of the Sudbury Area and its Influence on Urban Development. IN The Physical Environment of the City of Greater Sudbury. D.H. Rousell and K.J. Jansons, editors. Ontario Geological Survey, Special Volume 6. Pages 3-18.

Szkokan-Emilson, E.J., B.E. Wesolek and J.M. Gunn. 2010. Terrestrial organic matter as subsidies that aid in the recovery of macroinvertebrates in industrially damaged lakes. Ecological Applications 21(6): 2082-2093.

US EPA (United States Environmental Protection Agency). 2001a. National Management Measures to Protect and Restore Wetlands and Riparian Areas for the Abatement of Nonpoint Source Pollution. Office of Water, Washington, D.C. EPA 841-B-01-001. 199 p.

US EPA (United States Environmental Protection Agency). 2001b. Protecting and Restoring America's Watersheds: status, trends and initiatives in watershed management. Office of Water, Washington, D.C. EPA-840-R-00-001. 56 p.

Wenger, S. 1999. A Review on the Scientific Literature on Riparian Buffer Width, Extent and Vegetation. Office of Public Service and Outreach, Institute of Ecology, University of Georgia. Athens, Georgia. 59 p.

Wenger, S.J. and L. Fowler. 2000. Protecting Stream and River Corridors: creating effective local riparian buffer ordinances. Public Policy Research Series. Carl Vinson Institute of Government, University of Georgia. Athens, Georgia. 79 p.

Wesolek, B.E., E.J. Szkokan-Emilson and J.M. Gunn. 2010. Assessment of littoral benthic invertebrate communities and the land-water interface in lakes recovering from severe acid- and metal-damage. Human and Ecological Risk Assessment 16(3): 536-559.

Whitelaw, C. 2004. Personal communication with Mr. Whitelaw, a long-time member of the Sudbury Ornithological Society. Based on recent additions to the Bird Checklist for the District of Sudbury, second edition, 1998.

Wren, Christopher. 2012. Risk Assessment and Environmental Management: a case study in Sudbury, Ontario, Canada. Maralte B.V. Leiden, The Netherlands. 454 p.

APPENDIX A

Amphibians and Reptiles of the City of Greater Sudbury

Amphibians and reptiles of the City of Greater Sudbury. This list is based on records from the Ontario Herpetological Summary Atlas (Oldham and Weller, 2000) and Ontario's Reptile and Amphibian Atlas (Ontario Nature, 2012).

Salamanders

Eastern Newt
Blue-spotted Salamander (historical sighting)
Jefferson - Blue Spotted Salamander Complex (historical sighting)
Spotted Salamander (historical sighting)
Eastern Red-backed Salamander

Frogs and Toads

American Toad
Spring Peeper
Gray Treefrog
Wood Frog
Northern Leopard Frog
Green Frog
Mink Frog
American Bullfrog

Turtles

Blanding's Turtle
Snapping Turtle
Midland Painted Turtle

Snakes

Eastern Gartersnake
Northern Watersnake
Red-bellied Snake
Smooth Greensnake
Northern Ring-necked Snake
Milksnake

APPENDIX B

Birds of the City of Greater Sudbury

Breeding Birds of the City of Greater Sudbury

Presence of breeding bird species Data obtained from the Ontario Breeding Bird Atlas. A total of 45 squares each measuring 10 x 10 km are contained within the City of Greater Sudbury. Species are shown in order of decreasing occurrence of breeding evidence in 2nd atlas period.

	2nd Atlas Period 2000 - 2005		1st Atlas Period 1980 - 1985	
Bird Species	Number of squares with breeding evidence	Percent	Number of squares with breeding evidence	Percent
Red-eyed Vireo	45	100.0	45	100.0
Chestnut-sided Warbler	45	100.0	44	97.8
White-throated Sparrow	45	100.0	45	100.0
Northern Flicker	45	100.0	45	100.0
Common Raven	45	100.0	44	97.8
Yellow-rumped Warbler	45	100.0	44	97.8
Common Yellowthroat	45	100.0	45	100.0
Black-capped Chickadee	45	100.0	45	100.0
Chipping Sparrow	45	100.0	45	100.0
Hairy Woodpecker	45	100.0	39	86.7
Veery	44	97.8	45	100.0
American Redstart	44	97.8	45	100.0
Cedar Waxwing	44	97.8	45	100.0
Song Sparrow	44	97.8	45	100.0
Common Grackle	44	97.8	44	97.8
Hermit Thrush	43	95.6	45	100.0
Blue Jay	43	95.6	41	91.1
American Robin	43	95.6	45	100.0
American Crow	42	93.3	45	100.0
Nashville Warbler	42	93.3	45	100.0
Mallard	42	93.3	39	86.7
Least Flycatcher	42	93.3	45	100.0
Alder Flycatcher	41	91.1	43	95.6
Broad-winged Hawk	41	91.1	40	88.9
Swamp Sparrow	41	91.1	45	100.0
American Goldfinch	41	91.1	41	91.1
Ruffed Grouse	41	91.1	41	91.1
Ovenbird	40	88.9	45	100.0
Belted Kingfisher	40	88.9	44	97.8
Mourning Warbler	40	88.9	41	91.1
Common Loon	39	86.7	37	82.2
Magnolia Warbler	39	86.7	39	86.7
Yellow-bellied Sapsucker	39	86.7	37	82.2
Purple Finch	38	84.4	45	100.0
Yellow Warbler	37	82.2	43	95.6

Red-winged Blackbird	37	82.2	44	97.8
Red-breasted Nuthatch	37	82.2	37	82.2
Black-throated Green Warbler	37	82.2	34	75.6
Pileated Woodpecker	37	82.2	25	55.6
Black-and-white Warbler	37	82.2	42	93.3
Tree Swallow	36	80.0	45	100.0
Black-billed Cuckoo	36	80.0	26	57.8
Ring-necked Duck	36	80.0	28	62.2
Ruby-throated Hummingbird	36	80.0	37	82.2
Downy Woodpecker	36	80.0	35	77.8
Canada Goose	36	80.0	2	4.4
Winter Wren	35	77.8	34	75.6
American Bittern	34	75.6	18	40.0
Dark-eyed Junco	34	75.6	39	86.7
Black-throated Blue Warbler	34	75.6	29	64.4
Sandhill Crane	33	73.3	5	11.1
Merlin	33	73.3	5	11.1
Ruby-crowned Kinglet	33	73.3	36	80.0
Spotted Sandpiper	32	71.1	44	97.8
European Starling	32	71.1	32	71.1
Wood Duck	32	71.1	23	51.1
American Kestrel	32	71.1	35	77.8
Rose-breasted Grosbeak	32	71.1	42	93.3
Blackburnian Warbler	31	68.9	24	53.3
Evening Grosbeak	31	68.9	41	91.1
Blue-headed Vireo	31	68.9	16	35.6
Eastern Phoebe	30	66.7	25	55.6
Canada Warbler	30	66.7	42	93.3
Hooded Merganser	30	66.7	28	62.2
Northern Harrier	30	66.7	32	71.1
Red-tailed Hawk	30	66.7	15	33.3
Mourning Dove	29	64.4	22	48.9
Eastern Kingbird	29	64.4	45	100.0
Philadelphia Vireo	29	64.4	19	42.2
Common Snipe	29	64.4	33	73.3
Indigo Bunting	28	62.2	29	64.4
Savannah Sparrow	28	62.2	32	71.1
American Woodcock	28	62.2	38	84.4
Common Merganser	27	60.0	33	73.3
Swainson's Thrush	27	60.0	32	71.1
Gray Jay	27	60.0	14	31.1
Golden-crowned Kinglet	27	60.0	14	31.1
Wilson's Warbler	27	60.0	17	37.8
Gray Catbird	26	57.8	33	73.3

Brown Thrasher	26	57.8	25	55.6
Great Crested Flycatcher	26	57.8	33	73.3
Pied-billed Grebe	26	57.8	16	35.6
Barn Swallow	25	55.6	41	91.1
Killdeer	25	55.6	40	88.9
Green-winged Teal	24	53.3	20	44.4
Vesper Sparrow	23	51.1	26	57.8
Virginia Rail	23	51.1	13	28.9
Scarlet Tanager	22	48.9	23	51.1
Pine Siskin	22	48.9	22	48.9
Whip-poor-will	21	46.7	40	88.9
Great Blue Heron	21	46.7	33	73.3
Sora	21	46.7	15	33.3
Sharp-shinned Hawk	20	44.4	16	35.6
Common Nighthawk	20	44.4	44	97.8
American Black Duck	20	44.4	37	82.2
Tennessee Warbler	20	44.4	23	51.1
Baltimore Oriole	19	42.2	25	55.6
Blue-winged Teal	19	42.2	32	71.1
Bobolink	19	42.2	28	62.2
Brown Creeper	19	42.2	9	20.0
Rock Pigeon	18	40.0	15	33.3
Herring Gull	18	40.0	22	48.9
Pine Warbler	18	40.0	9	20.0
Brown-headed Cowbird	18	40.0	37	82.2
Turkey Vulture	18	40.0	4	8.9
Warbling Vireo	17	37.8	16	35.6
White-breasted Nuthatch	17	37.8	9	20.0
Eastern Bluebird	16	35.6	10	22.2
Common Goldeneye	16	35.6	16	35.6
Lincoln's Sparrow	15	33.3	8	17.8
Northern Waterthrush	14	31.1	21	46.7
Barred Owl	14	31.1	14	31.1
Black-backed Woodpecker	14	31.1	8	17.8
Olive-sided Flycatcher	13	28.9	31	68.9
Eastern Meadowlark	12	26.7	21	46.7
Eastern Wood-Pewee	12	26.7	16	35.6
Great Horned Owl	12	26.7	14	31.1
Osprey	11	24.4	8	17.8
Solitary Sandpiper	11	24.4	11	24.4
Northern Saw-whet Owl	11	24.4	8	17.8
Double-crested Cormorant	10	22.2	1	2.2
Yellow-bellied Flycatcher	10	22.2	10	22.2
Bank Swallow	10	22.2	19	42.2
Golden-winged Warbler	9	20.0	9	20.0
Cliff Swallow	9	20.0	30	66.7
American Wigeon	8	17.8	5	11.1

House Wren	8	17.8	5	11.1
Willow Flycatcher	7	15.6	3	6.7
Sedge Wren	7	15.6	11	24.4
American Coot	6	13.3	2	4.4
Northern Shoveler	6	13.3	7	15.6
Ring-billed Gull	6	13.3	1	2.2
Clay-colored Sparrow	6	13.3	6	13.3
Peregrine Falcon	6	13.3	0	0.0
Cape May Warbler	6	13.3	16	35.6
Rusty Blackbird	6	13.3	6	13.3
Black/Yellow-billed Cuckoo	5	11.1	0	0.0
Chimney Swift	5	11.1	10	22.2
Wood Thrush	5	11.1	9	20.0
Northern Mockingbird	4	8.9	4	8.9
Trumpeter Swan	4	8.9	0	0.0
Gadwall	4	8.9	0	0.0
Red-shouldered Hawk	4	8.9	0	0.0
Yellow-billed Cuckoo	4	8.9	3	6.7
Lesser Scaup	4	8.9	3	6.7
Long-eared Owl	4	8.9	2	4.4
Spruce Grouse	4	8.9	3	6.7
Northern Pintail	3	6.7	8	17.8
Upland Sandpiper	3	6.7	11	24.4
Short-eared Owl	3	6.7	2	4.4
Northern Parula	3	6.7	1	2.2
Le Conte's Sparrow	3	6.7	1	2.2
Northern Cardinal	3	6.7	2	4.4
Northern Goshawk	3	6.7	3	6.7
White-winged Crossbill	3	6.7	3	6.7
Bay-breasted Warbler	3	6.7	8	17.8
Brewer's Blackbird	3	6.7	18	40.0
House Sparrow	3	6.7	20	44.4
Bald Eagle	2	4.4	0	0.0
Marsh Wren	2	4.4	2	4.4
Connecticut Warbler	2	4.4	0	0.0
Cooper's Hawk	2	4.4	5	11.1
Boreal Chickadee	2	0.0	8	17.8
Red-necked Grebe	1	2.2	1	2.2
Redhead	1	2.2	1	2.2
Red-breasted Merganser	1	2.2	0	0.0
Caspian Tern	1	2.2	0	0.0
Great Gray Owl	1	2.2	0	0.0
Northern Rough-winged Swallow	1	2.2	6	13.3
Western Meadowlark	1	2.2	1	2.2
House Finch	1	2.2	0	0.0
Red Crossbill	1	2.2	5	11.1

Great Egret	0	0.0	1	2.2
Ruddy Duck	0	0.0	2	4.4
Wilson's Phalarope	0	0.0	3	6.7
Black Tern	0	0.0	1	2.2
Boreal Owl	0	0.0	1	2.2
Red-headed Woodpecker	0	0.0	1	2.2
Horned Lark	0	0.0	1	2.2
Purple Martin	0	0.0	9	20.0
Eastern Towhee	0	0.0	1	2.2
Field Sparrow	0	0.0	1	2.2
Grasshopper Sparrow	0	0.0	2	4.4

APPENDIX C

Mammals of the City of Greater Sudbury

Mammals of the City of Greater Sudbury. This list is based on records from the Atlas of the Mammals of Ontario (Dobbyn, 1994).

Common Shrew
Smoky Shrew
Pygmy Shrew
Water Shrew
Northern Short-tailed Shrew
Hairy-tailed Mole
Star-nosed Mole
Little Brown Bat
Northern Myotis
Big Brown Bat
Snowshoe Hare
Least Chipmunk
Eastern Chipmunk
Woodchuck
Gray Squirrel
Red Squirrel
Northern Flying Squirrel
Beaver
Deer Mouse
Southern Red-backed Vole
Rock Vole
Meadow Vole
Muskrat
Southern Bog Lemming
Norway Rat
House Mouse
Meadow Jumping Mouse
Woodland Jumping Mouse
Porcupine
Coyote
Eastern Wolf
Red Fox
Black Bear
Raccoon
Marten
Fisher
Ermine
Long-tailed Weasel
Mink
Striped Skunk
River Otter
Canada Lynx
Bobcat
Wapiti
White-tailed Deer
Moose

APPENDIX D

Sites of Geological Interest of the City of Greater Sudbury

Geological Sites of Interest

Name	Candidate PS ANSI*	Candidate R&L ANSI†	Information Source	Brief Description
Anthraxolite Vein			3,4	A small vein of anthraxolite, a rare form of anthracitic carbon. Only occurrence known in Ontario and may be the only anthraxolite occurrence in Canada.
Bailey Corners Glacial Striae			3,4	Glacial striae with some over 45 cm deep.
Capreol Delta			1,4	May be one of the best-developed perched deltas in the province. Gallie et al (1995) consider as provincially significant.
Chelmsford - Chelmsford Formation		√	2	Good example of turbidite bedding.
Denison - Aphebian Formations		√		No description information available.
Dowling - Onwatin Formation	√		2,4	A 12 m long by 2 m high, weathered outcrop exhibits the thin-bedded black, carbonaceous, pyritic siltstone of the Onwatin Formation. Provincially significant representation of this Formation.
Drury Bedrock Formations		√		No description information available.
Elsie Mountain Formation		√	2	The type locality for the Elsie Mountain Formation. Thick metabasalt flows with well-preserved amygdules and pillows.
Graham - Copper Cliff Formation	√		2,4	Regionally significant representation of the Copper Cliff Formation.
Graham - Stobie Formation		√		No description information available.
Hanmer Ice Contact Delta			1,4	Vermilion River cuts through Cartier I Moraine ridge and down to bedrock and upper portions of a kettled delta surface on which terraces are preserved. Fronted by extensive outwash fans. Gallie et al (1995) include with Capreol Delta, which they consider provincially significant.
Kelly Lake Shatter Cones	√		2,3,4	Provincially significant for their exceptional size, form and distribution. Features remain a key element in the study of the origins of the Sudbury Basin.
Larchwood - Chelmsford Formation	√		2,3	Provincially significant representation of Chelmsford Formation due to its size and excellent interpretive features.
Laurentian University - Sudbury Breccia		√	2	Good exposure of Sudbury Breccia.

Levack Astrobleme		√		No description information available from sources. Astrobleme is the remains of an ancient meteorite-impact structure, generally in the form of circular scar of crushed and deformed bedrock.
Lively - Elsie Mountain Formation	√		2,4	Regionally significant representation of the Elsie Mountain Formation due to good access and use by geologists.
Louise - Aphebian Formations		√		No description information available from sources.
McCrea Heights - South Range Norite	√		2,4	Provincially significant representation of the upper zone South Range Norite, Sudbury Nickel Irruptive; and an example of the youngest rock type in the Sudbury Basin, an olivine diabase dike.
Murray Mine Discovery Site		√	2,3,4	Relocation of Highway 144 and expansion of the Murray Mine open pit operation has removed the original discovery site. What remains is an outcrop of a rusty, weathered portion of the sub-layer, the heterogenous marginal phase of the Sudbury Irruptive.
Naughton A - Pecors Formation	√		2,4	Provincially significant representation of a section through the Pecors Formation.
Naughton B- Ramsey Lake Formation	√		2,4	Provincially significant representation of the Ramsay Lake Formation. A large outcrop area exposes most of the Ramsay Lake Formation, Hough Lake Group, a polymictic paraconglomerate and pebbly sandstone, and the upper part of the McKim Formation, Elliot Lake Group, a greywacke and argillite.
Nelson River Delta			1,4	Nelson River delta may have the most complete record of postglacial lake levels in glacial Lake Algonquin along the north shore of the Huron basin. Gallie et al (1995) consider the feature to be provincially significant.
Onaping River Delta			1	Gallie et al (1995) consider this glacially formed delta feature to be regionally significant.
Onaping Formation			2,4	Provincially significant representation of the Onaping Formation, Whitewater Group, as it is the type locality and the discovery site of shock metamorphic microfeatures related to the genesis of the Sudbury Basin.

Onaping - Sudbury Nickel Irruptive	√		2,4	Provincially significant representation of the outer portion of the Sudbury Irruptive event. As a single outcrop, the rock types have low significance, but in context with history of the Irruptive, provincial status is achieved.
Ramsey Lake Shatter Cones		√	2,4	Although shatter cones are not particularly rare in the Sudbury area, the significance of the Ramsay Lake site is its accessibility, its high interpretive value, the abundance of the features, and its scientific value.
Robinson Lake - Ramsey Lake Pecors Formation		√	2,4	Regionally significant representation of the Sudbury Breccia.
Sandcherry Creek Delta			1	Gallie et al (1995) consider this glacially formed delta feature to be regionally significant.
Seal Lake Moraine/Delta Complex			4	Considered a provincially significant moraine/delta complex related to the Cartier I Moraine (OMNR, 1997). Not mentioned in Kor (2004b).
Serpent Gowganda Formation		√		No description information available from sources. Contained within the Wanapitei Provincial Park.
Sudbury Airport Glacial Lake & Sand Delta			1,2,3,4	Kor is quoted in Gallie et al (1995): “The airport meltwater channel is an extraordinary landform with some of the largest and best developed kettles (ice block depressions) in Ontario”. Kor (2004b) confirmed that this statement still holds true.
Sudbury Airport Kettles	√ proposed		1,2,3,4	Kor is quoted in Gallie et al (1995): “The airport meltwater channel is an extraordinary landform with some of the largest and best developed kettles (ice block depressions) in Ontario”. Kor (2004b) confirmed that this statement still holds true.
Sudbury A - Norite	√		2,4	Provincially significant exposure of South Range Norite, Sudbury Nickel Irruptive
Sudbury B - Norite	√		2,4	Provincially significant representation of the quartz-rich norite of the South Range Norite, Sudbury Nickel Irruptive.
Sudbury Treeless Area			4	
Vermillion River - Chelmsford Formation		√		

* Candidate provincially significant ANSI. From Kor, P. 2004b.

† Candidate Regional or Local ANSI. From Kor, 2004b.

1. Gallie, E.A., A. Lampinen, and K. Rukholm. 1995. A Study of Selected Glacial Landforms of the Sudbury Basin. Report for the Ontario Ministry of Natural Resources, Parks Ontario, Central Region, Sudbury, Ontario. Centre in Mining and Mineral Exploration Research, Laurentian University, Sudbury, Ontario. 44 p. + maps.

2. Kor, P. 2004b. Personal Communication. Senior Conservation Geologist. Ontario Parks. Peterborough, Ontario. From an email with attached maps received December 8, 2003 and from an email with attached information sheets received April 15, 2004. Information sheets included selections from Ontario Nature Reserve Program Environmental Data Cards, Earth Science Inventory Checklist and Natural Area Database.

3. OMNR (Ontario Ministry of Natural Resources). 1975. Northeastern Region - Sensitive Area Report.

4. OMNR (Ontario Ministry of Natural Resources). 1997. Natural Resources Values Maps and Accompanying Information for Determining Application of the Provincial Policy Statement under the Planning Act. Sudbury District OMNR. Unpublished.

APPENDIX E

Vegetation Classification Model Used to Generate Figure 2

Vegetation Classification Model

Outlined below are the details of the vegetation classification model used to generate Figure 2 (City of Greater Sudbury Vegetation Cover Types). The model used Microsoft Excel formulas to classify over 85,000 polygons based on forest stand information and other land cover information provided in the Forest Resources Inventory database. The model proceeds in a stepwise manner across spreadsheet columns following the order shown below for each spreadsheet row.

The formulas were developed by City of Greater Sudbury staff. As with all vegetation classification, this is only one interpretation.

Red Pine and/or White Pine

=IF(OR((AND(Pj+Pr+Pw>=50%,Pr>=20%,Pw<20%)),(AND(Pj+Pr+Pw>=50%,Pw>=20%,Pj<20%)),(Pw>=40%),(Pr>=40%)),"Red Pine and/or White Pine","")

Lowland Deciduous

=IF((Ab+Pb+E)>=50%, "Lowland Deciduous","")

Lowland Coniferous

=IF(AND((OR(L<>0,Ce<>0,Sb>=60%)),(Bw<30%),(Po<30%),(Mh=0),(Pr<=10%),(By<=10%),(He<=20%),(Pj=0),(Pw<20%),(L+Ce+Sb)>50%),("Lowland Coniferous"),"")

Jack Pine and/or Black Spruce (upland)

=IF(AND(Pj>Pw,Pj>Pr,Pj>Sb,Pj>Bw+Po,Pj>40%),"Pj+Sb",IF(AND((OR(Pj<>0,Sb<>0,Pr<>0,Pw>10%)),(Sb<100%),(Sb>10%),(EE=""),(L<1),(Sb>=Pw),(Sb>Pr),(Sb>=B),(Ce<=20%),Sb>=40%),(Pj+B+Ce+Sb+Pr+Sw+Pw)>50%),("Pj+Sb"),IF(Pj+Sb>=70%,"Jack Pine and/or Black Spruce (upland)","")))

Shade Intolerant Deciduous and Shade Intolerant Mixed

=IF(AND((Ab+Bw+Mr+By+Mh+Or+Po>=70%),(Ab<=10%),(Mh<=20%),(By<=20%),(Or<=30%),(Mr<=60%),(EI6="")),"Shade Intolerant Deciduous",
IF(AND((Ab+Mh+Bw+By+Mr+Po>=40%),(Mh<=20%),(By<=30%),(Bw+Mr+Po<=60%),(Mr<40%),(Pj+Pr+Pw+He+Sw+B+Ce+Sb>=40%),(Pj+Pr+Pw+Sw+B+Ce+Sb<=60%),(Pr<30%),(Ab<=10%),(Pw<40%),(Sw<=40%),(B<50%),(Ce<=40%),(He<=20%),(Sb<40%),(Pj<50%),(EF="")),"Shade Intolerant Mixed",
IF(AND((Bw+Mr+Or>=40%),(Bw+Mr+Or<=60%),(He+Pj+Pr+Pw+Sw+B+Ce+Sb>=40%),(EF=""),(He<=10%),(Pj+Pr+Pw+Sw+B+Ce+Sb<=60%)),"Shade Intolerant Mixed","")))

Shade Intolerant Coniferous

=IF(AND((Ce+He+B+Ps+Pr+Pw+Sw+Pj+Sb>60%),(He<=10%),(Pr<=30%),(Pw<=30%),(Pj<50%),(Sb<=30%),(EE=""),(EC=""),(EF=""),(Pw<40%)),"Shade Intolerant Coniferous","")

Shade Tolerant Deciduous , Shade Tolerant Mixed, and Shade Tolerant Coniferous

=IF(AND((OR(Bw+H+Mh+By+Iw+Be+Bd+Or+Mr>=70%,Or>=40%,Mh>20%)),(Bw<=30%),(Mr<40%)),"Shade Tolerant Deciduous",
IF(AND(Pr+Pw+Sw+B+He+Ce<=60%,Pr+Pw+Sw+B+He+Ce>=40%,Pw<50%,EC="",EE="",EF="",EH="",He>10%), "Shade Tolerant Mixed",
IF(AND((OR(Pr+Pw+Sw+B+He+Sb+Ce>=70%,He>=50%)),
EC="",EE="",EF="",EH=""),"Shade Tolerant Coniferous","")))

Category Codes in Formulas

EC = Red Pine and/or White Pine
ED = Lowland Deciduous
EE = Lowland Coniferous
EF = Jack Pine and/or Black Spruce (upland)
EG = Shade Intolerant Hardwood and Shade Intolerant Mixed
EH = Shade Intolerant Coniferous
EI = Shade Tolerant Deciduous and Shade Tolerant Mixed

Tree Species Codes

Ab = Black Ash
Aw = White Ash
Bw = White Birch
H = Hardwood
Mr = Red Maple
Pb = Balsam Poplar
Po = Poplar (upland)
By = Yellow Birch
E = American Elm
Or = Red Oak
Ow = White Oak
Bd = Basswood
Be = American Beech
Iw = Ironwood
Mh = Sugar Maple
L = Tamarack
Pj = Jack Pine
Pr = Red Pine
Pw = White Pine
Sw = White Spruce
B = Balsam Fir
He = Hemlock
Ce = Eastern White Cedar
Sb = Black Spruce