

Appendix C: Natural Environment Inventory



January 19, 2016

1680

Dadean Assam
Oxford County
21 Reeve St., P.O. Box 1614
Woodstock, ON, N4S 7Y3

Dear Mr. Assam,

**RE: Oxford Road 16 Class Environmental Assessment
Natural Environment Characterization Report**

Natural Resource Solutions Inc. (NRSI) was retained in September 2015 by Oxford County to complete the natural environment component of the above noted Class Environmental Assessment (EA). The Class EA has been commissioned by Oxford County in response to required improvements to Oxford Road 16 between the village of Kintore and 31st Line.

For the purposes of this letter, the term “study area” refers to the Oxford Road 16 ROW and adjacent lands within approximately 120 m (Map 1). The study area is within the Middle Thames River watershed and straddles the boundary of Ecoregions 6E and 7E. It is primarily comprised of active agricultural lands and rural residential properties, with smaller, isolated natural feature patches. The study area includes crossings of several small unnamed drainage features as well as the Pearson and Cuskey Drain, Borland Drain, McCall-McCorquodale Drain and Nissouri Creek. Designated natural heritage features within the study area include Significant Valleylands associated with the above-named tributaries of the Middle Thames River) and Significant Woodlands associated with Nissouri Creek and the McCall-McCorquodale Drain within the study area (County of Oxford 1979, County of Oxford 2006).

This letter summarizes background information on natural heritage features, as well as the results of field surveys including Ecological Land Classification (ELC), a fall vascular flora inventory, aquatic habitat characterization, and fish community assessments. The detailed characterization of existing natural features was used to inform an analysis of natural feature significance and sensitivity within the study area with consideration for applicable County and provincial policies and legislation. This report is intended to inform the selection of a preferred alternative design for road improvements as part of the EA process. It is understood that a subsequent impact assessment of the preferred alternative design will be completed during the detailed design stage.

Methods

Background Review and Habitat Screening

A review of existing natural heritage information was completed to identify key natural heritage features and species that are known or have potential to occur within the study area. Requests for background information were sent to MNR/Aylmer District as well as to Upper Thames River Conservation Authority (UTRCA). Background information relevant to the study area was also collected and reviewed from sources including the following:

- Natural Heritage Information Centre (NHIC) (MNR 2014);
- Land Information Ontario (LIO) data base mapping;
- Oxford County Official Plan (1979);
- Oxford Natural Heritage Study (2006);
- UTRCA (J. Schwindt pers. comm. 2015);
- Department of Fisheries and Oceans Canada (DFO) (DFO 2015);
- Atlas of the Mammals of Ontario (Dobbyn 1994);
- Odonata Atlas of Ontario (C. Jones pers. comm. 2015);
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2015);
- Ontario Butterfly Atlas (Jones *et al.* 2015); and
- Ontario Breeding Bird Atlas (BSC *et al.* 2006).

Based on the results of the background information review, a total of 9 Species at Risk (SAR) and 11 Species of Conservation Concern (SCC) were identified as having records from within the vicinity of the study area (i.e. within 10 km). For the purposes of this report, SAR are defined as species listed as Threatened or Endangered provincially which are afforded protection under the *Endangered Species Act, 2007* (ESA). Within Ontario, SCC refer to:

- Species designated provincially as Special Concern;
- Species that have been assigned a conservation status (S-Rank) of S1 to S3 or SH by the NHIC;
- Species that are designated federally as Threatened or Endangered by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC) but not provincially by the Committee on the Status of Species at Risk in Ontario (COSSARO). These species are protected by the federal *Species at Risk Act* but not provincially by the ESA.

Habitat for SCC may be considered Significant Wildlife Habitat (SWH), which is afforded protection under the Provincial Policy Statement (OMMAH 2014) and various municipal natural heritage protection policies.

A preliminary screening exercise was conducted on these identified SAR and SCC to determine which species have suitable habitat within the study area. This involved cross-referencing the preferred habitat for reported SAR and SCC (OMNR 2000, MNR 2015a) against habitats known to occur in the study area. This was completed to ensure that the potential presence of all significant species within the study area was adequately assessed to inform the EA.

Based on this screening exercise, suitable habitat for six SAR and nine SCC were identified within the study area. Full results of the SAR and SCC screening exercise are provided in Appendix I.

A preliminary screening for the presence of SWH was also completed for the study area (Appendix II). The Significant Wildlife Habitat Technical Guide (SWHTG) is a guideline

document that outlines the types of habitats that the MNRF considers significant in Ontario as well as criteria to identify these habitats (OMNR 2000, MNRF 2015b, MNRF 2015c). The SWHTG groups SWH into four broad categories: seasonal concentration areas, rare vegetation communities and specialized wildlife habitat, habitats of SCC, and animal movement corridors. This screening involved the comparison of criteria outlined in the SWHTG against habitats known to occur in the study area. As the study area straddles the boundary of Ecoregions 6E and 7E, criteria from both Ecoregions were considered for the screening of SWH. Based on the results of this preliminary screening exercise, 5 Candidate SWH types were identified within the study area while none were confirmed. These are discussed further under Significance and Sensitivity below.

Field Studies

Aquatic and terrestrial field surveys were undertaken within the study area to characterize natural features and identify those that are significant and sensitive and that have potential to be adversely affected by the proposed development. A total of two site visits were completed in October 2015. Field investigations focused on areas within and immediately adjacent to the municipal road ROW that were most likely to be potentially impacted by the proposed undertaking. Surveys were undertaken in accordance with provincial and local guidance documents.

Vegetation communities within the study area were described and mapped using the Ecological Land Classification (ELC) system for southern Ontario (Lee *et al.* 1998, Lee 2008) on October 2, 2015. A detailed vegetation inventory was completed with a focus on areas within and adjacent to (within approximately 30 m of) the road ROW. Emphasis was placed on the identification of any federally, provincially, or locally significant vegetation species that may occur in the study area.

Aquatic features within the study area were characterized on October 1 and 2, 2015. Detailed aquatic habitat assessments were completed at crossings of Pearson and Cuskey Drain, McCall-McCorquodale Drain and Nissouri Creek (Map 2). Aquatic habitat from 30 m upstream to 50 m downstream of each road crossing was assessed. The following information was collected for each assessed aquatic feature:

- adjacent lands (valley form, riparian habitat, canopy cover, land use etc.);
- channel morphology;
- substrate type and composition;
- water quality (including water temperature, dissolved oxygen, conductivity, pH, and total dissolved solids);
- instream habitat and cover (including critical life stage areas);
- flow conditions; and
- culvert type.

In conjunction with each habitat characterization, electrofishing surveys were conducted at two of the three crossing locations (Pearson and Cuskey Drain and the McCall-McCorquodale Drain) to assess the current fish community present within those aquatic habitats. The locations of the electrofishing surveys are shown on Maps 2A – 2F. An electrofishing survey was not completed for Nissouri Creek since current fisheries information was available for this waterbody from the UTRCA (J. Schwindt pers. comm. 2015). Electrofishing surveys were completed within the 30 and 50 m limits of the aquatic habitat characterizations. A crew of two biologists utilized a backpack electrofishing unit and dip net to capture fish throughout the surveyed stretch, making sure to sample the different habitat types (ie. pools, riffles, undercut banks, overhanging vegetation etc.). All captured fish were identified to species, enumerated, and the

shortest and longest lengths were measured for each species prior to being live released at the location of capture. For each electrofishing survey the water conditions, electrofishing settings, and the duration of sampling were recorded and are summarized in Table 1.

In order to sample fish using electrofishing equipment, a *License to Collect Fish for Scientific Purposes* was obtained from the MNRF Aylmer District. Licence No. 1081341 was issued to NRSI on September 9, 2015.

During the field work program, all incidental observations of mammals, herpetofauna, butterflies, dragonflies, and damselflies were documented on all field visits. This included direct observations of individuals, as well as signs of wildlife presence (i.e. tracks, scat, dens, nests, etc.).

Table 1. Electrofishing Conditions, Settings, and Shocking Time

	Station EMS-001	Station EMS-001
Date	October 1, 2015	October 2, 2015
Sampling start time	10:00	9:30
Sampling end time	10:50	13:00
Air temperature (°C)	16.0	12.0
Water temperature (°C)	10.5	8.0
Time water temp. taken	11:00	10:00
Conductivity (µs/cm)	670	640
Dissolved Oxygen (ppm, %)	9.45, 87.4	10.75, 93.3
Electrofisher Type	Halltech backpack unit	Halltech backpack unit
Number of Netters	1	1
Voltage (V)	150	150
Pulsating Frequency (Hz)	40	40
Shocking time (sec.) - Upstream	200	450
Shocking time (sec.) - Downstream	1006	932

Existing Conditions

Physiography, Geology, Soils and Drainage

Surficial deposit conditions in the study area vary from well-drained loamy till, to imperfectly and poorly-drained clayey and loamy tills (Agriculture and Agri-Food Canada 1996). The study area topography includes drainage ditches along the north and south roadsides, including drainage culverts. Drainage in the study area is flowing predominately south, including the Pearson & Cuskey Drain, McCall-McCorquodale Drain, and Nissouri Creek. Beyond the ROW, topography is predominantly flat to gently-rolling, with relatively small slopes associated with riparian areas.

Vegetation Communities

A total of 7 vegetation communities exist within the study area, with the majority of the surrounding land uses comprised of agricultural lands and rural residential properties. Agricultural lands within the study area consist of corn and soybean annual row crops (OAGM1) and hay perennial cover crops (OAGM2). Vegetation communities identified within the study area are described in Table 2 below. Refer to Maps 2A – 2F for study area ELC communities and surrounding study area land uses.

Table 2. Vegetation Communities Identified within the Study Area

ELC Ecosite Type	ELC Description	Environmental Characteristics
Wetland		
SWDM3-3	Swamp Maple Mineral Deciduous Swamp	This deciduous swamp community is characterized by Freeman's Maple (<i>Acer X freemanii</i>), White Elm (<i>Ulmus americana</i>), and Green Ash (<i>Fraxinus pennsylvanica</i>) in the canopy and sub-canopy. Understorey vegetation is comprised of Common Buckthorn (<i>Rhamnus cathartica</i>), Gray Dogwood (<i>Cornus racemosa</i>), and Red-osier Dogwood (<i>Cornus stolonifera</i>). The groundcover layer is dominated by Yellow Avens (<i>Geum allepicum</i>), False Nettle (<i>Boehmeria cylindrica</i>), and Spotted Jewelweed (<i>Impatiens capensis</i>).
Deciduous Forest		
FODM7	Fresh-Moist Lowland Deciduous Forest	This lowland deciduous forest community occurs in multiple locations throughout the study area, and is associated with treed riparian areas. It is dominated by Black Walnut (<i>Juglans nigra</i>), Crack Willow (<i>Salix fragilis</i>), and Trembling Aspen (<i>Populus tremuloides</i>) in the canopy. The sub-canopy is dominated by Black Walnut, Manitoba Maple (<i>Acer negundo</i>), and Hawthorn (<i>Crataegus sp.</i>). Understorey vegetation is comprised of Red-osier Dogwood, Red Raspberry (<i>Rubus idaeus ssp. melanolasius</i>), and Wild Black Currant (<i>Ribes americanum</i>). The groundcover layer is dominated by Reed Canary Grass (<i>Phalaris arundinacea</i>), Spotted Jewelweed, and American Stinging Nettle (<i>Urtica dioica ssp. gracilis</i>). A distinct habitat inclusion exists within this feature where it is associated with the McCall-McCorquodale Drain: Coniferous Plantation (TAGM1) dominated by Norway Spruce (<i>Picea abies</i>).
FODM4-2	Dry-Fresh White Ash – Hardwood Deciduous Forest	This deciduous forest community exists adjacent to and upslope of a watercourse at the eastern extent of the study area. It may represent a former apple orchard that has since been abandoned and left to naturalize. It is dominated by White Ash (<i>Fraxinus americana</i>), Black Cherry (<i>Prunus serotina</i>), Common Apple (<i>Malus pumila</i>), and Hawthorn in the canopy and sub-canopy. Understorey growth is characterized by White Ash, Choke Cherry (<i>Prunus virginiana</i>), and Gray Dogwood. The groundcover layer is comprised of White Avens (<i>Geum canadense</i>), Garlic Mustard (<i>Alliaria petiolata</i>), and Wild Strawberry (<i>Fragaria virginiana</i>).
FODM5	Dry-Fresh Sugar Maple Deciduous Forest	This deciduous forest community is dominated by Sugar Maple (<i>Acer saccharum</i>), Bitternut Hickory (<i>Carya cordiformis</i>), and American Beech (<i>Fagus grandifolia</i>) in the canopy. Ironwood (<i>Ostrya virginiana</i>), Black Cherry, and Bitternut Hickory comprise the sub-canopy. The understorey is characterized by Choke Cherry, White Ash, and Nannyberry (<i>Viburnum lentago</i>). The groundcover layer is comprised of White Avens, False Solomon's Seal (<i>Maianthemum racemosum</i>), and Running Strawberry-bush (<i>Euonymus obovata</i>).
Meadow		
MEGM3-8	Reed Canary Grass Graminoid Meadow	This graminoid-dominated meadow community is associated with the riparian area in the eastern portion of the study area. Woody species include Red-osier Dogwood, Common Apple, and White Ash. The groundcover is comprised of Reed Canary Grass, Giant Ragweed (<i>Ambrosia trifida</i>), and American Stinging Nettle.
MEMM3	Dry-Fresh Mixed Meadow	This mixed meadow community occurs in the western portion of the study area in two separate locations. The sub-canopy of this community is dominated by Sugar Maple and the understorey by Red-osier Dogwood. The groundcover layer is dominated by Awnless Brome (<i>Bromus inermis ssp. inermis</i>), Tall Goldenrod (<i>Solidago altissima var. altissima</i>), and Wild Strawberry (<i>Fragaria virginiana</i>).
Cultural		
TAGM1	Coniferous Plantation	This coniferous plantation community exists adjacent to residential properties fronting Oxford Road 16. It is dominated by White Pine (<i>Pinus strobus</i>) and White Cedar (<i>Thuja occidentalis</i>) in the canopy and sub-canopy, with lesser amounts of Trembling Aspen, Common Apple, and

ELC Ecosite Type	ELC Description	Environmental Characteristics
		Black Walnut. Understorey growth is sparse and is characterized by Gray Dogwood, Common Buckthorn, and Nannyberry. Groudcover vegetation is sparse due to dense canopy coverage, and is comprised of Bittersweet Nightshade (<i>Solanum dulcamara</i>), Garlic Mustard, and Jack-in-the-pulpit (<i>Arisaema triphyllum</i>).
N/A	Roadside Areas	Roadside areas are dominated by hardy and opportunistic graminoids such as Smooth Brome (<i>Bromus inermis ssp. inermis</i>), Witch Grass (<i>Panicum capillare</i>), and Kentucky Bluegrass (<i>Poa pratensis ssp. pratensis</i>). Few trees exist within the right-of-way, and include White Ash, Freeman's Maple, Norway Spruce, and Norway Maple (<i>Acer platanoides</i>).

Vascular Flora

A total of 113 species of vascular flora were identified within the study area natural features shown on Maps 2A – 2F. A complete list of inventoried species is provided in Appendix III. Of the 113 species observed, approximately 30% were non-native species. Of the grass-dominated roadside areas that are most likely to be impacted by the proposed undertaking, approximately 68% were non-native species.

Appendix I lists federally and provincially significant flora species known from the study area vicinity (within 1 km) based the results of background review and whether suitable habitat is present for each within the study area. No significant vascular flora species were observed within the study area.

Wildlife

Birds

A total of 97 bird species have been recorded in the vicinity of the study area (BSC *et al.* 2006, MNRF 2014). Of these, eight were observed as incidentals during field surveys. Refer to Appendix IV for a complete list of all bird species known and observed in the study area and vicinity, including highest breeding evidence codes in accordance with the OBBA (2001).

Based on background review data, three bird SAR, Barn Swallow (*Hirundo rustica*), Bobolink (*Dolichonyx oryzivorus*), and Eastern Meadowlark (*Sturnella magna*), and three bird SCC, Red-headed Woodpecker (*Melanerpes erythrocephalus*), Eastern Wood-pewee (*Contopus virens*), and Wood Thrush (*Hylocichla mustelina*), were identified as having potential to occur within the study area based on existing records in the vicinity and presence of appropriate habitat (Appendix I). No bird SAR or SCC were observed during field investigations in the study area, however, targeted surveys for birds were not completed.

Herpetofauna

A total of 16 reptile and amphibian species have been recorded from the vicinity of the study area (Ontario Nature 2015). No herpetofauna species were observed incidentally during field investigations in the study area. A complete list of all herpetofauna species known from the study area is provided in Appendix V.

Based on a review of background information, two herpetofauna SCC, Eastern Milksnake (*Lampropeltis taylori triangulum*), and Western Chorus Frog (*Pseudacris triseriata*), were identified as having potential to occur within the study area based on existing records in the vicinity and presence of suitable habitat (Appendix I). No herpetofauna SAR or SCC

were observed during field surveys in the study area, however, targeted surveys for reptiles or amphibians were not completed.

Mammals

A total of 29 mammal species are documented within the vicinity of the study area (Dobbyn 1994). No mammal species were observed incidentally during field investigations in the study area. A complete list of all mammal species known from the study area is provided in Appendix VI.

Based on a review of background information, three mammal SAR, Little Brown Myotis (*Myotis lucifuga*), Northern Myotis (*Myotis septentrionalis*), and American Badger (*Taxidea taxus jacksoni*), as well as one mammal SCC, Tri-colored Bat (*Perimyotis subflavus*), were identified as having potential to occur within the study area based on existing records in the vicinity and presence of suitable habitat (Appendix I). No mammal SAR or SCC were observed during field surveys in the study area, however, targeted surveys for mammals were not completed.

Insects

A total of five Lepidoptera and four Odonata species are documented within the vicinity of the study area (Jones *et al.* 2015, C. Jones pers. comm. 2015). No Lepidoptera or Odonata species were observed incidentally during field investigations in the study area. A complete list of all Lepidoptera and Odonata species known from the study area is provided in Appendix VII.

Based on a review of background information, one Lepidoptera SCC, Monarch (*Danaus plexippus*), was identified as having potential to occur within the study area based on existing records in the vicinity and presence of suitable habitat (Appendix I). No Lepidoptera or Odonata SAR or SCC were observed during field surveys in the study area, however, targeted surveys for insects were not completed.

Aquatic Habitat

The following is a description of the aquatic habitat present in each watercourse within the study area from west to east; Pearson and Cuskey Drain, McCall-McCorquodale Drain, and Nissouri Creek (Maps 2A – 2F).

Pearson and Cuskey Drain

This drain flows south under Oxford Road 16 approximately 350 m east of the intersection of Oxford Road 16 and 19th Line in the village of Kintore. Immediately adjacent and to the west of the Pearson & Cuskey Drain, the riparian area is occupied by residential properties with maintained lawns and several mature trees. The lands to the east are exclusively agricultural and were cultivated with corn in 2015. The adjacent lands slope gently towards the water body and several tile drain outlets were observed along the banks, contributing drainage from the fields to the east and west.

North of Oxford Road 16, the drain flows over a moderate gradient and through a relatively wide, straight channel comprised of relatively shallow pools, runs, and riffles. Wetted widths throughout this stretch ranged from 2.1 to 3.7 m with bankfull widths from 3.4 to 6.5 m. Water depths ranged from approximately 0.1 m within the riffles to 0.28 m in the pools. Due to the shallow water depths in the riffles, the majority of fish observed in this stretch occurred in the pool and run habitats, which provided more suitable water depths. Instream cover was generally limited but did occur in the form of woody debris (slumping shrubs and exposed roots) and cobble substrates. Cobble substrate was prevalent throughout this stretch comprising roughly 50% of the overall channel substrates. The remaining substrates included gravel (20%) and sand (20%) with some

silt (5%) and boulder (5%). The banks along both sides of the channel were relatively steep and high (up to approximately 1.2 m) and showed evidence of heavy erosion as a result of freshet flows, which had exposed the roots of trees and shrubs that are growing along the banks. No undercut banks were observed. Within the 30 m surveyed stretch, the channel was shaded by mature deciduous trees which provided close to 90% shade, helping to minimize thermal impacts to the watercourse. The water temperature was measured at 11.5°C at 13:10 on October 1, 2015 and dissolved oxygen levels were good (10.07 ppm and 94.2%) indicating suitable water quality for coolwater fish species. Additional water quality measurements included conductivity (670 µs/cm), pH (7.4), and total dissolved solids (320 ppm). Throughout the channel there is evidence of nutrient enrichment due to encrusted and filamentous algae growing on substrates. Following a long riffle, the channel flows through a pool and into a large metal corrugated steel pipe culvert (diameter 3.3 m) which conveys flow south, under Oxford Road 16. Within the culvert the wetted width was measured at 1.78 m and depth was 0.26 m. At the downstream end of the culvert near its outlet a large school of small Cyprinidae were observed.

South of Oxford Road 16, the channel narrows slightly but continues to flow over a moderate gradient through a straight channel with consistent riffle, run, and pool sequences. Wetted widths throughout the 50 m stretch ranged from 2.0 to 3.0 m with bankfull widths from 2.1 to 3.0 m. Water depths ranged from approximately 0.15 m within the riffles to 0.28 m in the pools. However, generally, the riffles were deeper throughout the downstream stretch when compared to upstream. Riffles and pools provided suitable cover for fish within the system in addition to small backwater areas, undercut banks, woody debris, embedded and unembedded cobble, and overhanging vegetation including shrubs, grasses, and herbaceous plants. A narrow vegetated buffer exists along both banks of the drain beyond the 50 m surveyed reach with bank vegetation extending to approximately 5 m on the east bank and up to 8 m on the west bank before transitioning to corn field and manicured lawn, respectively. The vegetation includes a variety of shrub and herbaceous plant species including Red Osier Dogwood, Crack Willow, Spotted Jewelweed, American Stinging Nettle, Spotted Joe-Pye Weed (*Eutrochium maculatum*), asters (*Asteraceae* spp.), goldenrods (*Solidago* spp.), and Common Milkweed (*Asclepias syriaca*). The dense bank vegetation provided good bank stability and a fair amount of shading for the channel (approximately 50 – 75%). No mature trees were noted along the banks to provide additional shade benefits. Banks exhibited a relatively uniform slope (approximately 135°) on both sides, indicating channelization, with a height of roughly 2.5 m to the top of bank. The channel appeared incised to depths ranging from 0.3 to 1.0 m. Within the channel, substrates continued to be dominated by cobble (50%) with gravel (20%), sand (20%), silt (5%), and boulder (5%) contributing to the remaining substrate composition. The water temperature downstream of the culvert, at 10.5°C, was slightly colder than upstream, and Watercress (*Nasturtium officinale*) was observed at several locations along the edges of the channel, indicating potential groundwater inputs. Additional water quality measurements included dissolved oxygen (9.45 ppm and 87.4%), conductivity (670 µs/cm), pH (7.4), and total dissolved solids (320 ppm). Throughout the channel there is evidence of nutrient enrichment due to encrusted and filamentous algae growing on substrates.

Pearson and Cuksey Drain was identified as a permanent feature and the presence of a variety of fish species captured and observed upstream and downstream of the culvert indicates this water body as direct fish habitat. The UTRCA has classified this watercourse as a 'type 2 system' in the Oxford Natural Heritage Study. According to the study, a type 2 system is a permanent, warmwater feature that supports a variety of baitfish species (UTRCA 2006).

McCall-McCorquodale Drain

This drain flows south under Oxford Road 16 approximately 5.5 km east of the intersection of Oxford Road 16 and 19th Line in Kintore and eventually flows into Nissouri Creek. The adjacent lands to the west and to the east of the riparian corridor, north of Oxford Road 16, are exclusively agricultural and cultivated. The lands to the east, south of the road, are occupied by a residential property with maintained lawns and mature trees. The adjacent lands slope gently towards the water body from the east and west.

North of Oxford Road 16 the drain flows over a low to moderate gradient and through a natural, meandering channel comprised of consistent pools, runs, and riffles. Wetted widths throughout this stretch ranged from 2.5 to 3.8 m with bankfull widths from 2.8 to 4.6 m. Water depths ranged from approximately 0.09 m within the riffles to 0.27 m in the pools. Channel substrates were fairly well distributed with cobble (30%), gravel (25%), sand (25%), silt (15%) and some muck (5%). The banks were densely vegetated on both sides and provided cover at many locations where it was overhanging the channel. Additional cover was present throughout the surveyed stretch in the form of backwater areas, undercut banks, and cobble. Woody debris was also noted to be prevalent throughout this stretch including slumping shrubs and large fallen Black Walnut trees which cut across the channel and created pools underneath as a result of scouring. This woody debris and overhanging vegetation provided direct shade for close to 50% of the channel. Additional shade was provided by large, mature Black Walnut and Crack Willow trees that were growing throughout the vegetated buffer adjacent to the water body. This natural buffer extended approximately 80 m to the west and between 10 and 20 m to the east, beyond which were cultivated agricultural fields. The water temperature was measured at 8.0°C at 12:30 on October 2, 2015 and dissolved oxygen levels were good (10.75 ppm and 93.3%) indicating suitable water quality for cool and coldwater fish species. Additional water quality measurements included conductivity (640 µs/cm), pH (7.36), and total dissolved solids (320 ppm). Water-cress was observed at several locations along the edges of the channel, indicating potential groundwater inputs. Throughout the channel there is also evidence of nutrient enrichment due to encrusted and filamentous algae growing on substrates. The channel flows through an open-bottom concrete box culvert measured at 4.38 m wide and 1.42 m high (measured to the top of the water). A large pool was observed at the upstream side of this culvert and bank erosion was noted on both sides on the culvert's foundation, indicating a potential undersized culvert. Within the culvert the channel deflected off the east side of the foundation, creating a build-up of sand and silt along a portion of the west side.

South of Oxford Road 16, the channel exits the culvert into a pool and widens but continues to flow through a slightly meandering channel with riffle, run, and pool sequences. Wetted widths throughout the 50 m stretch ranged from 3.4 to 4.9 m with bankfull widths from 4.1 to 5.8 m. Water depths ranged from approximately 0.1 m within the riffles to 0.32 m in the pools. Heavy erosion was noted throughout this stretch, particularly along the outside bends of the channel where tree roots were exposed and banks formed close to a 90° angle. Bank heights ranged from 0.3 to 0.8 m and bank stability was classified as poor to fair due to the low bank vegetation. Where bank vegetation was observed it was comprised of goldenrods, asters, Spotted Jewelweed, American Stinging Nettle, and grasses; however, the majority of this vegetation coverage occurred within the ROW and extended south from the road up to 20 m. This vegetation provided some cover where it was overhanging the channel nearest to the road, however most of the instream habitat and cover was provided by the pool and riffle habitat, undercut banks, and cobble. Substrates continued to be dominated by cobble (35%) with gravel (25%), sand (25%), silt (10%), and boulder (5%) contributing to the

remaining substrate composition. Mature deciduous trees provided the majority of shading for the channel and beyond the ROW provided up to 100% shade in some areas, helping to maintain the cold water temperature, which was measured at 8.0°C. Similar to the upstream reach, water-cress was present in low abundance along the banks nearest to the culvert outlet and filamentous algae was observed growing on channel substrates.

McCall-McCorquodale Drain was identified as a permanent feature and the presence of a variety of fish species captured and observed upstream and downstream of the culvert indicates this water body as direct fish habitat. The UTRCA has classified this watercourse as a 'type 2 system', similar to Pearson & Cuskey Drain (UTRCA 2006).

Nissouri Creek

Nissouri Creek flows south, parallel to 31st Line along the east side, under Oxford Road 16. The adjacent lands to the west and to the east of the riparian corridor are exclusively agricultural and cultivated on both the north and south sides of the road.

North of Oxford Road 16, Nissouri Creek flows over a moderate gradient through a straightened channel comprised of shallow riffles and runs. Wetted widths throughout this stretch were approximately 1.5 m with bankfull widths around 4.5 m and water depths up to 0.1 m. Substrates throughout this section were dominated by cobble and gravel with some boulders and areas of sand. The channel flows through heavily eroded banks on both sides where cedar roots were exposed from cedar hedges planted along the top of each bank. Bank height throughout this section was up to 1.5 m with slopes of approximately 120°. The cedar hedges provide close to 100% shade for the channel before it exits the hedges near the road ROW. At this location the cedar hedges transition to meadow habitat with a variety of herbaceous plants and grasses. The channel gradient was noted to decrease, which resulted in an increase in water depth up to 0.46 m at the entrance to an open bottom concrete box culvert which directs the flow under the road. This culvert was measured at 5.65 m wide and 1.7 m high (measured to the top of water). The decrease in gradient and increase in water depth resulted in a transition to predominantly fine substrates (sand and silt) at the culvert entrance. Similar to the McCall-McCorquodale Drain culvert entrance some erosion of the banks was noted along the upstream foundations of the culvert indicating potential flow restriction and an improperly sized culvert. South of Oxford Road 16, the creek narrows and flows through an incised channel with wetted widths up to 2.11 m and bankfull widths up to 2.5 m. Water depths were measured up to 0.21 m and substrates were dominated by fine materials including sand and silt with some muck. Occasional areas of gravel and cobble were noted in deep riffles. Instream habitat and cover included pools, backwater areas, undercut banks, overhanging bank vegetation, and some areas of riffle habitat with cobble. Bank vegetation was moderate to high south of Oxford Road 16, which created fairly good bank stability and likely caused the incised channel throughout this stretch. Water temperature was measured at 11.0°C at 14:00 on October 1, 2015 and moderately abundant Water-cress was observed along the banks south of the road, indicating potential groundwater discharge to the creek. Additional water quality measurements included conductivity (710 µs/cm), pH (6.83), and total dissolved solids (360 ppm). Nutrient enrichment was also evident throughout this creek due to the presence of encrusted algae.

Nissouri Creek was identified as a permanent feature and the presence of a variety of fish species upstream and downstream of the culvert indicates this watercourse as direct fish habitat. The UTRCA has classified Nissouri Creek as a 'type 1 system' in the Oxford Natural Heritage Study. A type 1 system is defined as a permanent, warmwater

or cold/coolwater feature that may support sensitive or significant species. This may include species at risk, top level predators, sportfish, sensitive species, or the habitat to support these species (UTRCA 2006).

Fish Community

A total of 410 fish, representing 8 different species, were captured during electrofishing surveys within the study area (Table 3). A list of fish species inventoried and known from the study area is also summarized in Appendix IV. Historical fish sampling records were obtained from the UTRCA and have been included in both Table 3 and Appendix IV.

The fish community in each of the three watercourses was found to be comprised of species that are common and widespread throughout southern Ontario. The most common species within the study area are indicative of coolwater thermal regimes, however warmwater species were also noted. The identified species are relatively tolerant to changes in water quality and habitat conditions. Several different environments and trophic levels are represented indicating the presence of a variety of habitats.

Historic records of Northern Brook Lamprey (*Ichthyomyzon fossor*) were identified by NHIC (MNRF 2014) within the study area from May 27, 1931. This species is currently classified as Special Concern provincially and federally and is protected under Schedule 1 of the Species at Risk Act (SARA); consequently, this species is considered a SCC in Ontario. However, a review of federal Department of Fisheries and Oceans (DFO) SAR red-line mapping did not indicate the presence of any fish or mussel SAR within the study area and no SAR were captured during electrofishing surveys conducted by UTRCA or NRSI. Furthermore, the study area watercourses were not found to provide suitable habitat as substrates documented in the study area were generally too large to support this species (Appendix I). Generally, Northern Brook Lamprey require clean coarse gravel substrates with a relatively swift, unidirectional current for spawning. Larval lamprey require soft substrates comprised of silt and sand in which they can create burrows, where they reside for between 3 and 7 years. These burrows have been found to range from 0.2 to 0.6m deep (COSEWIC 2007). As such, it is not expected that any aquatic SAR or SCC, including Northern Brook Lamprey, are currently present within the study area.

Table 3. Fish Species Identified within the Study Area

Scientific Name	Common Name	S-rank	National Status (SARA) ⁴	Provincial Status (ESA) ⁴	Environment ⁴	Trophic Status ⁴	Thermal Regime ⁴
<i>Catostomus commersonii</i>	White Sucker ^{1,3}	S5	No status	No status	benthic	invertivore/ detritivore	coolwater
<i>Culaea inconstans</i>	Brook Stickleback ^{1,2,3}	S5	No status	No status	benthopelagic	planktivore/ invertivore	coolwater
<i>Luxilus cornutus</i>	Common Shiner ^{2,3}	S5	No status	No status	benthopelagic	planktivore/ invertivore	coolwater
<i>Luxilus chrysocephalus</i>	Striped Shiner ³	S4	Not at Risk	Not at Risk	benthopelagic	invertivore	coolwater
<i>Pimephales notatus</i>	Bluntnose Minnow ³	S5	No status	No status	benthopelagic	detritivore	warmwater
<i>Campostoma anomalum</i>	Central Stoneroller ^{1,3}	S4	Not at Risk	Not at Risk	benthic	herbivore	coolwater
<i>Pimephales promelas</i>	Fathead Minnow ^{1,3}	S5	No status	No status	benthopelagic	detritivore/ invertivore	warmwater
<i>Rhinichthys obtusus</i>	Blacknose Dace ^{1,2,3}	S5	No status	No status	benthic	invertivore	coolwater

Scientific Name	Common Name	S-rank	National Status (SARA) ⁴	Provincial Status (ESA) ⁴	Environment ⁴	Trophic Status ⁴	Thermal Regime ⁴
<i>Semotilus atromaculatus</i>	Creek Chub ^{1,3}	S5	No status	No status	benthopelagic	invertivore/ carnivore	coolwater
<i>Etheostoma flabellare</i>	Fantail Darter ^{1,3}	S4	No status	No status	benthic	invertivore	coolwater
<i>Etheostoma nigrum</i>	Johnny Darter ^{1,2,3}	S5	No status	No status	benthic	invertivore	coolwater
<i>Micropterus dolomieu</i>	Smallmouth Bass ³	S5	No status	No status	benthopelagic	invertivore/ carnivore	coolwater
<i>Lepomis gibbosus</i>	Pumpkinseed ³	S5	No status	No status	benthopelagic	invertivore/ carnivore	warmwater

¹NRSI 2015

²UTRCA 2015

³UTRCA 1993, 2000, 2005

⁴Eakins 2015

Natural Feature Significance and Sensitivity

Analysis of the significance and sensitivity of existing natural features was used to identify those features and habitats that are sensitive to disturbance based on the rarity or significance of the feature or the functions/processes and/or policies, legislation, or planning related studies. The following is a brief discussion of the results of this analysis with regards to significant natural areas and features which may represent natural feature constraints to be considered as part of the selection of a preferred alternative design for the proposed undertaking.

Wetlands

Wetlands directly provide habitat for various species of wildlife and plants while many other species indirectly benefit from the hydrologic functions that wetlands provide such as flow augmentation, recharge and discharge (UTRCA 2006).

One wetland is found within the study area, a small (1.7ha) Swamp Maple Mineral Deciduous Swamp (SWDM3-3) (Map 2B), which is unevaluated. This wetland feature falls within the same watershed as the Lakeside Wildwood PSW complex, however, it is greater than 750 m from the nearest wetland polygon of the PSW complex. At this time, there does not appear to be a rationale for including the wetland in the PSW complex. All non-PSWs and unevaluated wetlands are considered to be of local significance in the County of Oxford (UTRCA 2006, County of Oxford 1979).

Development within non-PSWs and within 30 m of non-PSWs \leq 2 ha in size is prohibited under UTRCA's Ontario Regulation 157/06 unless in the opinion of the UTRCA, the control of flooding, erosion, dynamic beaches, pollution or the conservation of land will not be affected by the development and no negative impacts on the feature or its ecological function will result.

An OWES wetland evaluation of the SWDM3-3 feature may be required during detailed design, in consultation with the MNR, to further inform protection and impact mitigation measures. The need for the evaluation will be dependent on the design of the preferred alternative and the potential for impact to the feature. Consultation with the UTRCA may also be required to confirm and accurately survey the wetland boundary as part of detailed design of the proposed undertaking if there is potential for impact to this feature.

Woodlands

Woodlands provide environmental and economic benefits such as erosion prevention, water retention, provision of habitat, recreation and sustainable harvest of woodland products (UTRCA 2006).

Based on a review of background information, two Significant Woodlands are found within the study area (County of Oxford 2006). Specifically, the woodlands associated with Nissouri Creek and McCall-McCorquodale Drain (FODM7, FODM4-2; Map 2F). These woodland features were designated as significant based on a study that compared vegetation patch characteristics within the context of the County of Oxford as a whole. In order to evaluate significance on a landscape scale, nine criteria were developed (County of Oxford 2006). A minimum of one criteria was required to be met in order for a vegetation patch to be designated as Significant. A review of the nine criteria was conducted with respect to the woodlands associated with Nissouri Creek and McCall-McCorquodale Drain in order to confirm the presence of the attributes and/or functions for which the woodlands were designated as significant (Appendix IX). The review confirmed these woodland features currently meet more than one of the nine criteria and should therefore remain designated as Significant Woodlands.

Development or site alteration is not permitted within Significant Woodlands under Section 3.3.3 of the UTRCA Environmental Planning Policy Manual (UTRCA 2006). Development or site alteration may be permitted within adjacent lands (within 50 m) to Significant Woodlands provided it is demonstrated to the satisfaction of the UTRCA that no negative impacts on the feature or its ecological function will result (UTRCA 2006).

The County of Oxford Official Plan (1979) considers Significant Woodlands as Environmental Protection Areas. Under Section 3.2.4.1.1 of the County of Oxford Official Plan (1979), activities that create or maintain infrastructure authorized under an EA process may be permitted within and adjacent to an Environmental Protection Area.

Three additional woodlands are also present within the study area including a Fresh-Moist Lowland Deciduous Forest (FODM7) associated with the Pearson & Cuskey Drain, a Maple Mineral Deciduous Swamp (SWDM3-3), and a Dry-Fresh Sugar Maple Deciduous Forest (FODM5).

Development or site alteration may be permitted in other woodlands or within their adjacent lands (within 50 m) provided it is demonstrated to the satisfaction of the UTRCA that no negative impacts on the feature or its ecological function will result (UTRCA 2006).

Under Sections 3.2.7.1 and 3.2.4.2 of the County of Oxford Official Plan (1979), activities that create or maintain infrastructure authorized under an EA process may also be permitted within or immediately adjacent to non-significant woodlands.

The creation of strategically placed new habitat, linkages or restoration of other ecosystem functions may be considered as mitigation measures for development within or adjacent to other woodlands (UTRCA 2006). The County of Oxford Official Plan (1979) requires the County to consider alternative road and pavement width and standards so as to minimize the cutting of trees when developing plans for the construction and/or widening of County roads. Where tree cutting is necessary, tree replacement shall be a minimum ratio of two trees for each tree lost in connection with the widening or construction of County roads (County of Oxford 1979).

Valleylands

Valleylands are natural areas that occur in a valley or other landform depression that has water flowing through or standing for some period of the year (OMMAH 2014).

Valleylands provide several ecological functions including nutrient and sediment cycling and transport, fish and wildlife habitat, natural linkages and migration corridors between different habitat features, and act as a reservoir for biodiversity.

Three Significant Valleylands are present within the study area and include the valleylands associated with Pearson & Cuskey Drain and McCall-McCorquodale Drain. The section of Nissouri Creek that lies south of Oxford Rd 16 is also identified as Significant Valleyland (County of Oxford 1979).

Under Section 3.3.4 of the UTRCA Environmental Planning Policy Manual, development and/or site alteration is not permitted in natural valleylands (UTRCA 2006).

Development and/or site alteration may be permitted within 50 m of valleylands provided it is demonstrated to the satisfaction of the UTRCA that no negative impacts on the feature or its ecological function will result (UTRCA 2006).

The County of Oxford Official Plan (1979) considers Significant Valleylands as Environmental Protection Areas. Under Section 3.2.4.1.1 of the County of Oxford Official Plan (1979), activities that create or maintain infrastructure authorized under an EA process may be permitted within and adjacent to an Environmental Protection Area.

Significant Wildlife Habitat

The results of background information review, agency consultation, and field studies were used to assess the presence of SWH within the study area based on the PPS (OMMAH 2014), the Natural Heritage Reference Manual (OMNR 2010) and the SWHTG (MNRF 2015b, 2015c).

Based on background information and field investigations, no SWH types were confirmed within the study area and five SWH types were identified as candidate. Development or site alteration is not permitted within or adjacent to SWH unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions as outlined in Section 2.1.5 of the PPS (OMMAH 2014). This is also consistent with UTRCA and County of Oxford policies (UTRCA 2006, County of Oxford 1979)

Candidate SWH types identified for the study area include the following:

- Raptor Wintering Area;
- Bat Maternity Colonies;
- Snake Hibernaculum;
- Amphibian Breeding Habitat (Woodland); and
- Special Concern and Rare Wildlife Species.

The following sections discuss each of the above Candidate SWH types in detail.

Raptor Wintering Area

Winter habitat for raptors must provide a combination of fields and woodlands that contain roosting, foraging, and resting habitats (OMNR 2011). Hay fields, pastures and open meadows provide critical winter roosting areas for Northern Harriers (*Circus cyaneus*) and Short-eared Owls (*Asio flammeus*) in Southern Ontario. Open habitats are also preferred by Rough-legged Hawks (*Buteo lagopus*), Red-tailed Hawks (*Buteo jamaicensis*) and Snowy Owls (*Nyctea scandiaca*). Wintering American Kestrels (*Falco sparverius*) use a wide variety of

open to semi-open habitats, including meadows, grasslands, early successional communities, open parkland, agricultural fields, and both urban and suburban areas. Other wintering raptors, such as the Long-eared Owl (*Asio otus*), occur in more closed habitats, with denser vegetation and smaller open patches.

A combination of forested and open habitats occur within and adjacent to the study area and could provide suitable Raptor Wintering Area SWH. However, because the proposed road upgrades will be confined to relatively narrow areas within and adjacent to the ROW, no negative impacts to this Candidate SWH type are anticipated. Therefore, no targeted surveys to confirm the presence of this Candidate SWH type are considered necessary.

Bat Maternity Colonies

Bat maternity (or nursery) colonies are day roosts inhabited solely by females and juveniles/subadults and are used for giving birth and raising young (OMNR 2011). They can range in size from tens to hundreds of adult females and their young and some species form individual maternal roosts (OMNR 2011). Maternity colonies can be located in human structures (e.g., barns and attics), in tree cracks and hollows, and under loose tree bark. Guidelines for identifying candidate significant bat maternity colony are outlined by the MNRF (OMNR 2011) and the SWHTG (MNRF 2015b, 2015c). These documents recommend that all deciduous or mixed forest communities (FOD, FOM, SWD, and SWM) should be assessed for cavity trees ≥ 25 cm dbh (diameter at breast height) which may be suitable for roosting bats. There are several wooded areas within the study area (FODM5, FODM7, FODM4-2, SWDM3-3; Map 2) that may be suitable for bat maternal roosts, however, no specific assessments have been completed to date. Targeted bat habitat surveys may therefore be required during detailed design depending on the design of the preferred alternative and the potential for impact to woodlands and trees which may provide this Candidate SWH type.

Snake Hibernaculum

Snakes depend on hibernation sites located below frost lines in burrows, rock crevices and other natural locations to escape freezing temperatures (OMNR 2011). Suitable snake hibernaculum can be obvious and easy to identify (e.g. obvious broken or fissured rock that provides access to subterranean sites below the frost line). However, often access to these sites are along tree roots, through broken foundations, or through mammal burrows which are difficult to see. It is also possible that seeps and springs are potentially important hibernation sites for some snake species such as the Northern Ribbonsnake (OMNR 2011).

A circular pile of rocks enclosed by wooden posts was observed adjacent to the intersection of Oxford Road 16 and 29th Line, and was considered to potentially contain an old infilled well (see Appendix X). See Map 2D for the presence of this structure. This feature may therefore provide suitable hibernaculum habitat for snakes. Targeted surveys for snakes would be required to confirm or rule out the presence of this Candidate SWH type. The need for additional targeted surveys may be determined based on the potential for impact to this feature during the detailed design stage.

Woodland Amphibian Breeding Habitat

Most amphibians require a source of water to reproduce and during spring, many of these species concentrate in woodland ponds to mate and lay eggs. Amphibian woodland breeding ponds may be along the edge of swamps, in floodplains, in groundwater seeps, or in depressions in upland forests but must

be within 120 m of upland habitat (OMNR 2011). There are several species of frog and salamander that are dependent on a combination of upland woodland and woodland ponds. The presence of 20 or more individuals of these species confirms these areas as SWH (MNR 2015b, MNR 2015c).

Candidate SWH for woodland amphibian breeding was identified based on the presence of SWDM3-3 deciduous swamp habitat within the study area, as well as potential for vernal pool habitat within the FODM5, FODM7, FODM4-2, forest communities. Spring-based amphibian call surveys would be required to confirm or rule out the presence of this Candidate SWH type within the study area. The need for additional targeted surveys may be determined based on the potential for impact to this feature during the detailed design stage.

Special Concern and Rare Wildlife Species Habitat

Special Concern and Rare Wildlife species are those species defined above as SCC. Confirmed habitat for SCC may be considered Significant Wildlife Habitat (OMNR 2000). Based on background information, 11 SCC were reported from the vicinity of the study area. Candidate habitat for 9 of these species was identified within the study area as discussed above and listed in Appendix I. The location of these Candidate SWH types within the study area are summarized in Table 4.

Table 4. Candidate Special Concern and Rare Wildlife SWH within the Oxford Road 16 Class EA Study Area

Species	Preferred Habitat ^{1,2}	Candidate SWH in Study Area (ELC Vegetation Community)	Map Reference(s)
Vascular Flora			
Oswego-tea (<i>Monarda didyma</i>)	Moist woods, swampy thickets and roadsides.	Swamp Maple Mineral Deciduous Swamp (SWDM3-3) and the roadside of Oxford Road 16	Maps 2A – 2F
Birds			
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	Well-drained grassland or prairie with low cover of grasses, taller weeds on sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities; perches for singing; requires tracts of grassland >10ha.	Perennial Cover Crop (OAGM2)	Maps 2A – 2F
Eastern Wood-pewee (<i>Contopus virens</i>)	Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks.	Fresh-Moist Lowland Deciduous Forest (FODM7), Dry-Fresh White Ash – Hardwood Deciduous Forest (FODM4-2), Dry-Fresh Sugar Maple Deciduous Forest (FODM5)	Maps 2D, 2E, and 2F
Wood Thrush (<i>Hylocichla mustelina</i>)	Undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges; must have some	Fresh-Moist Lowland Deciduous Forest (FODM7), Dry-Fresh White Ash – Hardwood Deciduous Forest (FODM4-2), Dry-Fresh Sugar Maple Deciduous	Maps 2D, 2E, and 2F

	trees higher than 12m.	Forest (FODM5)	
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; feeds on insects and stores nuts or acorns for winter; loss of habitat is limiting factor; requires cavity trees with at least 40 cm dbh; require about 4 ha for a territory.	Swamp Maple Mineral Deciduous Swamp (SWDM3-3), Fresh-Moist Lowland Deciduous Forest (FODM7), Dry-Fresh White Ash – Hardwood Deciduous Forest (FODM4-2), Dry-Fresh Sugar Maple Deciduous Forest (FODM5)	Maps 2B, 2D, 2E, and 2F
Reptiles and Amphibians			
Eastern Milksnake (<i>Lampropeltis taylori triangulum</i>)	Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings.	Fresh-Moist Lowland Deciduous Forest (FODM7), Dry-Fresh White Ash – Hardwood Deciduous Forest (FODM4-2), Dry-Fresh Sugar Maple Deciduous Forest (FODM5), Perennial Cover Crop (OAGM2), Reed Canary Grass Graminoid Meadow (MEGM3-8), Dry-Fresh Mixed Meadow (MEMM3)	Maps 2A – 2F
Western Chorus Frog (<i>Pseudacris triseriata</i>)	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools.	Reed Canary Grass Graminoid Meadow (MEGM3-8), Swamp Maple Mineral Deciduous Swamp (SWDM3-3), and roadside ditches of Oxford Road 16	Maps 2A – 2F
Mammals			
Tri-colored Bat (<i>Perimyotis subflavus</i>)	Open woods near water; roosts in trees, cliff crevices, buildings or caves; hibernates in damp, draft-free, warm caves, mines or rock crevices	Swamp Maple Mineral Deciduous Swamp (SWDM3-3), Fresh-Moist Lowland Deciduous Forest (FODM7), Dry-Fresh White Ash – Hardwood Deciduous Forest (FODM4-2), Dry-Fresh Sugar Maple Deciduous Forest (FODM5)	Maps 2B, 2D, 2E, and 2F
Lepidoptera			
Monarch (<i>Danaus plexippus</i>)	Host plant is Milkweed (<i>Asclepias</i> spp.)	Reed Canary Grass Graminoid Meadow (MEGM3-8), roadsides of Oxford Road 16	Maps 2A – 2F

¹OMNR 2000, ²Layberry *et al.* 1998

Development or site alteration within habitats of SCC is permitted under the PPS if it can be demonstrated that there will be no negative impacts to the form or function of these areas (OMMAH 2014). The need for additional targeted surveys may be determined based on the potential for impact to this Candidate SWH type during the detailed design stage.

Fish Habitat

Pearson and Cuskey Drain, McCall-McCorquodale Drain, and Nissouri Creek provide direct habitat for fish as discussed above. Various habitat features were identified during field investigations within each watercourse including pools, riffles, and substrates of sand, gravel, and cobble. The riparian habitat provides a food source for fish, stream bed and bank stability, cover and habitat for young fish, water temperature regulation, and the mitigation of water quality impacts from runoff. These watercourses are therefore assumed to provide suitable spawning, nursery, and rearing habitats as well as various food sources on which fish depend directly upon in order to carry out their life processes.

Following the selection of the preferred road improvement design, a DFO self-assessment screening exercise is recommended to be completed in order to determine the need for DFO involvement in the proposed development. This tool allows for an assessment to determine if serious harm to fish, as defined by the federal *Fisheries Act*, will occur based on details of the proposed activity.

This project will not require a DFO review as long as:

- there is no temporary or permanent increase in the existing footprint below the high water mark(s),
- there is no new temporary or permanent fill placed below the high water mark(s),
- channel realignment is not required,
- there is no proposed narrowing of the channel,
- any obstruction to fish passage respects timing windows,
- work provides for fish passage, and
- work can be done in isolation of flowing water

If the above can be achieved there will be no need to involve DFO. However, there will still be a requirement to avoid causing serious harm to fish by following best management practices. If proposed culvert works result in any of the above listed, a DFO review of the project will be required.

Habitat of Provincially Endangered and Threatened Species

Based on the results of background information screening exercises, habitat for six SAR were identified as potentially present within the study area (Appendix II). These habitats are described below.

Barn Swallow

Several structures on private property which may provide Barn Swallow (*Hirundo rustica*) nest sites occur within the study area. Barn Swallow is designated as provincially Threatened; therefore, this species and its general habitat are protected under the ESA. It represents one of many species of common aerial-foraging insectivorous birds that are of conservation concern in northeastern Canada and the United States due to long-term population declines for a combination of reasons that are not well understood (Heagy *et al.* 2014). Habitat for this species is protected under the General Habitat provisions of the ESA and is categorized as 1) nest, 2) the area within 5 m of the nest, and 3) the area between 5 m and 200 m of the nest (OMNR 2013a).

The entirety of the study area represents suitable foraging habitat for Barn Swallow. However, no suitable nesting structures occur within or immediately

adjacent to (i.e., within 30 m) the Oxford Road 16 ROW. Therefore, no impact to nesting habitat is anticipated as a result of the proposed undertaking. Furthermore, the relatively small footprint that may be required for road widening is not anticipated to cause negative impact to existing foraging habitat. The proposed undertaking is therefore not anticipated to require MNRF authorization or permitting to address impacts to Barn Swallow or its general habitat.

Bobolink and Eastern Meadowlark

Perennial cover crop fields (i.e., hay fields; OAGM2) within the study area may provide suitable breeding habitat for Eastern Meadowlark (*Sturnella magna*) and Bobolink (*Dolichonyx orizyvorus*). These species are designated as provincially Threatened; therefore, these species and their general habitats are protected under the ESA. Similar to many grassland birds in Ontario, Eastern Meadowlark and Bobolink populations are shrinking due to changes in land use and the loss of suitable habitat that has resulted from development and changes in agricultural practices. Because Bobolink and Eastern Meadowlark have similar habitat preferences and face similar threats, they are considered together under the same protection policies of the ESA and its species-specific regulations. Habitat for Eastern Meadowlark is protected under the General Habitat provisions of the ESA and is categorized as 1) a nest area and 10 m around the nest, 2) the area between 10 m and 100 m of the nest or centre of approximated defended territory, and 3) the area of continuous suitable habitat between 100 m and 300 m of the nest or approximated centre of defended territory (MNRF 2014). Similarly, habitat for Bobolink is protected under the General Habitat provisions of the ESA and is categorized as 1) a nest area and 10 m around the nest, 2) the area between 10 m and 60 m of the nest or centre of approximated defended territory, and 3) the area of continuous suitable habitat between 60 m and 300 m of the nest or approximated centre of defended territory (OMNR 2013a).

Impact potential to Bobolink and Eastern Meadowlark habitat, and the need for additional targeted surveys, will be determined based on details of the preferred alternative design. However, due to the relatively small footprint that may be required for road widening, it is not anticipated that the proposed undertaking will cause negative impact to Bobolink or Eastern Meadowlark, or their general habitat.

Little Brown Myotis and Northern Myotis

Little Brown Myotis (*Myotis lucifuga*) will use buildings and occasionally tree cavities as maternity and day roost sites (OMNR 2000), both of which are present within the study area. Northern Myotis (*Myotis septentrionalis*) prefer tree cavities or spaces under loose bark and will occasionally use buildings for maternity and day roost sites (OMNR 2000), all of which are also present within the study area. These species are listed as Endangered in Ontario; therefore, these species and their general habitats are protected under the ESA. Myotis species are experiencing significant declines in population sizes throughout eastern North America due to the fungus, *Pseudogymnoascus destructans* which causes “white nose syndrome”, and is terminal to bats. Bats are affected by the fungus during hibernation where it grows on their muzzles, ears, and wing membranes and results in the arousal of individuals from hibernation more frequently, and/or for longer periods than normal, and in the premature expenditure of fat reserves which they rely on for winter survival.

Field studies confirmed the presence of two cavity trees within approximately 30m of the Oxford Road 16 ROW (Map 2). These trees may provide suitable maternity colony or roosting habitat for SAR bats. Additional targeted surveys may be required, in consultation with the MNRF, to assess the use of these trees by SAR bats. The need for targeted surveys and MNRF consultation will be determined based on details of the preferred alternative design.

American Badger

Suitable habitat for American Badger (*Taxidea taxus jacksoni*) is limited within the study area, however, is present in the form of meadow habitat (MEMM3) and transitional habitat between treed areas and agricultural fields. This species is designated as Endangered in Ontario; therefore, this species and its general habitat is protected under the ESA. Similar to grassland birds discussed above, the greatest threat to American Badger populations in Ontario is the loss and fragmentation of native and human-maintained grassland habitats due to development and changes in agricultural practices. American Badger habitat is defined under Section 24 of the O. Reg. 242/08 of the ESA as 1) den currently being used or was used by American Badger in the previous 12 months, 2) the area within 5 m of the entrance of the den, and 3) a Woodchuck (*Marmota monax*) burrow or Franklin's Ground Squirrel (*Spermophilus franklinii*) burrow that i) is being used or was used by a Woodchuck or Franklin's Ground Squirrel at any time in the past, and ii) is within 850 m of an American Badger den.

Potential dens were not observed within the road ROW during field investigations. Impact potential to American Badger habitat, and the need for additional targeted surveys, will be determined based on details of the preferred alternative design.

Summary of Natural Feature Constraints

A summary of natural features identified as constraints to the proposed road improvements is provided below. Although many of these features are identified as significant, there are allowances in the provincial and local policies to permit activities that create or maintain infrastructure authorized under an EA process. The design of the preferred alternative should seek to minimize impacts to these features wherever possible.

- The locally significant Swamp Maple Mineral Deciduous Swamp (SWDM3-3, Map 2) falls within the proposed 30 m ROW.
- Significant Woodlands are associated with McCall-McCorquodale Drain and Nissouri Creek.
- Significant Valleyland features are associated with the Pearson & Cuskey Drain, McCall-McCorquodale Drain, and Nissouri Creek floodplains. Additional studies may be required once the preferred alternative is selected to inform potential impacts to these features (e.g. slope stability assessment).
- Fish habitat is present in Pearson & Cuskey Drain, McCall-McCorquodale Drain, and Nissouri Creek. Completion of a DFO self-assessment screening exercise is recommended for each crossing to determine DFO involvement in the proposed development. Further consultation and review with DFO may be required once the preferred alternative is selected, if there is the potential to cause serious harm to fish habitat.
- The design of the preferred alternative should have regard for potential SWH; additional targeted surveys may be considered during detailed design to confirm/rule out Candidate SWH.

- No SAR were confirmed within the study area, but candidate habitat for the several SAR was identified within the study area. Due to the relatively small footprint that may be required for road widening, it is not anticipated that the proposed undertaking will cause negative impact to SAR, or their general habitat. The exception being Little Brown Myotis and Northern Myotis, and only if they are found to be using the candidate cavity trees identified as habitat. Potential impacts to SAR bats will need to be considered in consultation with MNRF once the preferred alternative is selected and the need to remove those trees is determined.

Conclusions

Natural Resource Solutions Inc. (NRSI) was retained in 2015 by Oxford County to complete the natural heritage component of the Oxford Road 16 Class EA. This report summarizes background information on natural heritage features, as well as the methods and results of a scoped field program within the study area.

The characterization of existing natural features was used to inform an analysis of the significance and sensitivity of natural features within the study area. This information is intended to inform the selection of a preferred alternative design that seeks to avoid or minimize impact to existing natural features and species. In summary, proposed road improvements to Oxford Road 16, such as the widening of the road ROW from 20 m to 30 m, may have the potential to impact existing natural features within the study area. These include potential for impact to adjacent wetland, Significant Woodland and Significant Valleyland features, Candidate SWH types (snake hibernaculum and woodland amphibian breeding habitat) and bat SAR habitat.

This analysis is one component of the EA which will inform the selection of the preferred alternative. Other components which need to be considered are technical feasibility, potential impacts to the local community (i.e. social impacts), cost, and input from a variety of stakeholders.

The final EA will include an impact assessment based on details of the preferred alternative design. The details of the proposed undertaking will be reviewed and compared to the existing conditions in the study area. The need for additional targeted field surveys will be considered based on the detailed design to inform the impact assessment. Adverse environmental impacts likely to arise directly or indirectly from the proposed development will be discussed with the project team and options for minimizing impacts will be examined. Recommendations for mitigation measures will be proposed to offset negative impacts on the natural environment and species occupying the study area. In addition, potential enhancements or compensation measures that can be achieved will also be highlighted.

References

- Agriculture and Agri-Food Canada. 1996. Soils of Oxford County, Ontario. Soil Survey Report No. 28, Sheet 1.
- 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 Database, 31 January 2008.
<http://www.birdsontario.org/atlas/aboutdata.jsp?lang=en> (Accessed September 2015)
- COSEWIC. 2007. COSEWIC Assessment and Update Status Report on the Northern Brook Lamprey *Ichthyomyzon fossor* (Great Lakes – Upper St. Lawrence Populations and Saskatchewan – Nelson Population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Vi + 30pp.
www.sararegistry.gc.ca/status/status_e.cfm.
- County of Oxford. 1979. Official Plan. Adopted by County Council and approved by the Province in 1979.
- County of Oxford. 2006. Oxford Natural Heritage Study. County of Oxford, Woodstock, ON. Available Online: <http://www.oxfordcounty.ca/Business-in-Oxford/Planning-and-Development/Official-Plan-and-Special-Projects/5-year-Official-Plan-Review/Oxford-Natural-Heritage-Study> (Accessed September 2015).
- Dobbyn, J.S. 1994. Atlas of the Mammals of Ontario. Don Mills, Federation of Ontario Naturalists.
- Eakins, R. J. 2015. Ontario Freshwater Fishes Life History Database. Version 4.60. On-line database. (<http://www.ontariofishes.ca>) (Accessed October 2015).
- Fisheries and Oceans Canada (DFO). 2015. Distribution of Fish and Mussel Species at Risk. Upper Thames River Conservation Authority. May 2015. Valid until May 2016.
- Government of Canada. 2015. Species at Risk Public Registry: Species Index. Last updated May 29, 2015. http://www.sararegistry.gc.ca/sar/index/default_e.cfm (Accessed 2015)
- Heagy, A., D. Badzinski, D. Bradley, M. Falconer, J. McCracken, R.A. Reid and K. Richardson. 2014. DRAFT Recovery Strategy for the Barn Swallow (*Hirundorustica*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 64 pp.
- Jones, C. 2015. Provincial Arthropod Zoologist, Ontario Natural Heritage Information Centre. Email Correspondence with Christopher Law. September 23, 2015.
- Jones, C., R. Layberry, and A. Macnaughton. 2015. Ontario Butterfly Atlas Online. Toronto Entomologists' Association. Last updated June 1, 2015.
http://www.ontarioinsects.org/atlas_online.htm (Accessed September 2015).
- Layberry, R.A., P.W. Hall, and J.D. Lafontaine. 1998. The Butterflies of Canada. University of Toronto Press, Toronto, Canada.

- Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.
- Lee, H. 2008. Southern Ontario Ecological Land Classification - Vegetation Type List. Ontario Ministry of Natural Resources: London, Ontario.
- Ministry of Natural Resources and Forestry (MNRF). 2014. Natural Heritage Information Centre (NHIC): Biodiversity Explorer, Land Information Ontario: <http://www.giscoeapp.lrc.gov.on.ca/web/MNR/NHLUPS/NaturalHeritage/Viewer/Viewer.html> (Accessed 2015).
- Ministry of Natural Resources and Forestry (MNRF). 2015a. Species at Risk in Ontario (SARO) List: <http://www.ontario.ca/environment-and-energy/species-risk-ontario-list> (Accessed October 2015).
- Ministry of Natural Resources and Forestry (MNRF). 2015b. Significant Wildlife Habitat Ecoregion 6E Criterion Schedule: Addendum to Significant Wildlife Habitat Technical Guide. MNRF, January 2015.
- Ministry of Natural Resources and Forestry (MNRF). 2015c. Significant Wildlife Habitat Ecoregion 7E Criterion Schedule: Addendum to Significant Wildlife Habitat Technical Guide. MNRF, January 2015.
- Naughton, D. 2012. The Natural History of Canadian Mammals. Canadian Museum of Nature. University of Toronto Press. 784 pp.
- Oldham, M.J. 1993. Distribution and status of the vascular plants of Southwestern Ontario. Ontario Ministry of Natural Resources, Aylmer District. 105pp.
- Ontario Breeding Bird Atlas. 2001. Guide for Participants. Atlas Management Board, Federation of Ontario Naturalists, Don Mills.
- Ontario Ministry of Municipal Affairs and Housing (OMMAH). 2014. Provincial Policy Statement.
- Ontario Ministry of Natural Resources (OMNR). 2013a. General Habitat Description for the Barn Swallow (*Hirundo rustica*).
- Ontario Ministry of Natural Resources (OMNR). 2013b. General Habitat Description for the Bobolink (*Dolichonyx oryzivorus*).
- Ontario Ministry of Natural Resources (OMNR). 2014. General Habitat Description for the Eastern Meadowlark (*Sturnella magna*).
- Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide. October 2000.
- Ontario Ministry of Natural Resources (OMNR). 2010. Natural Heritage Reference Manual for Policies of the Provincial Policy Statement, Second Edition. March 18, 2010.

Ontario Ministry of Natural Resources (OMNR). 2011. Significant Wildlife Habitat Mitigation Support Tool. Version 4.0. April 2011.

Ontario Ministry of Natural Resources (OMNR). 2013. Ontario Wetland Evaluation System: Southern Manual. 3rd Edition, Version 3.2.

Ontario Nature. 2015. Reptiles and Amphibians of Ontario Range Maps. Last Updated June 2015. http://www.ontarioinsects.org/herpatlas/herp_online.html (Accessed September 2015).

Schwindt, J. 2015. Aquatic Biologist, Upper Thames River Conservation Authority. Email Correspondence with Heather Fotherby. September 1, 2015.

Upper Thames River Conservation Authority (UTRCA). 2006. Environmental Planning Policy Manual for the Upper Thames River Conservation Authority. Approved by Board of Directors June 28, 2006.

Upper Thames River Conservation Authority (UTRCA). 2012. Middle Thames River Watershed Report Card *in* Upper Thames River Watershed Report Cards. UTRCA: 6 pp.

MAPS



Map 1

Oxford Road 16 Class EA Study Area

Legend

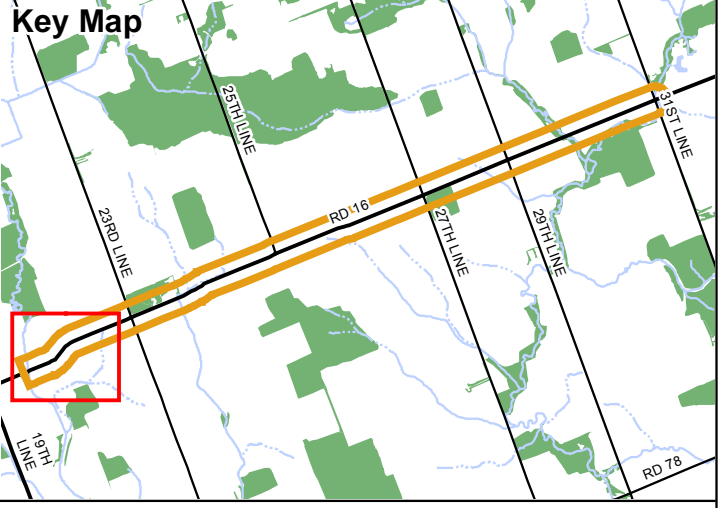
- Study Area
- Primary Road
- Secondary Road
- Permanent Watercourse
- Intermittent Watercourse
- Waterbody
- Provincially Significant Wetland (PSW)
- Wooded Area
- ANSI, Life Science

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

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Project: 1680 Date: October 28, 2015	NAD83 - UTM Zone 17 Size: 11x17" 1:24,000
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Oxford Road 16 Class EA Vegetation Communities and Aquatic Survey Locations



- Legend**
- Study Area
 - Aquatic Habitat Point (AHP)
 - Electrofishing Monitoring Station (EMS)
 - Permanent Watercourse
 - Intermittent Watercourse
 - Ecological Land Classification (ELC)
 - (CGL_2) Parkland
 - (CVR) Residential
 - (FODM7) Fresh-Moist Lowland Deciduous Forest Ecosite
 - (MEMM3) Dry-Fresh Mixed Meadow Ecosite
 - (OAGM1) Annual Row Crops
 - (OAGM2) Perennial Cover Crops

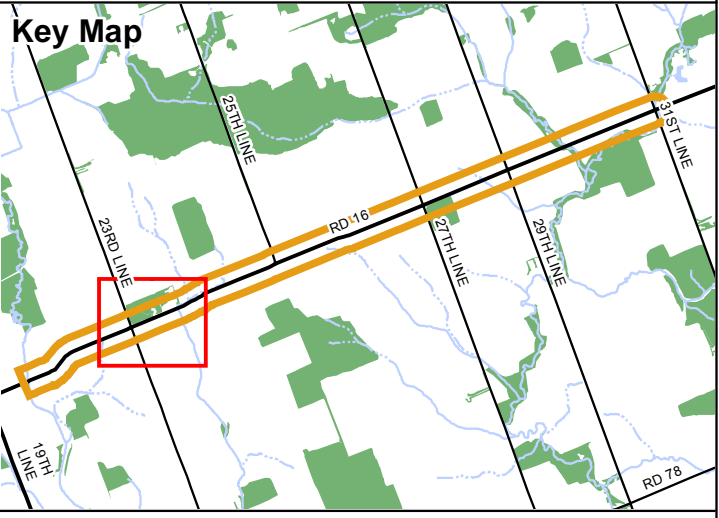


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Project: 1680 Date: October 28, 2015	NAD83 - UTM Zone 18 Size: 11x17" 1:3,000
0 50 100 150 200 Metres	



Map 2B
Oxford Road 16 Class EA
Vegetation Communities and
Aquatic Survey Locations



- Legend**
- Study Area
 - Permanent Watercourse
 - Intermittent Watercourse
 - Locally Significant Wetland
 - Ecological Land Classification (ELC)
 - (CVR) Residential
 - (OAGM1) Annual Row Crops
 - (OAGM2) Perennial Cover Crops
 - (SWDM3-3) Swamp Maple Mineral Deciduous Swamp Type
 - (TAGM1) Coniferous Plantation



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Project: 1680 Date: October 28, 2015	NAD83 - UTM Zone 18 Size: 11x17" 1:3,000
0 50 100 150 200 Metres	



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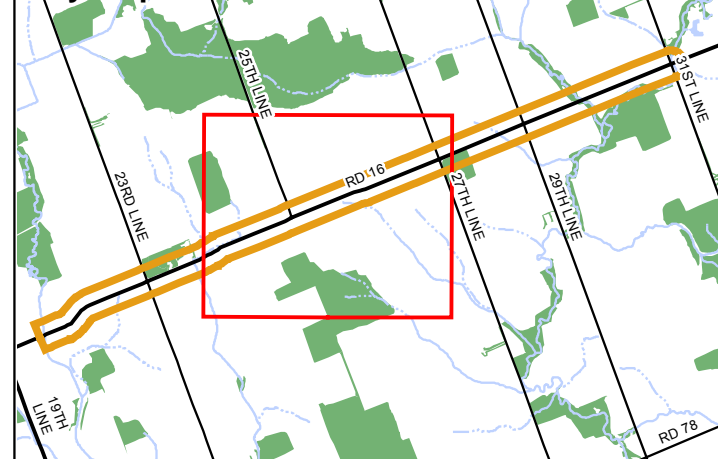
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Map 2C

Oxford Road 16 Class EA Vegetation Communities and Aquatic Survey Locations

Key Map



Legend

- Study Area
- Permanent Watercourse
- Intermittent Watercourse
- Ecological Land Classification (ELC)
 - (CVR) Residential
 - (OAGM1) Annual Row Crops
 - (OAGM2) Perennial Cover Crops

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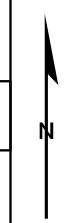
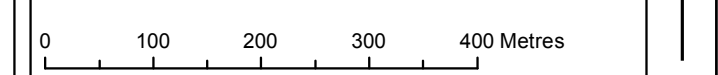
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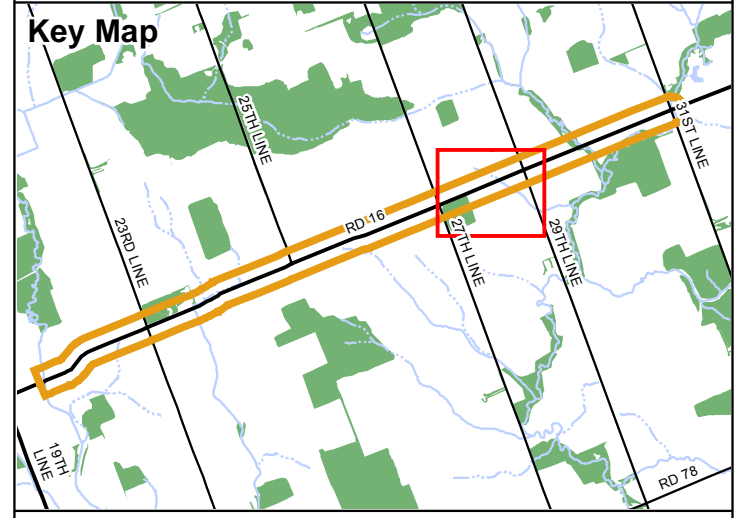
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Project: 1680 Date: October 28, 2015	NAD83 - UTM Zone 18 Size: 11x17" 1:7,000
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Map 2D
Oxford Road 16 Class EA
Vegetation Communities and
Aquatic Survey Locations



- Legend**
- Study Area
 - Potential Snake Hibernaculum
 - Cavity Tree
 - Permanent Watercourse
 - Intermittent Watercourse
 - Ecological Land Classification (ELC)
 - (CVR) Residential
 - (FODM5) Dry-Fresh Sugar Maple Deciduous Forest
 - (OAGM1) Annual Row Crops
 - (OAGM2) Perennial Cover Crops

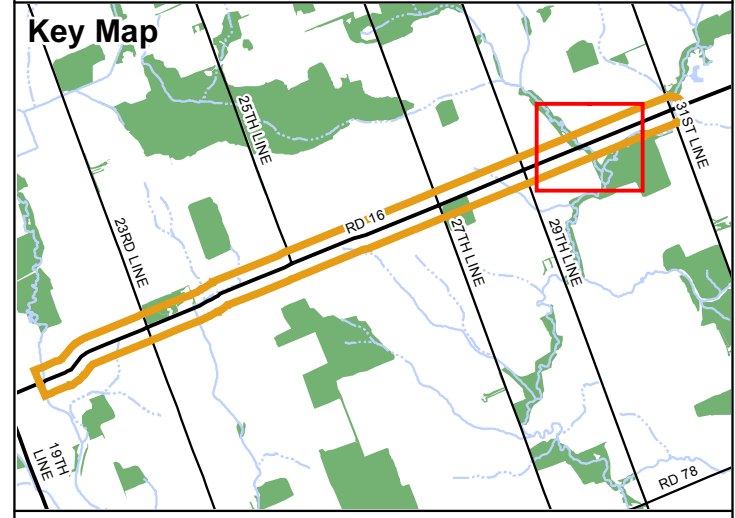


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Project: 1680 Date: October 28, 2015	NAD83 - UTM Zone 18 Size: 11x17" 1:3,000



Map 2E
Oxford Road 16 Class EA
Vegetation Communities and
Aquatic Survey Locations



- Legend**
- Study Area
 - Aquatic Habitat Point (AHP)
 - Electrofishing Monitoring Station (EMS)
 - Cavity Tree
 - Permanent Watercourse
 - Significant Woodland (County of Oxford 2006)
 - Ecological Land Classification (ELC)
- (CVR) Residential
(FODM4-2) Dry-Fresh White Ash-Hardwood Deciduous Forest Type
(FODM7) Fresh-Moist Lowland Deciduous Forest Ecosite
(MEGM3-8) Reed Canary Grass Graminoid Meadow Type
(OAGM1) Annual Row Crops
(OAGM2) Perennial Cover Crops
(OAGM3) Specialty Crops
(TAGM1) Coniferous Plantation



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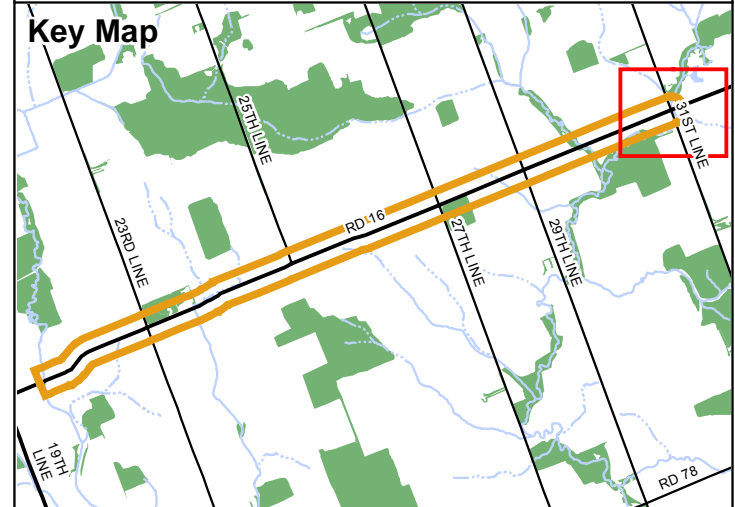
Project: 1680 Date: October 28, 2015	NAD83 - UTM Zone 18 Size: 11x17" 1:3,000
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503000 503200 503400 503600 503800

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4778800
4778600
4778400



Map 2F
Oxford Road 16 Class EA
Vegetation Communities and
Aquatic Survey Locations



- Legend**
- Study Area
 - Aquatic Habitat Point (AHP)
 - Permanent Watercourse
 - Intermittent Watercourse
 - Significant Woodland (County of Oxford 2006)
 - Ecological Land Classification (ELC)
 - (FODM4-2) Dry-Fresh White Ash-Hardwood Deciduous Forest Type
 - (FODM7) Fresh-Moist Lowland Deciduous Forest Ecosite
 - (MEGM3-8) Reed Canary Grass Graminoid Meadow Type
 - (OAGM1) Annual Row Crops
 - (OAGM2) Perennial Cover Crops



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Project: 1680 Date: October 28, 2015	NAD83 - UTM Zone 18 Size: 11x17" 1:3,000	

APPENDIX I
Federally and Provincially Significant Species Known for the Study Area and
Vicinity

Federally and Provincially Significant Species Known from the Study Area and Vicinity

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ⁴	Habitat Preference ^{5,6,7,8,9,10,11,12,13,14}	Background Source	Suitable Habitats within Study Area	Observed by NRSI
Vascular Flora									
<i>Collinsia verna</i>	Blue-eyed Mary	SX	EXP	XT	Schedule 1	Rich deciduous forests, especially in ravines and moist areas.	MNRF 2015b	No	No
<i>Frasera caroliniensis</i>	American Columbo	S2	END	E	Schedule 1	Woodlands on sandy and clay soils.	MNRF 2015b	No	No
<i>Monarda didyma</i>	Oswego-tea	S3	--	--	--	Moist woods, swampy thickets and roadsides.	MNRF 2015b	Yes	No
Birds									
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	S4B	--	SC	--	Well-drained grassland or prairie with low cover of grasses, taller weeds on sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities; perches for singing; requires tracts of grassland >10ha.	BSC et al. 2008	No; All fields within study area are actively being used for agriculture.	No
<i>Chaetura pelagica</i>	Chimney Swift	S4B, S4N	THR	T	Schedule 1	Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water.	BSC et al. 2008	No	No
<i>Contopus virens</i>	Eastern Wood-pewee	S4B	SC	SC	--	Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks.	BSC et al. 2008	Yes	No
<i>Dolichonyx oryzivorus</i>	Bobolink	S4B	THR	T	--	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha.	BSC et al. 2008	Yes	No
<i>Hirundo rustica</i>	Barn Swallow	S4B	THR	T	--	Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water.	BSC et al. 2008	Yes; foraging habitat is present within the study area.	No
<i>Hylocichla mustelina</i>	Wood Thrush	S4B	SC	T	--	Undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges; must have some trees higher than 12m.	BSC et al. 2008	Yes	No
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	S4B	SC	T	Schedule 1	Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; feeds on insects and stores nuts or acorns for winter; loss of habitat is limiting factor; requires cavity trees with at least 40 cm dbh; require about 4 ha for a territory.	BSC et al. 2008	Yes	No

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ⁴	Habitat Preference ^{5,6,7,8,9,10,11,12,13,14}	Background Source	Suitable Habitats within Study Area	Observed by NRSI
<i>Riparia riparia</i>	Bank Swallow	S4B	THR	T	--	Sand, clay or gravel river banks or steep riverbank cliffs; lakeshore bluffs of easily crumbled sand or gravel; gravel pits, road-cuts, grassland or cultivated fields that are close to water.	BSC et al. 2008	No	No
<i>Setophaga cerulea</i>	Cerulean Warbler	S3B	THR	E	Schedule 1	Mature deciduous woodland of Great Lakes- St. Lawrence and Carolinian forests, sometimes coniferous; swamps or bottomlands with large trees; area sensitive species needing extensive areas of forest (>100 ha).	MNRF 2015b	No	No
<i>Sturnella magna</i>	Eastern Meadowlark	S4B	THR	T	--	Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10 ha in size.	BSC et al. 2008	Yes	No
Herpetofauna									
<i>Chelydra serpentina serpentina</i>	Snapping Turtle	S3	SC	SC	Schedule 1	Permanent, semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddy banks or bottoms; often uses soft soil or clean dry sand on south-facing slopes for nest sites.	Ontario Nature 2015; MNRF 2015b	No	No
<i>Emydoidea blandingii</i>	Blanding's Turtle	S3	THR	T	Schedule 1	Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps, or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs.	Ontario Nature 2015	No	No
<i>Lampropeltis taylori triangulum</i>	Eastern Milksnake	S3	SC	SC	Schedule 1	Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings.	Ontario Nature 2015	Yes	No
<i>Pseudacris triseriata</i> pop. 2	Western Chorus Frog (Great Lakes/St. Lawrence - Canadian Shield Population)	S3	NAR	T	Schedule 1	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools.	Ontario Nature 2015	Yes	No

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ⁴	Habitat Preference ^{5,6,7,8,9,10,11,12,13,14}	Background Source	Suitable Habitats within Study Area	Observed by NRSI
Mammals									
<i>Perimyotis subflavus</i>	Tri-colored Bat	S3?		E	Schedule 1	Open woods near water; roosts in trees, cliff crevices, buildings or caves; hibernates in damp, draft-free, warm caves, mines or rock crevices	Dobbyn 1994	Yes; Suitable roosting habitat (cavity trees, forested habitat) and foraging habitat present (forested habitat adjacent to watercourses) present within study area.	No
<i>Myotis leibii</i>	Eastern Small-footed Myotis	S2S3	END			Roosts in open, sunny, rocky habitats; males and females roost alone, however, females will form maternity colonies of up to 2 to 3 adults; hibernates in cold dry caves or mines; forages in forests and over waterbodies	Dobbyn 1994	No	No
<i>Myotis septentrionalis</i>	Northern Myotis	S3	END	E	Schedule 1	Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, manmade structures but prefers hollow trees or under loose bark; forages within forests, below canopy.	Dobbyn 1994	Yes; Suitable roosting habitat (cavity trees, forested habitat) and foraging habitat present (forested habitat) present within study area.	No
<i>Taxidea taxus jacksoni</i>	American Badger	S2	END	E	Schedule 1	Open habitat such as meadows, prairies, and oak savannahs as well as grassy and weedy edges of fields and forests; dens in new hole or enlarged existing hole.	Dobbyn 1994, Naughton 2012	Yes; Suitable habitat is present within the study area, specifically, grassy and weedy edges of fields.	No
<i>Myotis lucifuga</i>	Little Brown Myotis	S4	END	E	Schedule 1	Uses caves, quarries, tunnels, hollow trees or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; forages primarily in wetlands, forest edges.	Dobbyn 1994	Yes; Suitable roosting habitat (cavity trees, buildings) and foraging habitat (forested areas) present within study area.	No
Insects									
<i>Danaus plexippus</i>	Monarch	S2N, S4B	SC	SC	Schedule 1	Host plant is Milkweed (<i>Asclepias</i> spp.)	Jones et al. 2015	Yes	No

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ⁴	Habitat Preference ^{5,6,7,8,9,10,11,12,13,14}	Background Source	Suitable Habitats within Study Area	Observed by NRSI
Fish									
<i>Ichthyomyzon fossor</i>	Northern Brook Lamprey (GL-USL Pop.)	S3	SC	SC (April 2007)	Schedule 1	Adults in clean, clear riffles and runs of small rivers with gravel and sand substrates; ammocoetes occupy quiet water with sand, silt and detritus substrates.	MNRF 2015b	No	No

^{1,2}MNRF 2015a, ^{3,4}Government of Canada 2015, ⁵MNRF 2000, ⁶Layberry et al. 1998, ⁷Eakins 2015, ⁸Best and Jennings 1997, ⁹Johnson and Gates 2008, ¹⁰Johnson et al. 2011, ¹¹Moosman et al. 2013, ¹²USFWS 2013, ¹³Whitby et al. 2013, ¹⁴Moosman et al. 2015

LEGEND
SRANK
S2 Imperiled
S3 Vulnerable
S4 Apparently Secure
B Breeding
N Non-breeding
SX Extirpated
COSSARO/COSEWIC
END/E Endangered
THR/T Threatened
SC/SC Special Concern
EXP/XT Extirpated
NAR Not at Risk
SARA Schedule
Schedule 1 Officially Protected under SARA

APPENDIX II
Significant Wildlife Habitat Assessment Tables

Significant Wildlife Habitat Assessment Tables

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E and 7E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Raptor Wintering Area					
<p><u>Rationale:</u> Sites used by multiple species, a high number of individuals and used annually are most significant</p>	<p>Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl</p> <p><u>Special Concern:</u> Short-eared Owl Bald Eagle</p>	<p>Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class: Forest: FOD, FOM, FOC</p> <p>Upland: CUM, CUT, CUS, CUW</p>	<p>The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors.</p> <p>Raptor wintering sites need to be > 20 ha^{cxlviii, cxlix} with a combination of forest and upland.^{xvi, xvii, xviii, xix, xx, xxi}</p> <p>Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands^{cxlix}</p> <p>Field area of the habitat is to be wind swept with limited snow depth or accumulation.</p> <p>Eagle sites have open water, large trees and snags available for roosting</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNRF Ecologist or Biologist • Field Natural Clubs • Natural Heritage Information Center (NHIC) Raptor Winter Concentration Area • Data from Bird Studies Canada • Reports and other information available from Conservation Authorities CAs. 	<p>Studies confirm the use of these habitats by:</p> <ul style="list-style-type: none"> • One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two listed hawk/owl species • To be significant a site must be used regularly (3 in 5 years)^{cxlix} for a minimum of 20 days by the above number of birdsⁱ. • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"^{ccxi} • SWHMiST^{cxlix} Index #10 and #11 provides development effects and mitigation measures. 	<p>Suitable combination of hayfield and treed habitat exists within the study area.</p> <p>Candidate SWH</p>
Wildlife Habitat: Bat Maternity Colonies					
<p><u>Rationale:</u> Known locations of forested bat maternity colonies is extremely rare in all Ontario landscapes.</p>	<p>Big Brown Bat Silver-haired Bat</p>	<p>Maternity colonies considered SWH are found in forested Ecosites.</p> <p>All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM</p>	<p>Maternity colonies can be found in tree cavities, vegetation and often in buildings^{xxii, xxv, xxvi, xxvii, xxxi} (buildings are not considered to be SWH).</p> <ul style="list-style-type: none"> • Maternity roosts are not found in caves and mines in Ontario^{xxii}. • Maternity colonies located in Mature deciduous or mixed forest stands^{ccix, ccx} with >10/ha large diameter (>25cm dbh) wildlife trees^{ccvii} • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3^{ccxiv} or class 1 or 2^{ccxii}. • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred^{ccx} <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNRF for possible locations and contact for local experts • University Biology Departments with bat experts. 	<ul style="list-style-type: none"> • Maternity Colonies with confirmed use by: <ul style="list-style-type: none"> • >10 Big Brown Bats • >5 Adult Female Silver-haired Batsⁱ • The area of the habitat includes the entire woodland or the forest stand ELC Ecosite or an Ecoelement containing the maternity colonies. • Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for wind Power Projects"^{ccv}. • SWHMiST^{cxlix} Index #12 provides development effects and mitigation measures. 	<p>The study area contains suitable forested habitat (FODM7, FODM4-2, FODM5, SWDM3-3).</p> <p>Candidate SWH</p>

Wildlife Habitat: Snake Hibernaculum

<p>Rationale: Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant</p>	<p>Snakes: Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake</p> <p>Special Concern: Milksnake Eastern Ribbonsnake</p> <p>Lizard: Special Concern (Southern Shield population): Five-lined Skink</p>	<p>For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats.</p> <p>Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator.</p> <p>For Five-lined Skink, ELC Community Series of FOD and FOM and Ecosites: FOC1 FOC3</p>	<p>• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations. The existence of features that go below the frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH.</p> <p>• Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line. • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover.</p> <p>• Five-lined skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures cciii.</p> <p>Information Sources</p> <p>• In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells).</p> <p>• Reports and other information from CAs.</p> <p>• Local Field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. clubs</p> <p>• Natural Heritage Information Center (NHIC)</p> <p>• OMNRF ecologist or biologist may be aware of locations of wintering skinks</p>	<p>Studies confirming:</p> <ul style="list-style-type: none"> • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct)¹. • Note: If there are Special Concern Species present, then site is SWH • Note: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population [i.e. strong hibernation site fidelity]. Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30m buffer is the SWH¹ • SWHMiST^{cxlix} Index #13 provides development effects and mitigation measures for snake hibernacula. • Presence of any active hibernaculum for skink is significant. • SWHMiST^{cxlix} Index #37 provides development effects and mitigation measures for five-lined skink wintering habitat. 	<p>The study area contains suitable habitat (i.e. old stone well) that would support potential snake hibernacula.</p> <p>Candidate SWH</p>
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Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E and 7E.

Wildlife Habitat: Amphibian Breeding Habitat (Woodland)					
<p>Rationale: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations.</p>	<p>Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog</p>	<p>All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD</p> <p>Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.</p>	<ul style="list-style-type: none"> • Presence of a wetland, pond or woodland pool (including vernal pools) >500m² (about 25m diameter) ^{ccvii} within or adjacent (within 120m) to a woodland (no minimum size) ^{cbxxxii, lxiii, lxvi, lxvii, lxviii, lxxx, lxx}. Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat ^{cxlviii}. <p>Information Sources</p> <ul style="list-style-type: none"> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records • Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF District • OMNRF wetland evaluations • Field naturalist clubs • Canadian Wildlife Service Amphibian Road Call Survey • Ontario Vernal Pool Association: http://www.ontariovernalpools.org 	<p>Studies confirm:</p> <ul style="list-style-type: none"> • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) ^{lxxi} or 2 or more of the listed frog species with Call Level Codes of 3. • A combination of observational study and call count surveys ^{cviii} will be required during the spring March-June when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the woodland area plus a 230m radius of woodland area ^{lxiii, lxv, lxvii, lxviii, lxxx, lxx, lxxi} if a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • SWHMiST ^{cxlix} Index #14 provides development effects and mitigation measures. 	<p>Suitable amphibian breeding habitat may exist within the study area. However, specific field surveys were not conducted to confirm.</p> <p>Candidate SWH</p>

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E and 7E.

Wildlife Habitat: Special Concern and Rare Wildlife Species					
<p>Rationale: These species are quite rare or have experienced significant population declines in Ontario.</p>	<p>All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre.</p>	<p>All plant and animal element occurrences (EO) within a 1 or 10km grid.</p> <p>Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.</p>	<p>When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites ^{lxxviii}.</p> <p>Information Sources</p> <ul style="list-style-type: none"> • Natural Heritage Information Centre (NHIC) will have the Special Concern and Provincially Rare (S1-S3, SH) species lists with and element occurrences data. • NHIC Website: "Get Information": http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas ^{ccv} • Expert advice should be sought as many of the rare spp. have little information available about their requirements. 	<p>Studies Confirm:</p> <ul style="list-style-type: none"> • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs to be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat. • SWHMiST ^{cxlix} Index #37 provides development effects and mitigation 	<p>Several Special Concern and Provincially Rare (S1-S3, SH) species records are documented within the vicinity of the study area and have been included in the table below.</p> <p>Candidate SWH</p>
Special Concern and Rare Wildlife Species - Vascular Flora					
<p>Oswego-tea (<i>Monarda didyma</i>)</p>		<p>Moist woods, swampy thickets and roadsides.</p>		<p>Suitable habitat is present within study area (SWDM3-3, roadsides). Not observed during targeted vascular flora field investigations within 30 m of the existing roadside.</p> <p>Candidate SWH</p>	

Special Concern and Rare Wildlife Species - Birds		
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	Well-drained grassland or prairie with low cover of grasses, taller weeds on sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities; perches for singing; requires tracts of grassland >10ha.	Suitable habitat is present within the study area as agricultural hayfields. Candidate SWH
Eastern Wood-pewee (<i>Contopus virens</i>)	Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks.	Suitable habitat is present (FODM7, FODM4-2, FODM5) within the study area. Candidate SWH
Wood Thrush (<i>Hylocichla mustelina</i>)	Undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges; must have some trees higher than 12m.	Suitable habitat is present within the study area (FODM7, FODM4-2, FODM5). Candidate SWH
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; feeds on insects and stores nuts or acorns for winter; loss of habitat is limiting factor; requires cavity trees with at least 40 cm dbh; require about 4 ha for a territory.	Suitable habitat is present within the study area (SWDM3-3, FODM7, FODM4-2, FODM5, agricultural hayfields with scattered large trees). Candidate SWH
Special Concern and Rare Wildlife Species - Reptiles and Amphibians		
Snapping Turtle (<i>Chelydra serpentina serpentina</i>)	Permanent, semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddy banks or bottoms; often uses soft soil or clean dry sand on south-facing slopes for nest sites.	Suitable habitat is not present within the study area. Watercourses within study area do not have soft muddy substrates. Not SWH
Eastern Milksnake (<i>Lampropeltis taylori triangulum</i>)	Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings.	Suitable habitat is present within the study area (agricultural fields, FODM7, FODM4-2, FODM5). Candidate SWH
Western Chorus Frog (<i>Pseudacris triseriata</i> pop. 2)	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools.	Suitable habitat is present within the study area (SWDM3-3, MEGM3 8, roadside ditches). Candidate SWH
Special Concern and Rare Wildlife Species - Mammals		
Tri-colored Bat (<i>Perimyotis subflavus</i>)	Open woods near water; roosts in trees, cliff crevices, buildings or caves; hibernates in damp, draft-free, warm caves, mines or rock crevices	Suitable roosting habitat (FODM7, FODM4-2, FODM5) and foraging habitat present (forested habitat adjacent to watercourses) present within study area. Candidate SWH
Special Concern and Rare Wildlife Species - Insects		
Monarch (<i>Danaus plexippus</i>)	Host plant is Milkweed (<i>Asclepias</i> spp.)	Suitable habitat is present within the study area. Common Milkweed (<i>Asclepias syriaca</i>) was observed during vascular flora field investigations. Candidate SWH

Special Concern and Rare Wildlife Species - FishNorthern Brook Lamprey (*Ichthyomyzon fossor*)

Adults in clean, clear riffles and runs of small rivers with gravel and sand substrates; ammocoetes occupy quiet water with sand, silt and detritus substrates.

Suitable habitat is not present within the study area. Substrates are too large to support this species.

Not SWH

APPENDIX III
Vascular Plant Species Reported From the Study Area

Vascular Plant Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	Oxford County ⁴	NHIC Data ¹	NRSI Observed
Pteridophytes	Ferns & Allies							
Equisetaceae	Horsetail Family							
<i>Equisetum arvense</i>	Field Horsetail	S5				X		X
Gymnosperms	Conifers							
Cupressaceae	Cypress Family							
<i>Thuja occidentalis</i>	White Cedar	S5				X		X
Pinaceae	Pine Family							
<i>Picea abies</i>	Norway Spruce	SE3				I		X
<i>Pinus strobus</i>	Eastern White Pine	S5				X		X
Dicotyledons	Dicots							
Aceraceae	Maple Family							
<i>Acer negundo</i>	Manitoba Maple	S5				X		X
<i>Acer platanoides</i>	Norway Maple	SE5						X
<i>Acer saccharum ssp. saccharum</i>	Sugar Maple	S5				X		X
<i>Acer X freemanii</i>	Freeman's Maple							X
Anacardiaceae	Sumac or Cashew Family							
<i>Toxicodendron rydbergii</i>	Poison-ivy	S5				X		X
Apiaceae	Carrot or Parsley Family							
<i>Cicuta maculata</i>	Spotted Water-hemlock	S5				X		X
<i>Daucus carota</i>	Wild Carrot	SE5				I		X
Asclepiadaceae	Milkweed Family							
<i>Asclepias syriaca</i>	Common Milkweed	S5				X		X
Asteraceae	Composite or Aster Family							
<i>Ambrosia artemisiifolia</i>	Common Ragweed	S5				X		X
<i>Ambrosia trifida</i>	Giant Ragweed	S5				X		X
<i>Arctium minus ssp. minus</i>	Common Burdock	SE5				I		X
<i>Bidens frondosa</i>	Devil's Beggar-ticks	S5				X		X
<i>Cichorium intybus</i>	Chicory	SE5				I		X
<i>Cirsium arvense</i>	Canada Thistle	SE5						X
<i>Cirsium vulgare</i>	Bull Thistle	SE5				I		X
<i>Coryza canadensis</i>	Horseweed	S5				X		X
<i>Eupatorium maculatum ssp. maculatum</i>	Spotted Joe-pye-weed	S5				X		X
<i>Euthamia graminifolia</i>	Flat-topped Bushy Goldenrod	S5				X		X
<i>Matricaria discoidea</i>	Pineapple-weed	SE5				I		X
<i>Solidago altissima var. altissima</i>	Tall Goldenrod	S5				X		X

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	Oxford County ⁴	NHIC Data ¹	NRSI Observed
<i>Solidago canadensis</i>	Canada Goldenrod	S5				X		X
<i>Sonchus arvensis</i> ssp. <i>arvensis</i>	Field Sow-thistle	SE5				I		X
<i>Symphotrichum lanceolatum</i> var. <i>lanceolatum</i>	Tall White Aster	S5				X		X
<i>Symphotrichum lateriflorum</i> var. <i>lateriflorum</i>	Calico Aster	S5				X		X
<i>Symphotrichum novae-angliae</i>	New England Aster	S5				X		X
<i>Symphotrichum pilosum</i> var. <i>pilosum</i>	Hairy Aster	S5				X		X
<i>Symphotrichum urophyllum</i>	Arrow-leaved Aster	S4				X		X
<i>Taraxacum officinale</i>	Common Dandelion	SE5				I		X
<i>Tussilago farfara</i>	Coltsfoot	SE5				I		X
Balsaminaceae	Touch-me-not Family							
<i>Impatiens capensis</i>	Spotted Touch-me-not	S5				X		X
Berberidaceae	Barberry Family							
<i>Caulophyllum thalictroides</i>	Blue Cohosh	S5				X		X
Betulaceae	Birch Family							
<i>Ostrya virginiana</i>	Hop Hornbeam	S5				X		X
Brassicaceae	Mustard Family							
<i>Alliaria petiolata</i>	Garlic Mustard	SE5				I		X
Caprifoliaceae	Honeysuckle Family							
<i>Sambucus canadensis</i>	Common Elderberry	S5				X		X
<i>Triosteum aurantiacum</i>	Wild Coffee	S5				X		X
<i>Viburnum lentago</i>	Nannyberry	S5				X		X
<i>Viburnum opulus</i>	Guelder Rose	SE4				I		X
Celastraceae	Staff-tree Family							
<i>Euonymus obovata</i>	Running Strawberry-bush	S5				X		X
Chenopodiaceae	Goosefoot Family							
<i>Chenopodium album</i> var. <i>album</i>	Lamb's-quarters	SE5				I		X
Cornaceae	Dogwood Family							
<i>Cornus alternifolia</i>	Alternate-leaved Dogwood	S5				X		X
<i>Cornus amomum</i> ssp. <i>obliqua</i>	Silky Dogwood	S5				X		X
<i>Cornus foemina</i> ssp. <i>racemosa</i>	Red Panicked Dogwood	S5				X		X
<i>Cornus stolonifera</i>	Red-osier Dogwood	S5				X		X
Cucurbitaceae	Gourd Family							
<i>Echinocystis lobata</i>	Prickly Cucumber	S5				X		X
<i>Sicyos angulatus</i>	One-seeded Bur-cucumber	S5						X

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	Oxford County ⁴	NHIC Data ¹	NRSI Observed
Fabaceae	Pea Family							
<i>Coronilla varia</i>	Variable Crown-vetch	SE5						X
<i>Robinia pseudo-acacia</i>	Black Locust	SE5				I		X
Fagaceae	Beech Family							
<i>Fagus grandifolia</i>	American Beech	S5				X		X
Gentianaceae	Gentian Family							
<i>Frasera caroliniensis</i>	American Columbo	S2	END	E	Schedule 1	?	X	
Geraniaceae	Geranium Family							
<i>Geranium robertianum</i>	Herb Robert	SE5				I		X
Grossulariaceae	Currant Family							
<i>Ribes americanum</i>	Wild Black Currant	S5				X		X
Hydrophyllaceae	Water-leaf Family							
<i>Hydrophyllum virginianum</i>	Virginia Water-leaf	S5				X		X
Juglandaceae	Walnut Family							
<i>Carya cordiformis</i>	Bitternut hickory	S5				X		X
<i>Juglans nigra</i>	Black Walnut	S4				X		X
Lamiaceae	Mint Family							
<i>Glechoma hederacea</i>	Creeping Charlie	SE5				I		X
<i>Monarda didyma</i>	Oswego-tea	S3				X	X	
<i>Prunella vulgaris ssp. lanceolata</i>	Heal-all	S5				X		X
Malvaceae	Mallow Family							
<i>Malva neglecta</i>	Cheeses	SE5				I		X
Oleaceae	Olive Family							
<i>Fraxinus americana</i>	White Ash	S5				X		X
<i>Fraxinus pennsylvanica</i>	Green Ash	S5				X		X
Onagraceae	Evening-primrose Family							
<i>Circaea lutetiana ssp. canadensis</i>	Yellowish Enchanter's Nightshade	S5				X		X
Oxalidaceae	Wood Sorrel Family							
<i>Oxalis stricta</i>	Upright Yellow Wood-sorrel	S5				X		X
Ranunculaceae	Buttercup Family							
<i>Anemone acutiloba</i>	Sharp-lobed Hepatica	S5				X		X
<i>Ranunculus recurvatus var. recurvatus</i>	Hooked Buttercup	S5				X		X

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	Oxford County ⁴	NHIC Data ¹	NRSI Observed
<i>Thalictrum pubescens</i>	Tall Meadow-rue	S5				X		X
Rhamnaceae		Buckthorn Family						
<i>Rhamnus cathartica</i>	Common Buckthorn	SE5				I		X
<i>Frangula alnus</i>	Glossy Buckthorn	SE5				I		X
Rosaceae		Rose Family						
<i>Agrimonia gryposepala</i>	Tall Hairy Agrimony	S5				X		X
<i>Crataegus species</i>	Hawthorn species							X
<i>Fragaria virginiana</i>	Wild Strawberry	S5						X
<i>Geum aleppicum</i>	Yellow Avens	S5				X		X
<i>Geum canadense</i>	White Avens	S5				X		X
<i>Malus pumila</i>	Common Crabapple	SE5				I		X
<i>Prunus serotina</i>	Black Cherry	S5				X		X
<i>Prunus virginiana ssp. virginiana</i>	Choke Cherry	S5				X		X
<i>Rubus idaeus ssp. melanolasius</i>	Wild Red Raspberry	S5				X		X
<i>Rubus occidentalis</i>	Thimble-berry	S5				X		X
Salicaceae		Willow Family						
<i>Populus deltoides ssp. deltoides</i>	Eastern Cottonwood	S5				X		X
<i>Populus tremuloides</i>	Trembling Aspen	S5				X		X
<i>Salix fragilis</i>	Crack Willow	SE5				I		X
<i>Salix nigra</i>	Black Willow	S4?				X		X
Scrophulariaceae		Figwort Family						
<i>Collinsia verna</i>	Blue-eyed Mary	SX	EXP	XT	Schedule 1	X	X	
<i>Linaria vulgaris</i>	Butter-and-eggs	SE5				I		X
<i>Verbascum thapsus</i>	Common Mullein	SE5				I		X
Solanaceae		Nightshade Family						
<i>Solanum dulcamara</i>	Bitter Nightshade	SE5				I		X
Tiliaceae		Linden Family						
<i>Tilia americana</i>	American Basswood	S5				X		X
Ulmaceae		Elm Family						
<i>Ulmus americana</i>	White Elm	S5				X		X
Urticaceae		Nettle Family						
<i>Boehmeria cylindrica</i>	False Nettle	S5				X		X
<i>Pilea pumila</i>	Dwarf Clearweed	S5				X		X
<i>Urtica dioica ssp. gracilis</i>	American Stinging Nettle	S5				X		X
Verbenaceae		Vervain Family						

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	Oxford County ⁴	NHIC Data ¹	NRSI Observed
<i>Verbena hastata</i>	Blue Vervain	S5				X		X
<i>Verbena urticifolia</i>	White Vervain	S5				X		X
Vitaceae	Grape Family							
<i>Parthenocissus vitacea</i>	Woodbine	S5				X		X
<i>Vitis riparia</i>	Riverbank Grape	S5				X		X
Monocotyledons	Monocots							
Araceae	Arum Family							
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	S5				X		X
Cyperaceae	Sedge Family							
<i>Carex species</i>	Sedge species							X
<i>Carex gracillima</i>	Graceful Sedge	S5				X		X
<i>Carex radiata</i>	Radiate Sedge	S5				X		X
Liliaceae	Lily Family							
<i>Maianthemum racemosum ssp. racemosum</i>	False Solomon's Seal	S5				X		X
Orchidaceae	Orchid Family							
<i>Epipactis helleborine</i>	Common Helleborine	SE5				I		X
Poaceae	Grass Family							
<i>Agrostis gigantea</i>	Redtop	SE5				I		X
<i>Bromus inermis ssp. inermis</i>	Awnless Brome	SE5				I		X
<i>Dactylis glomerata</i>	Orchard Grass	SE5				I		X
<i>Digitaria sanguinalis</i>	Large Crabgrass	SE5				I		X
<i>Elymus virginicus var. virginicus</i>	Virginia Wild Rye	S5				X		X
<i>Festuca arundinacea</i>	Tall Fescue	SE5				I		X
<i>Glyceria striata</i>	Fowl Meadow Grass	S5				X		X
<i>Panicum capillare</i>	Witch Grass	S5				X		X
<i>Phalaris arundinacea</i>	Reed Canary Grass	S5				X		X
<i>Phragmites australis ssp. Australis</i>	European Common Reed	SNA						X
<i>Poa pratensis ssp. pratensis</i>	Kentucky Bluegrass	S5				X		X
<i>Setaria viridis</i>	Green Foxtail	SE5				I		X
						Total	3	113

¹MNRF 2014, ²MNRF 2015a, ³Government of Canada 2015, ⁴Oldham 1993

LEGEND				
SRANK		COSSARO/COSEWIC	Oxford County	SARA Schedule
S2 Imperiled	SX Presumed Extirpated	END/E Endangered	X Present and Native	Schedule 1 Officially
S3 Vulnerable	S#? Rank Uncertain	EXP/XT Extirpated	I Present and Introduced	
S4 Apparently Secure	SE Exotic Species		? Questionable Records	
S5 Secure				
SNA Unranked				

APPENDIX IV
Bird Species Reported From the Study Area

Bird Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	OBBA ⁴	OBBA ⁴	NHIC Data ¹	NRSI Observed
						17MH97	17NH07		
Anatidae	Ducks, Geese & Swans								
<i>Branta canadensis</i>	Canada Goose	S5				P	FY		X
<i>Aix sponsa</i>	Wood Duck	S5				FY	P		
<i>Anas platyrhynchos</i>	Mallard	S5				FY	FY		
Phasianidae	Partridges, Grouse & Turkeys								
<i>Phasianus colchicus</i>	Ring-necked Pheasant	SNA				T			
<i>Bonasa umbellus</i>	Ruffed Grouse	S4				D	S		
<i>Meleagris gallopavo</i>	Wild Turkey	S5				FY	FY		
Ardeidae	Hérons & Bitterns								
<i>Ardea herodias</i>	Great Blue Heron	S4B				H			
<i>Butorides virescens</i>	Green Heron	S4B				P			
Cathartidae	Vultures								
<i>Cathartes aura</i>	Turkey Vulture	S5B				H	H		X
Accipitridae	Hawks, Kites, Eagles & Allies								
<i>Circus cyaneus</i>	Northern Harrier	S4B	NAR	NAR			H		
<i>Accipiter striatus</i>	Sharp-shinned Hawk	S5	NAR			CF			
<i>Accipiter cooperii</i>	Cooper's Hawk	S4	NAR	NAR			FY		
<i>Buteo jamaicensis</i>	Red-tailed Hawk	S5	NAR	NAR		P	FY		
Rallidae	Rails, Gallinules & Coots								
<i>Rallus limicola</i>	Virginia Rail	S5B					T		
<i>Porzana carolina</i>	Sora	S4B					S		
Charadriidae	Plovers								
<i>Charadrius vociferus</i>	Killdeer	S5B, S5N				NE	FY		X
Scolopacidae	Sandpipers, Phalaropes & Allies								
<i>Actitis macularia</i>	Spotted Sandpiper	S5				T	FY		
<i>Bartramia longicauda</i>	Upland Sandpiper	S4B					S		
<i>Scolopax minor</i>	American Woodcock	S4B				D	S		
Columbidae	Pigeons & Doves								
<i>Columba livia</i>	Rock Pigeon	SNA				T	AE		
<i>Zenaida macroura</i>	Mourning Dove	S5				T	AE		

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	OBBA ⁴	OBBA ⁴	NHIC Data ¹	NRSI Observed
						17MH97	17NH07		
Cuculiformes	Cuckoos & Anis								
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	S4B				S	T		
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	S5B				S			
Strigidae	Typical Owls								
<i>Megascops asio</i>	Eastern Screech-Owl	S4	NAR	NAR		A	T		
<i>Bubo virginianus</i>	Great Horned Owl	S4				S	S		
Apodidae	Swifts								
<i>Chaetura pelagica</i>	Chimney Swift	S4B, S4N	THR	T	Schedule 1	H	T		
Trochilidae	Hummingbirds								
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	S5B				T	NE		
Alcedinidae	Kingfishers								
<i>Megasceryle alcyon</i>	Belted Kingfisher	S4B				D	T		
Picidae	Woodpeckers								
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	S4B	SC	T	Schedule 1	H			
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker	S4				T	NY		
<i>Picoides pubescens</i>	Downy Woodpecker	S5				P	NY		
<i>Picoides villosus</i>	Hairy Woodpecker	S5				P	NY		
<i>Colaptes auratus</i>	Northern Flicker	S4B				T	NY		
<i>Dryocopus pileatus</i>	Pileated Woodpecker	S5				T			
Falconidae	Caracaras & Falcons								
<i>Falco sparverius</i>	American Kestrel	S4				FY	T		
Tyrannidae	Tyrant Flycatchers								
<i>Contopus virens</i>	Eastern Wood-Pewee	S4B	SC	SC		T	FY		
<i>Empidonax alnorum</i>	Alder Flycatcher	S5B				T			
<i>Empidonax traillii</i>	Willow Flycatcher	S5B				T	CF		
<i>Empidonax minimus</i>	Least Flycatcher	S4B				S	T		
<i>Sayornis phoebe</i>	Eastern Phoebe	S5B				NY	NE		
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	S4B				T	NE		
<i>Tyrannus tyrannus</i>	Eastern Kingbird	S4B				P	NY		

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	OBBA ⁴	OBBA ⁴	NHIC Data ¹	NRSI Observed
						17MH97	17NH07		
Vireonidae	Vireos								
<i>Vireo gilvus</i>	Warbling Vireo	S5B				T	T		
<i>Vireo olivaceus</i>	Red-eyed Vireo	S5B				T	NE		
Corvidae	Crows & Jays								
<i>Cyanocitta cristata</i>	Blue Jay	S5				T	CF		X
<i>Corvus brachyrhynchos</i>	American Crow	S5B				A	FY		X
Alaudidae	Larks								
<i>Eremophila alpestris</i>	Horned Lark	S5B				FY	FY		
Hirundinidae	Swallows								
<i>Tachycineta bicolor</i>	Tree Swallow	S4B				AE	AE		
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow	S4B				P	T		
<i>Riparia riparia</i>	Bank Swallow	S4B	THR	T		AE	AE		
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	S4B				AE	AE		
<i>Hirundo rustica</i>	Barn Swallow	S4B	THR	T		AE	AE		
Paridae	Chickadees & Titmice								
<i>Poecile atricapillus</i>	Black-capped Chickadee	S5				FY	CF		X
Sittidae	Nuthatches								
<i>Sitta carolinensis</i>	White-breasted Nuthatch	S5				S	CF		
Certhiidae	Creepers								
<i>Certhia americana</i>	Brown Creeper	S5B				T			
Troglodytidae	Wrens								
<i>Troglodytes aedon</i>	House Wren	S5B				T	NY		
<i>Troglodytes hiemalis</i>	Winter Wren	S5B				T			
Poliopitilidae	Gnatcatchers								
<i>Poliopitila caerulea</i>	Blue-gray Gnatcatcher	S4B					P		
Turdidae	Thrushes								
<i>Sialia sialis</i>	Eastern Bluebird	S5B	NAR	NAR		CF	AE		
<i>Catharus fuscescens</i>	Veery	S4B				A	T		
<i>Hylocichla mustelina</i>	Wood Thrush	S4B	SC	T		T	NY		
<i>Turdus migratorius</i>	American Robin	S5B				CF	NY		X

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	OBBA ⁴	OBBA ⁴	NHIC Data ¹	NRSI Observed
						17MH97	17NH07		
Mimidae	Mockingbirds, Thrashers & Allies								
<i>Dumetella carolinensis</i>	Gray Catbird	S4B				T	CF		
<i>Toxostoma rufum</i>	Brown Thrasher	S4B				T	CF		
Sturnidae	Starlings								
<i>Sturnus vulgaris</i>	European Starling	SNA				CF	NY		
Motacillidae	Pipits								
Bombycillidae	Waxwings								
<i>Bombycilla cedrorum</i>	Cedar Waxwing	S5B				S	AE		
Parulidae	Wood Warblers								
<i>Seiurus aurocapillus</i>	Ovenbird	S4B				T	T		
<i>Parkesia noveboracensis</i>	Northern Waterthrush	S5B				S	S		
<i>Mniotilta varia</i>	Black-and-white Warbler	S5B				S			
<i>Geothlypis philadelphia</i>	Mourning Warbler	S4B				S			
<i>Geothlypis trichas</i>	Common Yellowthroat	S5B				A	CF		
<i>Setophaga ruticilla</i>	American Redstart	S5B				S	A		
<i>Setophaga cerulea</i>	Cerulean Warbler	S3B	THR	E	Schedule 1			X	
<i>Setophaga petechia</i>	Yellow Warbler	S5B				T	CF		
<i>Setophaga pinus</i>	Pine Warbler	S5B					T		
Emberizidae	New World Sparrows & Allies								
<i>Pipilo erythrophthalmus</i>	Eastern Towhee	S4B					S		
<i>Spizella passerina</i>	Chipping Sparrow	S5B				CF	CF		
<i>Spizella pusilla</i>	Field Sparrow	S4B				T	T		
<i>Pooecetes gramineus</i>	Vesper Sparrow	S4B				CF	T		
<i>Passerculus sandwichensis</i>	Savannah Sparrow	S4B				CF	FY		
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	S4B		SC		S			
<i>Melospiza melodia</i>	Song Sparrow	S5B				CF	CF		
<i>Melospiza georgiana</i>	Swamp Sparrow	S5B				T	CF		

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	OBBA ⁴	OBBA ⁴	NHIC Data ¹	NRSI Observed
						17MH97	17NH07		
Cardinalidae		Cardinals, Grosbeaks & Allies							
<i>Piranga olivacea</i>	Scarlet Tanager	S4B				S			
<i>Cardinalis cardinalis</i>	Northern Cardinal	S5				T	FY		
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	S4B				P	NY		
<i>Passerina cyanea</i>	Indigo Bunting	S4B				A	NY		
Icteridae		Blackbirds							
<i>Dolichonyx oryzivorus</i>	Bobolink	S4B	THR	T	No Schedule	T	CF		
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	S4				CF	CF		
<i>Sturnella magna</i>	Eastern Meadowlark	S4B	THR	T		T	CF		
<i>Quiscalus quiscula</i>	Common Grackle	S5B				CF	CF		
<i>Molothrus ater</i>	Brown-headed Cowbird	S4B				P	FY		
<i>Icterus galbula</i>	Baltimore Oriole	S4B				P	FY		
Fringillidae		Finches & Allies							
<i>Carpodacus mexicanus</i>	House Finch	SNA				T	AE		
<i>Carpodacus purpureus</i>	Purple Finch	S4B				S			
<i>Spinus tristis</i>	American Goldfinch	S5B				T	FY		X
Passeridae		Old World Sparrows							
<i>Passer domesticus</i>	House Sparrow	SNA				AE	AE		
Total						89	82	1	8

¹MNRF 2014, ²MNRF 2015a, ³Government of Canada 2015, ⁴BSC et al. 2008

LEGEND
SRANK
S3 Vulnerable
S4 Apparently Secure
S5 Secure
B Breeding
N Non-breeding
SNA Unranked
COSSARO/COSEWIC
END/E Endangered
THR/T Threatened
SC/SC Special Concern
NAR Not at Risk
SARA Schedule
Schedule 1 Officially Protected under SARA

APPENDIX V
Reptile and Amphibian Species Reported From the Study Area

Reptile and Amphibian Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	Ontario Reptile and Amphibian Atlas (17MH97) ⁴	Ontario Reptile and Amphibian Atlas (17NH07) ⁴	NHIC Data ¹
Turtles								
<i>Chelydra serpentina serpentina</i>	Snapping Turtle	S3	SC	SC	Schedule 1	X		X
<i>Chrysemys picta marginata</i>	Midland Painted Turtle	S5					X	
<i>Emydoidea blandingii</i>	Blanding's Turtle (<i>Great Lakes/St Lawrence population</i>)	S3	THR	T	Schedule 1		X	
Snakes								
<i>Lampropeltis taylori triangulum</i>	Eastern Milksnake	S3	SC	SC	Schedule 1	X	X	
<i>Storeria dekayi dekayi</i>	Northern Brownsnake	S5	NAR	NAR			X	
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake	S5					X	
<i>Thamnophis sirtalis sirtalis</i>	Eastern Gartersnake	S5					X	
Salamanders								
<i>Notophthalmus viridescens viridescens</i>	Red-spotted Newt	S5				X		
<i>Plethodon cinereus</i>	Eastern Red-backed Salamander	S5				X	X	
Toads and Frogs								
<i>Anaxyrus americanus</i>	American Toad	S5				X		
<i>Hyla versicolor</i>	Tetraploid Gray Treefrog	S5				X	X	
<i>Pseudacris triseriata</i> pop. 2	Western Chorus Frog (<i>Great Lakes/St. Lawrence - Canadian Shield Population</i>)	S3	NAR	T	Schedule 1	X	X	
<i>Pseudacris crucifer</i>	Spring Peeper	S5				X	X	
<i>Lithobates clamitans melanota</i>	Northern Green Frog	S5				X	X	
<i>Lithobates pipiens</i>	Northern Leopard Frog	S5	NAR	NAR			X	
<i>Lithobates sylvatica</i>	Wood Frog	S5				X	X	
Total						10	13	1

¹MNRF 2014, ²MNRF 2015a, ³Government of Canada 2015, ⁴Ontario Nature 2015

LEGEND
SRANK
S3 Vulnerable
S5 Secure
COSSARO/COSEWIC
NAR Not at Risk
SC Special Concern
THR/T Threatened
SARA Schedule
Schedule 1 Officially protected under SARA

APPENDIX VI
Mammal Species Reported From the Study Area

Mammal Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	Ontario Mammal Atlas ⁴	NHIC Data ¹	NRSI Observed
Didelphimorphia	Opossums							
<i>Didelphis virginiana</i>	Virginia Opossum	S4				X		
Insectivora	Shrews and Moles							
<i>Blarina brevicauda</i>	Northern Short-tailed Shrew	S5				X		
<i>Condylura cristata</i>	Star-nosed Mole	S5				X		
Chiroptera	Bats							
<i>Eptesicus fuscus</i>	Big Brown Bat	S5				X		
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	S4				X		
<i>Lasiurus borealis</i>	Red Bat	S4				X		
<i>Lasiurus cinereus</i>	Hoary Bat	S4				X		
<i>Myotis leibii</i>	Eastern Small-footed Bat	S2S3	END			X		
<i>Myotis lucifugus</i>	Little Brown Myotis	S4	END	E	Schedule 1	X		
<i>Myotis septentrionalis</i>	Northern Myotis	S3	END	E	Schedule 1	X		
<i>Perimyotis subflavus</i>	Tri-colored Bat	S3?		E	Schedule 1	X		
Lagomorpha	Rabbits and Hares							
<i>Lepus europaeus</i>	European Hare	SNA				X		
<i>Sylvilagus floridanus</i>	Eastern Cottontail	S5				X		
Rodentia	Rodents							
<i>Castor canadensis</i>	Beaver	S5				X		
<i>Glaucomys volans</i>	Southern Flying Squirrel	S4	NAR	NAR		X		
<i>Marmota monax</i>	Woodchuck	S5				X		
<i>Microtus pennsylvanicus</i>	Meadow Vole	S5				X		
<i>Ondatra zibethicus</i>	Muskrat	S5				X		
<i>Peromyscus leucopus</i>	White-footed Mouse	S5				X		
<i>Peromyscus maniculatus</i>	Deer Mouse	S5				X		
<i>Rattus norvegicus</i>	Norway Rat	SNA				X		
<i>Sciurus carolinensis</i>	Eastern Gray Squirrel	S5				X		
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	S5				X		
<i>Tamias striatus</i>	Eastern Chipmunk	S5				X		
<i>Zapus hudsonius</i>	Meadow Jumping Mouse	S5				X		
Cetacea	Whales							

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	Ontario Mammal Atlas ⁴	NHIC Data ¹	NRSI Observed
Carnivora	Carnivores							
<i>Canis latrans</i>	Coyote	S5				X		
<i>Mephitis mephitis</i>	Striped Skunk	S5				X		
<i>Mustela erminea</i>	Ermine	S5				X		
<i>Mustela vison</i>	American Mink	S4				X		
<i>Procyon lotor</i>	Northern Raccoon	S5				X		
<i>Taxidea taxus jacksoni</i>	American Badger	S2	END	E	Schedule 1	X		
<i>Vulpes vulpes</i>	Red Fox	S5				X		
Artiodactyla	Deer and Bison							
<i>Odocoileus virginianus</i>	White-tailed Deer	S5				X		
Total						33	0	0

¹MNRF 2014; ²MNRF 2015a; ³Government of Canada 2015; ⁴Dobbyn 1994

LEGEND
SRANK
S2 Imperiled
S3 Vulnerable
S4 Apparently Secure
S5 Secure
SNA Unranked
COSSARO/COSEWIC
NAR Not at Risk
END/E Endangered
SARA Schedule
Schedule 1 Officially protected under SARA

APPENDIX VII
Butterfly, Damselfly, and Dragonfly Species Reported From the Study Area

Butterfly, Damselfly, and Dragonfly Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	TEA Atlas (17MH97) ⁴	TEA Atlas (17NH07) ⁴	Odonata Atlas (17MH97) ⁵	Odonata Atlas (17NH07) ⁵
Lepidoptera									
Pieridae		Whites and Sulphurs							
<i>Colias philodice</i>	Clouded Sulphur	S5					X		
Nymphalidae		Brush-footed Butterflies							
<i>Coenonympha tullia</i>	Common Ringlet	S5					X		
<i>Danaus plexippus</i>	Monarch	S2N, S4B	SC	SC	Schedule 1		X		
<i>Megisto cymela</i>	Little Wood-Satyr	S5					X		
<i>Polygonia interrogationis</i>	Question Mark	S5				X			
Odonata									
Calopterygidae		Broadwinged Damselflies							
<i>Calopteryx maculata</i>	Ebony Jewelwing								X
Coenagrionidae		Narrow-winged Damselflies							
<i>Argia fumipennis violacea</i>	Violet Dancer								X
<i>Enallagma exsulans</i>	Stream Bluet								X
<i>Ischnura posita</i>	Fragile Forktail								X
Total						1	4	0	4

¹MNRF 2014, ²MNRF 2015a, ³Government of Canada 2015, ⁴Jones et al. 2015, ⁵C. Jones pers. comm. 2015

LEGEND
SRANK
S2 Imperiled
S4 Apparently Secure
S5 Secure
COSSARO/COSEWIC
SC Special Concern
SARA Schedule
Schedule 1 Officially protected under SARA

APPENDIX VIII
Fish Species Reported From the Study Area

Fish Species Reported from the Study Area

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ³	NHIC ¹	UTRCA ⁴	UTRCA ⁵	UTRCA ⁶	UTRCA ⁷	NRSI Observed
Petromyzontidae	Lampreys										
<i>Ichthyomyzon fossor</i>	Northern Brook Lamprey (GL-USL Pop.)	S3	SC	SC (April 2007)	Schedule 1	X					
Cyprinidae	Carps and Minnows										
<i>Campostoma anomalum</i>	Central Stoneroller	S4		NAR (April 1998)				X	X		X
<i>Luxilus cornutus</i>	Common Shiner	S5					X	X		X	
<i>Luxilus chrysocephalus</i>	Striped Shiner	S4	NAR	NAR (April 1993)				X			
<i>Pimephales notatus</i>	Bluntnose Minnow	S5	NAR	NAR (April 1998)				X	X		
<i>Pimephales promelas</i>	Fathead Minnow	S5						X			X
<i>Rhinichthys obtusus</i>	Blacknose Dace	S5					X	X	X	X	X
<i>Semotilus atromaculatus</i>	Creek Chub	S5					X	X	X		X
Catostomidae	Suckers										
<i>Catostomus commersonii</i>	White Sucker	S5					X	X	X		X
Gasterosteidae	Sticklebacks										
<i>Culaea inconstans</i>	Brook Stickleback	S5						X		X	X
Centrarchidae	Sunfishes and Basses										
<i>Lepomis gibbosus</i>	Pumpkinseed	S5						X			
<i>Micropterus dolomieu</i>	Smallmouth Bass	S5							X		
Percidae	Perches and Darters										
<i>Etheostoma flabellare</i>	Fantail Darter	S4					X	X	X		X
<i>Etheostoma nigrum</i>	Johnny Darter	S5					X	X	X	X	X
Total						1	6	12	8	4	8

¹MNRF 2014, ²MNRF 2015a, ³Government of Canada 2015, ⁴UTRCA 1993, ⁵UTRCA 2000, ⁶UTRCA 2005; ⁷UTRCA 2015

LEGEND
SRANK
S3 Vulnerable
S4 Apparently Secure
S5 Secure
COSSARO
SC Special Concern
COSEWIC
SC Special Concern
SARA Schedule
Schedule 1 Officially Protected under SARA

APPENDIX IX
Review of Criteria for Significance of Terrestrial Habitats within the Study Area

Review of Criteria for Significance of Terrestrial Habitats within the Study Area

Criteria¹	Locally Significant Woodland Feature A²	Criteria Met?	Locally Significant Woodland Feature B³	Criteria Met?
Ecological Function				
Patches that contain rare species	Historical records of rare species within vicinity of woodland feature. Suitable habitat identified as present for several rare species (Appendix I).	To be Confirmed	Historical records of rare species within vicinity of woodland feature. Suitable habitat identified as present for several rare species (Appendix I).	To be Confirmed
Patches that contain habitat designated in the Official Plans of Oxford County	Woodland feature does not contain designated habitat under the Official Plan of Oxford County	No	Woodland feature does not contain designated habitat under the Official Plan of Oxford County	No
Patches within 150 m of designated, non-wetland habitats in the Official Plan OR within 750 m of designated wetland habitats in the Official Plan (PSW, Locally Significant Wetland)	Woodland feature are within 750 m of Lakeside Wildwood PSW complex	Yes	Woodland feature are within 750 m of Lakeside Wildwood PSW complex	Yes
Patches >10 ha in size	Woodland feature is greater than 10 ha in size	Yes	Woodland feature is greater than 10 ha in size	Yes
Patches with interior habitat	Woodland feature contains interior habitat	Yes	Woodland feature does not contain interior habitat	No
Patches that occur within well-head capture zones or intrinsic groundwater susceptibility areas.	Woodland feature not within well-head capture zone or intrinsic groundwater susceptibility area.	No	Woodland feature not within well-head capture zone or intrinsic groundwater susceptibility area.	No
Patches that contain an open watercourse or are within 50 m of an open watercourse.	Woodland feature contains an open watercourse	Yes	Woodland feature contains an open watercourse	Yes
Representation				
Patches with the largest amount of area on each landform and soil type in Oxford County and all patches that occur on valleylands.	Woodland feature occurs on Significant Valleylands. Feature is not the largest vegetation patch to occur on its specific soil type.	Yes	Woodland feature does not occur on valleylands. Feature is not the largest vegetation patch to occur on its specific soil type.	No
Patches that contain large amounts of each natural vegetation community type	Woodland feature does not contain large amounts of each natural vegetation community type	No	Woodland feature does not contain large amounts of each natural vegetation community type	No
Total Criteria Met		5		3

¹County of Oxford 2006

²Feature A is defined as the vegetation patch associated with Nissouri Creek and McCall-McCorquodale Drain to the west of the intersection of Oxford Rd 16 and 31st Line

³Feature B is defined as the vegetation patch associated with Nissouri Creek to the east of the intersection of Oxford Rd 16 and 31st Line

APPENDIX X
Photo Log



Figure 1. Potential Snake Hibernaculum.



Figure 2. Potential Snake Hibernaculum.



Figure 3. Potential Snake Hibernaculum. View from above.



Figure 4. Potential Snake Hibernaculum.