LYON'S CREEK EAST
WETLAND INVENTORY & MONITORING STUDY

FINAL INTERIM REPORT

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Prepared for: **Niagara Peninsula Conservation Authority, Environment Canada, & Ontario Ministry of Natural Resources**

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1 EXECUTIVE SUMMARY

Dougan & Associates and C. Portt & Associates were retained by the Niagara Region Conservation Authority, the Ontario Ministry of Natural Resources, and Environment Canada to conduct a detailed inventory of wetland and aquatic features of the Lyon's Creek East Wetlands, part of the Lyon's Creek Provincially Significant Wetland Complex. Regulatory agencies have expressed concern about the impacts of potential remedial actions on existing wetland and aquatic resources along a 3.8 km reach of Lyon's Creek between the Welland Canal and Doan's Ridge Road, particularly on sensitive or significant wetland features and functions. This study incorporated existing background data, remote sensing, and field inventories of vascular plants, vegetation communities, breeding amphibians, and breeding birds to catalogue the terrestrial and aquatic resources present, establish baseline conditions, and identify sensitive features and functions.

Aerial photographic interpretation and field inventories documented 18 wetland vegetation types comprising forty-five units totalling 18.64 ha. A total of 126 vascular plants representing 43 families and 81 genera were documented over three field visits. Nine individual amphibian point count stations were monitored over three nocturnal visits following the Marsh Monitoring Protocol. A total of six species of frogs and toads were documented. Eleven point count stations monitored breeding birds over 2 early morning visits. Forty-four species were documented using a hybrid Ontario Breeding Bird Atlas and Forest Bird Monitoring Program protocol. Existing fish sampling data from Fisheries and Oceans Canada was used to generate baseline fish community conditions. A total of 26 species have been documented from the Lyon's Creek East area.

Based on the background review and field investigations, the current study has identified a number of significant elements in the study area including:

- It supports habitat for a fish species designated as Threatened by COSEWIC: Lake Chubsucker (*Erimyzon sucetta*);
- It supports habitat for a fish species designated as Special Concern by COSEWIC: Grass Pickerel (*Esox americanus vermiculatus*);
- It supports the only extant location for a vascular plant in Ontario and Canada updating it status from possibly extirpated (SH) to critically imperilled (S1): Smartweed Dodder (*Cuscuta polygonorum*);
- It contains habitat for at least one other provincially rare vascular plant listed as vulnerable (S3): Pin Oak (*Quercus palustris*);
- It supports habitat for at least two provincially rare vegetation types: Silky Dogwood Mineral Thicket Swamp Type (SWT2-4) and Buttonbush Mineral Thicket Swamp Type (SWT2-8);
- It supports foraging and potentially (though not recently verified) nesting habitat for a provincially rare colonial nesting bird listed as vulnerable (S3): Black-crowned Night Heron (*Nycticorax nycticorax);*

- It supports habitat for nine regionally significant breeding bird species, only one of which is entirely dependent on the creek or its aquatic resources, the Belted Kingfisher (*Ceryle alcyon*);

- It supports habitat for a regionally uncommon snake species: Northern Watersnake (*Nerodia sipedon sipedon);* and

- It provides habitat for two area-sensitive species: American Bullfrog (*Rana catesbeiana*) and White-breasted Nuthatch (*Sitta carolinensis*).

Key recommendations stemming from this study include:

- The initiation of monitoring of wetland vegetation communities and significant species populations as well as amphibians (i.e. calling frogs and toads) and breeding bird populations prior to and after any remediation works are initiated (should they be initiated);

- Having regard for the Migratory Birds Convention Act and timing remediation activities outside the breeding bird season; and

- Updating the wetland data record to reflect the significant features and findings of the current study.

2 INTRODUCTION

Dougan & Associates and C. Portt & Associates were retained in March 2006 by the Niagara Peninsula Conservation Authority (NPCA), Ontario Ministry of Natural Resources (OMNR) and Environment Canada to conduct a terrestrial and aquatic inventory of the Lyon's Creek East Wetlands in Niagara Falls, Ontario. The purpose of the wetland inventory was to comprehensively document wetland resources within portions of Lyon's Creek that may potentially be affected by contaminant remediation works. Recently, elevated levels of polychlorinated biphenyls (PCBs) have been found in the sediments of both Lyon's Creek, as well as in tissues of biota in Lyon's Creek East. Accordingly, remedial options are being proposed based on identified risks to biota and humans (and the need to reduce these risks) (Dillon Consulting Ltd. 2005). Regulatory agencies have expressed concern regarding the potential impact of remedial actions on existing wetland and aquatic resources within the Lyon's Creek Provincially Significant Wetland Complex, particularly on those resources considered sensitive or significant. In order to accurately characterize the wetland and aquatic resources and identify areas supporting sensitive or significant resources, it was necessary to first characterize the resource through detailed inventories. Dougan & Associates coordinated the overall study and participated in the vegetation and wildlife resource inventories; C. Portt & Associates characterized the aquatic resources.

The wetland inventory identifies and maps discrete ecological units or polygons with similar homogenous attributes, classifies units according to the Ecological Land Classification System (ELC) and Ontario Wetland Evaluation System (O.W.E.S.), records data on their biophysical attributes, and identifies portions of the wetland complex that are of high biological sensitivity and significance. This information is intended to inform potential remediation strategies so as to avoid or minimize impacts to sensitive biological resources in the Lyon's Creek East Provincially Significant Wetland.

2.1 Study Area

The study area includes a 3.8 km reach of Lyon's Creek between the Welland Canal and Doan's Ridge Road (Figure 1). Lyon's Creek is a major tributary of the Welland River, with a total length of 17km. The present size of Lyon's Creek watershed is 88.0 km². The construction of the Welland Canal in 1971 severed Lyon's Creek, splitting the waterway into two watersheds. These include Lyon's Creek West, which drains to the Welland Canal By-Pass and contains the headwaters of Lyon's Creek that remained after construction of the original canal and development in the City of Welland; and Lyon's Creek East that, after construction of the By Pass, has its headwaters in the Welland Canal (Dillon Consulting Ltd. 2005). Currently, a pumping station sustains flow in Lyon's Creek East by augmenting flows with water from Lake Erie.

The study area comprises portions of the Lyon's Creek East Provincial Significant Wetland complex. The wetland was evaluated under the Ontario Wetland Evaluation System (O.W.E.S) in 1984 and is 14.4% swamp and 85.6% marsh (Moraal and Smith, 1984). This riverine wetland system extends from upstream of Highway 140 through Cooks Mills, downstream to the confluence of the Welland River. Important ecological values outlined in the wetland data record include: nesting colonial waterbirds; winter cover for wildlife; waterfowl production (of local significance); and significance for fish spawning and rearing (NHIC 2006b).

Figure 1. Study Area Location.

A segment of Lyon's Creek in the vicinity of Cooks Mills is associated with the Lyon's Creek Floodplain Wetland provincially significant Area of Natural and Scientific Interest (ANSI) and considered the best example of an incised meander stream basin in the region by Macdonald (1980). Portions of the Lyon's Creek corridor and adjacent uplands are also designated as part of the Lyon's Creek Environmentally Sensitive Area (ESA) referenced in the Niagara Regional Policy Plan mapping (Regional Municipality of Niagara, 2004). Adjacent terrestrial habitat includes croplands, regenerating old field, remnant woodlots and forested rim and plains. Low density residential and rural residential properties are located along the creek, including a small residential community at Cooks Mills.

2.2 Wetland Definition and Classification

Wetlands are considered transitional ecosystems, found along a gradient between upland and open water systems (Tiner 1991; Doust and Doust 1995). Wetlands typically support high levels of biological productivity and diversity and have become a conservation priority in recent years. Accordingly, many wetlands are protected, managed and monitored by various agencies. The Ontario Wetland Evaluation System (O.W.E.S.) (OMNR 1993) defines wetlands as follows:

> *"Lands that are seasonally or permanently flooded by shallow water as well as lands where the water table is close to the surface; in either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic or water tolerant plants." (OMNR 1993, p. 5)*

Riverine wetlands are naturally highly dynamic, and delineation of their boundaries may require several seasons to capture the natural range of variation. The present study delineates wetland boundaries using vegetation observations primarily, based on the

prevalence of coverage by hydrophytic plant species (≥ 50% coverage), and the lack of flood-intolerant vegetation as a primary indicator. In the broad sense, a hydrophyte can be defined as any plant that grows in water or in substrates that are, at least periodically, anaerobic due to excess water (Tiner 1991).

3 METHODS

3.1 Background Review

All available background information on terrestrial and aquatic resources within the study area was reviewed and assessed as part of this investigation. This information was used to aid in characterizing the biophysical conditions in the study area. Table 2.1 summarizes data sources consulted to assist in compiling the inventory.

Table 2.1. Summary of background documents, data & individuals consulted.

Description	Source
Reports/Documents	
Regional Municipality of Niagara Official Plan Studies - Potential Recreation Areas and Fragile Biological Sites Inventory and Recommendations	Philips Planning and Engineering Ltd. (1972)
Regional Municipality of Niagara – Environmentally Sensitive Areas	Brady (1980)
Life Science Features of the Haldimand Clay Plain Physiographic Region	Macdonald (1980)
Wetland Data Record and Evaluation - Lyon's Creek Wetlands	Moraal & Smith (1984)
Natural Areas of the Niagara Region: A Preliminary Survey	Regional Municipality of Niagara (1985)
The Physiography of Southern Ontario (3rd Edition)	Chapman & Putnam (1984)
Wetland Data Record and Evaluation- Lyon's Creek Woodlot 26	Bacro *et al* (1988)
Wetland Data Record and Evaluation- Lyon's Creek Corridor Woodlot 13	Nash *et al* (1988)
The Soils of the Regional Municipality of Niagara.	Kingston & Presant (1989)
Distribution and Status of the Vascular Plants of Central Region	Riley (1989)
The Ontario Butterfly Atlas	Holmes *et al* (1991)
Atlas of the Mammals of Ontario	Dobbyn (1994)
Report on Niagara River Area of Concern Contaminated Sediment Site Assessment Phase III	Golder Associates Ltd. (2005)
Niagara River AOC Phase IV: Sediment Management Options For Lyon's Creek East And West *Draft*	Dillon Consulting Ltd. (2005)
Species at Risk in Ontario	OMNR (2006a)
Web-based Database Queries	
NHIC (Natural Heritage Information Centre) - Natural Areas database query (electronic).	NHIC (Natural Heritage Information Centre) (2006b)
NHIC (Natural Heritage Information Centre) - Element Occurrence database query (electronic).	NHIC (Natural Heritage Information Centre) (2006b)
NHIC (Natural Heritage Information Centre) - Vegetation Community database query (electronic).	NHIC (Natural Heritage Information Centre) (2006b)
OBBA (Ontario Breeding Bird Atlas) breeding bird data web query for atlas squares 17PH45 and 17PH46.	OBBA (Ontario Breeding Bird Atlas) database (2006) http://www.birdsontario.org/atlas/datasummaries.jsp

Description	Source
Aerial Photographic Resources	
Digital Orthogonally Rectified Imagery Flown April 2000	Regional Municipality of Niagara
Cartographic Resources	
Generalized Soil Map of the Regional Municipality of Niagara	Map G 3464 H34 J3 1985 L35
Soils of the Regional Municipality of Niagara, Ontario	Map G 3463 N54 J3 1989 O567 (7 maps)
1:50,000 Canadian Topographic Series Maps	Welland 30L/14 ; Niagara 30M/3&6
Personal Communication	
Personal communication to confirm the identification of *Cuscuta polygonorum*.	Bill Crins, Senior Ecologist, Ontario Parks
Personal communication regarding the status of *Cuscuta polygonorum* in Ontario.	Mike Oldham, Botanist/Herpetologist, Natural Heritage Information Centre
Personal communication to acquire list of odonates on record in the Ontario Odonata Atlas for atlas squares 17PH45 and 17PH46.	Colin Jones, Wildlife Technician, Natural Heritage Information Centre
Personal communication to acquire list of herpetofauna on record in the Ontario Herpetofauna Summary (Atlas) for atlas squares 17PH45 and 17PH46.	Mike Oldham, Botanist/Herpetologist, Natural Heritage Information Centre
Personal communication to acquire names of the principle atlassers for 17PH45 and 17PH46, as well as ask about his own familiarity with the study area.	John Black, Ontario Breeding Bird Atlas (OBBA) coordinator for Niagara Region
Personal communication to determine what species listed in OBBA atlas square 17PH45 and 17PH46 were recorded within the study area.	Brad Clements, principal atlasser for 17PH45 Gary Pieterse, principle atlasser for 17PH46
Fish sampling data	N. Mandrak, Fisheries and Oceans Canada
Fish species lists (in MNR District files)	J. Durst, Ministry of Natural Resources
Personal communication regarding the status of grass pickerel (*Esox americanus vermiculatus)*	Don Sutherland, Zoologist, Natural Heritage Information Centre

3.2 Wetland Mapping

Preliminary wetland mapping incorporated remotely-sensed data that interpreted major physiognomic classes of wetland vegetation using digital ortho-imagery flown in April 2000. Identified wetlands were placed into one of the nested Ecological Land Classification (Lee *et al.* 1998) community units - the *community series*, which incorporates structural (e.g. forest, marsh, cliff) and cover (open, shrub, treed) diagnostics identifiable on appropriately scaled aerial photography. Discrete wetland vegetation polygons were identified at a scale of roughly 1:5,000. Information and data collected through the background review and field investigations were integrated to develop a comprehensive map of wetland resources for the study area. Wetland communities represented as polygons within the GIS environment were assigned unique identifiers to facilitate the collection and maintenance of biophysical data, and for comparisons in future monitoring. Wetland polygons were verified through field reconnaissance and updated in the geodatabase. All maps compiled for use in this study were prepared using ArcMap GIS (version 9). The native reference system, or datum used for mapping was North American Datum 1983 (NAD83), and was based on Universal Transverse Mercator (UTM) projection.

3.3 Vegetation Resources

The purpose of the vegetation resource inventory was to establish baseline conditions of the wetland features. These inventories were scheduled to coincide with periods considered optimal for sampling wetland and aquatic vascular plant species. The inventories were conducted in late August and early September. Field reconnaissance survey details are summarized in Table 2.2.

Table 2.2. Summary of survey dates, times, conditions for sampling vegetation resources.

	Date	Observer(s)	Time	Person hrs	Weather Conditions	Purpose
1	Aug 30, 2006	S. Brinker M. Black	10:30 – 17:30	14.0 hrs	20 °C, clear, breezy and dry.	Wetland mapping, floral inventory; incidental wildlife observations
2	Sept 8, 2006	S. Brinker M. Black	9:30 – 16:30	14.0 hrs	24°C, mainly clear.	Wetland mapping, floral inventory; incidental wildlife observations
3	Nov 2, 2006	S. Brinker	12:30 – 16:00	3.5 hrs	2–4 °C, mostly cloudy, windy.	General floral assessment.
			Total hours	31.05 hrs		

Shallow water units were sampled primarily from canoe, whereas marsh and swamp units were sampled on foot. Wetland units within the study area were largely described according to the methodology outlined in the O.W.E.S. As such, wetlands were classified primarily to the physiognomy and cover of the dominant vegetation, as well as floristic composition. In addition, each wetland polygon was classified to the vegetation type level using the Ecological Land Classification System for Southern Ontario (Lee *et al*. 1998). Biophysical attributes recorded from each unit is summarized in Table 2.3.

Table 2.3. Biophysical attributes and measures recorded for wetland vegetation communities.

Attribute	Measure
Cover Type	Vegetation forms as per O.W.E.S categories
Vegetation Type	Floristic composition
Height/Depth of Vegetation	Vegetation height recorded in intervals (m)
Structural Diversity	Number of strata/layers evident
Relative Abundance of Dominant Species	% cover estimates on a polygon basis
Species Richness	Recording all observable species

In addition to describing habitat associations, representative photographs were taken of each habitat. Floristic surveys were conducted in unison with wetland vegetation community sampling. A list of flora observed was maintained. Special attention was given to documenting habitats that could potentially support regionally or provincially significant resources (i.e., those ranked SH, S1, S1S2, S2, S2S3, S3, or S3S4). For explanations of ranking information refer to Appendix 1. The location of populations of significant vascular plant species were recoded with a Garmin *etrex* Legend© handheld GPS unit. All significant plant species observations were reported to the Natural Heritage Information Centre (NHIC).

Nomenclature for vascular plant species generally follows those set out in the Ontario Plant List, compiled by Newmaster *et al*. (1997), but have been updated to be consistent with the NHIC, following the Flora of North America (FNA 2006) treatment. Voucher specimens of difficult taxonomic groups (e.g. Cyperaceae, Potamogetonaceae, Juncaeae, Poaceae etc.) were collected and identified using the following references:

- Graminoids - Voss (1972)
  - Dore & McNeil (1980)
- Aquatics - Crow & Hellquist V I-II (2000a + b);
  -Haynes & Hellquist (2000);

- Voss (1985, 1996)
- Shrubs - Soper & Heimburger (1982)

Voucher specimens shall be deposited at the Ontario Agricultural College Herbarium (OAC), at the University of Guelph. The federal, provincial and regional status of individual species was assigned using the resources outlined below in Table 2.4.

Table 2.4. Background sources used to validate significant floral elements in the study area.

Significance Level	Applicable Sources
Federal	Canadian Species at Risk, September 2006 – after COSEWIC (2006).
Provincial	Species at Risk in Ontario List issued June 30 2006 - after OMNR (2006)
	Species List for Provincially-Tracked Vascular Plants, after NHIC (2006a)
Regional	Distribution and Status of the Vascular Plants of Central Region Ontario, after Riley (1989)

3.4 Wildlife Resources

Wildlife monitoring surveys were conducted to coincide with periods considered optimal for sampling calling frogs and toads (BSC, 2003) and breeding birds (OBBA, 2001; FBMP, 2002). Details of the various wildlife monitoring survey visits are summarized below in Table 2.5.

Table 2.5. Summary of survey dates, times, and weather conditions for monitoring wildlife.

	Date	Observer	Time	Person hrs	Weather Conditions	Purpose
1	Apr. 12, 2006	I. Richards	21:25 – 00:15	2.83 hrs	12 °C, south winds (Beaufort 3), overcast (100% cloud cover)	Amphibian (i.e. calling frogs & toads) Monitoring
2	May 30, 2006	I. Richards	21:30 – 23:50	2.33 hrs	26 °C, south winds (Beaufort 1), partly cloudy (70% cloud cover)	Amphibian (i.e. calling frogs & toads) Monitoring
3	June 5, 2006	I. Richards	06:00 – 09:00	3.00 hrs	12 °C, winds northeast (Beaufort 1), clear (0% cloud cover)	Bird Monitoring
4	June 29, 2006	I. Richards	21:20 – 23:35	2.25 hrs	24 °C, no wind, overcast (100% cloud cover)	Amphibian (i.e. calling frogs & toads) Monitoring
5	June 22, 2006	I. Richards	06:00 – 09:00	3.00 hrs	23 °C, wind south (Beaufort 2), overcast (100% cloud cover)	Bird Monitoring
6	Nov. 2, 2006	K. Konze	12:30 – 16:00	3.50 hrs	2–4 °C, NW winds (Beaufort 3). Mostly cloudy.	Colonial birds nest search survey.
			Total hours	16.92 hrs		

2.4.1 Amphibian Monitoring

Monitoring of amphibians was based on a point count survey method and limited to calling frogs and toads. Survey procedures largely follow the Marsh Monitoring Program (BSC, 2003), (i.e. timing of visits, separation of stations, suitable weather conditions etc.) with the following exceptions:

- Surveys were not limited to the marsh habitats. They also included adjacent swamp or swamp thicket habitats.
- The sample area at each point count station was not limited to semi-circle to better accommodate the linear nature of the study area as well as point count locations.
- Each point count location was surveyed for 6 minutes, differentiating observations before and after 3 minutes. The MMP is based on a 3-minute survey period.

Amphibian monitoring surveys were conducted on three occasions during the breeding season, between mid-April and end of April, between May and end of May, and mid-June

and end of June, to ensure all species present were documented (Table 2.5). Observations can be linked with vegetation community polygons used to define the wetland. Seven point count stations were established along the length of the creek (Figure 2). Attempts were made to separate each point count location by at least 500 m to reduce the likelihood of overlapping observations; however this was not always possible. As a consequence, extra care was exercised when documenting calling the overlapping stations.

Since point count stations to document calling frogs and toads are semi-circular in shape (to correspond with typical marsh edges), two of the point count stations allowed back-to-back stations to be established. This took place at A1 and A5. As a result, A1 is really A1 (North) and A1 (South), and A5 is really A5 (NE) and A1 (SW). The type in brackets refers to the direction of monitoring.

Individual point count station information is listed in Table 2.6 below. Also refer to Figure 2. Information also includes bird monitoring locations.

Table 2.6. Wildlife Monitoring Station Information.

Point Count Name	Coordinates (NAD83)			Orientation	Comments
	Zone	Easting	Northing		
A1(N)	17	645126	4759526	North	West end of Ridge Road.
A1 (S)	17	645126	4759526	South	West end of Ridge Road.
B1	17	645126	4759526	360°	West end of Ridge Road.
B2	17	645329	4759797	360°	North side of creek, at first bend east of canal.
A2	17	645718	4759874	Southeast	North side of creek, halfway between Hwy 140 and canal.
B3	17	645718	4759874	360°	North side of creek, halfway between Hwy 140 and canal.
A3	17	646161	4759901	East	North side of creek, southeast of SWM pond.
B4	17	646161	4759901	360°	North side of creek, southeast of SWM pond.
B5	17	646301	4759989	360°	About 35 west of Hwy 140, 100 m south of creek.
A4	17	646581	4760347	South	Approx. 150 m east of Hwy 140, off of new "closed" road.
B6	17	646581	4760347	360°	Approx. 150 m east of Hwy 140, off of new "closed" road.
A5 (NE)	17	646720	4760617	Northeast	At Buchner Road and railway tracks.
A5 (SW)	17	646720	4760617	Southwest	At Buchner Road and railway tracks.
B7	17	646720	4760617	360°	At Buchner Road and railway tracks.
B8	17	646953	4760792	360°	South side of creek, behind horse farm buildings.
B9	17	647148	4761046	360°	South side of creek, just west of horse farm
A6	17	647411	4761263	Northwest	South side of creek, along wooded bank.
B10	17	647411	4761263	360°	South side of creek, along wooded bank.
A7	17	647975	4761608	Southwest	At Doans Ridge Rd over Lyon's Creek.
B11	17	647975	4761608	360°	At Doans Ridge Rd over Lyon's Creek.

Note: "A"s in *Point Count Name* column refer to Amphibian Monitoring surveys.
"B"s in *Point Count Name* column refer to Bird Monitoring surveys.

2.4.2 Bird Monitoring

Breeding bird surveys were based on a blended point count methodology incorporating aspects of both the Ontario Breeding Bird Atlas (OBBA, 2001) and the Forest Bird Monitoring Program (FBMP, 2002). Survey duration for each point count location was 5 minutes. Two sampling sessions were completed between May 24 and July 10, the peak breeding season for most birds expected to be present on site (OBBA, 2001). The first samples took place between May 24 and June 17, and the second between June 13 and July, with at least 7 days between sampling dates (Table 2.5). All observations thought to be directly associated with the creek or its adjacent wetland habitat were differentiated and can be linked to wetland community mapping. Although 12 point count stations separated by at least 250 m were proposed to be established along the length of the creek, only 11 were ultimately established (Figure 2). In addition, two of the point count locations were not quite 250 m

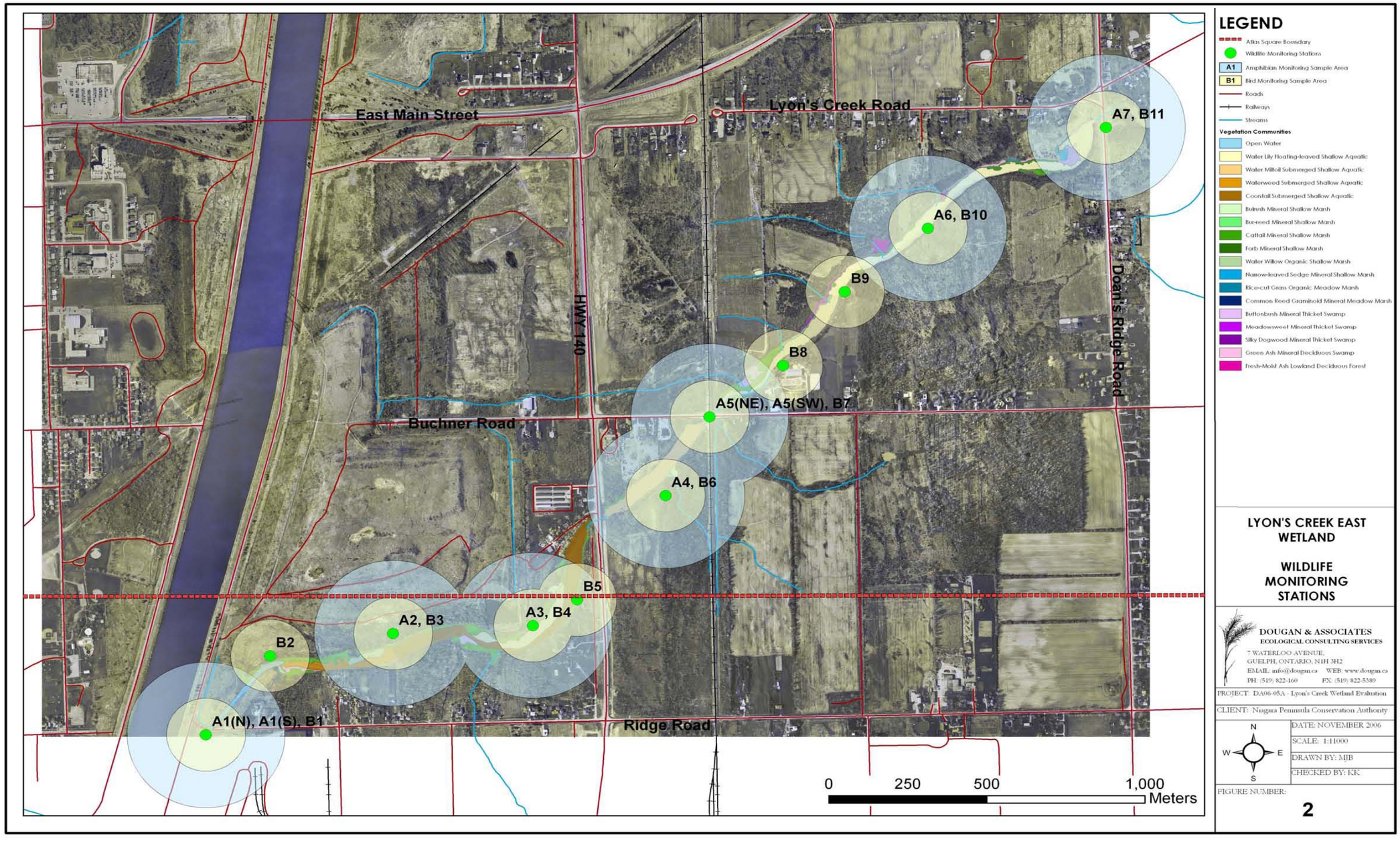

Figure 2. Wildlife Monitoring Stations

apart. Special care was made at these locations to ensure double counting did not take place. Individual point count station information is listed in Table 2.6.

2.4.3 Miscellaneous Wildlife Observations

Additional incidental wildlife observations were made during vegetation sampling.

3.5 Aquatic Resources

Fisheries field investigations were limited to a reconnaissance level examination of the study area, because 2004 fish sampling data from Fisheries and Oceans Canada (pers. comm. N. E. Mandrak, 2006) was considered adequate to characterize the fish community. Figure 3 illustrates fish sampling locations conducted by Fisheries and Oceans Canada.

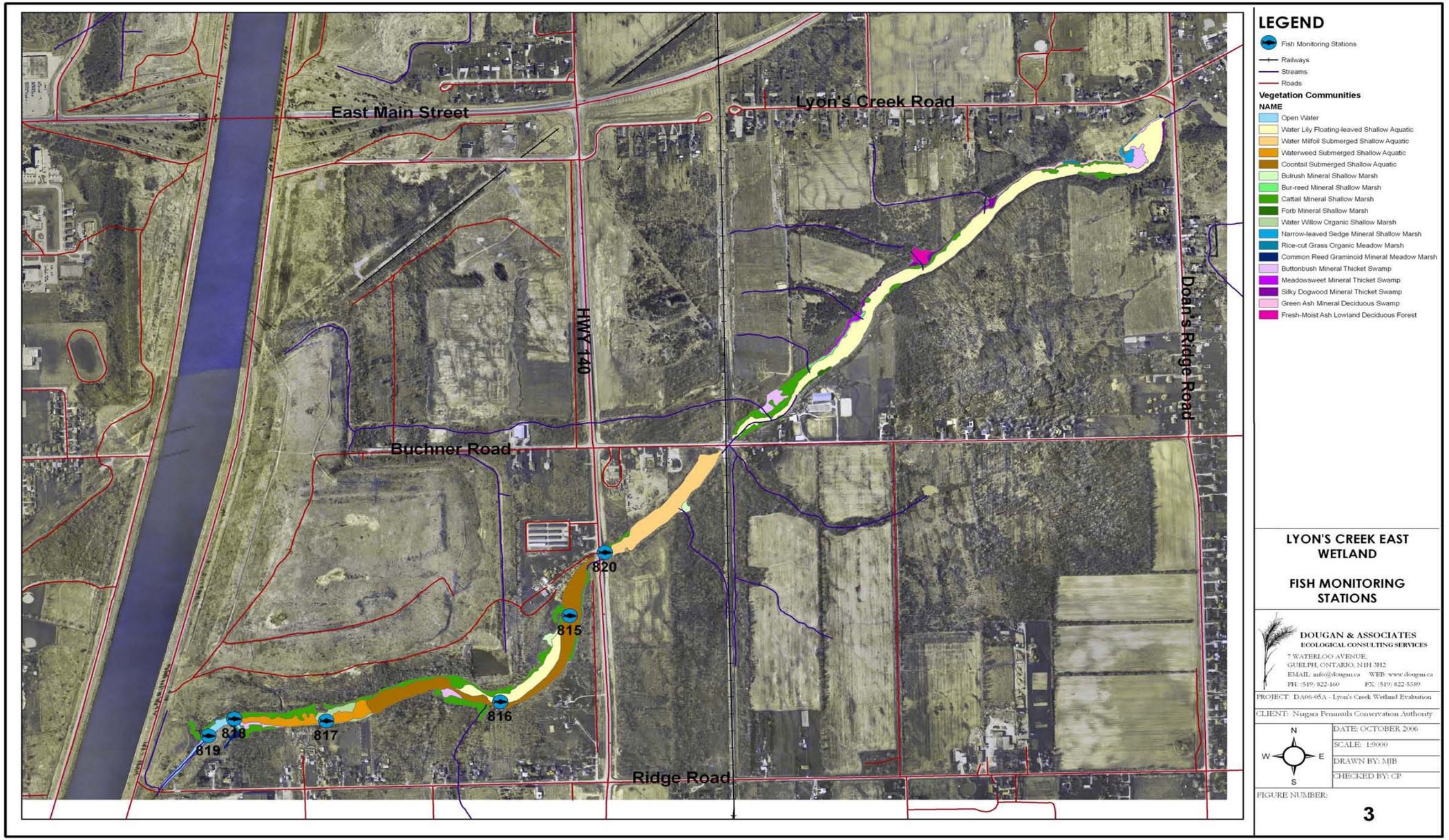

Figure 3. Fish Monitoring Stations

4 FINDINGS

4.1 Background Review

Information obtained through the review of background sources was used to characterize existing conditions on a preliminary basis prior to field sampling. All background information sources and data listed in Table 2.1 were reviewed and incorporated into this characterization where relevant.

3.1.1 Physical Resources

The study area occurs within the Haldimand Clay Plain physiographic region. The Haldimand Clay Plain is one of 53 physiographic regions across southern Ontario south of the Canadian Shield, defined by landform type, vegetation cover, and land use patterns. The Haldimand Clay Plain occupies 3,500 square kilometres, including the entire Niagara Peninsula south of the Niagara Escarpment, and extends west to the Norfolk Sandplain and south to Lake Erie. This physiographic region is flat to rolling, with clay and silt sediments draped over low moraines (Chapman and Putnam 1984). The underlying rocks consist of a succession of Paleozoic beds of Devonian and Silurian aged rock composed of limestone, dolostone, sandstone, and shale, that dips slightly southward under Lake Erie. Within the Haldimand Clay Plain physiographic region there are numerous sub-regions recognized by distinctive physical features, biota, vegetation patterns, and land use. Lyon's Creek falls broadly within the 'Niagara Slough Clay Plain' sub-region, and more precisely within the 'Incised Meander Stream Valley' sub-region. Bound by the Welland River, Niagara River, Niagara Escarpment, and the Onondaga Escarpment, the slough clay plain sub-region is characterized by a slough/ridge patterned clay plain of heavily compacted, poorly drained acid clay soils (Macdonald, 1980). Numerous incised valleys within the Niagara Slough Clay Plain are marked generally by easterly flowing meandering riparian landforms found throughout the region as small river systems.

The origins of the soils are thick glaciolacustrine clay deposits of Glacial Lake Warren, of the Lake Erie basin. The predominant soils along Lyon's Creek include Oneida red phase soils of the Oneida series. According to Kingston and Presant (1989), the Oneida series are moderately well-drained soils with a high water-holding capacity, and fairly rapid surface runoff. Soil textures are normally clay loam, with some silty clay loam. The Oneida series falls within the Brunisolic Gray Brown Luvisol soil classification unit. The heavy texture and drainage features of these soils have created unevenness in drainage across the region. As well, topographic features and culverts are known to impede the movement of water during high flow times.

3.1.2 Vegetation Resources

3.2.1.2 Vegetation Patterns

The study area lies within the Mixedwood Plains Ecozone, the largest spatial scale of classifying ecosystems in Canada, defined by major plant formations, climate and geology. This zone is bounded by the three Great Lakes in southern Ontario, and extends along the St. Lawrence shoreline to Quebec City. Within this broad ecozone, lies Ecoregion 7E. Known as the deciduous forest region (Rowe 1972), or the Carolinian Floral Zone (Scoggan 1978-1979), Ecoregion 7E has a moderated climate balanced with fertile luvosolic and gleysolic soils that

have created favourable conditions for a unique association of broadleaved trees, shrubs and herbs more typical to the south. The characteristic forest association of Ecoregion 7E consists of Sugar Maple (*Acer saccharum*) and American Beech (*Fagus grandiflora*), with American Basswood (*Tilia americana*), Black Cherry (*Prunus serotina*), Eastern White Pine (*Pinus strobus*), Red Oak (*Quercus rubra*), White Oak (*Quercus alba*) and Bur Oak (*Quercus macrocarpa*). Other less common associates with more southern affinities include Tulip Tree (*Liriodendron tulipifera*), Shagbark Hickory (*Carya ovata*), Pin Oak (*Quercus palustris*), Black Gum (*Nyssa sylvatica*), Sassafras (*Sassafras albidum*), and Black Walnut (*Juglans nigra*). Hills (1959) includes the area within Site District 7E-2. In the recent modifications of the Hills' classification by Crins (2000), the study area has been included in OMNR Ecodistrict 7E-5.

Macdonald (1980) and Riley (1989) note several floristic affinities of the region, including a strong southern or Carolinian component, but also an Atlantic Coastal Plain and Appalachian component. Other affinities include Great Lakes endemic flora, Midwestern, and to a lesser extent, northern coniferous and boreal components. Several forest associations are noted by Macdonald (1980), including wet mesic clay forest dominated by oaks (*Quercus* sp.) and Shagbark Hickory, with more moist to wet treed swamps containing Silver Maple (*Acer saccharinum*), White Elm (*Ulmus americana*), Green Ash (*Fraxinus pensylvanica*) and others. More mesic forests are dominated by Red Maple, Red Oak, Pin Oak, and White Ash (*Fraxinus americana*) with a rich ground flora. Wetland vegetation supports a diverse complement of thicket, marsh and emergent communities. Thicket swamps typically contain a Buttonbush (*Cephalanthus occidentalis*) – Winterberry (*Ilex verticillata*) – Southern Arrow-wood (*Viburnum recognitum*) - Poison Sumac (*Rhus vernix*) – Red Maple (*Acer rubrum*) association. Riparian zones are described as containing willow (*Salix* sp.) groves, extensive cattail (*Typha* sp.) and sedge (*Carex* sp.) or bulrush (*Scirpus* sp.) marshes.

Lyon's Creek is more closely associated with the 'Incised Meander Stream Valley' subregion, found scattered about the 'Niagara Slough Clay Plain' sub-region. Biota found within these river systems are generally quite diverse, occasionally containing species with distinct southern or western affinities, such as Green Dragon (*Arisaema dracontium*), Arrow Arum (*Peltandra virginica*), Virginia Bluebells (*Mertensia virginiana*), Sycamore (*Platanus occidentalis*), Sweet Flag (*Acorus calamus*), Gray's Sedge (*Carex grayi*), Wild Garlic (*Allium canadense*), and others (Macdonald 1980). Stream courses support distinct vegetation types, often supported by pondweeds (*Potamogeton* spp.), duckweed (*Lemna minor*), bulrushes (*Scirpus* spp.; *Schoenoplectus* spp.) etc. Macdonald (1980) acknowledged the long history of anthropogenic disturbance within these river systems, and noted they often have limited representational potential due to their generally disturbed and degraded nature. Macdonald (1980) surveyed a portion of Lyon's Creek - he termed 'Lyon's Creek Floodplain Wetland.' This site, which is several kilometres east of the current study area, contained a diverse wetland swamp scrub and marsh complex, having been formed following the partial inundation of the basin by highway construction. Several communities were described including: submergent aquatic meadows; wet sedge, bulrush, and Blue-joint Reedgrass (*Calamagrostis canadensis*) meadows; cattail marshes; scrub Buttonbush, Meadowsweet (*Spiraea alba*), dogwoods (*Cornus* sp.), and willow swamps; swamp forest groves of Green Ash, Silver Maple, White Willow (*Salix alba*), and White Elm; as well as embankment slope forest fringes of Red Oak, Red Maple and others.

3.2.1.1 Rare Vegetation Communities

A review of the Natural Heritage Information Centre database (2006b) did not reveal any previous known records of provincially significant vegetation communities from within the study area or environs (i.e., those listed as SH, S1, S1S2, S2, S2S3, S3, S3S4).

3.2.1.3 Species of Conservation Concern

A search of the Natural Heritage Information Centre's (NHIC 2006b) database was conducted for existing rare plant occurrences for the study area and environs. Only one significant vascular plant element occurrence was located for the vicinity, Hirsute Sedge (*Carex hirsutella*). This sedge has a provincial rank of S3, suggesting relatively few populations (often 80 or fewer) in the province. According to the Flora of North America Editorial Committee (FNA 2006), this species prefers a range of conditions, from meadows to dry mesic woods, over neutral to basic soils. Voss (1972) describes it's habitat as upland oak woods, low open ground and shady borders of ponds, marshes and swamps.

A review of wetland data records for evaluated wetlands along Lyon's Creek and its sub watershed (Moraal & Smith 1984; Bacro *et al* 1988; Nash *et al* 1988) highlighted the presence of several additional significant species. The most significant record is Round-leaved Greenbrier (*Smilax rotundifolia*), federally listed by COSEWIC as 'Threatened,' with a provincial rank of S2 (very few populations, often 20 or fewer) from Lyon's Creek North Wetland Complex, several hundred metres north of the study area. Round-leaved Greenbrier is an understorey woody vine found in moist to wet woodlands (COSEWIC 2001). Two provincially rare trees were identified, Black Gum (*Nyssa sylvatica*) and Pin Oak. Both species prefer low, wet ground often bordering swamps, vernal pools or streams. Two other species are listed, Southern Arrow-wood, a tall woody shrub of swampy woods and thickets (Soper & Heimburger 1982), and Small Beggar's Ticks (*Bidens discoidea*), an annual herb of shady swamps and muddy shores (Voss 1996). The status of the latter two species has recently been revised to S4 (uncommon but not rare) and are no longer provincially significant.

3.1.3 Wildlife Resources

The following resources were consulted in the preparation of this review:

NHIC Natural Areas Report: Lyon's Creek Wetlands (NHIC) (2006b)
The Natural Heritage Information Centre's (NHIC's) Natural Areas Report for Lyon's Creek Wetland was largely based on the 1984 Wetland Data Record and Evaluation by Moraal and Smith (see review below). In addition to repeating the list of provincially and regionally significant wildlife species, the Natural Areas Report also included a list of additional wildlife species observed as part of the original wetland evaluation by Moraal and Smith. For whatever reason, this information was not part of the wetland data record we received for review. The species observed were: Great Blue Heron, Green Heron, Wood Duck, Blue-winged Teal, Hooded Merganser, Belted Kingfisher, Cedar Waxwing, Red-winged Blackbird, and Midland Painted Turtle. At least according to the December 2002 revision to the 1993 Ontario Wetland Evaluation System Southern Manual (3rd Edition), Hooded Merganser (*Lophodytes cucullatus*) is regarded as regionally significant. This list of species also suggests that the wetland is important to colonial nesting birds, if not to nest, but then at least as an area to forage in. Similarly, by mentioning the three species of ducks, it seems to support the

determination that the Lyon's Creek Wetland is a locally significant waterfowl production area.

Ontario Ministry of Natural Resources Natural Heritage Information Centre (NHIC 2006b)
No wildlife records were on file for the study area or its vicinity.

Ontario Herpetofaunal Atlas (2006 - ongoing)
The Lyon's Creek study area straddles two 10 x 10 km atlas squares 17PH45 and 17PH46, formerly referred to as 17PT45 and 17PT46.

Michael Oldham, Herpetologist at the Natural Heritage Information Centre (NHIC), provided all amphibian and reptile records on file at the Ontario Herpetofaunal Atlas for the two squares. One-hundred and sixty-two observations were on record. Of these, only five observations, representing three species were from areas within or in close proximity to the study area. Lyon's Creek was specifically mentioned as the location, but more specific information was not available. The corresponding UTM coordinates had an accuracy of "4" or 10,000 m. The three species were Western Chorus Frog (*Pseudacris triseriata*), Green Frog (*Rana clamitans*), and Northern Leopard Frog (*Rana pipiens*). All of the observations were made in October or November 1983. None of the species are considered "local", "uncommon", or "rare" in the Ministry of Natural Resources (MNR) former 'Central' Region (Plourde et al., 1989). Similarly, none of them are considered to be of conservation concern in Ontario (i.e. are listed as "critically imperilled" (S1), "imperilled" (S2), or "vulnerable" (S3) (NHIC, 2006d).

Ontario Odonata Atlas (2006 - ongoing)
Colin Jones, Project Biologist with the Natural Heritage Information Centre, provided all odonate (i.e. damselfly and dragonfly) records on file in the Ontario Odonata Atlas for atlas squares 17PH45 and 17PH46 (OOA, 2006). Results revealed 26 records, representing 17 species. However, of these, only 7 records, representing 7 species, were considered to be directly associated with the study area. All records were obtained from the area where Lyon's Creek crosses Doan's Ridge Road, just southwest of Cooks Mills, Ontario, and the extreme eastern edge of our study area. The species on file are listed below in Table 3.3. None of the species are provincially significant; all species had a status of "Secure" or "Apparently Secure" (NHIC, 2006c).

Table 3.1. Odonate species on record for the study area.

	Common Name	Scientific Name	Conservation Status			Date	Observer	Comments
			National	Provincial				
			COSEWIC	MNR	Srank			
1	Familiar Bluet	*Enallagma civile*	---	---	S5	24-06-97	P.M. Catling	Specimen
2	Skimming Bluet	*Enallagma geminatum*	---	---	S4	24-06-97	P.M. Catling	Specimen
3	Hagen's Bluet	*Enallagma hageni*	---	---	S5	24-06-97	P.M. Catling	Specimen
4	Fragile Forktail	*Ischnura posita*	---	---	S4	24-06-97	P.M. Catling	Specimen
5	Eastern Forktail	*Ischnura verticalis*	---	---	S5	24-06-97	P.M. Catling	Specimen
6	Eastern Pondhawk	*Erythemis simplicicollis*	---	---	S5	24-06-97	P.M. Catling	Specimen
7	Blue Dasher	*Pachydiplax longipennis*	---	---	S5	24-06-97	P.M. Catling	Specimen

Note: For a list of sources and definitions of abbreviations, please refer to Appendix 1.

Ontario Breeding Bird Atlas (2001–2005)
According to the Ontario Breeding Bird Atlas website (http://www.birdsontario.org/atlas/datasummaries.jsp), 113 species were documented from 17PH45 and 101 from 17PH46, between 2001 and 2005 (Appendix 2). In addition to species

with Possible, Probable and Confirmed breeding evidence, it also includes species observed during the breeding species but that showed no breeding evidence. However, since the 10 x 10 km atlas squares also include lands that extend well beyond the study area, not all of the species listed were considered likely to have been documented from the study area. To determine if any significant species were noted from within or immediately adjacent to the study area, the principal atlassers for both squares were contacted. Brad Clements, principle atlasser for 17PH45 indicated that did not have any observations from our study area. That is, the Red-headed Woodpecker, Acadian flycatcher and Henslow's Sparrow observations were areas well beyond the study area (B. Clements, pers. comm., 2006). Despite establishing contact with Gary Pieterse, principle atlasser for 17PH46, no information was received. For the record, Table 3.1 lists all of the significant species on record with the Ontario Breeding Bird Atlas (2001–2005) for the two atlas squares:

Table 3.2. Significant breeding bird species documented from atlas squares 17PH45 & 17PH46 during the second Ontario Breeding Bird Atlas (2001-2005).

	Common Name	Scientific Name	Conservation Status				Area Sensitivity	Atlas Square	
			National	Provincial		Regional		17PH ??	
			COSEWIC	MNR	Srank	BCR13		45	46
1	Northern Harrier	*Circus cyaneus*	NAR	NAR	S4B	PLS	AS	CF	FY
2	American Kestrel	*Falco sparverius*	---	---	S5B	PLS	---	FY	NY
3	Black-billed Cuckoo	*Coccyzus erythropthalmus*	---	---	S4B	PLS	---	S	---
4	Whip-poor-will	*Caprimulgus vociferus*	---	---	S4B	PLS	AS	S	---
5	Chimney Swift	*Chaetura pelagica*	---	---	S5B	PLS	---	S	AE
6	Belted Kingfisher	*Ceryle alcyon*	---	---	S5B	PLS	---	CF	NY
7	Red-headed Woodpecker	*Melanerpes erythrocephalus*	SC	SC	S3B	PLS	---	H	---
8	Northern Flicker	*Colaptes auratus*	---	---	S5B	PLS	---	CF	FS
9	Eastern Wood-Pewee	*Contopus virens*	---	---	S5B	PLS	---	FY	FY
10	Acadian Flycatcher	*Empidonax virescens*	END	END	S2B	PLS	AS	T	---
11	Willow Flycatcher	*Empidonax traillii*	---	---	S5B	PLS	---	FY	AE
12	Eastern Kingbird	*Tyrannus tyrannus*	---	---	S5B	PLS	---	CF	FY
13	Bank Swallow	*Riparia riparia*	---	---	S5B	PLS	---	CF	CF
14	Wood Thrush	*Hylocichla mustelina*	---	---	S5B	PLS	---	FY	FY
15	Brown Thrasher	*Toxostoma rufum*	---	---	S5B	PLS	---	CF	S
16	Blue-winged Warbler	*Vermivora pinus*	---	---	S4B	PLS	---	---	CF
17	Golden-winged Warbler	*Vermivora chrysoptera*	THR	---	S4B	PLS	---	---	T
18	Hooded Warbler	*Wilsonia citrina*	THR	THR	S3B	PLS	---	---	NU
19	Eastern Towhee	*Pipilo erythrophthalmus*	---	---	S4B	PLS	---	CF	CF
20	Field Sparrow	*Spizella pusilla*	---	---	S5B	PLS	---	CF	CF
21	Vesper Sparrow	*Pooecetes gramineus*	---	---	S4B	PLS	---	T	T
22	Savannah Sparrow	*Passerculus sandwichensis*	---	---	S5B	PLS	AS	FY	CF
23	Grasshopper Sparrow	*Ammodramus savannarum*	---	---	S4B	PLS	AS	FY	CF
24	Henslow's Sparrow	*Ammodramus henslowii*	END	END-R	S1B	PLS	AS	S	---
25	Rose-breasted Grosbeak	*Pheucticus ludovicianus*	---	---	S5B	PLS	---	CF	NY
26	Bobolink	*Dolichonyx oryzivorus*	---	---	S4B	PLS	AS	FY	CF
27	Eastern Meadowlark	*Sturnella magna*	---	---	S5B	PLS	AS	CF	FY
28	Baltimore Oriole	*Icterus galbula*	---	---	S5B	PLS	---	NY	CF

Note: For a list of sources and definitions of abbreviations, please refer to Appendix 1.

Ontario Mammals Atlas (Dobbyn, 1994)

A list of species documented from atlas squares 17PH45 and 17PH46 was generated by leafing through the pages of the Atlas of the Mammals of Ontario (Dobbyn, 1994). This review revealed that 15 species were on file for 17PH45 and 18 for 17PH46 (Table 3.2). Aside

from Norway Rat, which is an introduced species, all of the species listed are designated as "Secure" or "Apparently Secure" in Ontario (NHIC, 2006g).

Table 3.3. Mammals species documented from atlas squares 17PH45 and 17PH46 up to 1993.

	Common Name	Scientific Name	Conservation Status			Area Sensitivity	Atlas Square	
			National	Provincial				
			COSEWIC	MNR	Srank		17PH45	17PH46
1	Virginia Opossum	*Didelphis virginiana*	---	---	S4	---		■
2	Star-nosed Mole	*Condylura cristata*	---	---	S5	---	■	■
3	Little Brown Bat	*Myotis lucifugus*	---	---	S5	---	△	
4	Silver-haired Bat	*Lasionycteris noctivagans*	---	---	S4	---	△	
5	Big Brown Bat	*Eptesicus fuscus*	---	---	S5	---		■
6	Eastern Cottontail	*Sylvilagus floridanus*	---	---	S5	---		■
7	European Hare	*Lepus europaeus*	---	---	SE	---		■
8	Woodchuck	*Marmota monax*	---	---	S5	---		■
9	Grey Squirrel	*Sciurus carolinensis*	---	---	S5	---	■	■
10	White-footed Mouse	*Peromyscus leucopus*	---	---	S5	---	△	▲
11	Meadow Vole	*Microtus pennsylvanicus*	---	---	S5	---	△	■
12	Norway Rat	*Rattus norvegicus*	---	---	SE	---		■
13	Muskrat	*Ondatra zibethicus*	---	---	S5	---	■	■
14	Meadow Jumping Mouse	*Zapus hudsonius*	---	---	S5	---	■	▲
15	Coyote	*Canis latrans*	---	---	S5	---	■	■
16	Red Fox	*Vulpes vulpes*	---	---	S5	---	■	■
17	Raccoon	*Procyon lotor*	---	---	S5	---	■	■
18	Long-tailed Weasel	*Mustela frenata*	---	---	S4	---	△	
19	Mink	*Mustela vison*	---	---	S5	---	■	□
20	Striped Skunk	*Mephitis mephitis*	---	---	S5	---	■	■
21	White-tailed Deer	*Odocoileus virginianus*	---	---	S5	---	■	■

Note: For a list of sources and definitions of abbreviations, please refer to Appendix 1.

The Ontario Butterfly Atlas (Holmes et al., 1991)

Aside from the Monarch (*Danaus plexippus*) butterfly, no other provincially significant species (i.e. "Species at Risk" or those designated S1, S2, or S3 by NHIC [2006d]) appeared to be recorded from the vicinity of the study area. The Monarch is currently designated as "Special Concern" in Ontario (OMNR, 2006) and Canada (COSEWIC, 2006). The Monarch likely occurs in the area and possibly in the wetland habitats. Though not recorded during the 2006 surveys, the Swamp Milkweed (*Asclepias incarnata*), one of its potential host plants, likely occurs along the creek.

Natural Areas of the Niagara Region: A Preliminary Study (RMN, 1985)

This document, prepared to assist in the goal of developing a revised set of municipal policies for the use and management of natural areas, describes 90 natural areas in the Regional Municipality of Niagara. Included amongst them is a summary description for provincially significant Lyon's Creek Wetlands ("Class 1"). It is described as 150.5 ha, linear riverine marsh that, despite severe pollution, provides excellent waterfowl habitat. Unfortunately, no details describing if this comment was made in reference to breeding or migratory habitat was provided. In another summary point, the report states that:

> *"significant avian species present include Green and Great Blue Heron, American Bittern, Mallard and Black Ducks, Blue-winged Teal, Sharp-shinned and Sparrow Hawks* [now know as American Kestrel], *Red-tailed Hawk, Ruffed Grouse, Ring-necked Pheasant, Spotted Sandpiper, Short-eared Owl,* [Ruby-throated] *Hummingbird, Rose-breasted and*

Evening Grosbeak, Eastern Kingbird, Downy and Hairy Woodpeckers, Red-headed Woodpecker, and Wood Duck"

Short-eared Owl and Red-headed Woodpecker are currently designated as 'Species at Risk'. That is, both species are designated as "Special Concern" in Canada (COSEWIC, 2006) and Ontario (2006). Unfortunately, despite the "Atlas of the Breeding Birds of Ontario" showing that both species occurred in the early to mid 80s from atlas squares containing the study area (Cadman et al., 1987), it is not clear exactly where these records are from. Nevertheless, it is reasonable to assume that the Short-eared Owl record was indeed from along or adjacent to the study area since the only portion of Lyon's Creek in atlas square 17PH45, where Short-eared Owl is on file, falls entirely within the current study area. American Bittern is currently regarded as an area-sensitive species, meaning that it is dependent on large areas of suitable habitat for their long-term survival (OMNR, 2000). It is not clear why some of the other species were included on the list since some of them are common species (e.g. Spotted Sandpiper, Downy Woodpecker) and the Evening Grosbeak does not breed on the Niagara Peninsula (Cadman et al., 1987).

Included in the list of "significant" mammals is Star-nosed Mole, Mink, Red and Grey Fox, and Long-tailed Weasel. Reference to Grey Fox is indeed significant since it is designated as "Threatened" in Canada (COSEWIC, 2006) and Ontario (OMNR, 2006), and has a provincial conservation rank (i.e. Srank) of SZB?, or yet to be ranked. It is thought to be a rare resident in Ontario occurring south of the Canadian Shield and in Rainy River, northwestern Ontario (Dobbyn, 1994). However, this particular record is almost certainly not from within the "Lyon's Creek East" study area, the subject of interest in this study, since it wasn't on record for the atlas square that the study area falls within. Instead, it was likely from further downstream Lyon's Creek. The "Atlas of the Mammals of Ontario" does show a 1900 – 1969 record for atlas square 17PH56, which includes the lower reaches of Lyon's Creek.

The summary description then goes on to repeat information presented in the two following reports, both of which are summarized below in this report:

- Regional Municipality of Niagara Environmentally Sensitive Areas report (Brady, 1980), and
- Regional Municipality of Niagara official Plan Studies Report Number 11 – Potential Recreation Areas and Fragile Biological Sites (PPEL, 1972)

<u>Wetland Data Record and Evaluation - Lyon's Creek Wetlands. (Moraal and Smith, 1984)</u>
The information contained in the wetland data record corresponds with an assessment that took place along the entire length of Lyon's Creek. As a result, it is not possible to definitively state whether the data presented is also true for the area of interest in this study, namely, the area west of Doan's Ridge Road. Nevertheless, the following information was gleaned from the data record. Information sources are contained in square brackets.

- American Bullfrogs (*Rana catesbeina*) were present [field assessment]
- Snapping Turtles (Chelydra serpentina) were not detected [field assessment]
- Furbearers, including Muskrat (*Ondatra zibethicus*), Raccoon (*Procyon lotor*) and Mink (*Mustela vison*) were noted during the field assessment
- Provincially significant species noted in the Special Features Component included Black-crowned Night-Heron (*Nycticorax nycticorax*) [NPCA] and Marsh Wren (*Cistothorus palustris*) [NPCA].

- Regionally significant species noted in the Special Features Component included Wood Duck (*Aix sponsa*) [OMNR] and Sora (*Porzana carolina*) [Ontario Breeding Bird Atlas].
- Nesting colonial waterbirds nested within 5 years of the 1984 assessment date (NPCA).
- The wetland provides good winter cover for Muskrat and Raccoon (no source)
- The wetland is known to be a locally significant waterfowl staging area (OMNR, NPCA)
- The wetland is known to be a locally significant waterfowl production area (OMNR, NPCA)
- It is not thought to be a significant migratory passerine and/or shorebird stopover area (OMNR, NPCA)

Black-crowned Night-Heron is still regarded as provincially significant (OMNR, 1993). They have a provincial conservation rank (i.e. Srank) of S3 or "Vulnerable" (NHIC, 2006f). Marsh Wren currently has an Srank of S4 or "Apparently Secure" (NHIC, 2006f) and is no longer regarded as provincially significant when scoring wetlands (OMNR, 1993). It is also not clear what source of information was used at the time to designate Wood Duck and Sora as regionally significant. Neither of them are on the December 2002 list of Regionally Significant Breeding Birds for Region 7 (OMNR, 1993).

Thrown in with the wetland data record and evaluation was a brief report titled "Lyon's Creek Wetland Study – A Preliminary Report". Although it wasn't possible to determine who the report author(s) was/were, it appears to have been produced in 1986 or 1987, following the completion of the original wetland assessment. Referring to the Regional Municipality of Niagara preliminary survey of the Natural Areas of the Niagara Region (1983), it describes Lyon's Creek as providing "habitat for a wide selection of wildlife with several provincially significant species." It then goes on to state that "The area is known for its great concentrations of autumn roosting wood ducks and for its black-crowned night-herons, marsh wrens, red-shouldered hawks, turkey vultures, long-tailed weasels, mink, red and grey foxes." Red-shouldered Hawk (*Buteo lineatus*) is currently designated as "Special Concern" in Ontario (OMNR, 2006) and up until very recently had a similar national conservation rank. Similarly, Grey Fox (*Urocyon cinereoargenteus*) is currently designated as "Threatened" in Canada (COSEWIC, 2006) and Ontario (OMNR, 2006). While it is not clear whether the Red-shouldered Hawk was a past resident of the study area (Cadman et al., 1987), results of the current Ontario Breeding Bird Atlas do not indicate that the species occurs in the atlas squares (http://www.birdsontario.org/atlas/map.jsp?map=be&species=RSHA&no=5&stype=1) that the study area is in. Similarly, the Grey Fox record likely refers to an observation made further east along Lyon's Creek, outside the current study area. See the previous section for more details.

Regional Municipality of Niagara Environmentally Sensitive Areas (Brady, 1980)

None of the areas inventoried as part of Regional Municipality of Niagara Environmentally Sensitive Areas study included the Lyon's Creek East study area. According to Figure 14b of the report, the closest natural areas inventoried included Babion Road Woodlot (PC-01), Bill's Bush (PC-07) and Yokom Woodlot (NF-09), all located south of Lyon's Creek. All of the wildlife species mentioned in those natural area accounts were of common wildlife species and do not suggest the possibility or presence of something significant in the Lyon's Creek East study area. Furthermore, only four brief pages were devoted to describing the overall wildlife resources in the Regional Municipality of Niagara. Most descriptions were overly general in

nature and of little use in this study. Only one comment, copied below, makes direct reference to Lyon's Creek.

> *"The Lake Ontario shoreline and several large ponds and rivers provide breeding grounds for a variety of shore-birds and water-fowl. The Welland River, Mud Lake, Martindale Pond and Lyon's Creek are examples of such sites."*

Regional Municipality of Niagara official Plan Studies Report Number 11 – Potential Recreation Areas and Fragile Biological Sites (PPEL, 1972)
"Lyon's Creek Area" was listed as one of 51 "Biologically Unique Areas in the Regional Municipality of Niagara." Figure 2 of that report illustrates where each of these areas are located. The brief summary description provided in the report, and copied below, contains 5 bulleted, some of which speak to its wildlife resources and potential.

- *Local swamps and small marshlands along the creek*
- *One of the few autumn Wood Duck roosting areas known in the Region for its great concentrations.*
- *Black-crowned Night-Herons and other marsh birds found here.*
- *Many buttonwood trees here.*
- *Severe residential encroachment – recommended that remaining natural lands be set aside as a "bird sanctuary" to preserve the habitat.*

Neither Wood Duck (*Aix sponsa*) nor Black-crowned Night-Heron (*Nycticorax nycticorax*) are currently designated as "Species at Risk'. That is neither are designated as "Special Concern", "Threatened", or "Endangered" in Canada (COSEWIC, 2006) or Ontario (OMNR, 2006). However, Black-crowned Night-Heron has a provincial conservation rank of S3B or "Vulnerable" (NHIC, 2006f) meaning "Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation." Wood Duck has a provincial conservation rank of S5 or "Secure" (NHIC, 2006f).

3.1.4 Aquatic Resources

A total of fifteen fish species are listed as resident in the Lyon's Creek wetland (MNR files), however no sampling details are included. A report of a fish collection in Lyon's Creek west of Highway 140 in 1991 lists bluegill sunfish, largemouth bass, pumpkinseed sunfish and unidentified centrarchids and cyprinids.

Fisheries and Oceans Canada staff sampled Lyon's Creek In 2004. Most of the sampling was conducted with an electrofishing boat, but this was supplemented by seining, backpack electrofishing and fine mesh hoop net sets at a few locations. In June, 2004, two areas nearer the mouth were sampled, and in August, 2004, the reach between Highway 140 and the Welland Canal was sampled with an electrofishing boat; a quarter inch mesh hoop net was also set immediately upstream from Highway 140 (pers. comm. N.E. Mandrak, 2006).

Twenty-six fish species were captured in Lyon's Creek by Fisheries and Oceans Canada (Appendix 3). All of the species described as resident in the MNR wetland evaluation were captured except for creek chub (*Semotilus atromaculatus*). Fifteen fish species were captured within the study area. With the exception of lake chubsucker, which was only captured at the sites upstream from Highway 140, the species captured within the study area were also present elsewhere in the system. It is considered likely that the fish species

that were captured in the lower reaches outside the study area are present in the study area, at least occasionally.

The lake chubsucker has "threatened" COSEWIC status and is listed under the Species at Risk Act. Grass pickerel has "special concern" COSEWIC status and is not listed under the Species at Risk Act.

4.2 Field Inventories

3.2.1 Vegetation Resources

The documentation of vegetation resources in the study area focused on measuring community and species level diversity. Wetland communities were qualitatively assigned to vegetation types on the basis of dominant species present, and major habitat features. Vascular plant species richness was qualitatively assessed for the entire site, and for a subset of representative polygons.

3.2.1.1 Vegetation Communities

The wetland community classes within the study area include swamp, marsh and shallow water aquatic. Within these broad classes, there is significant variation in wetland vegetation types. Often, vegetation units are marked by a series of complexes, rather than single discernable ones, complicating vegetation categorization. In most situations, the dominant cover (>25%) defined the wetland type. Definitions of these three broad wetland classes are provided, followed by a general description of each vegetation type encountered in the field.

Swamps are wooded wetlands with at least 25% cover of woody trees or shrubs (OMNR, 1993). Most have significant spring flooding with inorganic nutrient input, and late-summer draw-down periods that allow for oxidation, decomposition, and nutrient cycling of organic materials. This drawdown improves root-aeration for mature canopy species. Swamps can develop on mineral or peat substrates, and this depends on many factors, such as wood type (conifers tend to decompose more slowly than hardwoods), topographic position, degree of drawdown, local climate, etc. Marshes in the broad sense are wet areas periodically inundated with standing or slowly moving water and/or permanently inundated areas characterized by robust emergents, and to a lesser extent, anchored floating plants and submergents (OMNR 1993). Marshes are further subdivided into shallow and meadow marshes following Lee *et al* (1998). Shallow marshes have standing or flowing water for a large portion of the growing season, and are usually over mineral soils. Meadow marshes have lower water levels or may be seasonally flooded, so they support predominantly emergent wetland plants such as cattails, sedges and rushes. Shallow water aquatic communities have standing or flowing water with submergent and/or floating leaved plant cover greater than 25%, and less than 25% emergent plant growth. Water depth is typically less than 2 metres deep.

A total of 18 different wetland vegetation types comprising forty-five units were identified in the study area. Several vegetation types were most conspicuous, namely Water Lily Floating-leaved Shallow Aquatic (SAF1-1), Cattail Mineral Shallow Marsh (MAS2-1) and Coontail Submerged Shallow Aquatic (SAS1) making up almost 70 percent of the wetland

coverage. Refer to Table 3.4 for a summary of vegetation types, conservation status, and aerial extent.

Table 3.4. Summary of vegetation communities documented in the study area.

Code	Vegetation Types	Grank	Srank	Number of Polygons	Area (ha)
Swamp					
SWD2-2	Green Ash Mineral Deciduous Swamp	G?	S5	2	0.33
SWT2-4	Buttonbush Mineral Thicket Swamp	G4	S3	5	0.76
SWT2-6	Meadowsweet Mineral Thicket Swamp	G?	S5	1	0.14
SWT2-8	Silky Dogwood Mineral Thicket Swamp	G5	S3S4	4	0.41
Marsh					
MAM2	Common Reed Graminoid Mineral Meadow Marsh	?	?	3	0.15
MAS2-1	Cattail Mineral Shallow Marsh	G5	S5	14	3.60
MAS2-2	Bulrush Mineral Shallow Marsh	G?	S5	2	0.16
MAS2-3	Narrow-leaved Sedge Mineral Shallow Marsh	G4?	S5	1	0.12
MAS2-4	Broad-leaved Sedge Mineral Shallow Marsh	G4G5Q	S5	1	0.02
MAS2-7	Bur-reed Mineral Shallow Marsh	G4G5Q	S4	1	0.12
MAS2-8	Rice-cut Grass Mineral Shallow Marsh	G?	S4	1	0.03
MAS2-9	Forb Mineral Shallow Marsh Type	G?	S5	1	0.09
MAS3-13	Water Willow Organic Shallow Marsh	G?	S4	2	0.31
Shallow Water Aquatic					
SAS1-2	Waterweed Submerged Shallow Aquatic	G5Q	S4S5	1	0.96
SAS1-4	Water Milfoil Submerged Shallow Aquatic	G?	S5	1	1.90
SAS1	Coontail Submerged Shallow Aquatic	?	?	1	3.01
SAF1-1	Water Lily-Bullhead Lily Floating-leaved Shallow Aquatic	G5	S5	2	6.08
OAO	Open Water	-	-	1	0.46
Total				**44**	**18.64**

The following descriptions highlight the diversity of discrete wetland communities, and the dominant floral component of each wetland type observed in the field. Classification of vegetation types follows ELC categories outlined in Lee *et al.* (1998). The physiognomic descriptions follow the life forms and cover types identified in the O.W.E.S. (OMNR 1993) and are outlined below:

- deciduous trees
- coniferous trees
- dead deciduous trees
- dead coniferous trees
- tall shrubs
- low shrubs
- dead shrubs
- herbs
- mosses
- robust emergents
- narrow-leaved emergents
- broad-leaved emergents
- floating plants (rooted)
- free floating plants
- submerged
- unvegetated

Detailed vegetation mapping of the study area is presented in Figures 4a & 4b. See Appendix 4 for photographs of representative vegetation types.

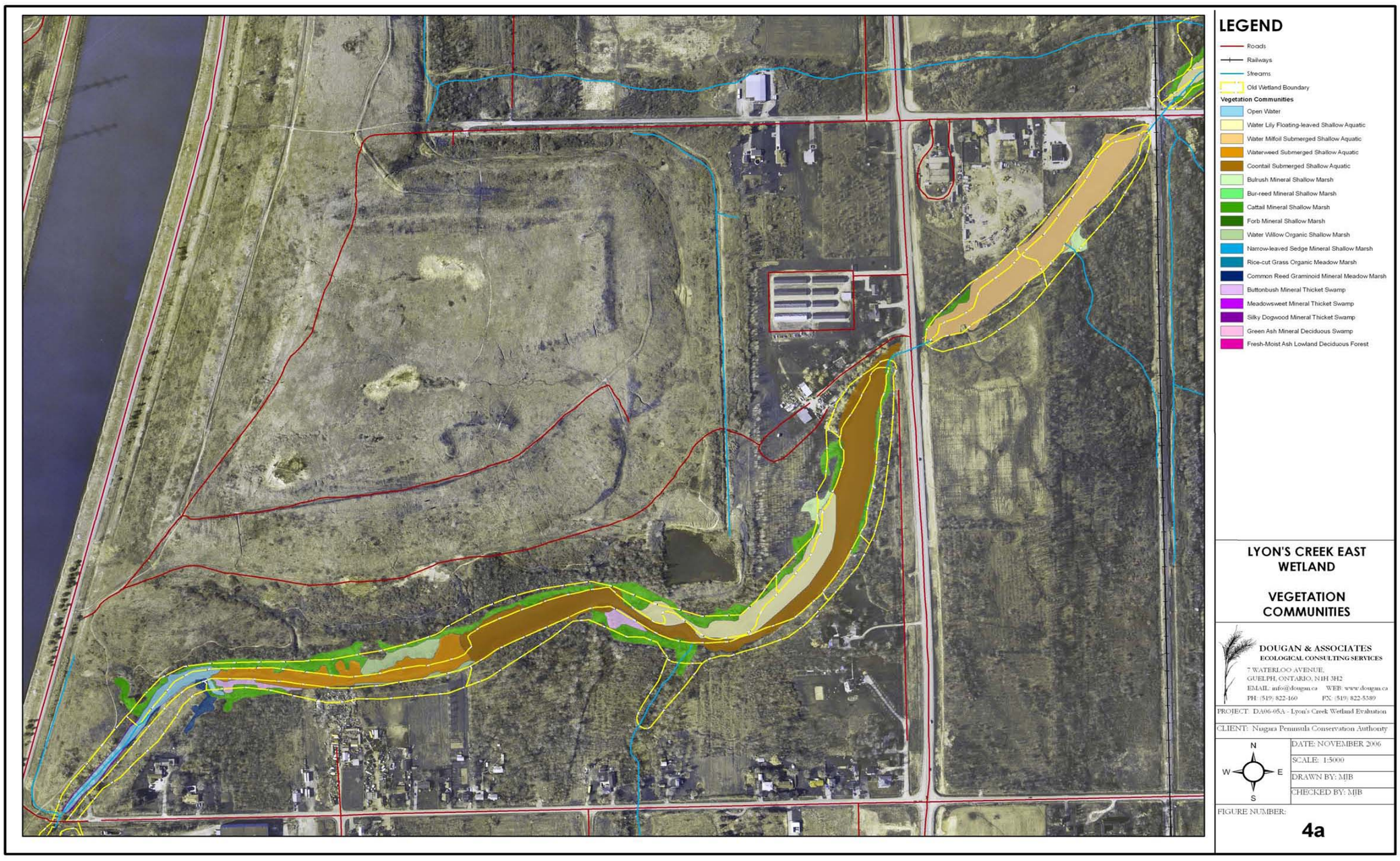

Figure 4a. Vegetation Communities – West Half.

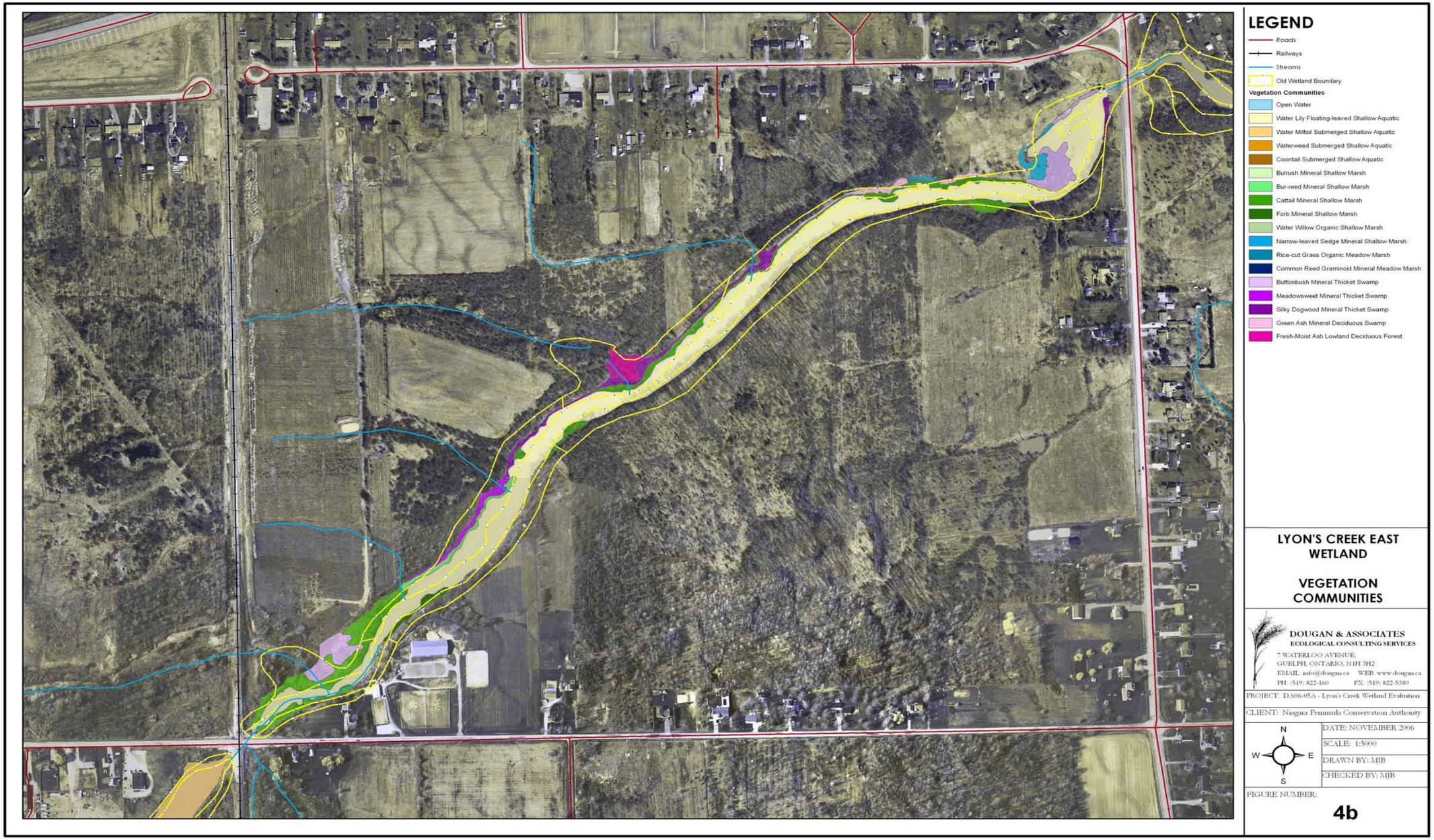

Figure 4b. Vegetation Communities – East Half.

1) Swamp

Deciduous Swamp

Deciduous Swamp (SWD) series occupies 0.33 ha of the study area. Typically, deciduous swamps occur adjacent to upland deciduous forest in low lying depressions and areas closer to shorelines, along floodplains, meander scars, banks, incised valleys etc. Moisture gradients in the study area tend to be short, quickly rising from permanently inundated conditions to drier, upland conditions, with very little floodplain, and small banks. Therefore, this community series is not well represented, nor overly diverse. As well, the long and varied disturbance history including agriculture, grazing, cutting and damming of the watercourse has reduced significant features associated with this community series.

SWD2-2 Green Ash Mineral Deciduous Swamp Type

Portions of a Green Ash Mineral Deciduous Swamp were sampled adjacent to upland deciduous plantation on the south-facing bank of Lyon's Creek. Much of this community is dominated by a narrow and linear deciduous canopy of Green Ash and Swamp Maple (*Acer x freemanii*) flanking Lyon's Creek. Less common associates include Reddish Willow (*Salix x rubens*) and American Elm. The understorey is composed mainly of a narrow band of tall shrubs including Silky Dogwood (*Cornus amomum* ssp. *obliqua*), Riverbank Grape (*Vitis riparia*), Red-berried Elder (*Sambucus racemosa*), Wild Red Raspberry (*Rubus idaeus* ssp. *melanolasius*), and Manitoba Maple (*Acer negundo*) saplings. The groundlayer is somewhat sparse and lacking in diversity, represented mainly by narrow-leaved emergents including Virginia Wild Rye (*Elymus virginicus*), and Hop Sedge (*Carex lupulina*). Herbs include Panicled Aster (*Symphyotrichum lanceolatum*), Virginia Knotweed (*Polygonum virginianum*), Sensitive Fern (*Onoclea sensibilis*), and Canada Clearweed (*Pilea pumila*).

Other sections recovering from past disturbance have a more broken canopy and a denser understorey layer. In these sections, Green Ash forms an open canopy with American Elm as a sub-dominant. The well developed understorey layer contains Silky Dogwood, Wild Red Raspberry, Green Ash saplings, Thicket Creeper (*Parthenocissus inserta*), Riverbank Grape and Common Buckthorn (*Rhamnus cathartica*). The groundlayer lacks diversity, and includes several herbs: Smooth Goldenrod (*Solidago gigantea*), Panicled Aster, Spotted Jewelweed (*Impatiens capensis*), Moneywort (*Lysimachia nummularia*), and Yellow Avens (*Geum aleppicum*). Narrow-leaved emergents are represented by Virginia Wild Rye. One provincially significant floral element was observed in this area. A single Pin Oak (S3 - relatively few populations, often 80 or fewer) individual was noted at this sample site in the sub-canopy.

Thicket Swamp

Thicket Swamp (SWT) series occupies 1.3 ha of the study area. Several swamp thicket types have developed along shoreline edges of Lyon's Creek and its banks. Buttonbush (*Cephalanthus occidentalis)* tends to dominate the deeper, flooded portions of the study area, though there are some areas better represented by Meadowsweet (*Spiraea alba*) and/or Silky Dogwood (*Cornus amomum* ssp. *obliqua)*, more typically associated with exposed areas not inundated with water.

SWT2-4 Buttonbush Mineral Thicket Swamp Type

Portions of this vegetation type were sampled near Doan's Ridge Road, the easterly limit of the study area. This section was inundated with water, up to approximately 70 cm, over mineral alluvial soils. Shrub canopy coverage was between 25-60 percent, likely due to the depth of standing water. Buttonbush forms the dominant tall shrub component, with Red-osier Dogwood (*Cornus stolonifera*), and Common Elderberry (*Sambucus canadensis*) as occasional associates where substrates are more exposed. The groundlayer is somewhat

sparse due to flooding, but includes a diverse mixture of cover types, namely robust emergents, narrow-leaved emergents, broad-leaved emergents, herbs, and free floating plants. Conspicuous robust emergent species include Large Bur-reed (*Sparganium eurycarpum*). Narrow-leaved emergents include Fringed Sedge (*Carex crinita*), Soft Rush (*Juncus effusus* ssp. *solutus*), Rice-cut Grass (*Leersia oryzoides*), Reed Canary Grass (*Phalaris arundinacea*), and Western Barnyard Grass (*Echinochloa wiegandii*). A number of broad-leaved emergents are present, including: Water Smartweed (*Polygonum amphibium)*, Dotted Smartweed *(Polygonum punctata*), Pennsylvania Smartweed *(Polygonum pensylvanicum*), and Broadleaf Arrowhead (*Sagittaria latifolia*). Herbs include Bulb-bearing Water Hemlock (*Cicuta bulbifera*), Ditch-stonecrop (*Penthorum sedoides*), and Moneywort. Free-floating plants include Lesser Duckweed (*Lemna minor*). One provincially significant floral element was observed in this area. A single immature Pin Oak (S3 - relatively few populations, often 80 or fewer) individual was noted at this sample site. This vegetation type (SWT2-4) is considered provincially rare by the NHIC (Bakowsky 1996), with a provincial rank of S3.

SWT2-6 Meadowsweet Mineral Thicket Swamp Type

A portion of this vegetation type was sampled between Doan's Ridge Road and the junction of the railway at Buchner Road. While not extensive in the study area, Meadowsweet thicket swamp forms a distinct unit on the south-facing bank of Lyon's Creek, above the high water mark, over mineral soil. Tall shrubs form the dominant cover type, represented by Narrow-leaved Meadow-sweet, with Buttonbush, and Silky Dogwood. A sparse deciduous tree component is represented by American Elm, and Green Ash, but does not reach 25 percent canopy coverage. Robust emergents are present, and include Cottongrass Bulrush (*Scirpus cyperinus*). Narrow-leaved emergents include Rough Bentgrass Western Barnyard Grass, and Soft Rush. Broad-leaved emergents are represented by Dotted Smartweed, Arrow-leaved Tearthumb, and Pennsylvania Smartweed. Herbs include Purple Loosestrife, Devil's Beggar's Ticks (*Bidens frondosa*), Moneywort, and Blueflag (*Iris versicolor*). No provincially or regionally significant flora was observed in this area.

SWT2-8 Silky Dogwood Mineral Thicket Swamp Type

Sections of this vegetation type were sampled midway between Doan's Ridge Road and the junction of the railway at Buchner Road. Often forming along the upper banks and portions of table land adjacent to Lyon's Creek, Silky Dogwood thicket swamp appears to avoid standing water, and has colonized past disturbed and degraded areas. Silky Dogwood forms the tall shrub component, along with Red-osier Dogwood, Narrow-leaved Meadow-sweet and Green Ash saplings. Low shrubs include Riverbank Grape and Thicket Creeper. Herbs include Sensitive Fern, Smooth Goldenrod (*Solidago gigantea*), Spotted Jewelweed, Panicled Aster, and Yellow Iris (*Iris pseudacorus*). Narrow-leaved emergents include Rice-cut Grass, Fowl Manna Grass, and Soft Rush. No provincially or regionally significant flora was observed in this area. This vegetation community is considered provincially rare to uncommon by the NHIC (Bakowsky 1996), with a provincial Srank of S3S4 (S3S4 indicates a range of uncertainty about the status of the community, between vulnerable and apparently secure).

2) Marsh

Meadow Marsh

Meadow Marsh (MAM) series makeup 0.15 ha of the study area. Meadow marshes often occur along shorelines and wet depressions and have saturated substrates often seasonally flooded, and can either be mineral, organic, or varying degrees of the two. Vegetation

consists of a closed canopy of graminoids, forbs, or a combination of both. Woody cover is often present, less than 25 percent, and is often transitional to thicket swamps.

MAM2 Common Reed Graminoid Mineral Meadow Marsh

This vegetation type is not listed in the first ELC approximation, yet updated versions of the ELC Community Catalogue obtained from Harold Lee (pers. com.) include this as a distinct vegetation type (MAMM1-12 – Common Reed Graminoid Mineral Meadow Marsh Type). A section of this vegetation type was sampled to the west of Highway 140 along the lower portion of the bank in a small embayment of Lyon's Creek on the north-facing bank. The dominant cover types in this unit include robust emergents, tall shrubs, and a minor broad-leaved emergent and free-floating plant component. Robust emergent vegetation includes Common Reed (*Phragmites australis*), Broad-leaf Cattail (*Typha latifolia*), and Large Bur-reed. Broad-leaved emergent species include Pennsylvania Smartweed and Dotted Smartweed. Free-floating plants included Lesser Duckweed and Common Water-flaxseed (*Spirodela polyrhiza*). No provincially or regionally significant flora was observed in this area.

Shallow Marsh

Shallow Marsh (MAS) series makeup 4.45 ha of the study area. Shallow marshes with water up to 2 metres deep typically contain more rooted herbaceous emergent macrophytes than meadow marshes. Dominant species invariably include Bur-reeds (e.g. *Sparganium eurycarpum*), cattails (*Typha spp.*), Bulrushes (*Scirpus spp. Schoenoplectus spp.*), Water Willow (*Decodon verticillatus*) and a variety of sedges, forbs and grasses more adapted to flooded conditions.

MAS2-1 Cattail Mineral Shallow Marsh Type

This vegetation type is the second largest in spatial extent in the study area, with a total of fourteen discrete units. Cattail Mineral Shallow Marsh occupies the shallow water fringes flanking Lyon's Creek up to about 1 m deep, often forming long linear units defining the limits of the shallow marsh - shallow water boundary continuum. Cover types represented in this vegetation type include robust emergents, herbs, narrow-leaved emergents, tall shrubs, broad-leaved emergents, and free floating plants. The dominant cover type are robust emergents, namely Broad-leaf Cattail, Narrow-leaved Cattail (*Typha angustifolia*) and Hybrid Cattail (*Typha x glauca*), with Soft-stemmed Bulrush (*Schoenoplectus tabernaemontani*), Cottongrass Bulrush, Woolgrass Bulrush (*Scirpus atrovirens*), and Large Bur-reed. Narrow-leaved emergents include: Reed Canary Grass, Rice-cut Grass, Three-way Sedge (*Dulichium arundinacea*), Shallow Sedge (*Carex lurida*), Straw-colored Umbrella Sedge (*Cyperus strigosus*), Soft Rush, Western Barnyard Grass, Hop Sedge, Rough Bentgrass (*Agrostis scabra*), and Fox Sedge (*Carex vulpinoidea*). A tall shrub component of less than 25 percent includes Buttonbush, Glossy Buckthorn (*Rhamnus frangula*), and Silky Dogwood. Conspicuous herbs include the following: Spotted Jewelweed, Devil's Beggar's Ticks, Swamp Milkweed (*Asclepias incarnata*), Canada Clearweed, and Panicled Aster. Broad-leaved emergents are represented by Broadleaf Arrowhead, Arrow-leaved Tearthumb (*Polygonum sagittatum*), Pennsylvania Smartweed, and Dotted Smartweed. Free-floating plants include Lesser Duckweed, Common Water-flaxseed and Columbia Watermeal (*Wolffia columbiana*). One provincially significant floral element was observed in this unit – Smartweed Dodder (*Cuscuta polygonorum*), with a provincial rank of SH (Possibly Extirpated (Historical)—species occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered).

MAS2-2 Bulrush Mineral Shallow Marsh Type

Two Bulrush Mineral Shallow Marshes were identified in the study area, of which one was sampled west of Highway 140. Several cover types make up this community including robust emergents, narrow-leaved emergents, herbs, and free floating plants. Important robust emergents include Soft-stemmed Bulrush, Cottongrass Bulrush, and Large Bur-reed. Narrow-leaved emergents include Bald Spikerush (*Eleocharis erythropoda*), Rough Bentgrass, Rice-cut Grass, Straw-colored Umbrella Sedge, Soft Rush, Western Barnyard Grass, Hop Sedge, and Fox Sedge. Herbs include Arrow-leaved Tearthumb, Blueflag, Purple Loosestrife, and Swamp Milkweed. Free floating plants are represented by Lesser Duckweed and Common Water-flaxseed. No provincially or regionally significant flora was observed in this area.

MAS2-3 Narrow-leaved Sedge Mineral Shallow Marsh Type

A notable unit of this vegetation type was sampled just west of Doan's Ridge Road, in a small embayment of Lyon's Creek. This wetland unit is situated in the upper portion of the flooded zone of Lyon's Creek, with standing water through to saturated conditions without little water, creating a diverse plant community within a small area. Important cover types include narrow-leaved emergents, robust emergents, broad-leaved emergents, herbs, and tall shrubs. Conspicuous narrow-leaved emergents include: Shallow Sedge, Rice-cut Grass, Western Barnyard Grass, Soft Rush, Straw-colored Umbrella Sedge, Bald Spikerush, Fowl Manna Grass (*Glyceria striata*), Blunt Broom Sedge (*Carex tribuloides*), and Bebb's Sedge (*Carex bebbiana*). Robust emergents include Cottongrass Bulrush, Large Bur-reed and Woolgrass Bulrush. Broad-leaved emergents include Arrow-leaved Tearthumb, Pennsylvania Smartweed, Dotted Smartweed, and Broadleaf Arrowhead. No provincially or regionally significant flora was observed in this area.

MAS2-4 Broad-leaved Sedge Mineral Shallow Marsh Type

This small unit represents an inclusion too small to map, but distinct from surrounding wetland communities. It occupies a portion of a low, exposed shoreline subject to some drawdown, receiving intermittent exposure. Plant cover includes narrow-leaved emergents, broad-leaved emergents, and free-floating plants. Straw-colored Umbrella Sedge was the species of highest visual coverage, with Bald Spikerush, Western Barnyard Grass, Rice-cut Grass, Dudley's Rush (*Juncus dudleyi*) and Soft Rush also attaining notable coverage. Broad-leaved emergents include Dotted Smartweed and Arrow-leaved Tearthumb. Free-floating plants include Common Water-flaxseed. No provincially or regionally significant flora was observed in this area.

MAS2-7 Bur-reed Mineral Shallow Marsh Type

One small Bur-reed Mineral Shallow Marsh unit was sampled west of Highway 140, halfway to the Welland Canal. Large Bur-reed forms almost pure stands with little else growing with it, except for a broad-leaved emergent and tall shrub component. Broad-leaved emergents are limited to Broadleaf Arrowhead and Water Smartweed (*Polygonum amphibium*). A small tall shrub component included Buttonbush near the fringe of the unit. No provincially or regionally significant flora was observed in this area.

MAS2-8 Rice-cut Grass Mineral Shallow Marsh Type

A small Rice Cut-grass Mineral Shallow Marsh unit was sampled on the south-facing shore of Lyon's Creek west of Doan's Ridge Road. Cover forms represented in this vegetation type include narrow-leaved emergents, broad-leaved emergents, herbs, and tall shrubs. Rice-cut Grass forms the dominant narrow-leaved emergent cover at the exclusion of most other species, with Reed Canary Grass. Broad-leaved emergents are represented by Large Bur-reed. Herb diversity is low, with Dotted Smartweed being fairly conspicuous. Tall shrubs

include Buttonbush and Silky Dogwood. No provincially or regionally significant flora was observed in this area.

MAS2-9 Forb Mineral Shallow Marsh Type
A small forb dominated shallow marsh was sampled near the junction of Buchner Road and the railway embankment. A number of broad-leaved emergents dominated this unit to the exclusion of others, represented by several smartweeds, including Pennsylvania Smartweed, and Dotted Smartweed. Water smartweed was also present, in its floating leaved form. No provincially or regionally significant flora was observed in this area.

MAS3-12 Water Willow Organic Shallow Marsh Type
Two Water Willow shallow marsh units were documented and sampled on either side of the main channel of Lyon's Creek, west of Highway 140. These units are permanently flooded over organic and mineral substrates occupying the creek margins, held together by a floating mat of roots. Plant cover includes broad-leaved emergents, herbs, robust emergents, tall shrubs, and free floating plants. Broad-leaved emergents include Water Willow (*Decodon verticillatus*), Pennsylvania Smartweed, Dotted Smartweed, and Broadleaf Arrowhead. Herbs include Spotted Jewelweed, Purple Loosestrife, Northern Bugleweed (*Lycopus uniflorus*), and Devil's Beggar's Ticks. Robust emergents include mainly Broad-leaf Cattail. Tall shrubs are represented by Buttonbush. Free floating plants include Common Water-flaxseed and Lesser Duckweed. No provincially or regionally significant flora was observed in this area.

3) Shallow Water

Submerged Shallow Aquatic

Submerged Shallow Aquatic (SAS) series make up 5.87 ha of the study area and are dominated by >25 percent submerged macrophytes. Water regime is permanently flooded with moderate to slow water movement, not excessively disturbed by water current action. Species composition varies, but typically is low in overall plant diversity, with a few dominant species. With the exception of one area, the submerged aquatic communities are largely composed of native species. However, Eurasian Water Milfoil (*Myriophyllum spicatum*) was present in large quantities between the junction of the railway at Buchner Road and Highway 140. There was very little emergent vegetation growing in this area, and it is possible that disturbance from road and railway construction have altered the hydrologic regime, resulting in a change in the vegetation communities in this portion of the wetland favouring the spread of the aggressive Eurasian Water Milfoil.

SAS1 Coontail Submerged Shallow Aquatic
This vegetation type is not represented in the first ELC approximation. However, updated versions of the ELC Community Catalogue obtained from Harold Lee (pers. com.) include this as a distinct vegetation type (SAS1-8 – Coon-tail Submerged Shallow Aquatic Type). Plant cover types in this area include submerged and free-floating plants. Prominent submerged species include Coontail (*Ceratophyllum demersum*) and Canada Waterweed (*Elodea canadensis*), limited to areas with no discernable flow. Tapegrass (*Vallisneria americana*), Eurasian Water Milfoil, Slender Pondweed (*Potamogeton pusillus*), Leafy Pondweed (*Potamogeton foliosus*) and Sago Pondweed (*Stuckenia pectinata*) were found in closer association with water movement where the channel narrows. Free-floating species include Lesser Duckweed, Common Water-flaxseed, and Columbia Watermeal. No provincially or regionally significant flora was observed in this area.

SAS1-2 Waterweed Submerged Shallow Aquatic Type

This vegetation type was sampled west of Highway 140, midway towards the Welland Canal. Submergent cover often dominates, with some floating-leaved and free-floating plant cover, and robust emergent and broad-leaved emergent cover as well. In some sections closer to the Welland Canal, submergent cover is reduced, with more unvegetated, open water portions with stronger currents. Important submergents include Canada Waterweed, Coontail, Tapegrass and Eurasian Water Milfoil. Each species tends to be widespread within the unit, but often forming sporadic, smaller pure stands of varying density. Floating-leaved species are limited to Fragrant White Water-lily and Water Smartweed, attaining good coverage around shorelines and small sheltered areas with no flow. Free-floating plants occur scattered throughout the unit, and include Lesser Duckweed and Common Water-flaxseed. Robust emergent cover is not well represented, but includes Broad-leaf Cattail and Large Bur-reed. Broad-leaved emergents include Broadleaf Arrowhead near shoreline fringes. No provincially or regionally significant flora was observed in this area.

SAS1-4 Water Milfoil Submerged Shallow Aquatic Type

This vegetation type was sampled between the junction of the railway at Buchner Road and Highway 140. Submergent vegetation cover dominates, creating thick impenetrable stands, choking out other vegetation. Submergent, free-floating plant and robust emergent cover is present. Submergents include the aggressive Eurasian Water Milfoil, along with Canada Waterweed, and Coontail. Free-floating species include Common Water-flaxseed, Lesser Duckweed and Columbia Watermeal. Robust emergent cover is limited to the near-littoral zone of the unit, represented by Large Bur-reed. No provincially or regionally significant flora was observed in this area.

Floating-leaved Shallow Aquatic

Floating-leaved Shallow Aquatic (SAF) series makeup 6.08 ha of the study area. Water regime is permanently flooded with little to no water movement, lacking in wave energy and current. Few species dominate, with well developed beds of Fragrant White Water-lily (*Nymphoides odorata*), and a high vegetative cover value (upwards of 95%). Submergent macrophytes are also present in areas with little current, but attain a low cover value.

SAF1-1 Water Lily – Bullhead Lily Floating-leaved Shallow Aquatic Type

This vegetation type attains the largest coverage in the study area. A representative unit of this vegetation type was sampled along the stretch of Lyon's Creek between Doan's Ridge Road and the junction of the railway at Buchner Road. Here, it occupies the shallow water portions of Lyon's Creek, were flow is reduced as the channel widens out. Plant cover includes floating plants, submerged, free-floating plants, and robust emergents. Floating plants are limited to Fragrant White Water-lily and Water Smartweed. Submergents include Canada Waterweed, Coontail, Curly Pondweed (*Potamogeton crispus*), and Slender Naiad (*Najas flexilis*). Tapegrass occupies the deeper portions of the channel where discernable water current is present. Free-floating plants include Lesser Duckweed, Common Water-flaxseed, Star Duckweed (*Lemna trisulca*), and Columbia Watermeal. Robust emergent cover is sparse, and includes Soft-stemmed Bulrush. No provincially or regionally significant flora was observed in this area.

Open Water

The remaining o.46 ha of habitat consists of open water, with no discernable vegetation cover.

3.2.1.2 Vascular Plants

Field inventories conducted August 30th and September 8th, 2006 recorded a total of 126 vascular plants representing 43 families and 81 genera. A checklist of all vascular plant species documented from the study area is included in Appendix 5. Of these, 108 species, or 86 percent are considered native to the flora of Ontario. The proportion of native species associated with the study area is considered high. No COSEWIC (2006) or OMNR (2006) listed species at risk were documented. Two nationally / provincially rare species were documented, including Pin Oak and Smartweed Dodder. No regionally rare species were observed.

3.2.2 Wildlife Resources

3.2.2.1 Amphibian Monitoring

Three nocturnal visits were made to the study in 2006 area to monitor calling frogs and toads. Weather conditions during the April 12th visit were overcast and mild (12 °C) with a gentle breeze (Beaufort 3) from the south. The next visit on May 30th took place under very warm temperatures (26 °C) and partly cloudy skies. There was only light air movement from the south (Beaufort 1). Temperatures were also warm (24 °C) on the final, June 29th visit. Skies were overcast and calm.

Six species of frogs and toads were documented over the course of the three survey visits from the nine monitoring stations (Appendices 6 & 7). Documentation was also provided for an additional there locations near the established monitoring locations. The first was a pond near Amphibian Monitoring station A3. The next one was a stormwater management (swm) pond next to station A4, and the last location corresponded to the fields east of station A6. There were no new species documented at these three additional locations that were not already documented from the 7 established monitoring stations.

None of the calling frogs or toads heard during these three nocturnal monitoring survey visits are designated as 'Species at Risk'. That is, none of them are designated to be "Special Concern", Threatened" or "Endangered" in Canada (COSEWIC, 2006) or Ontario (OMNR, 2006). Furthermore, all them are described as either "Secure" or "Apparently Secure" in Ontario by the Natural Heritage Information Centre (NHIC, 2006d). Plourde et al. (1989) also considered all six species to be "abundant and widespread" in the Ministry of Natural Resources' former 'Central Region', except for American Bullfrog which was assigned a status of "common and widespread".

Of the six species, American Bullfrog (*Rana catesbeiana*) is thought to be area sensitive (OMNR, 2000). That is, it requires a relatively large area of suitable habitat for its long-term survival. Area sensitive species may be more susceptible to habitat loss and fragmentation than generalist species and therefore of greater conservation concern.

Full choruses were noted at monitoring stations A5, A6 and in the fields east of A6. American Toads and Spring Peepers were associated with A5 and A6 while the same two species plus Western Chorus Frog were noted from the fields east of A6. Despite not being classified a full chorus, good numbers of Green Frogs were also encountered. Slightly lower numbers of Northern Leopard Frog were scattered throughout. Both the Green Frog and Northern Leopard Frog were the most widespread species occurring at seven of the nine monitoring stations each, as well as two of the three additional areas supporting breeding activity. The

least commonly recorded species was Western Chorus Frog. Aside from the April 12th full chorus from the fields east of A6, it was only documented from A1 (North) and A1 (South). Next least common was Spring Peeper and American Bullfrog, both reported from four of the nine monitoring stations and the two ponds outside the creek.

3.2.2.2 Bird Monitoring

Forty-four breeding bird species were documented over the course of the two June 2006 survey visits (Appendix 8). Forty-two species were observed on June 5th and 32 species were observed on June 22nd. Weather conditions were sunny, clear and cool (12 °C) on June 5th. Light air movement (Beaufort 1) was from the northeast. Weather conditions were overcast and warm (23 °C) on June 22nd, with a slight breeze (Beaufort 2) from the south.

None of the breeding bird species are designated as 'Species at Risk'. That is, none of them are designated "Special Concern", "Threatened", or "Endangered" in Canada (COSEWIC, 2006) or Ontario (OMNR, 2006). Furthermore, none of the species are considered provincially significant (i.e. have provincial conservation rank of S1, S1S2, S2, S2S3, or S3). All of the species had a provincial conservation rank of "Secure" or "Apparently Secure" (NHIC, 2006f).

At a regional scale, nine of the species have been designated priority landbird species for conservation in Bird Conservation Region (BCR) 13 by Ontario Partners in Flight (OPIF, 2006). BCR 13, the Lower Great Lakes – St. Lawrence Plain, corresponds roughly with the area south of the Canadian Shield. The nine species were:

1. American Kestrel *(Falco sparverius*) – B2
2. Belted Kingfisher (*Ceryle alcyon*) – B10
3. Northern Flicker (*Colaptes auratus*) – B4, B8
4. Eastern Wood-Pewee (*Contopus virens*) – B10
5. Willow Flycatcher (*Empidonax trailii*) – B1, B2, B9
6. Eastern Kingbird (*Tyrannus tyrannus*) – B8
7. Brown Thrasher (*Toxostoma rufum*) – B8
8. Rose-breasted Grosbeak (*Pheucticus ludovicianus*) – B6, B8, B9, B11
9. Baltimore Oriole (*Icterus galbula*) – B4, B6, B8, B10

Ontario Partners in Flight is a coalition of government agencies and organizations led by Environment Canada Ontario Region (EC) and the Ontario Ministry of Natural Resources (OMNR), in partnership with Bird Studies Canada (BSC).

These nine regionally significant bird species were found at 8 of the 11 point count stations. Only point count stations B3, B5 and B7 did not yield any regionally significant breeding bird species. The highest number of regionally significant breeding bird species was recorded at point count station B8, five. Most supported between one and three regionally significant species. Of the nine regionally significant species most of them were associated more with the adjacent riparian habitat than the wetland polygon themselves.

Local (i.e. Regional Municipality of Niagara) status was not assessed. The List of Significant Breeding Bird Species for the Town of Fort Erie, prepared for the Town of Fort Erie's Natural Areas Inventory (Dougan & Associates, 2003), did assess the distribution of breeding bird species in the Regional Municipality of Niagara but was not used because that assessment

was based on only two out of five years of Ontario Breeding Bird Atlas data and has not been updated to use the most current atlas information.

Due to the stationary nature of the breeding bird counts, it wasn't always possible to determine which breeding bird species were directly associated with the wetland communities along Lyon's Creek. For example, many may be terrestrial edge species that occasionally venture in the wetland communities while foraging. Nevertheless, it is reasonable to say that at least 11 of the 44 species documented in June 2006 were likely directly associated with the wetland communities. The 11 species are indicated in bold in Appendix 8. Of these 11, only one is considered significant; Belted Kingfisher (*Ceryle alcyon*). It is significant in BCR 13 (OPIF, 2006).

It is also worth mentioning that additional breeding bird data was collected while conducting the nocturnal amphibian (calling frog and toad) monitoring surveys. Although this was collected incidentally, there is no reason why the collection of this data could not be incorporated into the protocol used to document most diurnal passerines during the 'main' breeding season in June. This year, observations on April 12th 2006 included single Wilson's Snipe (*Gallinago delicata*) at stations A5 (B7) and A6 (B10), and single American Woodcock (*Scolopax minor*) at stations A1 (B1) and A6 (B10). An Eastern Screech-Owl (*Megascops asio*) was also heard calling at station A3 (B4). No other nocturnal bird observations were noted during the May 30th and June 29th visits. It is also important to note that in the case of Wilson's Snipe and American Woodcock, neither of these species were likely directly associated with the creek, although its presence nearby might have helped influence their choice to breed in the area.

3.2.2.3 Miscellaneous Observations

Miscellaneous Observations Made During Vegetation Inventories
The following noteworthy wildlife observations were made during the vegetation inventory visits:

- Northern Watersnake (*Nerodia sipedon sipedon*) – Two Northern Watersnakes were observed on separate occasions on September 8th, 2006. The first was a medium sized individual that was under cover of a large piece of plywood at the edge of Lyon's creek in a Cattail Mineral Shallow Marsh. When observed, the snake fled into open water. The second was a large individual observed swimming near the western limit of the study area in open water.
- Midland Painted Turtle (*Chrysemys picta marginata*) – Five Midland Painted Turtles were observed on the September 8th visit. These individuals were basking on exposed woody debris in Water Lily – Bullhead Lily Floating-leaved Shallow Aquatic vegetation.
- Black-crowned Night-Heron (*Nycticorax nycticorax*) – Black-crowned Night-herons were observed on two occasions; during the August 30th visit (1 individual) and the September 8th visit (3 individuals). On both occasions, adults were observed perched on low over-hanging woody vegetation on the lower portion of a steep north-facing bank, presumably foraging. These individuals were flushed from these locations upon approach.
- Orange Bluet (*Enallagma signatum*) – Countless individuals were observed in late afternoon on September 8th. Concentrations of individuals were noted in Waterweed Submerged Shallow Aquatic and Water Lily – Bullhead Lily Floating-leaved Shallow aquatic vegetation. Individuals were observed in tandem, depositing eggs on floating vegetation.

Colonial Bird Nest Search Survey

On November 2nd 2006 an additional visit was made to the study area to see if any nests of colonial nesting birds were visible. The majority of the leaves of the trees and shrubs had fallen off allowing an effective search to be completed. The entire length of the creek within the study area was canoed slowly over a period of approximately 3 hours. Occasional stops were made along the way to look at plants. Overall, it appears that Lyon's Creek does not support a significant population of breeding herons, at least within the study area. Large sections of the shoreline are relatively open and dominated by a variety of shrub species. Only 4 potential heron nests were noted, 3 of which were located in relatively close association to one another. All 4 were in the section of the creek west of Hwy 140. Although, not 100% certain, the nests appeared to more closely resemble those of Green Herons than Black-crowned Night-Herons in size and location (Sandilands, 2005).

Miscellaneous Observations during the Colonial Bird Nest Search Survey

The following wildlife species were noted during the November 2nd 2006 colonial bird nest search survey. Species are listed in taxonomic order:

- Great Blue Heron (*Ardea herodias*) – One individual was flushed from the creek, west of Hwy. 140. This individual was likely a migrant instead of a lingering local bird.
- American Black Duck (*Anas rubripes*) – Approximately 30 individuals were observed, mostly east of Hwy. 140. They were observed mingling with larger numbers of Mallards. No other waterfowl species were present in these groups. These birds likely represented either migrating birds or local residents in the area.
- Mallard (*Anas platyrhynchos*) – Over 80 birds were observed during the survey, with the largest numbers east of Hwy 140. Aside from American Black Duck, no other duck species were present in theses mixed groups. Although suitable nesting habitat was present along the creek, the relatively large numbers present strongly suggest that they were either migrants or locally occurring species.
- Red-bellied Woodpecker (*Melanerpes carolinus*) – A single male was first encountered halfway between the start of the creek and Hwy 140. It was actively heard vocalizing. Ultimately it flew NE along the creek corridor and was later observed in some mature residential trees bordering the creek immediately west of Hwy 140. Since this species is generally non-migratory, this individual was thought to be a locally occurring bird. It is possible it may have even nested in the forested areas adjacent to the creek.
- Northern Mockingbird (*Mimus polyglottos*) – A single bird was observed flying south across the creek halfway between the start of the creek and Hwy. 140. Although it may not necessarily utilize the wetland habitats along the creek on a regular basis, it is considered to be a local resident of the area.
- Fox Sparrow (*Passerella iliaca*) – Two separate groups of were encountered along the banks of creek totally 4 or 5 birds. These birds were migrants. They were not necessarily associated with the wetland.
- Rusty Blackbird (*Euphagus carolinus*) – Approximately two birds were heard flying over the creek. These birds were migrants and may not have even associated with the study area.
- Muskrat (*Ondatra zibethicus*) – Numerous Muskrat houses (15+) were observed along the length of Lyon's Creek.
- White-tailed Deer (*Odocoileus virginianus*) – Two individuals were observed along the north shore, both east of Hwy. 140.

5 DISCUSSION

5.1 Significant Features

Lyon's Creek East Wetland supports a number of functions, habitats and species of notable significance. Previously recorded important functions outlined in the Lyon's Creek wetland data record include: nesting colonial waterbirds; winter cover for wildlife; waterfowl production (of local significance); and significance for fish spawning and rearing (NHIC 2006b). However, because the Lyon's Creek Wetland boundary extends beyond the limits of our study area, it is not clear whether these functions also apply to the area west of Doan's Ridge Road. Significant features mentioned included provincially and regionally significant wildlife species. For a more detailed discussion of these species, the reader is referred to Section 3.1.3.

The current study found additional features including provincially rare species and vegetation communities. Rarity is often a factor that makes a species or community more vulnerable to natural and anthropogenic induced extirpation, and is therefore of conservation interest. The provincially significant element occurrences found within Lyon's Creek are of elevated importance due to the protected status afforded by the Provincially Significant Wetland (PSW) designation. These provincially rare features are described in more detail below, and mapped in Figures 5a and 5b.

3.3.1 Vegetation Resources

3.3.1.1 Significant Vascular Plants

As noted earlier, two significant vascular plant species were documented from the study area. Species listed in Table 3.6 represent provincially rare taxa found during the current study at Lyon's Creek East.

Table 3.6. Significant vascular plant species observed in the study area.

Species	Grank	Nrank	Srank	Status	Source
Cuscuta polygonorum	G5	NH	SH	Provincially Rare	NHIC (2006a)
Quercus palustris	G5	N3	S3	Provincially Rare	NHIC (2006a)

***Cuscuta polygonorum* (Smartweed Dodder)**

Description

Smartweed Dodder is a native, annual herb of the Cuscutatceae (Dodder) family. This family is composed of rootless, achlorophyllous (lacking chlorophyll), holoparasitic annuals or infrequently perennial herbs that attach to host plants by intrusive haustoria (suckers); at which point they obtain all their food and water from a host (Costea & Tardif, 2006). These plants have evolved special adaptations to ensure their success, whereby germination occurs late in the season when potential hosts are well established. *C. polygonorum* is parasitic on species of *Polygonum*, but also occasionally on *Impatiens, Ipomoea, Lycopus Penthorum*, and *Xanthium* (Costea *et al*. 2006).

Figure 5a. Significant Features – West Half.

Figure 5b. Significant Features – East Half.

Status

Prior to its discovery at Lyon's Creek, this species had a national rank of NH (Historical) (Argus & Pryer 1990), and a provincial rank of SH [possibly extirpated (historical)] (NHIC 2006a), not having been confirmed in recent years in Canada or Ontario. Thus, the Lyon's Creek population represents the first recently documented record of this species, updating its status to N1 nationally, and S1 provincially (critically imperilled, 5 or fewer occurrences). There are no other known extant records for this species as of the writing of this report. Crins and Ford (1987) listed *C. polygonorum* in the Atlas of Rare Vascular Plants of Ontario, but searches of herbaria did not locate a supporting specimen, despite Scoggan's (1978-79) report of an early collection from Amherstburg in southwestern Ontario. Personal communication with Mike Oldham (2006), provincial Botanist with the NHIC, raised the probability of a specimen residing at the Benedict Herbarium at the University of Windsor (WOCB), collected September 3rd, 1964 by W.G. Benedict from Point Pelee.

Habitat

The reported habitat preference of this species is somewhat conflicting. Crins and Ford (1987) describe the habitat from Point Pelee as sandy, open woods, where it was parasitic on an introduced species of Morning Glory (*Ipomoea*). Palmer & Steyermark (1935) describe habitat for *C. polygonorum* in Missouri as moist ground along streams, ponds, prairies and thickets, parasitic on species of *Polygonum* and other herbs. Ferguson (1926) notes *Cuscuta* species in New York (including *C. polygonorum)* preferred swamps, bogs, swampy woods, and borders of ponds and streams, [parasitic] on shrubs and herbs. At Lyon's Creek, the habitat association is more similar to those described by Palmer and Steyermark (1935) and Ferguson (1926), being a Cattail Mineral Shallow Marsh, with numerous hydrophytic emergent and herbaceous indicators over fine-textured alluvial substrates. A total of 4.6 ha or 25 percent of the study area is composed of similar graminoid and forb dominated shallow marsh, suggesting that suitable habitat for this species is prevalent. In addition, the majority of these shallow marsh units contain conspicuous populations of several host *Polygonum* species, most notably *P. pensylvanicum*, *P. punctatum*, *P. sagittatum* and *P. amphibium*.

Photo 1. Provincially Rare Smartweed Dodder (*Cuscuta polygonorum*) (credit S. Brinker, 02-11-2006)

The location of *C. polygonorum* in the study area and its association with intermittently flooded habitat along Lyon's Creek is of interest. Since the natural flow regime and flood dynamics of Lyon's Creek have been modified by the construction of the Welland Canal and several roadways, it is unclear whether or not this has benefited the species. Flooding may help maintain suitable open habitat conditions for the species, however not enough is known about the biology of this species to draw conclusions. Costea *et al* (2006) note a scarcity of information regarding the reproductive biology, seed dispersal and evolution of this genus. The capsules and seeds of *Cuscuta* are known to float, yet water dispersal has not been clearly documented. It is also reported that dodder seeds can remain viable in substrates for 20 years or more (Lanini & Kogan 2005). Therefore, it is reasonable that this species could colonize other suitable habitat along Lyon's Creek where its host plants are conspicuous, and adapt to dynamic hydrologic regimes as part of the soil seedbank.

Recommendations:
Further field investigations are required to assess the overall extent and population status of this highly significant species, last reported in Ontario in 1964. Considering this is the only extant population in Ontario currently known, all efforts to minimize disturbance to its habitat should be made. Due to the amount of suitable habitat (4.6 ha) in the study area, further searches for this species along the length of Lyon's Creek in similar shallow marsh habitat are warranted. Monitoring of Smartweed Dodder is also recommended to assess its current status (i.e., is the population shrinking, expanding, or maintaining current levels), threats, and to determine possible management strategies if any remediation works are to be carried out.

***Quercus palustris* (Pin Oak)**

Description
Pin Oak is a native monoecious, deciduous tree of the Fagaceae (Beech) family with a fibrous, shallow root system that allows it to tolerate flooded soil conditions.

Status
Nationally, Argus and Pryer (1990) list this species as N3 (rare to uncommon). Found only in in Ontario, it is restricted to the Carolinian Zone. Pin Oak is also considered rare in Ontario with a rank of S3, but is generally common in the Niagara Region.

Habitat
Pin Oak is usually associated with glacial till plains, clay plains and alluvial soils. It prefers slightly acid soil conditions, and is sensitive to pH ranges above the high 6's (Gilman & Watson 1994). Habitat preferences include edges of stream banks, vernal pools, flood plains, and bottomlands. Accordingly, Pin Oak grows well in areas where water stands for several weeks at a time. Pin Oak is intolerant of shade, and is characteristic of early successional stages of bottomland forests, often replacing species such as Buttonbush, Black Willow (*Salix nigra*), and Eastern Cottonwood (*Populus deltoides*) (USDA 2006). Four incidental observations of Pin Oak individuals were recorded in the study area, in shrub thicket and open deciduous swamp habitat, where shade was not a limiting factor. Pin Oak was also noted as a co-dominant in adjacent upland habitat between the Welland Canal and Highway 140 on the south side of Lyon's Creek, just outside of the study area. Due to it's conspicuousness in the region, no attempt was made to fully document it in the surrounding environs.

Recommendations:
Continued vegetation sampling and monitoring at Lyon's Creek should be sufficient to track this species, and help document its distribution and status, at which point management options can be determined if needed.

3.3.1.2 Significant Vegetation Communities

As outlined previously, two provincially significant vegetation communities were documented from the study area according to those defined by Bakowsky (1996), and are summarized in Table 3.7.

Table 3.7. Provincially rare vegetation community types documented in the study area.

Vegetation Type	6E	7E	Grank	Srank
SWT2-4 Silky Dogwood Mineral Thicket Swamp Type		X	G5	S3S4
SWT2-8 Buttonbush Mineral Thicket Swamp Type	X	X	G4	S3

Silky Dogwood Mineral Thicket Swamp Type

Description
This thicket swamp community appears to be succeeding more open meadow marsh habitat where periods of inundation are short or absent. Soils tend to be fine-textured alluvial. According to NatureServe (2006), stands are found along streams and lakes, or in upland depressions, with variable hydrology, but are typically seasonally flooded. Soils are wet, organic, and minerotrophic, with either highly decomposed peat or fine mineral soils.

Status
With a rank of S3S4, a range of uncertainty about the status of this community exists in Ontario, where it is currently considered vulnerable - to - apparently secure. According to Bakowsky (1996), it is restricted to Ecoregion 7E, and Niagara represents an area where it more commonly occurs. Close to 0.5 ha of this community type occurs in the study area, in thin discontinuous linear strips flanking Lyon's Creek, where suitable conditions are maintained.

Recommendations
Due to the abundance of this community in the region, its current status, and its overall lack of representation in the study area, no specific management needs are recommended, aside from continued monitoring to track its spatial extent.

Buttonbush Mineral Thicket Swamp Type

Description
According to NatureServe (2006), this thicket swamp type occupies shallow water depressions, oxbow ponds, and backwater sloughs of stream and river floodplains throughout swampy forested areas in glaciated terrain. Flooding is normally continuous throughout the year, but Faber-Langendoen and Maycock (1989) demonstrate that these sites can become dry in mid or late summer or during periods of prolonged drought. Soils are deep (>100 cm) often consisting of peat or muck over alluvial parent material. Stands are most often dominated by Buttonbush, due to its tolerance of flooding, and absence of competition resulting from anoxic conditions. Faber-Langendoen and Maycock (1989) examined Buttonbush ponds in Thorold Township, and found Buttonbush responded positively to increasing water depths. Maintenance of flooding regime is required for regulating the distribution and abundance of Buttonbush, otherwise, areas subject to

prolonged dry periods will be invaded by tree seedlings, eventually shading out Buttonbush. Therefore, changes in hydrology to Lyon's Creek may benefit or be of detriment, depending on whether flooding duration is maintained, increased or decreased.

Status
Buttonbush Mineral Thicket Swamp has a provincial rank of S3. A total of 0.76 ha of this provincially rare vegetation community currently exits in the study area.

Recommendations:
Alterations to base flow of Lyon's Creek may be of detriment to this community type. Any remediation works that have this type of result should be avoided. Monitoring the spatial extent of this community and water levels within Lyon's Creek should occur in order to track its status, and ensure its viability.

Photo 2. Provincially rare Buttonbush Mineral Deciduous Thicket Swamp Type (credit S. Brinker, 08-09-2006).

3.3.2 Wildlife Resources

Discussion relating to significant wildlife resources is limited to wildlife species documented in 2006. Significant wildlife species, identified from background materials, were not included because it was not always possible to determine if the species listed were observed in the study area. In addition, observations were dated, often based on information collected during the early 1980s, limiting their present relevancy.

Black-crowned Night-Heron (*Nycticorax nycticorax*)
Description
The Black-crowned Night Heron is a cosmopolitan species that breeds around the world except Australia and Antarctica. It is also widespread and common across most of North America (Davis, 1993). In Ontario, it occurs as far north as Sault Ste Marie, but almost exclusively south of the Canadian Shield. Within this range it is most frequently encountered

along the shores of the lower Great Lakes as well as St. Lawrence and Ottawa Rivers. It occurs less frequently inland along rivers and larger lakes. It is relatively small and stocky in stature compared to its diurnal cousin the Great Blue Heron, preferring to be active between dusk and dawn. The Black-crowned Night-Heron is also a colonial nester and generally gregarious in nature. Although they may occasionally nest singly (Sandilands, 2005), they usually nest in homogenous or mixed colonies with species such as Double-crested Cormorants, Great Blue Herons, Great Egrets, and Green Herons (Austen ***et al***, 1994; Sandilands, 2005).

Status

The Black-crowned Night-Heron is considered provincially significant. That is, it has a provincial conservation rank of S3 or "Vulnerable" (NHIC, 2006f).

Habitat

According to Austen et al. (1994), the Black-crowned Night-heron clearly prefers to nest in deciduous trees on islands, but does also nest along wooded river banks, swamps and cattail marshes. Nests are usually near water and isolated from disturbance and predators. During field investigations, three Black-crowned Night-Herons were observed on separate occasions perched in adjacent upland habitat along Lyon's Creek, presumably foraging for prey items, along the steeper portions of forested banks.

Recommendations:

Should Lyon's Creek support active or recent breeding by the species, proposed remediation works along the river should take place outside the breeding season to ensure that the Migratory Birds Convention Action is not inadvertently contravened. It is unlawful to disturb or destroy the nests of most species of birds in Ontario, including the Black-crowned Night-Heron. As a result, this recommendation should also be applied to all areas where proposed works could affect nesting birds. Potential impacts would likely be associated with vegetation clearing activities required for site access.

Northern Watersnake (*Nerodia sipedon sipedon*)

Description

The Northern Watersnake is a moderately large, variably-coloured snake that, like its name, is usually found near water. It ranges across most of eastern North America and in Ontario occurs as far north as Sault Ste Marie. It is thick-bodied, has keeled scales and a divided anal plate. "Small fish make up the largest part of its diet, followed in frequency by frogs, tadpoles, aquatic salamanders and crayfish" (Harding, 1997.)

Status

In Ontario, the Northern Watersnake has an overall conservation rank of S5 or "Secure" (NHIC, 2006e). The only source for regional status information is the "Distribution and Status of the Herpetofauna of Central Region" by Plourde et al. (1989), where it is listed as "uncommon and widespread." This seems like a reasonable assessment. Other nearby jurisdictions, such as Haldimand–Norfolk (Gartshore, 1987) and the City of Hamilton (Lamond and Duncan, 2003) also list it as uncommon.

Habitat

The Northern Watersnake can be found near most permanent bodies of water such as lakes, streams, rivers, ponds, swamps, marshes and impoundments (Logier, 1958; Lamond, 1994; Harding, 1997). Preferred basking sites are fairly open, sunny locations with cover for safety nearby (Harding, 1997). They also are often observed at waterside structures such as

wooden docks, boathouses, piers, bridge supports, earthen or rock dams and causeways, spillways and flowing culverts (Harding, 1997). Hibernation sites are typically located near their summer habitat and may include mammal and crayfish burrows, rock crevices, root systems, and other sheltered sites (Harding, 1997). In the study area, individuals were observed swimming in open water and using cover under a large piece of plywood within the Cattail Shallow Marsh (refer to Figure 5a & 5b).

Recommendations:
If possible, potential remediation works (including vegetation clearing and earth movement) should take place in late summer (mid August – beginning of October) before individuals retreat underground to hibernate.

Regionally Significant Breeding Bird Species

Description
Nine regionally significant species of breeding birds were recorded during the 2006 survey visits (Appendix 8).They are:

1. American Kestrel *(Falco sparverius*)
2. Belted Kingfisher (*Ceryle alcyon*)
3. Northern Flicker (*Colaptes auratus*)
4. Eastern Wood-Pewee (*Contopus virens*)
5. Willow Flycatcher (*Empidonax trailii*)
6. Eastern Kingbird (*Tyrannus tyrannus*)
7. Brown Thrasher (*Toxostoma rufum*)
8. Rose-breasted Grosbeak (*Pheucticus ludovicianus*)
9. Baltimore Oriole (*Icterus galbula*)

Status
According to Ontario Partners in Flight (OPIF, 2006) all nine species are considered to be priority landbird species for conservation in Bird Conservation Region 13 (i.e. the Lower Great Lakes – St. Lawrence Plain), roughly corresponding to the area south of the Canadian Shield.

Habitat
Of the nine, only Belted Kingfisher is almost always associated with wetlands, usually with open water. The others typically inhabit terrestrial vegetation communities and are therefore found adjacent to Lyon's Creek. For example, Northern Flicker, Eastern Wood-Pewee, Rose-breasted Grosbeak, and Baltimore Oriole prefer to inhabit woodlands or forests, whereas Willow Flycatcher and Eastern Kingbirds are typically found in shrubs and early successional areas, and American Kestrel and Eastern Kingbird prefer grasslands and agricultural verges.

Recommendations:
Careful attention must be given to ensure that the 1994 federal Migratory Birds Convention Act (MBCA) will not be contravened. Section 6 of the Migratory Birds Regulations (MBRs) made under the federal 1994 MBCA makes it an offence to "disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird." To this end, it is recommended that any vegetation clearing associated potential remediation works take place outside the breeding season for migratory birds so as not to "disturb" their nesting.

Environment Canada (EC) normally recommends restrictions on vegetation clearing during core breeding periods. In the City of Hamilton, this roughly corresponds with the following dates:

- Forested Habitats (May 9 – July 23)
- Open Habitats (May 1 – July 23)
- Wetland Habitats (May 9 – July 31)

However, nesting activity outside of these 'core' periods is possible. As a result, all contractors and consultants are required to show 'due diligence' with respect to the protection of migratory bird nests. To this end, it is recommended that a qualified avian biologist/ecologist be retained prior to the initiation of any construction works to check for the presence of breeding migratory birds. Appendix B of the Breeding Birds of Ontario, Nidiology and Distribution – Volume 2: Passerines by Peck and James (1987) provides good clues as to which bird species are likely to be nesting outside the normal core nesting periods.

Significant Wildlife Habitat (SWH)

Although the identification of Significant Wildlife habitat (SWH) was not a specific deliverable in the Terms of Reference, some consideration was given to this end because of its inclusion in the Provincial Policy Statement (OMMAH, 2005).

Significant wildlife habitat is defined by the Ontario Ministry of Natural Resources' Significant Wildlife Habitat Technical Guide (OMNR, 2000) as habitat that is "ecologically important in terms of features, functions, representation or amount and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System", and is protected under the Provincial Policy Statement (OMAH, 2005). Section 2.14 states that;

> *Development and site alteration shall not be permitted in: … d) significant wildlife habitat…unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.*

The following list of features and functions are thought to possibly occur in the study area. For clarity, they are grouped according four broad categories. Additional time and resources, beyond the scope of this project, would need to be devoted to come to a more definitive determination as to whether any of the features or functions merit designation as Significant Wildlife habitat.

- **Seasonal concentration areas**

Winter deer yard – Wooded sections of creek may be of local significance

Colonial bird nesting sites – The Lyon's Creek Wetlands data record indicated that colonial waterbirds nested between 1979 and 1984. However, it is not clear whether this was within the study area. It also didn't specify which species nested, but several species could have been involved. A November 2, 2006 survey revealed very few (4) *potential* heron nests along the length of the study area suggesting that it may not be a significant colonial bird nesting site. No swallow nests were observed either and virtually no suitable available habitat exists along this stretch.

Waterfowl stopover and staging area – The Lyon's Creek Wetlands data record indicated the wetland was a locally significant waterfowl staging area. Autumn roosts of Wood Duck have been mentioned in the background material. A November 2, 2006 survey by canoe only revealed the presence of 2 species along the length of the study area, American Black Duck (≈ 30) and Mallard (80+). No Wood Ducks were observed. Additional investigations, conducted slightly earlier in the autumn, could take place to see what sorts of numbers are involved and whether any other species are participating.

The Birds of Hamilton and Surrounding Areas (Curry, 2006) states with reference to Wood Ducks that "largest numbers are found in fall when family groups gather on Dundas Marsh: 150, 27 September 1997 (Mike Street et al.); 115, 3 November 1962 (John Miles); and 100, 17 October 1948 (North)."

Waterfowl nesting – The Lyon's Creek Wetlands data record indicated that the wetland was a locally significant waterfowl production area. American Black Duck, Blue-winged Teal and Hooded Merganser have been mentioned in background materials suggesting that local habitats do support a wider variety of waterfowl nesting species than just Mallard. Whether these three species are present in the study area during the breeding season is unclear. Based on 2006 observations, shoreline habitats showed promise.

Reptile Hibernacula – No checks for reptile hibernacula were made but could be investigated. The regionally uncommon Northern Watersnake was confirmed in the study area.

Bullfrog Concentration Area – Bullfrogs were documented from several locations along Lyon's Creek within the study area. In order to determine if Lyon's Creek can be considered a Bullfrog concentration area, the following suggested criteria would need to be evaluated: (1) Relative importance of the habitat to local populations, (2) Abundance, (3) Size of site, and (4) Historical use of area (OMNR, 2000).

- **Rare vegetation communities and specialized habitats for wildlife**

Rare vegetation communities – Two provincially significant vegetation communities were documented from the study area according to those defined by Bakowsky (1996). This included the Silky Dogwood Mineral Thicket Swamp Type and the Buttonbush Mineral Thicket Swamp Type. Both are relatively small in size (less than 0.5 ha and 0.76 ha respectively). It is likely these communities occur elsewhere in the Lyon's Creek wetland, and are relatively conspicuous in the region.

Habitat for area-sensitive species – Only two area sensitive species, American Bullfrog and White-breasted Nuthatch, were noted during the 2006 surveys. The low number of area-sensitive species present suggests that the study area, or at least those areas closer to the creek, only provides marginal support for such species.

Forests providing a high diversity of habitats – With minimal forest cover in the study area (approximately 2 percent), this community class does not contribute proportionally high levels of added diversity.

Turtle nesting habitat – Both Snapping Turtles and Midland Painted Turtles are known to exist in the Lyon's Creek wetland system. It is reasonable to assume that some nesting is also occurring. However, it is not clear how many individual turtles may be present, and therefore the potential significance of any turtle nesting habitat.

- **Habitats for species of conservation concern, excluding the habitats of endangered and threatened species**

Several regionally significant breeding bird species are known to occur in the study area. However, it is not thought that this assemblage of species is likely unique to the area or the region. The provincially significant Black-crowned Night-Heron has been recorded from within the study area along Lyon's Creek but it is not clear whether these observations simply represent foraging individuals or whether the species nests along its banks. Although speculative, it seems more likely that it is the former possibility.

- **Animal movement corridors**

It is likely that Lyon's Creek and its associated habitats offer at the least a locally significant animal movement corridor. Whether it is of greater or broader significance is not clear.

3.3.3 Aquatic Resources

The fish community present is consistent with the low gradient, warmwater and wetland habitats that are present. The majority of the fish species that are present are common in southern Ontario. The lake chubsucker, however, has "threatened" COSEWIC status and is listed under the Species at Risk Act. Grass pickerel and silver shiner have "special concern" COSEWIC status. Lake chubsucker and grass pickerel are Schedule 1 species under SARA, while silver shiner is Schedule 3. It is notable the lake chubsucker was not found in the lower reaches of Lyon's Creek in 2004. It is possible that the lower turbidity in proximity to the Welland Canal influences the distribution of this species.

5.2 Vegetation Monitoring

Regardless of the potential remediation options for Lyon's Creek, a number of techniques should be employed to map, classify, and describe temporal changes in wetland vegetation composition and structure over time. Goals should include the continued documentation of the spatial location and extent of wetland types and significant features using a consistent approach. With the collection of baseline vegetation field data and identification of significant features complete, eventual change in wetland vegetation can be detected. A practical approach relies on a combination of remote-sensing and ground-based sampling. By utilizing high-resolution aerial imagery within a consistent scale range, it is possible to interpret and delineate discrete vegetation polygons at a fine scale. This scale of analysis can acquire suitable data at regular intervals. The current use of a standardized approach to classifying vegetation communities in southern Ontario, the *Ecological Land Classification System for Southern Ontario* (Lee *et al* 1998), ensures consistent data collection and mapping of communities over time, and facilitates the quantification of spatial and temporal variation in vegetation communities. The repeated production of maps could then permit the comparison of surface area of wetland communities. A limitation of aerial photographic interpretation for monitoring activities is the inability to distinguish submerged aquatic vegetation. Therefore, ground-based vegetation surveys should be used in conjunction with remote-sensing to confirm polygon boundaries and collect vegetation data for the purposes of monitoring individual communities. When combined with field surveys to confirm existing conditions, indications of trends in the surface area change and the distribution of plant species can be surmised.

4.1.1 Data Collection

A number of scale dependant indicators could be used to document vegetation change, and these include (but not limited to):

- Landscape Level
    - A GIS or remote-sensing based characterization of surrounding landscape influencing Lyon's Creek:
        - Road density
        - Percent forest cover
        - Landuse categories
        - Percentage of wetland edge bordered by upland natural vegetation etc.

- Community Level

- Continued mapping and monitoring of the extent and type of wetland classes/types.
- Monitor overall gains/losses to wetland habitat.
- Degree of wetland community interspersion - this gives a measure of the presence and degree of ecotonal variation within the wetland, a measure that suggests extent of complexity and diversity (OMNR 1993).

- Species Level
  - Calculation of Floristic Quality Assessment (FQA) - FQA facilitates the comparison of plant species composition at different monitoring locations, and generates proportional scores reflecting the overall quality of vegetation at each sampling location
  - Field investigations to assess the presence and population status of *Cuscuta polygonorum*, and its habitat associations.
  - Further field investigations to search for other potentially rare plant resources.
  - Extent and coverage of invasive species.

5.3 Wildlife Monitoring

Wildlife monitoring surveys conducted in 2006 were successfully completed according to standardized protocols outlined in Section 2.4.2 & 2.4.3, with only minor deviations. Therefore baseline conditions have been established and changes in species diversity and abundance can be documented following future monitoring surveys.

To help establish which species are directly associated with the wetland communities along Lyon's Creek, it might be helpful to superimpose standard point count forms overtop of the most current aerial photography for each point count location.

6 RECOMMENDATIONS

Vegetation Resources

- Known occurrences of rare vascular plants within the study area should be monitored periodically to detect any significant changes in population size and health prior to, and after any remediation works are undertaken if deemed necessary;

- More thorough examinations of suitable habitat should be undertaken to check for additional locations for *Cuscuta polygonorum*, as they could have been overlooked due to survey timing;

- Temporal changes to wetland vegetation communities should be monitored prior to, and after any remediation works are undertaken if deemed necessary.

Wildlife Resources

- If circumstances permit, conduct one additional year of amphibian (i.e. calling frogs and toads) and breeding bird surveys to help confirm the 2006 baseline conditions, as well as to document any natural variability. Surveys should follow the 2006 protocols.

- If remediation works are undertaken, local amphibian (i.e. calling frogs and toads) and breeding bird populations within the study area should be monitored

periodically to determine if changes to species diversity and abundance are occurring. Monitoring surveys should follow the protocols established in 2006.

- Consideration should be given to expanding the wildlife monitoring program to include invertebrates such as odonates (damselflies and dragonflies), as well as other species due to their dependence on the aquatic environment within the creek and wetland communities. Baseline conditions should be established prior to any remediation works;

- Should any remediation works along Lyon's Creek be considered, timing should be outside the breeding bird season to ensure that the Migratory Birds Convention Act is not inadvertently contravened. Although some birds may nest before and after the core breeding period, dates to be avoided range from May 1st to July 31st;

- Preliminary consideration given to an assessment of Significant Wildlife Habitat (OMNR 2000) in the study area identified several features and functions that could potentially qualify, but their level of significance in the region compared to other areas is unclear. Additional research and field studies are needed to identify potential Significant Wildlife Habitats within the study area.

Aquatic Resources

- Known occurrences of rare fish species within the study area should be monitored periodically to detect any significant changes in population size and health prior to, and after any remediation efforts are undertaken if deemed necessary.

Updates to Wetland Data Record

The wetland data record and open file should be updated to include the significant features documented during the current study, including:

- Evaluation should score breeding habitat for an endangered or threatened species, Lake Chubsucker (*Erimyzon sucetta)*;

- Evaluation should score the following provincially significant animal / plant species:
  - Black-crowned Night Heron (*Nycticorax nycticorax)*; Grass Pickerel (*Esox americanus vermiculatus*); Smartweed Dodder (*Cuscuta polygonorum*) and Pin Oak (*Quercus palustris*);
  - Marsh Wren (*Cistothorus palustris*) is no longer considered provincially rare and should be removed from scoring.

- Northern Watersnake (*Nerodia sipedon sipedon*) could be considered for scoring as a locally significant species;

- The wetland boundaries and vegetation community mapping should be updated for the portion of the PSW currently evaluated in this study.

7 CONCLUSIONS

The goals of this study were to document terrestrial and aquatic resources within the Lyon's Creek East Wetlands, part of Lyon's Creek Provincially Significant Wetland. The inventories focused on documenting significant features that could potentially be affected by contaminant remediation works. The identification of significant features should assist in the selection of remediation strategies that avoid or minimize impacts to sensitive wetland resources. The current study has shown that Lyon's Creek, and its immediately adjacent habitats, has a number of significant elements including:

- It supports habitat for a fish species designated as Threatened by COSEWIC: Lake Chubsucker (*Erimyzon sucetta*);
- It supports habitat for a fish species designated as Special Concern by COSEWIC: Grass Pickerel (*Esox americanus vermiculatus*);
- It supports the only extant location for a vascular plant in Ontario and Canada updating it status from possibly extirpated (SH) to critically imperilled (S1): Smartweed Dodder (*Cuscuta polygonorum*);
- It contains habitat for at least one other provincially rare vascular plant listed as vulnerable (S3): Pin Oak (*Quercus palustris*);
- It supports habitat for at least two provincially rare vegetation types: Silky Dogwood Mineral Thicket Swamp Type (SWT2-4) and Buttonbush Mineral Thicket Swamp Type (SWT2-8);
- It supports foraging and potentially (though not recently verified) nesting habitat for a provincially rare colonial nesting bird listed as vulnerable (S3): Black-crowned Night Heron (*Nycticorax nycticorax);*
- It supports habitat for a number of regionally significant bird species including: American Kestrel *(Falco sparverius*), Belted Kingfisher (*Ceryle alcyon*), Northern Flicker (*Colaptes auratus*), Eastern Wood-Pewee (*Contopus virens*), Willow Flycatcher (*Empidonax traillii*), Eastern Kingbird (*Tyrannus tyrannus*),Brown Thrasher (*Toxostoma rufum*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*) and Baltimore Oriole (*Icterus galbula*);
- It supports habitat for a regionally uncommon snake species: Northern Watersnake (*Nerodia sipedon sipedon);* and
- It supports habitat for a number of area-sensitive species including: American Bullfrog (*Rana catesbeiana*) and White-breasted Nuthatch (*Sitta carolinensis*).

Future management of the study area should ensure that the provincially and regionally significant features, as well as overall diversity, be maintained if remediation works are undertaken.

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Appendix 1. Conservation Status Ranking Abbreviations, Definitions, and Sources.

Federal Conservation Status

Federal (COSEWIC) Status: Status assigned by the Committee on the Status of Endangered Wildlife in Canada. (COSEWIC, 2006)

EXT **Extinct**. A wildlife species that no longer exists.

EXP **Extirpated**. A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.

END **Endangered**. A wildlife species facing imminent extirpation or extinction.

THR **Threatened**. A wildlife species likely to become endangered if limiting factors are not reversed.

SC **Special Concern**. A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

DD **Data Deficient** - A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.

NAR **Not At Risk**. A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Provincial Conservation Status

Provincial (MNR) Status assigned by the Ontario Ministry of Natural Resources (OMNR, 2006).

EXT **Extinct**. A species that no longer exists anywhere.

EXP **Extirpated**. A species that no longer exists in the wild in Ontario but still occurs elsewhere.

END-R **Endangered (Regulated)**. A species facing imminent extinction or extirpation in Ontario which has been regulated under Ontario's Endangered Species Act (ESA).

END **Endangered (Not Regulated)**. A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.

THR **Threatened**. A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.

SC **Special Concern**. A species with characteristics that make it sensitive to human activities or natural events.

DD **Data Deficient**. A species for which there is insufficient information for a provincial status recommendation.

NAR **Not At Risk**. A species that has been evaluated and found to be not at risk.

Global Conservation Ranks (G Rank)

After NHIC (2005)

G1 **Extremely rare**; usually 5 or fewer occurrences in the overall range or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.

G2 **Very rare**; usually between 5 and 20 occurrences in the overall range or with many individuals in fewer occurrences; or because of some factor(s) making it vulnerable to extinction.

G3 **Rare to uncommon**; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

G4 **Common**; usually more than 100 occurrences; usually not susceptible to immediate threats.

G5 **Very common**; demonstrably secure under present conditions.

GH **Historic**, no records in the past 20 years.

GU **Status uncertain**, often because of low search effort or cryptic nature of the species; more data needed.

GX **Globally extinct**. No recent records despite specific searches.

? Denotes inexact numeric rank (i.e. G4?).

Provincial Conservation Ranks (S Rank)

Assigned by the Ontario Natural Heritage Information Centre (NHIC, 2006a,b,c)

SX Presumed Extirpated — Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

SH Possibly Extirpated (Historical) — Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.

S1 Critically Imperilled — Critically imperilled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

S2 Imperilled — Imperilled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

S3 Vulnerable — Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 Apparently Secure — Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5 Secure — Common, widespread, and abundant in the nation or state/province.

SNR Unranked — Nation or state/province conservation status not yet assessed.

SU Unrankable — Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SNA Not Applicable — A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

S#S# Range Rank — A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

Regional Conservation Status

Regional conservation status designations are based on the Distribution and Status of the Vascular Plants of Central region by Riley (1989). Designations are specific to Niagara-Haldimand (in Ontario Ministry of Natural Resources form 'Central Region').

R = Native species present and provincially rare (# of stations)

Bird Conservation Region (BCR) 13 status designations have been prepared b**y** Ontario Partner's in Flight (OPIF, 2006). They are currently in draft form. For a complete account on how species were evaluated, please refer to the Ontario Landbird Conservation (Draft) Plan cited above.

PLS = Priority Landbird Species for Conservation

Area Sensitivity

Area sensitivity designations based on Appendix C & G in OMNR (2000)

AS = Area Sensitive

Breeding Evidence & Status

Breeding Bird Evidence codes and breeding status designations based on the Ontario Breeding Bird Atlas (OBBA, 2001).

Observed

X = species observed in its breeding season, but no evidence of breeding (*i.e.* flyover only)

Possible Breeding

H = Species observed in its breeding season in suitable nesting habitat

S = Singing male present, or breeding calls heard, in its breeding season in suitable nesting habitat

Probable Breeding

P = Pair observed in their breeding season in suitable nesting habitat

T = Permanent territory presumed through registration of territorial song on at least two days, a week or more apart, at the same place.

Confirmed Breeding

NU = Used nest or egg shells found (occupied or laid within the period of the study).

FY = Recently fledged young or downy young, including young incapable of sustained flight.

AE = Adults leaving or entering nest site in circumstances indicating occupied nest

FS = Adult carrying faecal sac.

CF = Adult carry food for young.

NY = Nest with young seen or heard.

Mammal Atlas Symbols

▲ = Recorded between 1900 and 1969
■ = Recorded between 1970and 1993
** Note: Open symbols mean mammal record can't be pinpointed to a single square.

Coefficient of Conservatism (cc)

The information for Coefficient of Conservatism (cc) was obtained from the Floristic Quality Assessment System for Southern Ontario (M.J. Oldham, et al., 1995).

Each native taxon was assigned a rank of 0 to 10 ("coefficient of conservatism") based on its degree of fidelity to a range of synecological parameters. Plants found in a wide variety of plant communities, including disturbed sites, were assigned ranks of 0 to 3. Taxa that typically are associated with a specific plant community, but tolerate moderate disturbance, were assigned ranks of 4 to 6. Rankings of 7 to 8 were applied to those taxa associated with a plant community in an advanced successional stage that has undergone minor disturbance. Those plants with high degrees of fidelity to a narrow range of synecological parameters were assigned a value of 9 to 10.

Coefficient of Wetness (cw)

The information for Coefficient of Wetness (cw) was obtained from the Floristic Quality Assessment System for Southern Ontario (M.J. Oldham et al., 1995).

The wetness index gives an indication of where plant species are typically found. Wetness values (coefficient of wetness) are between -5 and 5.

These categories are defined as follows:

-5 Occurs almost always in wetlands under natural conditions (estimated > 99% probability).
-4 to **-2** Usually occurs in wetlands, but occasionally found in non-wetlands (estimated 67-99% probability).
-1 to **1** Equally likely to occur in wetlands or non-wetlands (estimated 34-66% probability).
2 to **4** Occasionally occurs in wetlands, but usually occurs in non-wetlands (estimated 1-33 % probability).
5 Occurs almost never in wetlands under natural conditions (estimated < 1 % probability).

Appendix 2. Ontario Breeding Bird Atlas (2001 – 2005) Data for Atlas Squares 17PH45 and 17PH46.

Ontario Breeding Bird Atlas

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Site hosted by Bird Studies Canada

Atlas Data Summary

Select what type of data summary you would like to display and click the appropriate *view* button.
Please note: *some summaries may take a few moments to create. Please be patient (attempting to refresh the page will only slow down your query further).*

What years do you want to display : [all years combined]

Show me statistics on the number of species reported, the effort, etc.

1. View summary statistics: [Province] [View]
2. View summary statistics [By Square] within region [1. Essex] [View]
3. View list of completed Point Counts in **square** : [ ] [View]

Show me the list of species, the highest breeding evidence and abundance

4. View species list for : [Province] [View]
5. View species list for **square** or **block no.** : [17PH45] [View]

Show me the list of regions or squares reporting a species

6. View list of [Regions] reporting [Acadian Flycatcher] [View]

Note: you must log in the data entry site to view personalized summaries

[View printable format]

Species list for square 17PH45 (number of entries returned: 113)

Region	Square	Species	Breeding Evidence				Point Counts			
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq
11	17PH45	Pied-billed Grebe	FY	CONF	1	Brad Clements				
11	17PH45	Double-crested Cormorant	X	OBS	1	Brad Clements	2	7.69	1.0769	1
11	17PH45	American Bittern	T	PROB	1	Brad Clements				
11	17PH45	Least Bittern	CF	CONF	1	Brad Clements				
11	17PH45	Great Blue Heron	H	POSS	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Green Heron	FY	CONF	1	Brad Clements				
11	17PH45	Black-crowned Night-Heron	X	OBS	1	Brad Clements				
11	17PH45	Turkey Vulture	FY	CONF	1	Brad Clements				
11	17PH45	Canada Goose	NE	CONF	1	Brad Clements	1	3.85	3.8462	1

http://www.birdsontario.org/atlas/datasummaries.jsp?...ePC=&region1=0&square=17PH45&region3=0&species1=ACFL (1 of 4)9/21/2006 11:58:53 AM

11	17PH45	Mute Swan	P	PROB	1	Brad Clements				
11	17PH45	Wood Duck	AE	CONF	1	Brad Clements				
11	17PH45	Gadwall	P	PROB	1	Brad Clements				
11	17PH45	American Wigeon	P	PROB	1	Brad Clements				
11	17PH45	Mallard	FY	CONF	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Blue-winged Teal	T	PROB	1	Brad Clements				
11	17PH45	Northern Harrier	CF	CONF	1	Brad Clements				
11	17PH45	Sharp-shinned Hawk	H	POSS	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Cooper's Hawk	NE	CONF	1	Brad Clements				
11	17PH45	Red-tailed Hawk	NY	CONF	1	Brad Clements				
11	17PH45	American Kestrel	FY	CONF	1	Brad Clements				
11	17PH45	Ruffed Grouse	T	PROB	1	Brad Clements				
11	17PH45	Wild Turkey	FY	CONF	1	Brad Clements				
11	17PH45	Virginia Rail	T	PROB	1	Brad Clements				
11	17PH45	Sora	FY	CONF	1	Brad Clements				
11	17PH45	American Coot	H	POSS	1	Brad Clements				
11	17PH45	Killdeer	DD	CONF	1	Brad Clements	7	26.92	0.3077	1
11	17PH45	Spotted Sandpiper	FY	CONF	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Upland Sandpiper	T	PROB	1	Brad Clements				
11	17PH45	Wilson's Snipe	FY	CONF	1	Brad Clements				
11	17PH45	American Woodcock	T	PROB	1	Brad Clements				
11	17PH45	Ring-billed Gull	X	OBS	1	Brad Clements	17	65.38	10.3846	1
11	17PH45	Caspian Tern	X	OBS	1	Brad Clements				
11	17PH45	Common Tern	X	OBS	1	Brad Clements				
11	17PH45	Rock Pigeon	NY	CONF	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Mourning Dove	NY	CONF	1	Brad Clements	10	38.46	0.6538	1
11	17PH45	Black-billed Cuckoo	S	POSS	1	Brad Clements				
11	17PH45	Yellow-billed Cuckoo	P	PROB	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Eastern Screech-Owl	FY	CONF	1	Brad Clements				
11	17PH45	Great Horned Owl	NY	CONF	1	Brad Clements				
11	17PH45	Long-eared Owl	H	POSS	1	Brad Clements				
11	17PH45	Whip-poor-will	S	POSS	1	Brad Clements				
11	17PH45	Chimney Swift	H	POSS	1	Brad Clements				
11	17PH45	Ruby-throated Hummingbird	FY	CONF	1	Brad Clements				
11	17PH45	Belted Kingfisher	CF	CONF	1	Brad Clements				
11	17PH45	Red-headed Woodpecker	H	POSS	1	Brad Clements				
11	17PH45	Red-bellied Woodpecker	FY	CONF	1	Brad Clements				
11	17PH45	Downy Woodpecker	FY	CONF	1	Brad Clements	6	23.08	0.3077	1
11	17PH45	Hairy Woodpecker	FY	CONF	1	Brad Clements				
11	17PH45	Northern Flicker	CF	CONF	1	Brad Clements	1	3.85	0.1154	1
11	17PH45	Eastern Wood-Pewee	FY	CONF	1	Brad Clements	2	7.69	0.0769	1
11	17PH45	Acadian Flycatcher	T	PROB	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Alder Flycatcher	T	PROB	1	Brad Clements	2	7.69	0.1538	1

11	17PH45	Willow Flycatcher	FY	CONF	1	Brad Clements	4	15.38	0.1538	1
11	17PH45	Least Flycatcher	T	PROB	1	Brad Clements				
11	17PH45	Eastern Phoebe	CF	CONF	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Great Crested Flycatcher	FY	CONF	1	Brad Clements	2	7.69	0.0769	1
11	17PH45	Eastern Kingbird	CF	CONF	1	Brad Clements	4	15.38	0.1538	1
11	17PH45	Yellow-throated Vireo	T	PROB	1	Brad Clements				
11	17PH45	Warbling Vireo	FY	CONF	1	Brad Clements	2	7.69	0.0769	1
11	17PH45	Red-eyed Vireo	FY	CONF	1	Brad Clements	7	26.92	0.3077	1
11	17PH45	Blue Jay	CF	CONF	1	Brad Clements	6	23.08	0.2692	1
11	17PH45	American Crow	NE	CONF	1	Brad Clements	9	34.62	0.5769	1
11	17PH45	Horned Lark	FY	CONF	1	Brad Clements	3	11.54	0.1923	1
11	17PH45	Purple Martin	AE	CONF	1	Brad Clements	1	3.85	0.2308	1
11	17PH45	Tree Swallow	NE	CONF	1	Brad Clements	4	15.38	0.2692	1
11	17PH45	Northern Rough-winged Swallow	FY	CONF	1	Brad Clements				
11	17PH45	Bank Swallow	CF	CONF	1	Brad Clements				
11	17PH45	Barn Swallow	NY	CONF	1	Brad Clements	6	23.08	0.8846	1
11	17PH45	Black-capped Chickadee	CF	CONF	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Tufted Titmouse	CF	CONF	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	White-breasted Nuthatch	P	PROB	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Carolina Wren	FY	CONF	1	Brad Clements				
11	17PH45	House Wren	NY	CONF	1	Brad Clements	2	7.69	0.1154	1
11	17PH45	Marsh Wren	CF	CONF	1	Brad Clements				
11	17PH45	Blue-gray Gnatcatcher	S	POSS	1	Brad Clements				
11	17PH45	Eastern Bluebird	FY	CONF	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Veery	CF	CONF	1	Brad Clements	3	11.54	0.1923	1
11	17PH45	Wood Thrush	FY	CONF	1	Brad Clements	4	15.38	0.2692	1
11	17PH45	American Robin	NE	CONF	1	Brad Clements	17	65.38	1.2692	1
11	17PH45	Gray Catbird	FY	CONF	1	Brad Clements	6	23.08	0.3077	1
11	17PH45	Northern Mockingbird	CF	CONF	1	Brad Clements	3	11.54	0.1154	1
11	17PH45	Brown Thrasher	CF	CONF	1	Brad Clements				
11	17PH45	European Starling	AE	CONF	1	Brad Clements	12	46.15	2.6923	1
11	17PH45	Cedar Waxwing	NE	CONF	1	Brad Clements	6	23.08	0.4615	1
11	17PH45	Yellow Warbler	FY	CONF	1	Brad Clements	9	34.62	0.8077	1
11	17PH45	Chestnut-sided Warbler	S	POSS	1	Brad Clements				
11	17PH45	American Redstart	S	POSS	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Ovenbird	T	PROB	1	Brad Clements				
11	17PH45	Mourning Warbler	T	PROB	1	Brad Clements				
11	17PH45	Common Yellowthroat	CF	CONF	1	Brad Clements	9	34.62	0.5769	1
11	17PH45	Eastern Towhee	CF	CONF	1	Brad Clements	2	7.69	0.2308	1
11	17PH45	Chipping Sparrow	FY	CONF	1	Brad Clements	4	15.38	0.1923	1
11	17PH45	Field Sparrow	CF	CONF	1	Brad Clements	3	11.54	0.1154	1
11	17PH45	Vesper Sparrow	T	PROB	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	Savannah Sparrow	FY	CONF	1	Brad Clements	12	46.15	1.2308	1

11	17PH45	Grasshopper Sparrow	FY	CONF	1	Brad Clements				
11	17PH45	Henslow's Sparrow	S	POSS	1	Brad Clements				
11	17PH45	Song Sparrow	CF	CONF	1	Brad Clements	13	50.0	0.8846	1
11	17PH45	Lincoln's Sparrow	NY	CONF	1	Brad Clements				
11	17PH45	Swamp Sparrow	T	PROB	1	Brad Clements				
11	17PH45	Northern Cardinal	NE	CONF	1	Brad Clements	13	50.0	0.5769	1
11	17PH45	Rose-breasted Grosbeak	CF	CONF	1	Brad Clements	3	11.54	0.1154	1
11	17PH45	Indigo Bunting	FY	CONF	1	Brad Clements	2	7.69	0.0769	1
11	17PH45	Bobolink	FY	CONF	1	Brad Clements	4	15.38	0.2308	1
11	17PH45	Red-winged Blackbird	NY	CONF	1	Brad Clements	16	61.54	2.8462	1
11	17PH45	Eastern Meadowlark	CF	CONF	1	Brad Clements	2	7.69	0.0769	1
11	17PH45	Common Grackle	FY	CONF	1	Brad Clements	12	46.15	1.1538	1
11	17PH45	Brown-headed Cowbird	FY	CONF	1	Brad Clements	13	50.0	0.7308	1
11	17PH45	Orchard Oriole	T	PROB	1	Brad Clements				
11	17PH45	Baltimore Oriole	NY	CONF	1	Brad Clements	2	7.69	0.0769	1
11	17PH45	House Finch	NY	CONF	1	Brad Clements	1	3.85	0.0385	1
11	17PH45	American Goldfinch	NE	CONF	1	Brad Clements	15	57.69	0.8077	1
11	17PH45	House Sparrow	NE	CONF	1	Brad Clements	5	19.23	1.0	1

Disclaimer: Data contained in these summaries are provisional data that have not necessarily been reviewed or edited, and may be subject to significant change. These data have been released for public interest only. If you wish to use the data in a publication, research or for any purpose, or would like information concerning the accuracy and appropriate uses of these data, read the data use policy and request form, or contact Angela Darwin, at telephone: 519-826-2092, e-mail: atlas@uoguelph.ca. **These data are current as of 21 Sep 2006 .**

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LEGEND

Breeding Evidence

Max BE: Highest Breeding Evidence recorded
Categ: Highest Breeding Category recorded (OBS=observed, POSS=possible, PROB=probable, CONF=confirmed)
#Sq: Number of squares with species (Breeding Evidence)
Atlasser name: Name of atlasser who reported the highest breeding evidence (if they accepted that their name be displayed). If more than one person provided the same breeding evidence code, then only the number of atlassers is listed.

Point Counts

#PC: Number of Point Counts with species
%PC: Percent of Point Counts with species
Abun: Average number of birds per Point Count
#Sq: Number of squares with species (Point Counts)

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Ontario Breeding Bird Atlas

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Atlas Data Summary

Select what type of data summary you would like to display and click the appropriate *view* button.
Please note: *some summaries may take a few moments to create. Please be patient (attempting to refresh the page will only slow down your query further).*

What years do you want to display : all years combined

Show me statistics on the number of species reported, the effort, etc.

1. View summary statistics: Province View
2. View summary statistics By Square within region 1. Essex View
3. View list of completed Point Counts in **square** : View

Show me the list of species, the highest breeding evidence and abundance

4. View species list for : Province View
5. View species list for **square** or **block no.** : 17PH46 View

Show me the list of regions or squares reporting a species

6. View list of Regions reporting Acadian Flycatcher
View

Note: you must log in the data entry site to view personalized summaries

View printable format

Species list for square 17PH46 (number of entries returned: 101)

Region	Square	Species	Breeding Evidence				Point Counts			
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq
11	17PH46	Double-crested Cormorant	X	OBS	1	Gary T Pieterse	2	5.13	0.1282	1
11	17PH46	Great Blue Heron	H	POSS	1	Gary T Pieterse				
11	17PH46	Green Heron	T	PROB	1	Gary T Pieterse	1	2.56	0.0256	1
11	17PH46	Turkey Vulture	H	POSS	1	Gary T Pieterse				
11	17PH46	Canada Goose	NE	CONF	1	Gary T Pieterse	1	2.56	0.1026	1
11	17PH46	Wood Duck	NE	CONF	1	Gary T Pieterse				
11	17PH46	American Black Duck	H	POSS	1	Gary T Pieterse				
11	17PH46	Mallard	NE	CONF	1	Gary T Pieterse	1	2.56	0.0513	1
11	17PH46	Blue-winged Teal	P	PROB	1	John E Black				

11	17PH46	Northern Harrier	FY	CONF	1	Gary T Pieterse				
11	17PH46	Sharp-shinned Hawk	AE	CONF	1	John E Black				
11	17PH46	Cooper's Hawk	NE	CONF	1	Gary T Pieterse				
11	17PH46	Northern Goshawk	X	OBS	1	Gary T Pieterse				
11	17PH46	Red-tailed Hawk	NE	CONF	1	Gary T Pieterse	2	5.13	0.0513	1
11	17PH46	American Kestrel	NY	CONF	1	Gary T Pieterse	1	2.56	0.0256	1
11	17PH46	Ring-necked Pheasant	S	POSS	1	Gary T Pieterse				
11	17PH46	Wild Turkey	FY	CONF	1					
11	17PH46	Killdeer	NE	CONF	1	Brett Groves	6	15.38	0.1538	1
11	17PH46	Spotted Sandpiper	FY	CONF	1	Gary T Pieterse	1	2.56	0.0256	1
11	17PH46	Wilson's Snipe	H	POSS	1	Gary T Pieterse				
11	17PH46	American Woodcock	T	PROB	1	2 atlassers				
11	17PH46	Ring-billed Gull	X	OBS	1	2 atlassers	9	23.08	0.5128	1
11	17PH46	Rock Pigeon	AE	CONF	1	Gary T Pieterse	3	7.69	0.9487	1
11	17PH46	Mourning Dove	NE	CONF	1	Gary T Pieterse	6	15.38	0.359	1
11	17PH46	Black-billed Cuckoo	CF	CONF	1	Gary T Pieterse				
11	17PH46	Eastern Screech-Owl	T	PROB	1	Donald N. Mills				
11	17PH46	Great Horned Owl	NY	CONF	1	Gary T Pieterse				
11	17PH46	Chimney Swift	AE	CONF	1	2 atlassers				
11	17PH46	Ruby-throated Hummingbird	T	PROB	1	Gary T Pieterse	1	2.56	0.0256	1
11	17PH46	Belted Kingfisher	NY	CONF	1	Gary T Pieterse				
11	17PH46	Red-bellied Woodpecker	NY	CONF	1	Gary T Pieterse	5	12.82	0.1538	1
11	17PH46	Downy Woodpecker	CF	CONF	1	Gary T Pieterse	6	15.38	0.1538	1
11	17PH46	Hairy Woodpecker	NY	CONF	1	John E Black				
11	17PH46	Northern Flicker	FS	CONF	1	Brett Groves	3	7.69	0.0769	1
11	17PH46	Pileated Woodpecker	S	POSS	1					
11	17PH46	Eastern Wood-Pewee	FY	CONF	1	Gary T Pieterse	14	35.9	0.4103	1
11	17PH46	Willow Flycatcher	AE	CONF	1	Gary T Pieterse	3	7.69	0.0769	1
11	17PH46	Least Flycatcher	S	POSS	1	2 atlassers				
11	17PH46	Eastern Phoebe	NE	CONF	1	Gary T Pieterse	1	2.56	0.0256	1
11	17PH46	Great Crested Flycatcher	T	PROB	1	2 atlassers	4	10.26	0.1026	1
11	17PH46	Eastern Kingbird	FY	CONF	1	Gary T Pieterse	3	7.69	0.0769	1
11	17PH46	Yellow-throated Vireo	A	PROB	1	John E Black				
11	17PH46	Warbling Vireo	T	PROB	1	2 atlassers	3	7.69	0.0769	1
11	17PH46	Red-eyed Vireo	AE	CONF	1	John E Black	17	43.59	0.5641	1
11	17PH46	Blue Jay	CF	CONF	1	Gary T Pieterse	22	56.41	0.6923	1
11	17PH46	American Crow	NE	CONF	1	Gary T Pieterse	11	28.21	0.4103	1
11	17PH46	Horned Lark	CF	CONF	1	Gary T Pieterse				
11	17PH46	Purple Martin	CF	CONF	1	Gary T Pieterse	1	2.56	0.0256	1
11	17PH46	Tree Swallow	NE	CONF	1	Gary T Pieterse	4	10.26	0.1282	1
11	17PH46	Northern Rough-winged Swallow	AE	CONF	1		1	2.56	0.0256	1
11	17PH46	Bank Swallow	CF	CONF	1	Gary T Pieterse				
11	17PH46	Cliff Swallow	AE	CONF	1	Gary T Pieterse				

11	17PH46	Barn Swallow	FY	CONF	1	Gary T Pieterse	7	17.95	0.2564	1
11	17PH46	Black-capped Chickadee	NY	CONF	1	Gary T Pieterse	7	17.95	0.2051	1
11	17PH46	Tufted Titmouse	FY	CONF	1	Gary T Pieterse	5	12.82	0.1282	1
11	17PH46	White-breasted Nuthatch	FY	CONF	1	Gary T Pieterse	2	5.13	0.0513	1
11	17PH46	Carolina Wren	NY	CONF	1	John E Black				
11	17PH46	House Wren	NE	CONF	1	Gary T Pieterse	4	10.26	0.1026	1
11	17PH46	Eastern Bluebird	NY	CONF	1	Gary T Pieterse	1	2.56	0.0513	1
11	17PH46	Veery	AE	CONF	1	Stuart Mackenzie	5	12.82	0.1282	1
11	17PH46	Wood Thrush	FY	CONF	1	Stuart Mackenzie	9	23.08	0.2308	1
11	17PH46	American Robin	NE	CONF	1	Gary T Pieterse	24	61.54	1.4615	1
11	17PH46	Gray Catbird	NE	CONF	1	Gary T Pieterse	9	23.08	0.2821	1
11	17PH46	Northern Mockingbird	NU	CONF	1	Gary T Pieterse	4	10.26	0.1795	1
11	17PH46	Brown Thrasher	S	POSS	1	2 atlassers	1	2.56	0.0256	1
11	17PH46	European Starling	NE	CONF	1	Gary T Pieterse	15	38.46	2.3846	1
11	17PH46	Cedar Waxwing	NY	CONF	1	Gary T Pieterse	6	15.38	0.2051	1
11	17PH46	Blue-winged Warbler	CF	CONF	1	John E Black	1	2.56	0.0256	1
11	17PH46	Golden-winged Warbler	T	PROB	1	Gary T Pieterse				
11	17PH46	Blue/Golden-winged Warbler	S	POSS	1					
11	17PH46	Yellow Warbler	NY	CONF	1	Gary T Pieterse	4	10.26	0.1282	1
11	17PH46	Chestnut-sided Warbler	T	PROB	1	Gary T Pieterse	2	5.13	0.0513	1
11	17PH46	Magnolia Warbler	S	POSS	1	Gary T Pieterse				
11	17PH46	Black-throated Green Warbler	S	POSS	1					
11	17PH46	Black-and-white Warbler	S	POSS	1	Stuart Mackenzie				
11	17PH46	American Redstart	X	OBS	1	Gary T Pieterse				
11	17PH46	Ovenbird	H	POSS	1		1	2.56	0.0256	1
11	17PH46	Mourning Warbler	S	POSS	1		1	2.56	0.0256	1
11	17PH46	Common Yellowthroat	FY	CONF	1	Gary T Pieterse	8	20.51	0.2308	1
11	17PH46	Hooded Warbler	NU	CONF	1	Stuart Mackenzie	11	28.21	0.3333	1
11	17PH46	Scarlet Tanager	T	PROB	1	2 atlassers	7	17.95	0.1795	1
11	17PH46	Eastern Towhee	CF	CONF	1	John E Black				
11	17PH46	Chipping Sparrow	FY	CONF	1	Gary T Pieterse	10	25.64	0.3846	1
11	17PH46	Field Sparrow	CF	CONF	1		3	7.69	0.0769	1
11	17PH46	Vesper Sparrow	T	PROB	1	John E Black	1	2.56	0.0256	1
11	17PH46	Savannah Sparrow	CF	CONF	1	Gary T Pieterse	10	25.64	0.6154	1
11	17PH46	Grasshopper Sparrow	CF	CONF	1	Gary T Pieterse				
11	17PH46	Song Sparrow	FY	CONF	1	Gary T Pieterse	21	53.85	1.0513	1
11	17PH46	Swamp Sparrow	FY	CONF	1	2 atlassers				
11	17PH46	Northern Cardinal	CF	CONF	1	Gary T Pieterse	16	41.03	0.5128	1
11	17PH46	Rose-breasted Grosbeak	NY	CONF	1	Gary T Pieterse	7	17.95	0.2308	1
11	17PH46	Indigo Bunting	CF	CONF	1	Gary T Pieterse	7	17.95	0.2308	1
11	17PH46	Bobolink	CF	CONF	1	Gary T Pieterse	1	2.56	0.0256	1
11	17PH46	Red-winged Blackbird	NY	CONF	1	Gary T Pieterse	11	28.21	0.5897	1
11	17PH46	Eastern Meadowlark	FY	CONF	1	John E Black				

11	17PH46	Common Grackle	FY	CONF	1	Gary T Pieterse	18	46.15	1.3077	1
11	17PH46	Brown-headed Cowbird	FY	CONF	1	Gary T Pieterse	5	12.82	0.1538	1
11	17PH46	Baltimore Oriole	CF	CONF	1	Gary T Pieterse	5	12.82	0.1282	1
11	17PH46	House Finch	FY	CONF	1	Gary T Pieterse	2	5.13	0.1282	1
11	17PH46	American Goldfinch	NY	CONF	1	Gary T Pieterse	14	35.9	0.5128	1
11	17PH46	House Sparrow	NE	CONF	1	Gary T Pieterse	10	25.64	0.641	1

Disclaimer: Data contained in these summaries are provisional data that have not necessarily been reviewed or edited, and may be subject to significant change. These data have been released for public interest only. If you wish to use the data in a publication, research or for any purpose, or would like information concerning the accuracy and appropriate uses of these data, read the data use policy and request form, or contact Angela Darwin, at telephone: 519-826-2092, e-mail: atlas@uoguelph.ca. **These data are current as of 21 Sep 2006 .**

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LEGEND

Breeding Evidence

Max BE: Highest Breeding Evidence recorded
Categ: Highest Breeding Category recorded (OBS=observed, POSS=possible, PROB=probable, CONF=confirmed)
#Sq: Number of squares with species (Breeding Evidence)
Atlasser name: Name of atlasser who reported the highest breeding evidence (if they accepted that their name be displayed). If more than one person provided the same breeding evidence code, then only the number of atlassers is listed.

Point Counts

#PC: Number of Point Counts with species
%PC: Percent of Point Counts with species
Abun: Average number of birds per Point Count
#Sq: Number of squares with species (Point Counts)

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Appendix 3. Fish Species Captured In The Lyon's Creek Watershed By Fisheries And Oceans Canada In 2004 (Source: pers. com., N. E. Mandrak, 2006).

Common Name	Scientific Name	COSEWIC (2006)	OMNR (2006)	Grank	Srank	Total catch within study area	Total catch outside of study area
Rock Bass	*Ambloplites rupestris*			G5	S5		6
Brown Bullhead	*Ameiurus nebulosus*			G5	S5	1	3
Bowfin	*Amia calva*			G5	S4		4
Goldfish	*Carassius auratus*			G5	SE	15	
Common White Sucker	*Catostomus commersoni*			G5	S5	3	4
Common Carp	*Cyprinus carpio*			G5	SE		3
Lake Chubsucker	*Erimyzon sucetta*	THR	THR	G5	S2	5	
Grass Pickerel	*Esox americanus vermiculatus*	SC		G5	S3	7	13
Northern Pike	*Esox lucius*			G5	S5		3
	Esox sp.						1
Johnny Darter	*Etheostoma nigrum*			G5	S5		4
Green Sunfish	*Lepomis cyanellus*			G5	S4	1	11
Pumpkinseed	*Lepomis gibbosus*			G5	S5	27	97
Bluegill Sunfish	*Lepomis macrochirus*			G5	S5	8	11
Striped Shiner	*Luxilus chrysocephalus*			G5	S4		9
Largemouth Bass	*Micropterus salmoides*			G5	S5	7	41
Golden Redhorse	*Moxostoma erythrurum*			G5	S4		2
Golden Shiner	*Notemigonus crysoleucas*			G5	S5	23	55
Emerald Shiner	*Notropis atherinoides*			G5	S5	3	29
Spottail Shiner	*Notropis hudsonius*			G5	S5		7
Tadpole Madtom	*Noturus gyrinus*			G5	S4		5
Yellow Perch	*Perca flavescens*			G5	S5	1	8
Bluntnose Minnow	*Pimephales notatus*			G5	S5	31	25
Fathead Minnow	*Pimephales promelas*			G5	S5	5	1
Black Crappie	*Pomoxis nigromaculatus*			G5	S4		4
Rudd	*Scardinius erythrophthalmus*			G5	SE		2
Central Mudminnow	*Umbra limi*			G5	S5	4	

***Note:** For a list of sources and definitions of abbreviations, please refer to Appendix 1.

Appendix 4. Representative Photographs of Habitats.

Photo 1. Edge of a linear Green Ash Mineral Deciduous Swamp (SWD2-2) (credit S. Brinker, 08-09-2006).

Photo 2. Buttonbush Mineral Deciduous Swamp (SWT2-4) (credit S. Brinker, 08-09-2006).

Photo 3. Along edge of Meadowsweet Mineral Thicket Swamp (SWT2-6) (credit S. Brinker, 11-02-2006).

Photo 4. Looking in a Common Reed Graminoid Mineral Meadow Marsh (MAM2) (credit S. Brinker, 08-09-2006).

Photo 5. Edge of Cattail Mineral Shallow Marsh (MAS2-1) (credit S. Brinker, 08-09-2006).

Photo 6. Narrow-leaved Sedge Mineral Shallow Marsh (MAS2-3) (credit S. Brinker, 08-09-2006).

Photo 7. Bur-reed Mineral Shallow Marsh (MAS2-7) (credit S. Brinker, 08-09-2006).

Photo 8. Rice-cut Grass Mineral Shallow Marsh (MAS2-8) (credit S. Brinker, 08-09-2006).

Photo 9. Forb Mineral Shallow Marsh in left foreground (MAS2-9) (credit S. Brinker, 30-08-2006).

Photo 10. Water Willow Organic Shallow Marsh (MAS3-12) (credit S. Brinker, 30-08-2006).

Photo 11. Water Milfoil Submerged Shallow Aquatic (SAS1-4) (credit S. Brinker, 30-08-2006).

Photo 12. Water Lily – Bullhead Lily Floating-leaved Shallow Aquatic Type (SAF1-1) (credit S. Brinker, 08-09-2006).

Appendix 5. Vascular Plant Species Observed from the Study Area in 2006.

Nomenclature			Conservation Status					
Scientific Name	**Common Name**	**Family**	**COSEWIC** (2006)	**OMNR** (2006)	**GRank**	**Srank**	**cc**	**cw**
Acer negundo	Manitoba Maple	Aceraceae			G5	S5	0	-2
Acer rubrum	Red Maple	Aceraceae			G5	S5	4	0
Acer saccharinum	Silver Maple	Aceraceae			G5	S5	5	-3
Acer x freemanii	Freeman's Maple	Aceraceae			G?	S5		0
Agrimonia gryposepala	Tall Hairy Agrimony	Rosaceae			G5	S5	2	2
Agrostis scabra	Rough Bentgrass	Poaceae			G5	S5	6	0
Agrostis stolonifera	Spreading Bentgrass	Poaceae			G5	S5	0	-3
Arctium minus ssp. minus	Lesser Burdock	Asteraceae			G?T?	SE5	0	5
Asclepias incarnata ssp. incarnata	Swamp Milkweed	Asclepiadaceae			G5T5	S5	6	-5
Bidens frondosa	Devil's Beggar's Ticks	Asteraceae			G5	S5	3	-3
Calystegia sepium ssp. angulata	Hedge Bindweed	Convolvulaceae			G4G5T?	S5	2	0
Carex bebbii	Bebb's Sedge	Cyperaceae			G5	S5	3	-5
Carex crinita	Fringed Sedge	Cyperaceae			G5	S5	6	-4
Carex intumescens	Bladder Sedge	Cyperaceae			G5	S5	6	-4
Carex lupulina	Hop Sedge	Cyperaceae			G5	S5	6	-5
Carex lurida	Shallow Sedge	Cyperaceae			G5	S5	6	-5
Carex tribuloides	Blunt Broom Sedge	Cyperaceae			G5	S4S5	5	-4
Carex vulpinoidea	Fox Sedge	Cyperaceae			G5	S5	3	-5
Cephalanthus occidentalis	Buttonbush	Rubiaceae			G5	S5	7	-5
Ceratophyllum demersum	Common Hornwort	Ceratophyllaceae			G5	S5	4	-5
Cicuta bulbifera	Bulb-bearing Water-hemlock	Apiaceae			G5	S5	5	-5
Cirsium arvense	Creeping Thistle	Asteraceae			G?	SE5	0	3
Convolvulus arvensis	Field Bindweed	Convolvulaceae			G?	SE5	0	5
Cornus amomum ssp. obliqua	Silky Dogwood	Cornaceae			G5T?	S5	5	-4
Cornus foemina ssp. racemosa	Gray Dogwood	Cornaceae			G5	S5	2	-2
Cornus stolonifera	Red-osier Dogwood	Cornaceae			G5	S5	2	-3
Cuscuta gronovii	Gronovius Dodder	Convolvulaceae			G5	S5	4	-3
Cuscuta polygonorum	Smartweed Dodder	Convolvulaceae			G5	SH	7	5
Cyperus strigosus	Straw-colored Umbrella Sedge	Cyperaceae			G5	S5	5	-3
Daucus carota	Queen Anne's Lace	Apiaceae			G?	SE5	0	5
Decodon verticillatus	Hairy Swamp Loosestrife	Lythraceae			G5	S5	7	-5
Dulichium arundinaceum	Three-way Sedge	Cyperaceae			G5	S5	7	-5
Echinochloa wiegandii	Western Barnyard Grass	Poaceae			G5T?	S4S5		
Eleocharis erythropoda	Bald Spikerush	Cyperaceae			G5	S5	4	-5
Eleocharis smallii	Creeping Spikerush	Cyperaceae			G5?	S5	6	-5
Elodea canadensis	Broad Waterweed	Hydrocharitaceae			G5	S5	4	-5
Elymus virginicus var virginicus	Virginia Wild-rye	Poaceae			G5T?	S5	5	-2
Epilobium hirsutum	Great-hairy Willow-herb	Onagraceae			G?	SE5	0	-4
Equisetum arvense	Field Horsetail	Equisetaceae			G5	S5	0	0
Eupatorium perfoliatum	Common Boneset	Asteraceae			G5	S5	2	-4
Euthamia graminifolia	Grass-leaved Goldenrod	Asteraceae			G5	S5	2	-2
Fragaria virginiana ssp. virginiana	Virginia Strawberry	Rosaceae			G5T?	SU	2	1

Nomenclature			Conservation Status					
Scientific Name	**Common Name**	**Family**	**COSEWIC** (2006)	**OMNR** (2006)	**GRank**	**Srank**	**cc**	**cw**
Fraxinus pennsylvanica	Green Ash	Oleaceae			G5	S5	3	-3
Galium palustre	Marsh Bedstraw	Rubiaceae			G5	S5	5	-5
Geum aleppicum	Yellow Avens	Rosaceae			G5	S5	2	-1
Geum laciniatum	Rough Avens	Rosaceae			G5	S4	4	-3
Glyceria striata	Fowl Manna Grass	Poaceae			G5	S5	3	-5
Impatiens capensis	Spotted Jewel-weed	Balsaminaceae			G5	S5	4	-3
Iris pseudacorus	Yellow Iris	Iridaceae			G?	SE3	0	-5
Iris versicolor	Blueflag	Iridaceae			G5	S5	5	-5
Juncus dudleyi	Dudley's Rush	Juncaceae			G5	S5	1	0
Juncus effusus ssp. solutus	Soft Rush	Juncaceae			G5T?	S5	4	-5
Juncus tenuis	Slender Rush	Juncaceae			G5	S5	0	0
Laportea canadensis	Wood Nettle	Urticaceae			G5	S5	6	-3
Leersia oryzoides	Rice Cutgrass	Poaceae			G5	S5	3	-5
Lemna minor	Lesser Duckweed	Lemnaceae			G5	S5	2	-5
Lemna trisulca	Star Duckweed	Lemnaceae			G5	S5	4	-5
Lindera benzoin	Spicebush	Lauraceae			G5	S5	6	-2
Lonicera hirsuta	Hairy Honeysuckle	Caprifoliaceae			G4G5	S5	7	0
Lycopus uniflorus	Northern Bugleweed	Lamiaceae			G5	S5	5	-5
Lysimachia nummularia	Moneywort	Primulaceae			G?	SE5	0	-4
Lythrum salicaria	Slender-spike Loosestrife	Lythraceae			G5	SE5	0	-5
Mentha arvensis ssp. borealis	Corn Mint	Lamiaceae			G5	S5	3	-3
Myriophyllum spicatum	Eurasian Water-milfoil	Haloragaceae			G?	SE5	0	-5
Najas flexilis	Slender Naiad	Najadaceae			G5	S5	5	-5
Nymphaea odorata	Fragrant White Water-lily	Nymphaeaceae			G5	S5	5	-5
Onoclea sensibilis	Sensitive Fern	Dryopteridaceae			G5	S5	4	-3
Parthenocissus inserta	Thicket Creeper	Vitaceae			G5	S5	3	3
Penthorum sedoides	Ditch-stonecrop	Saxifragaceae			G5	S5	4	-5
Phalaris arundinacea	Reed Canary Grass	Poaceae			G5	S5	0	-4
Pilea pumila	Canada Clearweed	Urticaceae			G5	S5	5	-3
Polygonum amphibium	Water Smartweed	Polygonaceae			G5	S5	5	-5
Polygonum lapathifolium	Dock-leaf Smartweed	Polygonaceae			G5	S5	2	-4
Polygonum pensylvanicum	Pennsylvania Smartweed	Polygonaceae			G5	S5	3	-4
Polygonum punctatum	Dotted Smartweed	Polygonaceae			G5	S5	4	-5
Polygonum sagittatum	Arrow-leaved Tearthumb	Polygonaceae			G5	S4	5	-5
Polygonum scandens	Climbing False-buckwheat	Polygonaceae			G5	S4S5	3	0
Polygonum virginianum	Virginia Knotweed	Polygonaceae			G5	S4	6	0
Populus deltoides ssp. monilifera	Eastern Cottonwood	Salicaceae			G5T?	S5	4	-1
Populus grandidentata	Large-tooth Aspen	Salicaceae			G5	S5	5	3
Populus tremuloides	Quaking Aspen	Salicaceae			G5	S5	2	0
Potamogeton crispus	Curly Pondweed	Potamogetonaceae			G5	SE5	0	-5
Potamogeton foliosus	Leafy Pondweed	Potamogetonaceae			G5	S5	4	-5
Potamogeton pusillus	Slender Pondweed	Potamogetonaceae			G5	S4S5	5	-5
Quercus alba	White Oak	Fagaceae			G5	S5	6	3
Quercus bicolor	Swamp White Oak	Fagaceae			G5	S4	8	-4

Nomenclature			Conservation Status					
Scientific Name	**Common Name**	**Family**	**COSEWIC** (2006)	**OMNR** (2006)	**GRank**	**Srank**	**cc**	**cw**
Quercus palustris	Pin Oak	Fagaceae			G5	S3	9	-3
Rhamnus cathartica	Buckthorn	Rhamnaceae			G?	SE5	0	3
Rhamnus frangula	Glossy Buckthorn	Rhamnaceae			G?	SE5	0	-1
Rosa multiflora	Rambler Rose	Rosaceae			G?	SE4	0	3
Rubus allegheniensis	Allegheny Blackberry	Rosaceae			G5	S5	2	2
Rubus idaeus ssp. melanolasius	Wild Red Raspberry	Rosaceae			G5T	S5	0	-2
Sagittaria latifolia	Broadleaf Arrowhead	Alismataceae			G5	S5	4	-5
Salix caprea	Goat Willow	Salicaceae			G?	SE1		
Salix x rubens	Reddish Willow	Salicaceae			HYB	SE4	0	-4
Sambucus canadensis	Common Elderberry	Caprifoliaceae			G5	S5	5	-2
Sambucus racemosa ssp. pubens	Red-berried Elder	Caprifoliaceae			G5T4T5	S5	5	2
Schoenoplectus tabernaemontani	Soft-stemmed Bulrush	Cyperaceae			G?	S5	5	-5
Scirpus atrovirens	Woolgrass Bulrush	Cyperaceae			G5?	S5	3	-5
Scirpus cyperinus	Cottongrass Bulrush	Cyperaceae			G5	S5	4	-5
Sisyrinchium montanum	Strict Blue-eyed-grass	Iridaceae			G5	S5	4	-1
Solanum dulcamara	Climbing Nightshade	Solanaceae			G?	SE5	0	0
Solidago canadensis	Canada Goldenrod	Asteraceae			G5	S5	1	3
Solidago gigantea	Smooth Goldenrod	Asteraceae			G5	S5	4	-3
Solidago rugosa ssp. rugosa	Rough Goldenrod	Asteraceae			G5T?	S5	4	-1
Sparganium emersum ssp. emersum	Greenfruit Bur-reed	Sparganiaceae			G5	S5	5	-5
Sparganium eurycarpum	Large Bur-reed	Sparganiaceae			G5	S5	3	-5
Spiraea alba	Narrow-leaved Meadow-sweet	Rosaceae			G5	S5	3	-4
Spirodela polyrhiza	Common Water-flaxseed	Lemnaceae			G5	S5	4	-5
Stuckenia pectinata	Sago Pondweed	Potamogetonaceae			G5	S5	4	-5
Symphyotrichum lanceolatum ssp. lanceolatum	Panicled Aster	Asteraceae			G5T?	S5	3	-3
Symphyotrichum lateriflorum var. lateriflorum	Calico Aster	Asteraceae			G5T5	S5	3	-2
Symphyotrichum novae-angliae	New England Aster	Asteraceae			G5	S5	2	-3
Typha angustifolia	Narrow-leaved Cattail	Typhaceae			G5	S5	3	-5
Typha latifolia	Broad-leaf Cattail	Typhaceae			G5	S5	3	-5
Typha x glauca	Blue Cattail	Typhaceae			HYB	S4?	3	-5
Ulmus americana	American Elm	Ulmaceae			G5?	S5	3	-2
Vallisneria americana	Eel-grass	Hydrocharitaceae			G5	S5	6	-5
Verbena hastata	Blue Vervain	Verbenaceae			G5	S5	4	-4
Verbena urticifolia	White Vervain	Verbenaceae			G5	S5	4	-1
Viburnum lantana	Wayfaring-tree	Caprifoliaceae			G?	SE2	0	5
Viburnum opulus	Guelder-rose Viburnum	Caprifoliaceae			G5	SE4	0	0
Viburnum recognitum	Southern Arrow-wood	Caprifoliaceae			G5	S4	7	-2
Viola cucullata	Marsh Blue Violet	Violaceae			G4G5	S5	5	-5
Vitis riparia	Riverbank Grape	Vitaceae			G5	S5	0	-2
Wolffia columbiana	Columbia Watermeal	Lemnaceae			G5	S4S5	4	-5

***Note:** For a list of sources and definitions of abbreviations, please refer to Appendix 1.

Appendix 6. 2006 Amphibian (Calling Frogs and Toads) Monitoring Results.

	Common Name	Scientific Name	Conservation Status				Area Sensi-tivity[5]	Survey Results by date and polygon[7]																																		
			National	Provincial		Regional		A1 (North)			A1 (South)			A2			A3			A4			A5 (NE)			A5 (SW)			A6			A7			Pond near A3			SWM Pond at A4			Fields east of A6		
			COSEWIC[1]	MNR[2]	Srank[3]	'Central Region'[4]		Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29	Apr 12	May 30	Jun 29
1	American Toad	*Bufo americanus*	---	---	S5	A & W	---	L1(1)	L1(1)					L2(4)			L2(4)						L3			L2(5)			L3									L2(3)			L3		
2	Spring Peeper	*Pseudacris crucifer*	---	---	S4	A & W	---																L2(5)			L1(1)			L3			L2(5)						L2(2)			L3		
3	Western Chorus Frog	*Pseudacris triseriata*	---	---	S4	A & W	---	L2(3)			L2(2)																														L3		
4	American Bullfrog	*Rana catesbeiana*	---	---	S4	C & W	AS					L2(4)	L1(2)											L1(1)			L2(5)	L1(1)					L2(4)	L1(1)	L2(2)	L2(3)	L2(3)		L2(2)				
5	Green Frog	*Rana clamitans*	---	---	S5	A & W	---								L2(3)			L1(2)			L1(2)			L2(7)	L2(10)		L2(2)	L2(5)		L2(3)			L3	L2(20)		L2(2)	L2(10)		L2(15)	L2(6)			
6	Northern Leopard Frog	*Rana pipiens*	---	---	S5	A & W	---					L1(1)		L2(3)			L2(3)						L2(5)			L1(1)			L2(6)			L2(10)			L2(4)								

LEGEND

Federal Conservation Status

1. Federal (COSEWIC) Status: Status assigned by the Committee on the Status of Endangered Wildlife in Canada. (COSEWIC, 2006)

EXT = Extinct. A wildlife species that no longer exists.
EXP = Extirpated. A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
END = Endangered. A wildlife species facing imminent extirpation or extinction.
THR = Threatened. A wildlife species likely to become endangered if limiting factors are not reversed.
SC = Special Concern. A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
DD = Data Deficient - A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.
NAR = Not At Risk. A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Provincial Conservation Status

2. Provincial (MNR) Status: Status assigned by the Ontario Ministry of Natural Resources (OMNR, 2006).

EXT = Extinct. A species that no longer exists anywhere.
EXP = Extirpated. A species that no longer exists in the wild in Ontario but still occurs elsewhere.
END-R = Endangered (Regulated). A species facing imminent extinction or extirpation in Ontario which has been regulated under Ontario's Endangered Species Act (ESA).
END = Endangered (Not Regulated). A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.
THR = Threatened. A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
SC = Special Concern. A species with characteristics that make it sensitive to human activities or natural events.
DD = Data Deficient. A species for which there is insufficient information for a provincial status recommendation.
NAR = Not At Risk. A species that has been evaluated and found to be not at risk.

3 Provincial rarity ranks are assigned by the Ontario Natural Heritage Information Centre (NHIC, 2006)

SX = Presumed Extirpated — Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH = Possibly Extirpated (Historical) — Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively & unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
S1 = Critically Imperiled — Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2 = Imperiled — Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3 = Vulnerable — Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 = Apparently Secure — Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 = Secure — Common, widespread, and abundant in the nation or state/province.
SNR = Unranked — Nation or state/province conservation status not yet assessed.
SU = Unrankable — Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA = Not Applicable — A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S# = Range Rank — A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

Regional Conservation Status

4. Status designations based on the "Distribution and Status of the Herpetofauna of Central Region" by Plourde et al. (1989).

W = Widespread: Any species that occurs throughout Central Region.
L = Local: Any species that is restricted in its distribution in Central Region, either geographically or because of specialized habitat requirements.
A = Abundant: Any species that occurs in high numbers in Central Region.
C = Common: Any species that occurs in moderate numbers in Central Region.
U = Uncommon: Any species that occurs in low numbers in Central Region, or is seldom observed because of its secretive nature
R = Rare: Any species that, because of its biological characteristics or because it occurs at the fringe of its range exists in small numbers or in very restricted areas in central Region. These species may be threatened with extirpation in the Region
E = Extirpated: Any species no longer existing in central Region but existing elsewhere.
I = Introduced: A non-native species which was artificially brought into Central Region.

Life History Information

6. Area sensitivity designations based on OMNR (2000) (See Appendix C & G)

AS = Area Sensitive

Survey Results

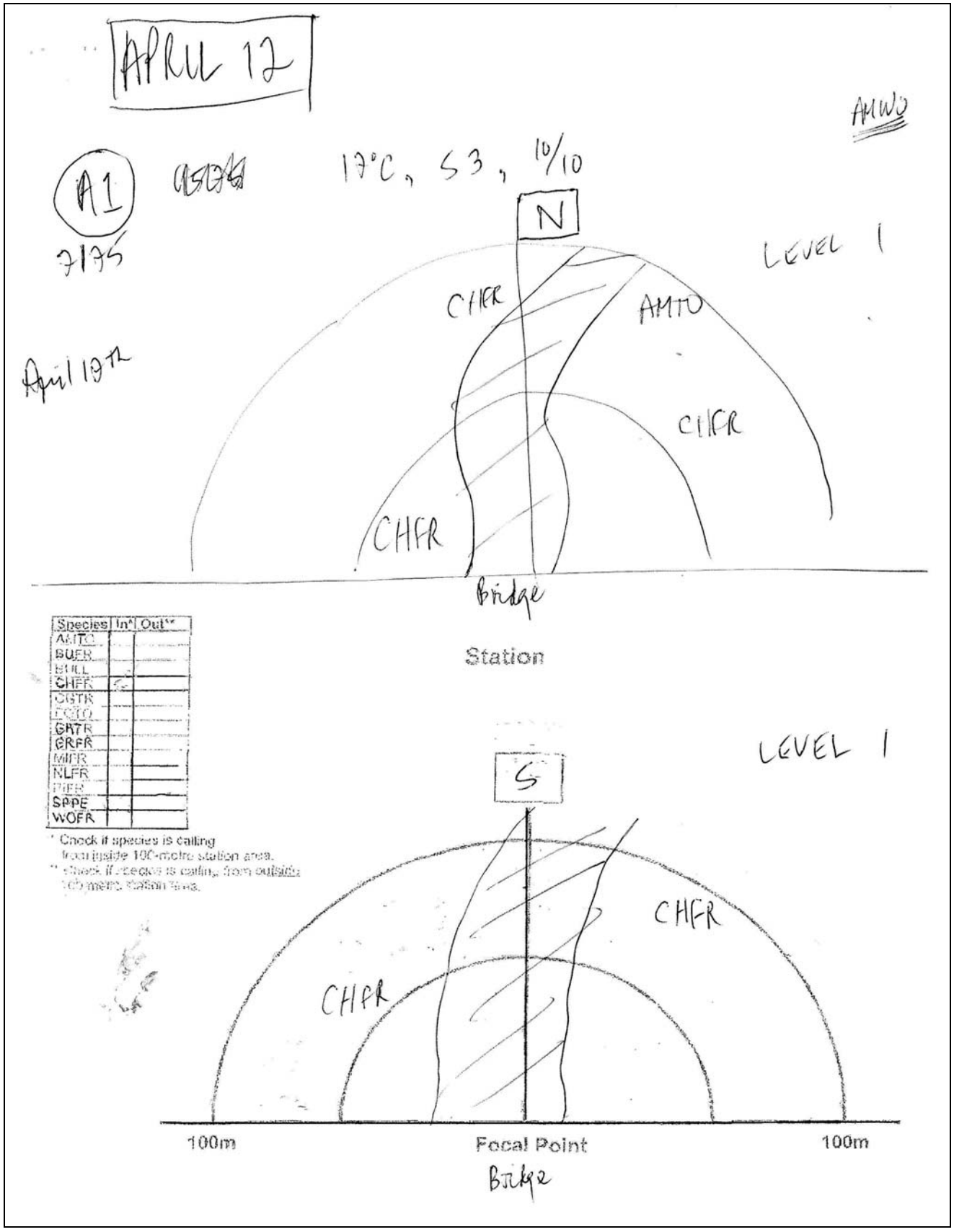
7. Codes used to describe survey results based on the Marsh Monitoring Program (BSC, 2003)

L1 = Level 1 = Individuals can be counted; calls not simultaneous
L2 = Level 2 = Calls distinguishable; some calls simultaneous
L3 = Level 3 = Full chorus; calls continuous and overlapping
( ) = numbers in brackets following L1 or L2 refer to estimates of individuals present

REFERENCES

BSC (Bird Studies Canada). 2003. Marsh Monitoring Program - Training Kit and Instructions for Surveying Marsh Birds, Amphibians and their Habitats. 2003 Edition. 40 pages. Published by Birds Studies Canada in cooperation with Environment Canada and the U.S. Environmental Protection Agency. March 2003.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2006. Canadian Species at Risk. Committee on the Status of Endangered Wildlife in Canada. August 2006. 74 pp. **http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.pdf**
NHIC (Ontario Natural Heritage Information Centre). 2006. NHIC List of Ontario Birds. Ontario Natural Heritage Information Centre Home Page. http://nhic.mnr.gov.on.ca/MNR/nhic/species/listout.cfm?el=ab
OMNR (Ontario Ministry of Natural Resources). 2000. Significant Wildlife Habitat Technical Guide. 151pp.
OMNR (Ontario Ministry of Natural Resources). 2006. Species at Risk in Ontario List. List issued June 30, 2006 by Ontario Ministry of Natural Resources Species at Risk Unit. http://www.mnr.gov.on.ca/mnr/speciesatrisk/status_list.html
Plourde, S.A., E.L. Szepesi, J.L. Riley, M.J. Oldham and C. Campbell. 1989. Distribution and Status of the Herpetofauna of Central Region, Ontario Ministry of Natural Resources. Parks and Recreational Areas Section, OMNR, Open File Ecological Report Sr8903, Central Region, Richmond Hill, Ontario. 27pp.

Appendix 7. 2006 Amphibian (Calling Frogs and Toads) Monitoring Field Notes.



A2 WP097

April 18th

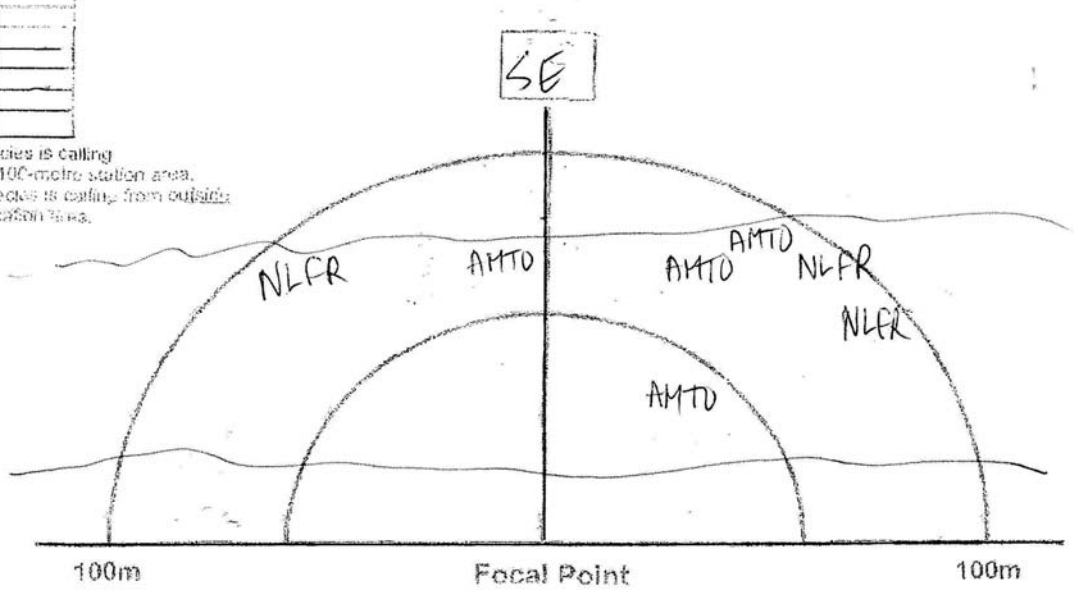
Species	In*	Out**
AMTO		
BUFR		
BULL		
CHFR		
DCTR		
ECCU		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.

2/50

LEVEL 2 AMTO

L1 - NLFR



April 17th

A3 WP041 0646011 4759919 (80m from WP039 S)

7305

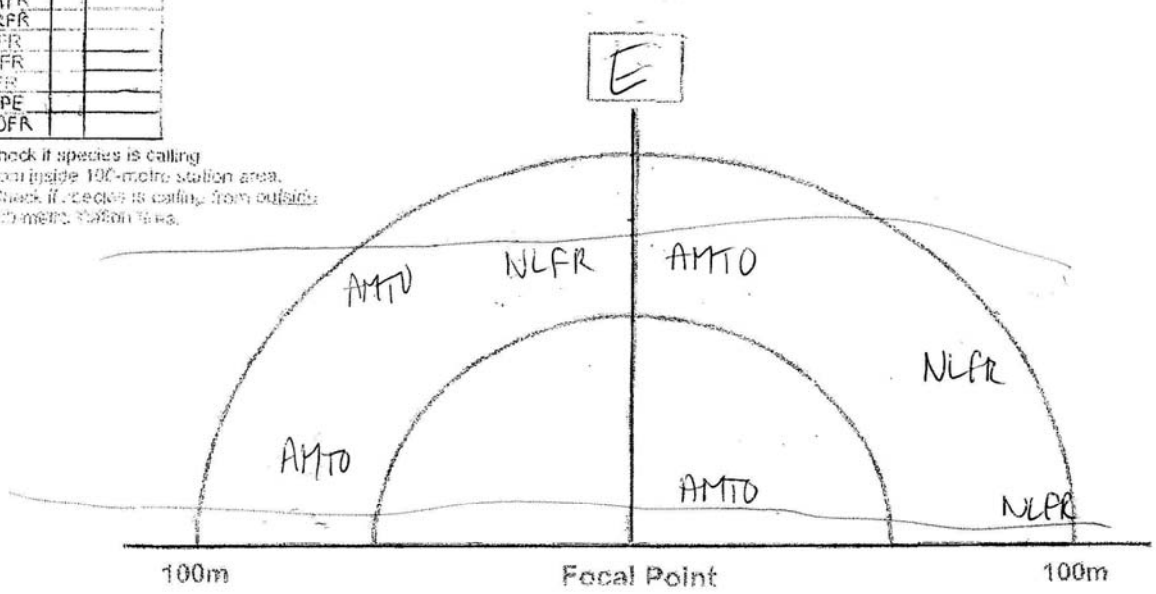
Pond - BUFR 2
NLFR 4

to west of me (behind me)

LEV. 7 - AMTO

Species	In*	Out**
AMTO		
BUFR		
BTLL		
CHFR		
CGTR		
ECTO		
GRTR		
GRER		
MIPR		
NLFR		
PIPR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.



April 17th

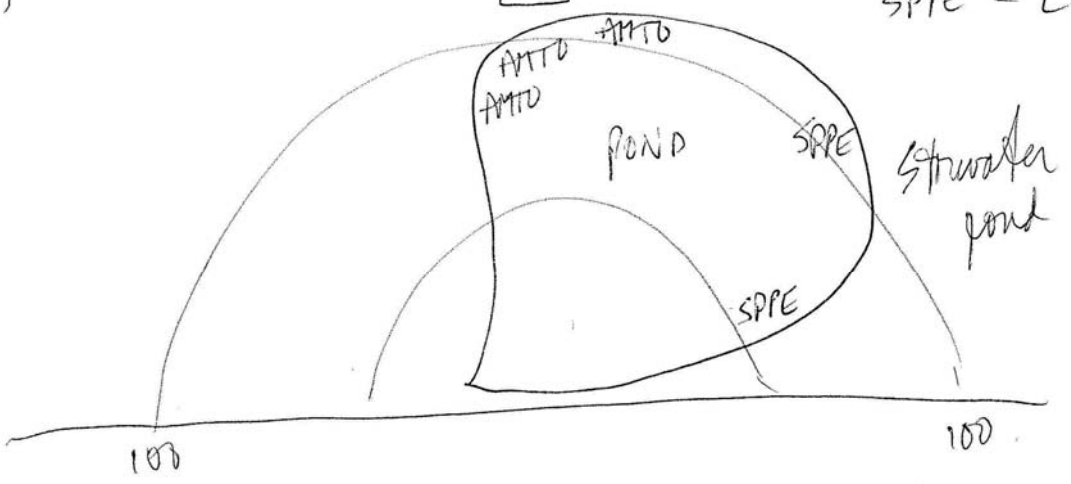
A4

1930
lt. rain

S 7
17°C

S

AMTO - L7
SPPE - L1



Stormwater pond

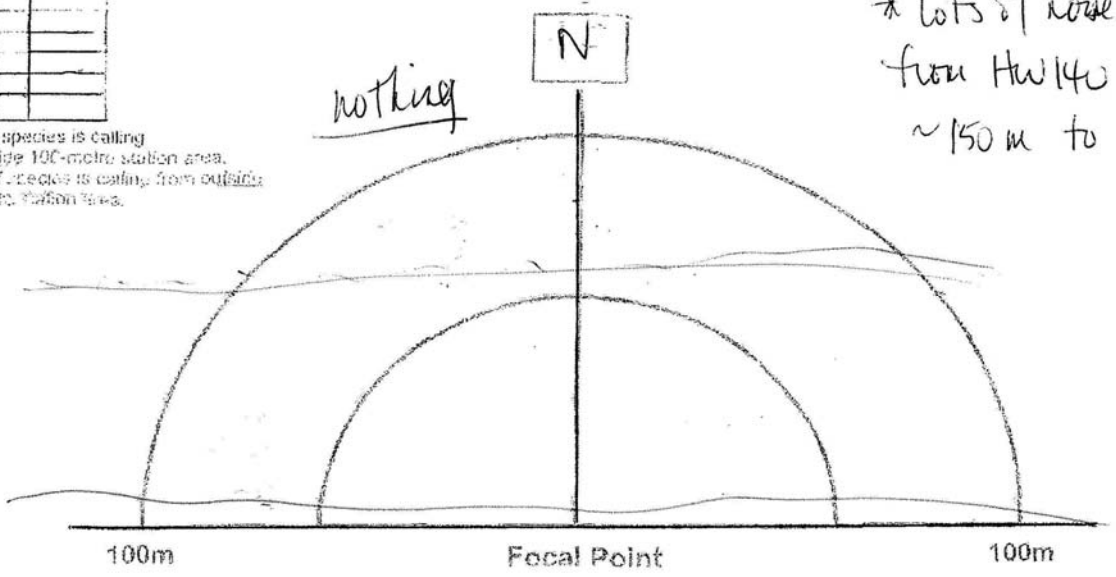
ESOW at A3

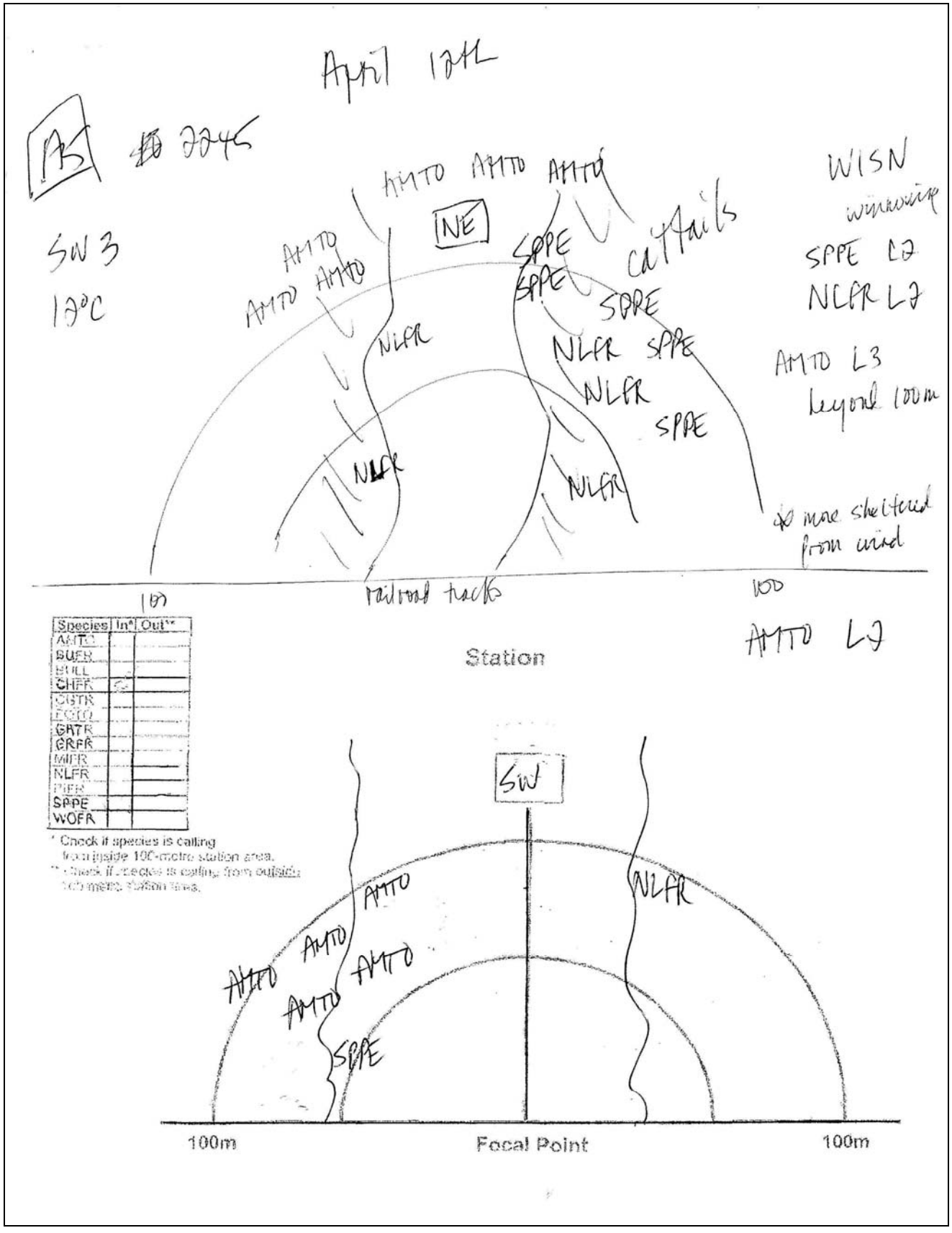
Species	In*	Out**
AMTO		
SUFR		
BULL		
CHFR		
OSTR		
FOTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.

Station

* lots of noise from Hwy 40 ~150 m to W




April 12th
B3
3245
SW 3
12°C
AMTO AMTO AMTO
NE
AMTO AMTO AMTO
NLFR
SPPE SPPE
cattails
SPRE
NLFR SPPE
NLFR
SPPE
NLFR
NLFR
WISN
SPPE L7
NLFR L7
AMTO L3
beyond 100m
more sheltered from wind
100
railroad tracks
100
AMTO L7
Species | In* | Out**
AMTO
BUFF
BULL
CHFR
CGTR
ECTO
GRTR
GREF
MIFR
NLFR
PIFR
SPPE
WOFR
* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.
Station
SW
AMTO AMTO AMTO AMTO AMTO
SPPE
NLFR
100m
Focal Point
100m

A6 7370 April 17th

SW 2

17°C

10/10

- whole field full of SPPE & AMTO & CHFR

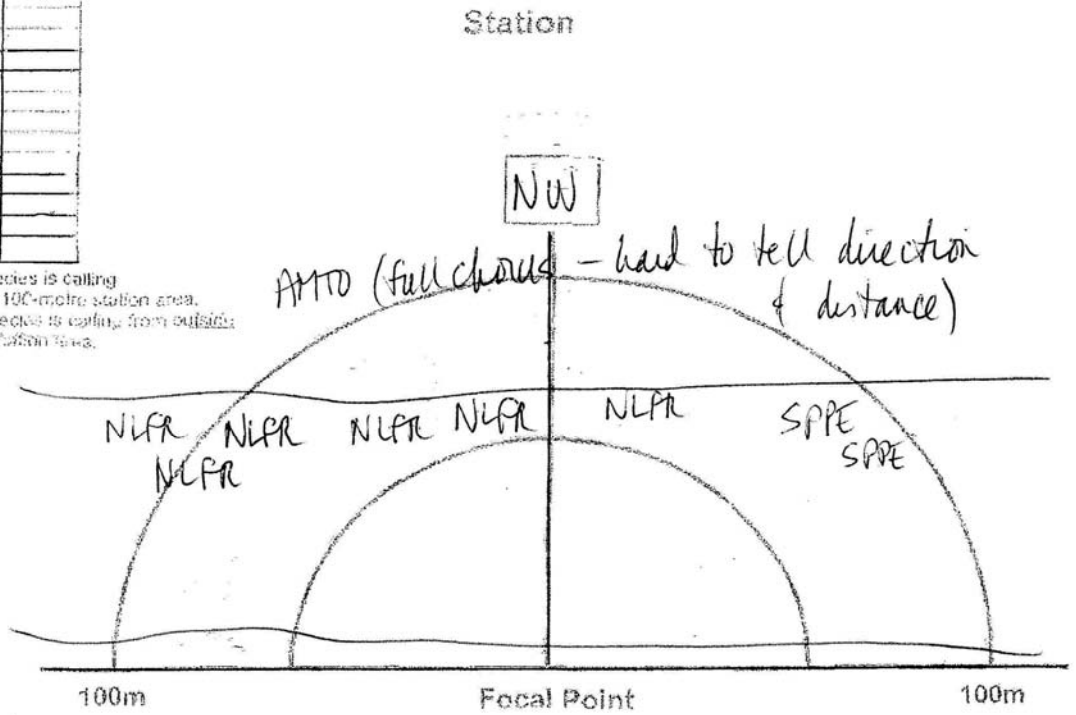
~~WISN~~ 1

AMWO 1

Species	In*	Out**
AMTO		
BUFR		
BULL		
CHFR		
CSTR		
ECTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIER		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.

** Check if species is calling from outside 100-metre station area.



SPPE full chorus

April 17th

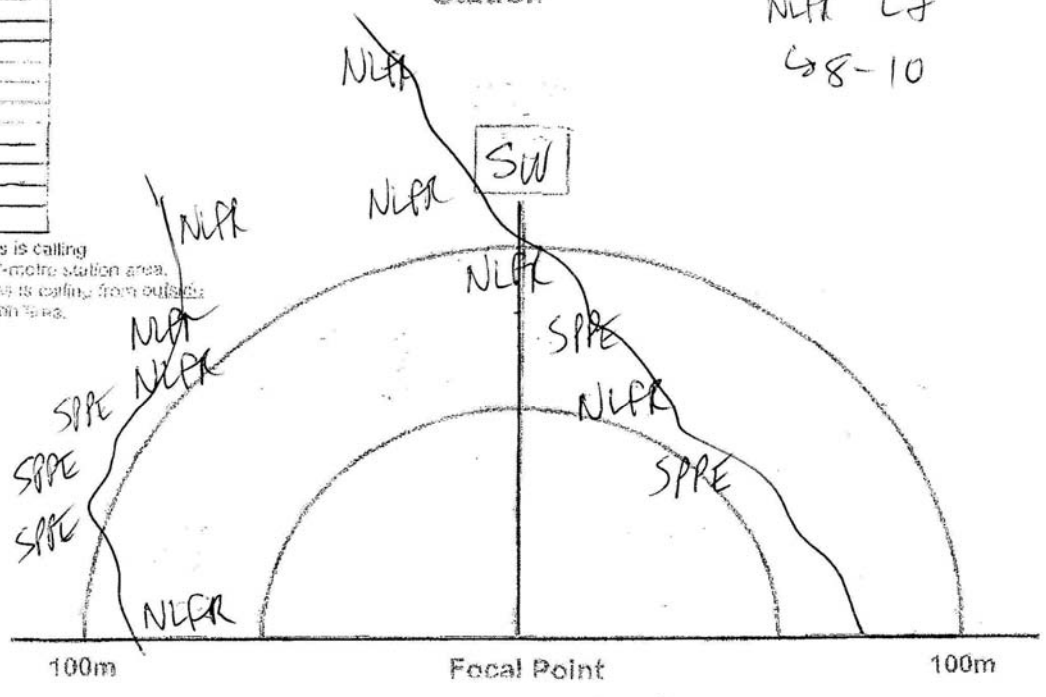
A7 couldn't reach from A6 (ie WP036)
- went 185 m N along W edge of field (from WP036) & hit trees/brush running E-W = no further.
∴ did W side of Doan Ridge Rd (just S of Lyon's Creek Rd).

1145
SW 7
10/10

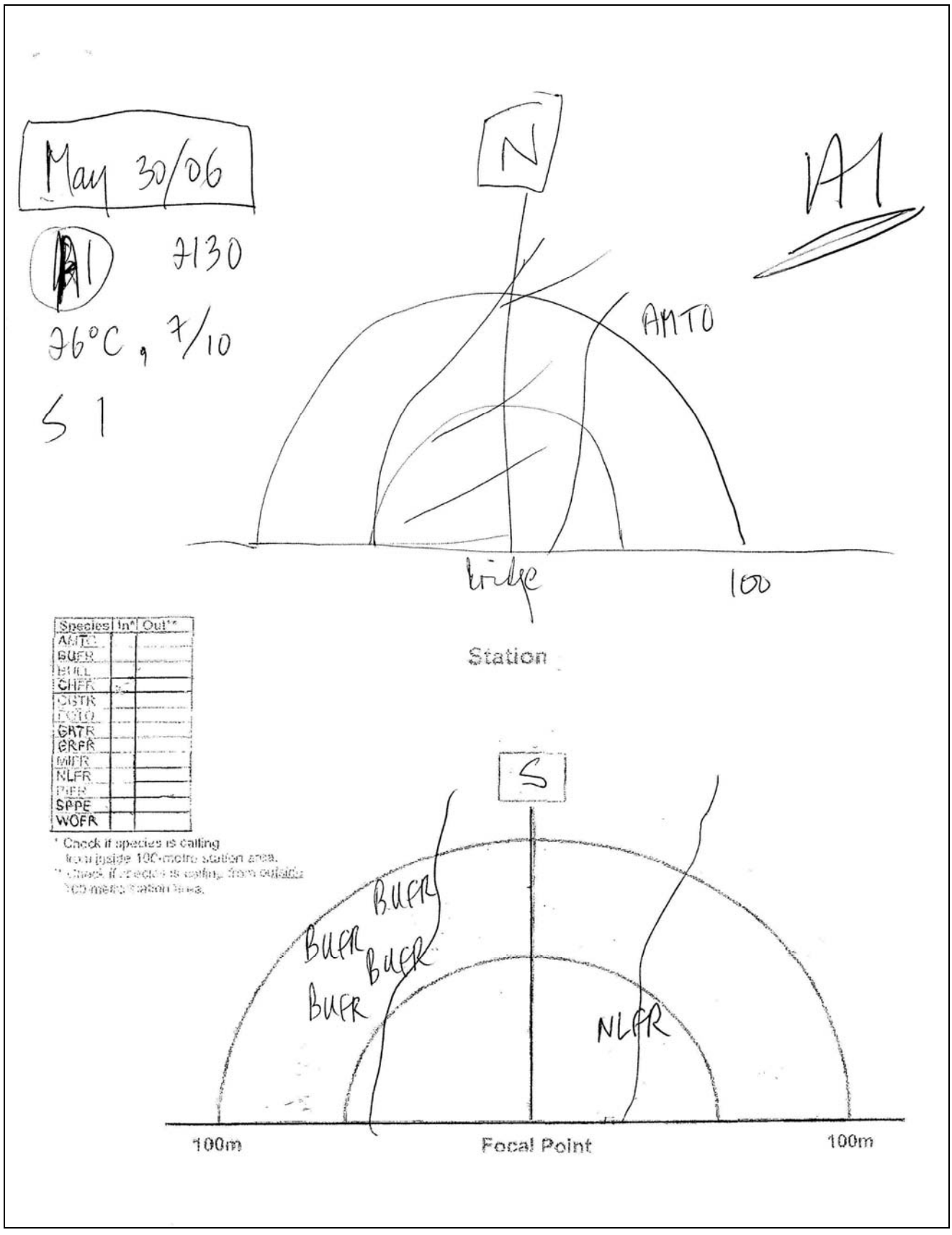
Species	In^	Out**
AMTO		
BUFR		
BULL		
CHFR	5	
CSTR		
ECTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

^ Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100 metre station area.

SPPE L7
NLFR L7
↳ 8-10



DOAN RIDGE RD.


May 30/06
A1
7130
76°C, 7/10
S 1
N
A1
AMTO
100
Station
Species In* Out**
AMTO
BUFR
BULL
CHFR
CSTR
DCIO
GRTR
GRFR
MIFR
NLFR
PIFR
SPPE
WOFR
* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.
S
BUFR
BUFR
BUFR
BUFR
NLFR
100m
Focal Point
100m

May 30 '06

A2

7150

A2

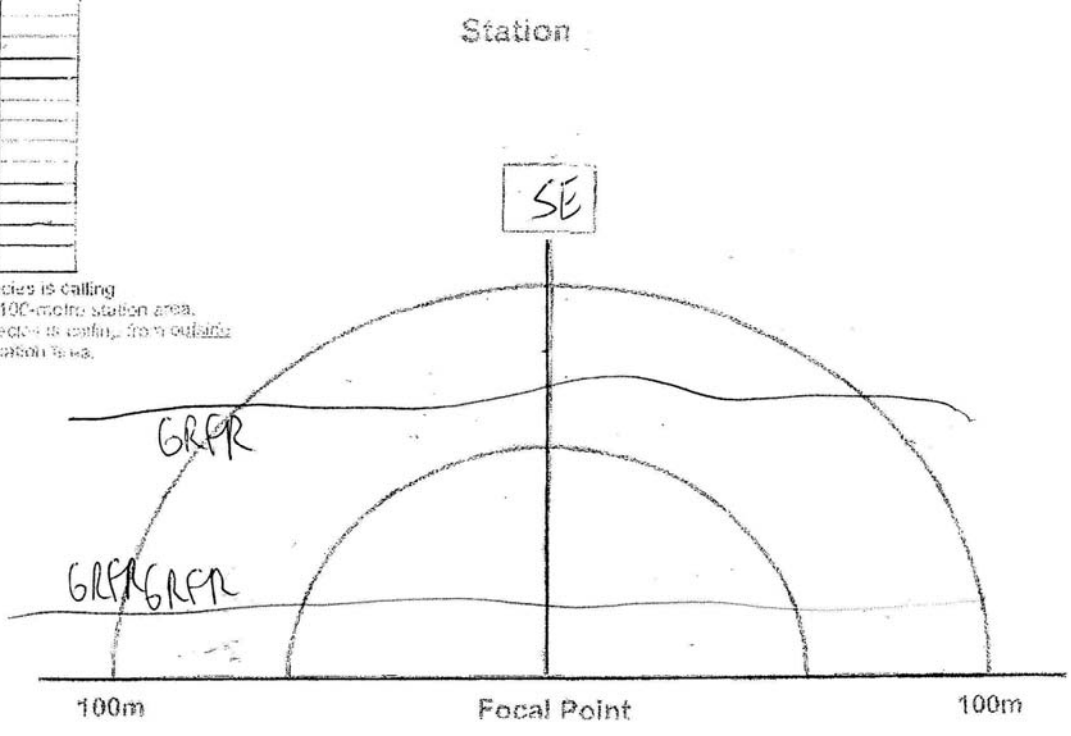
May 30/06

26°C, S1

7/10

Species	In*	Out**
AMTO		
BUFR		
BULL		
CHFR		
CGTR		
ECTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.



A3

May 30

7/10

26°C

S1

7/10

May 30th

Pond

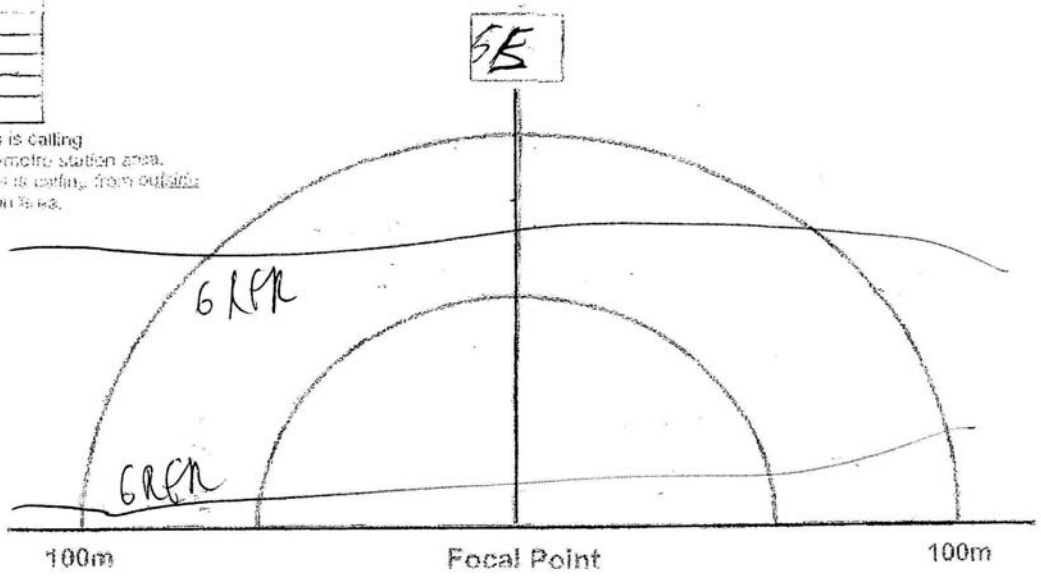
BUFR 3

GRFR 7

Species	In*	Out**
AMTE		
BUFR		
BULL		
CHFR		
CVSTR		
DCTO		
GRTR		
GRFR		
MIFR		
NLFR		
PUFR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.

** Check if species is calling from outside 100-metre station area.



A4

May 30th

S1, 35°C,

7730

Retention pond

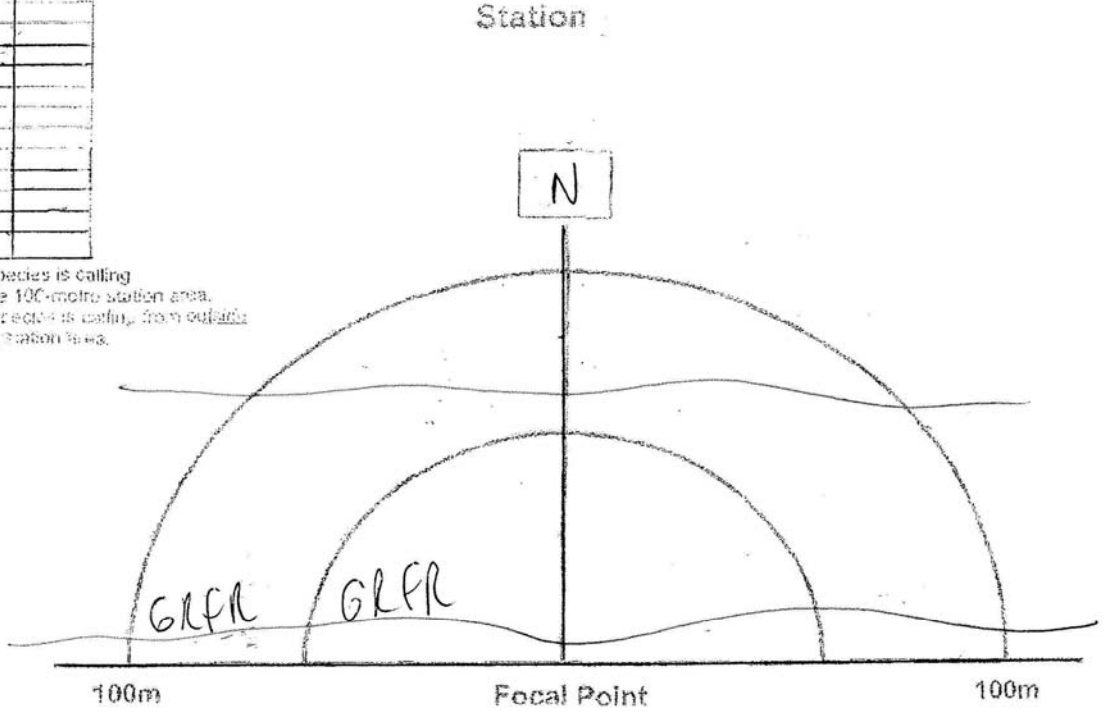
BUFR - 7

GRFR - 15+

Species	In*	Out**
AMTO		
BUFR		
BULL		
CHFR		
CSTR		
FCTO		
GRTR		
GRFR		
MIFR		
NLFR		
PUFR		
SPPE		
WOFR		

* Check if species is calling from a single 100-metre station area.

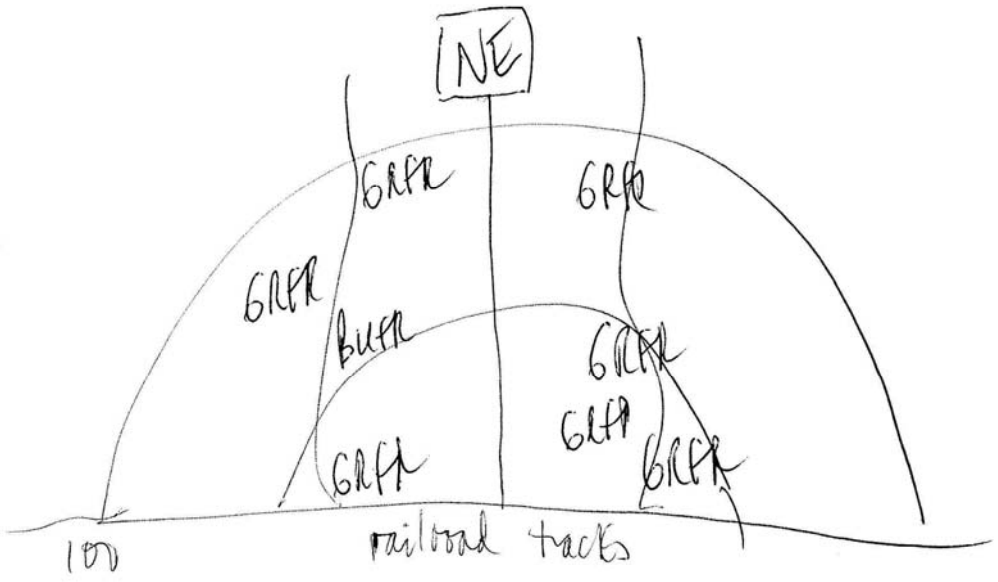
** Check if species is calling from outside 100-metre station area.



May 30th

A5

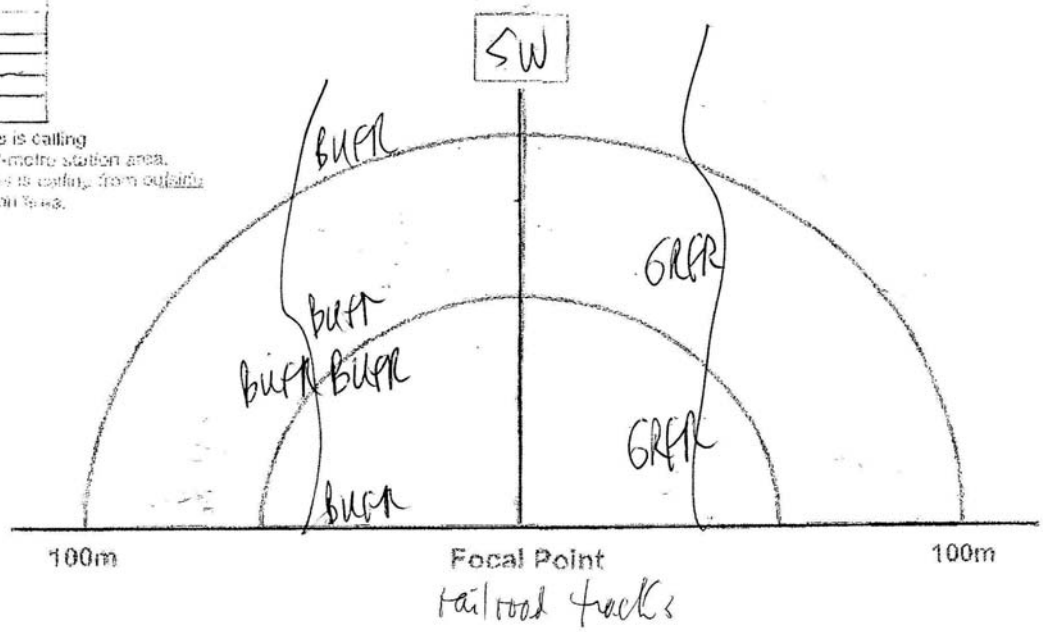
May 30/06
25°C, 51
1945



Species	In*	Out**
AMTE		
BUFR		
BULL		
CHFR		
CISTR		
COLO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.

Station



7315

A6

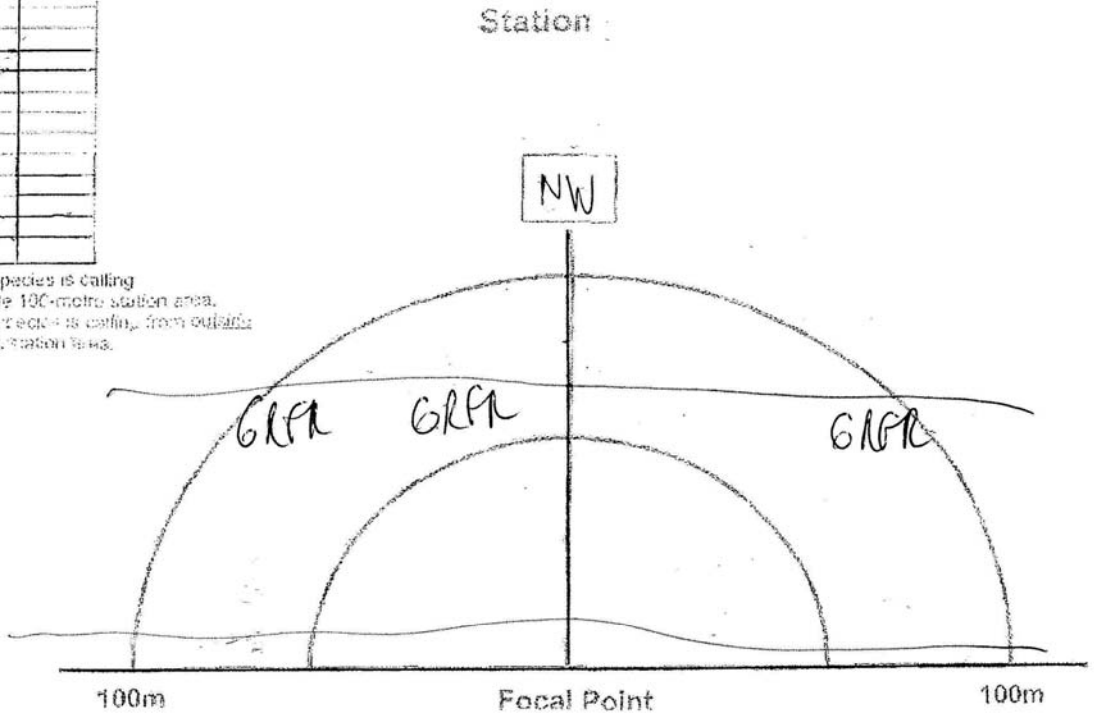
May 30th

51, 35°C

Species	In*	Out**
AMTE		
BUFR		
BULL		
CHFR		
CSTR		
DOTO		
GRTR		
GRFR		
MFR		
NLFR		
PIFR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.

** Check if species is calling from outside 100-metre station area.



Species	In*	Out**
AMTO		
BUFR		
BULL		
CHFR		
CSTR		
ECTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100 metre station area.

A7

7335

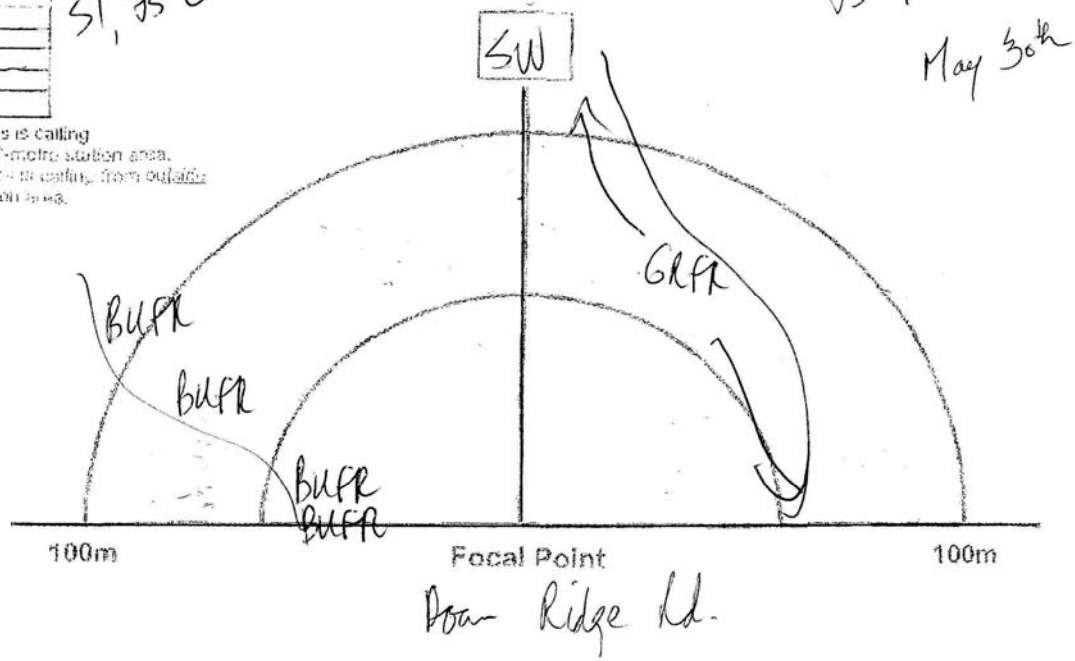
51, 35°C

Station

GRFR - L3

35 +

May 30th



Doan Ridge Rd.

June 29th/06

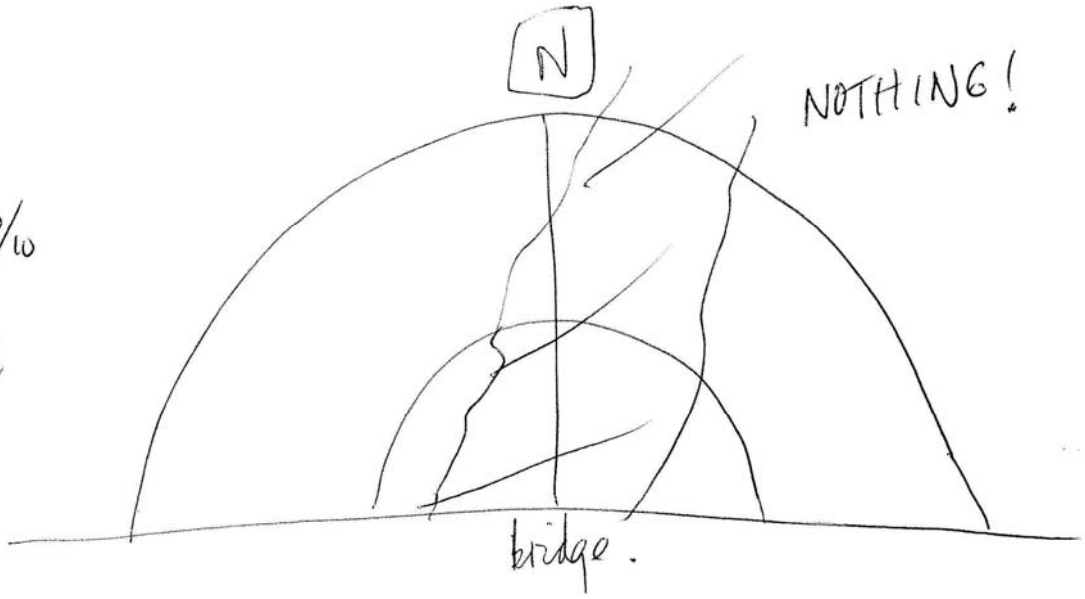
A1

7:30

24°C, 10/10

humid

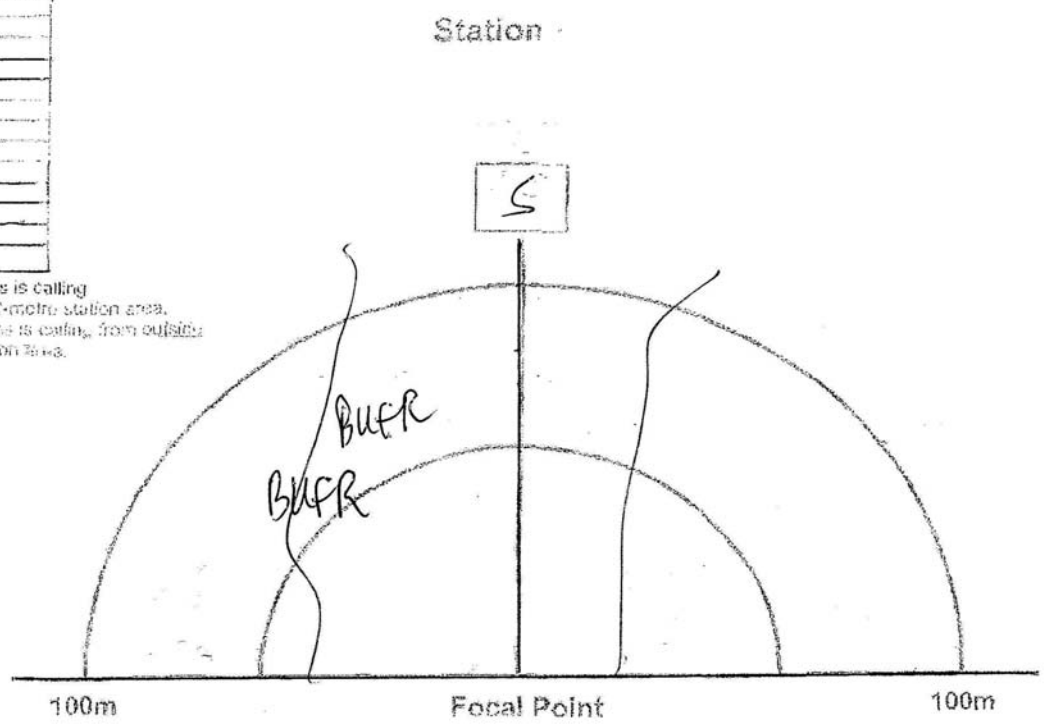
no wind

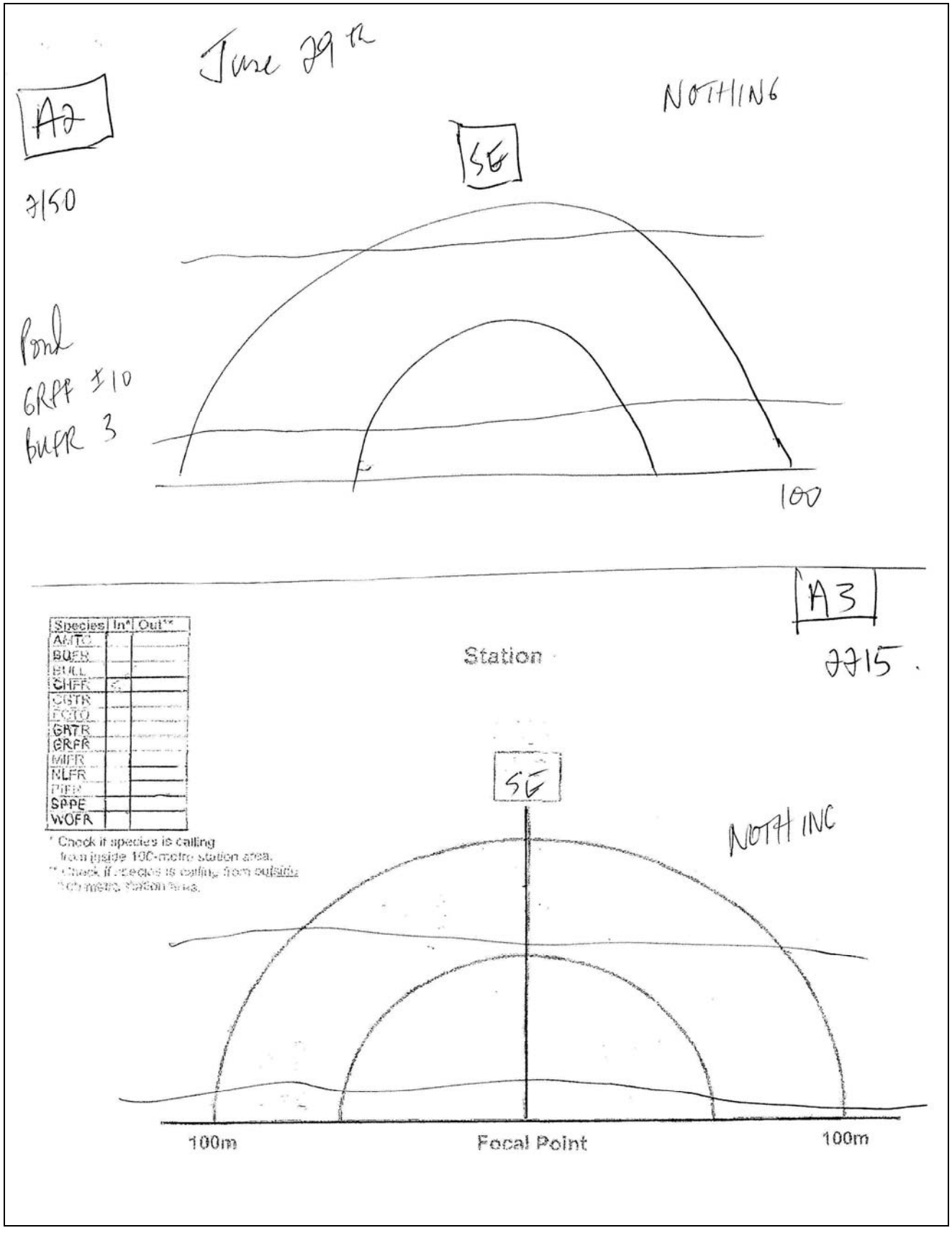


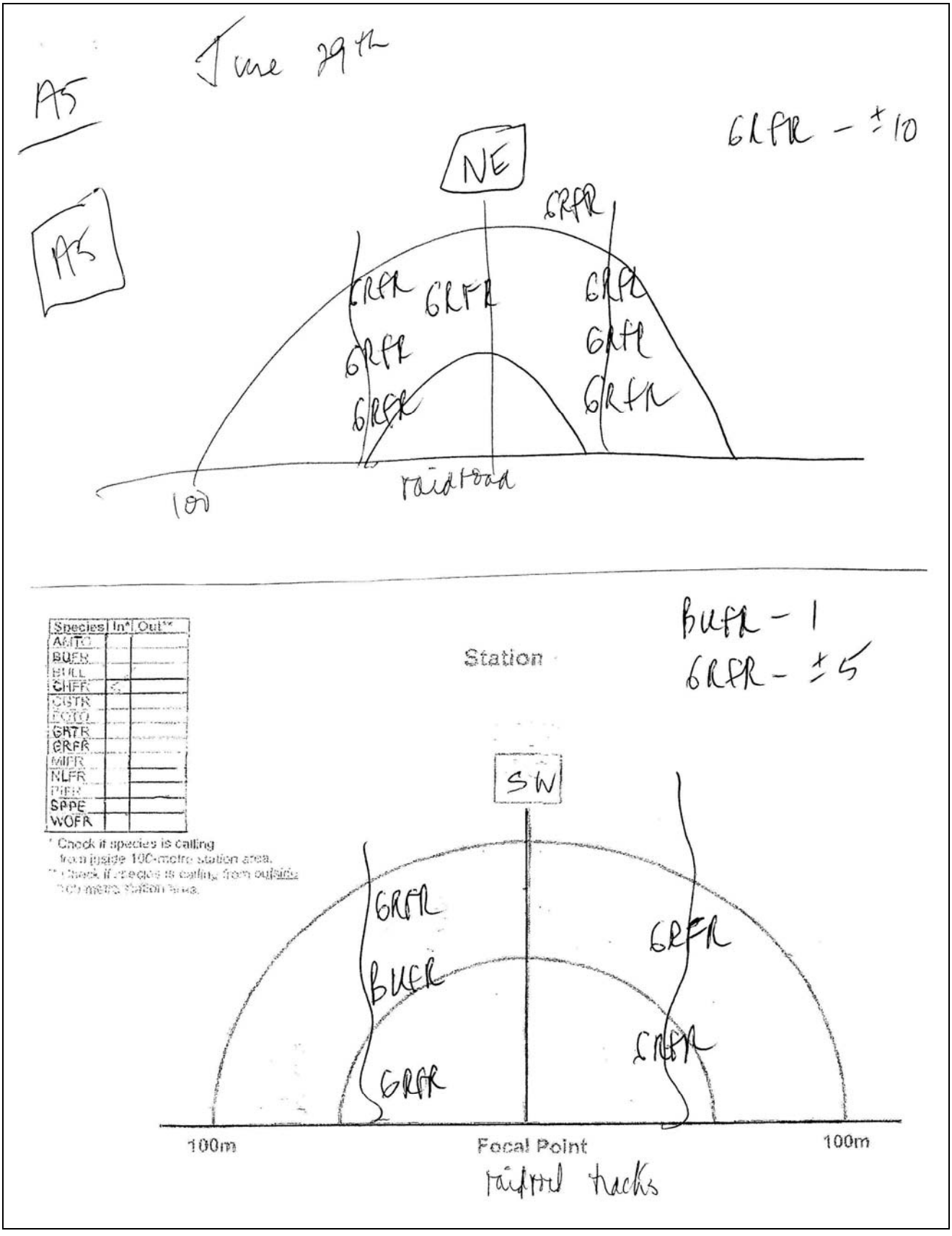
Species	In*	Out**
AMTO		
BUFR		
BULL		
CHFR		
CGTR		
COTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

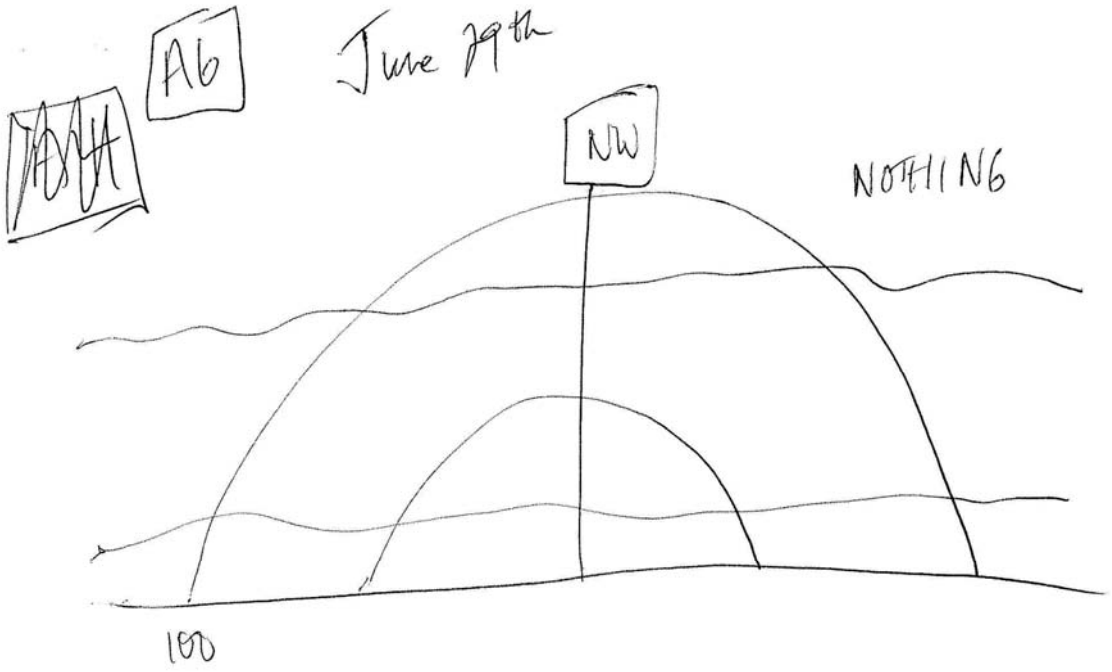
* Check if species is calling from inside 100-metre station area.

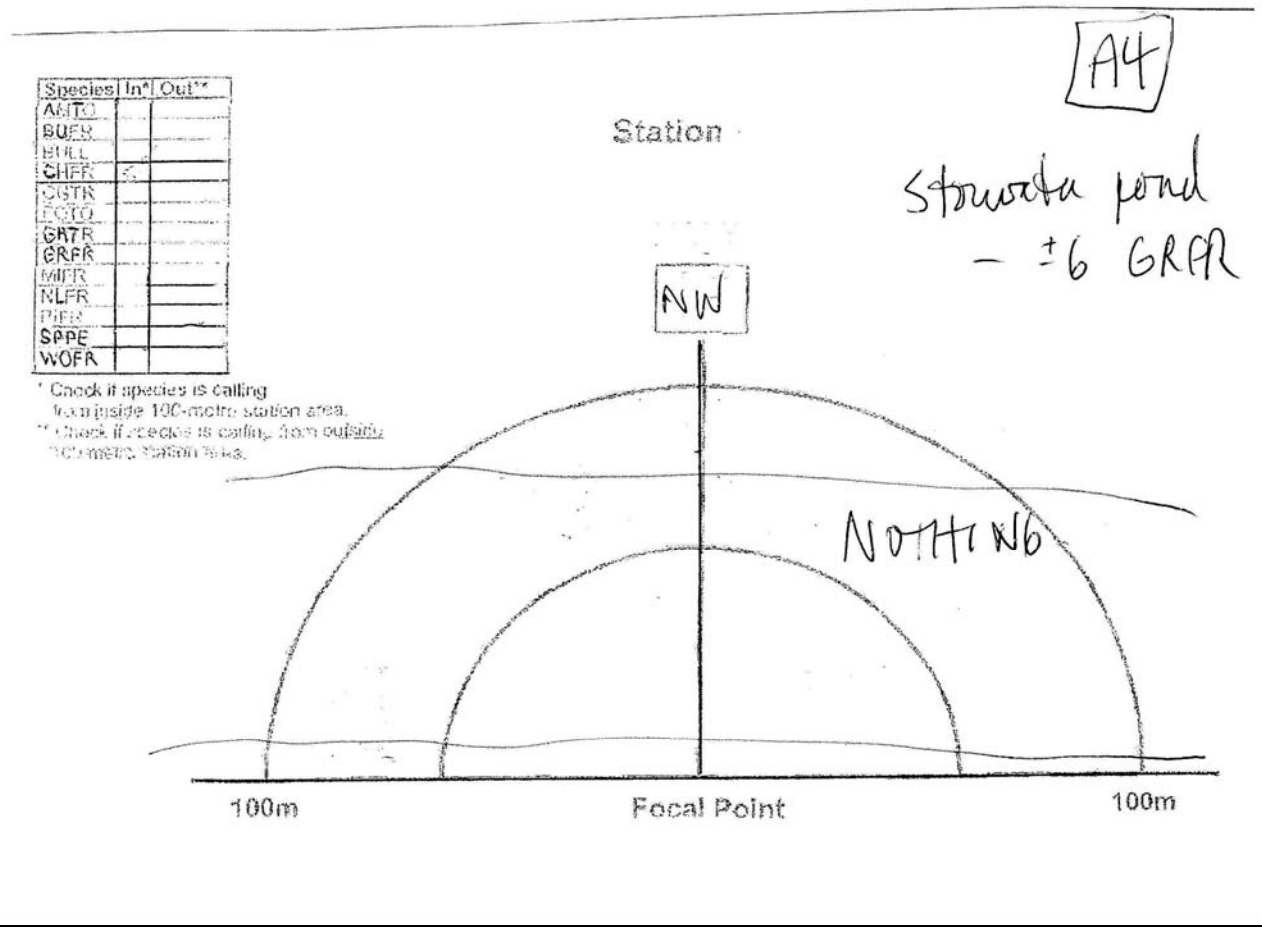
** Check if species is calling from outside 100-metre station area.




June 29th
A2
NOTHING
SE
7150
Pond
GRFR 10
BUFR 3
100
A3
7715.
Species
In*
Out**
AMTO
BUFR
BULL
CHFR
CSTR
ECTO
GRTR
GRFR
MIFR
NLFR
PIFR
SPPE
WOFR
* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.
Station
SE
NOTH INC
100m
Focal Point
100m


June 29th
AS
AS
NE
GRFR - ±10
GRFR
GRFR
GRFR
GRFR
GRFR
GRFR
GRFR
GRFR
100
raidroad
Species | In* | Out**
AMTO
BUFR
BULL
CHFR
CSTR
ECTO
GRTR
GRFR
MIPR
NLFR
PIEN
SPPE
WOFR
* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.
Station
BUFR - 1
GRFR - ±5
SW
GRFR
BUFR
GRFR
GRFR
GRFR
GRFR
100m
Focal Point
100m
raifroad tracks


A6
June 29th
NW
NOTHING
100


A4
Species In* Out**
AMTO
BUFL
BULL
CHFR
GBTR
GRFR
MIPR
NLFR
PIPR
SPPE
WOFR
* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.
Station
Stormwater pond
- ±6 GRFR
NW
NOTHING
100m
Focal Point
100m

Species	In*	Out**
AMTR		
BUFR		
BULL		
CHFR	✓	
CSTR		
FOTO		
GRTR		
GRFR		
MITR		
NLFR		
PIFR		
SPPE		
WOFR		

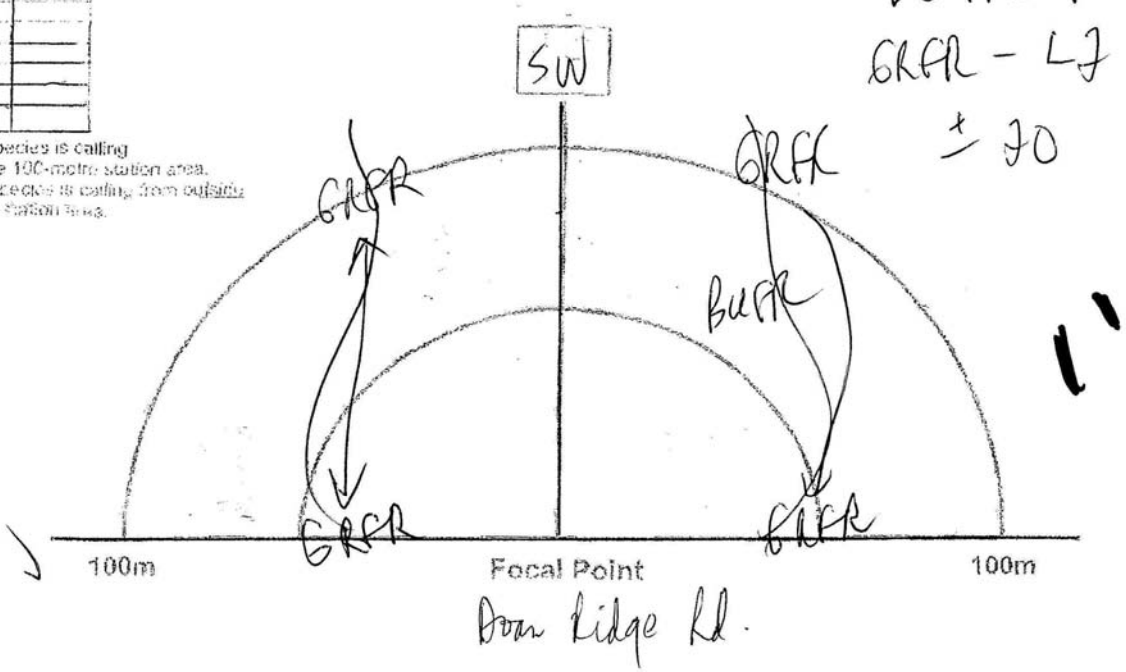
* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100 metre station area.

June 29th/06

Station

A7

BUFR 1
GRFR - L7
± 70



Doan Ridge Rd.

Appendix 8. 2006 Bird Monitoring Results.

	Common Name	Scientific Name	Conservation Status				Life History Information					B1		B2		B3		B4		B5		B6		B7		B8		B9		B10		B11	
			National	Provincial		Regional	Area																										
			COSEWIC[1]	MNR[2]	SRank[3]	BCR 13[4]	Sensitivity[5]	Group	Migration Strategy	Habitat Category	Habitat Subcategory	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun	5-Jun	22-Jun
1	**Great Blue Heron**	***Ardea herodias***	---	---	S5B	---	---	Waterbird	Neotropical	Wetlands	Wetlands	1 H					1 H														1 H	2 H
2	**Green Heron**	***Butorides striata***	---	---	S4B	---	---	Waterbird	Neotropical	Wetlands	Wetlands								1 H													
3	**Canada Goose**	***Branta canadensis***	---	---	S5B	---	---	Waterfowl	Short Distance	Wetlands	Wetlands	12 H																				
4	**Wood Duck**	***Aix sponsa***	---	---	S5B	---	---	Waterfowl	Short Distance	Wetlands	Marsh																	1 P				
5	**Mallard**	***Anas platyrhynchos***	---	---	S5B	---	---	Waterfowl	Short Distance	Wetlands	Wetlands					2 H																
6	Red-tailed Hawk	*Buteo jamaicensis*	NAR	NAR	S5B	---	---	Landbird	Short Distance	Woods/Forests	Woods Open																				1 H		
7	American Kestrel	*Falco sparverius*	---	---	S5B	PLS	---	Landbird	Short Distance	Grass/Agriculture/Open	Grassland/Agriculture			1 H																		
8	**Sora**	***Porzana carolina***	---	---	S4B	---	---	Waterbird	Short Distance	Wetlands	Marsh																	1 S				
9	Killdeer	*Charadrius vociferus*	---	---	S5B	---	---	Shorebird	Short Distance	Grass/Agriculture/Open	Various Open											1 D			1 S							
10	**Spotted Sandpiper**	***Actitis macularius***	---	---	S5B	---	---	Shorebird	Neotropical	Wetlands	Shores					1 D						1 D					1 T			1 P		
11	Mourning Dove	*Zenaida macroura*	---	---	S5B	---	---	Landbird	Short Distance	Urban/Suburban	Various	1 S								2 H											1 S	
12	**Belted Kingfisher**	***Ceryle alcyon***	---	---	S5B	PLS	---	Landbird	Short Distance	Wetlands	Water Open																			1 S			
13	Downy Woodpecker	*Picoides pubescens*	---	---	S5	---	---	Landbird	Resident	Woods/Forests	Woods Deciduous							1 H										1 H				
14	Northern Flicker	*Colaptes auratus*	---	---	S5B	PLS	---	Landbird	Short Distance	Woods/Forests	Woods Open								1 S							1 S						
15	Eastern Wood-Pewee	*Contopus virens*	---	---	S5B	PLS	---	Landbird	Neotropical	Woods/Forests	Woods Deciduous																			1 S	1 T		
16	Willow Flycatcher	*Empidonax traillii*	---	---	S5B	PLS	---	Landbird	Neotropical	Shrubs/Early Succession	Shrubs		1 S	1 S														1 S				
17	Great Crested Flycatcher	*Myiarchus crinitus*	---	---	S5B	---	---	Landbird	Neotropical	Woods/Forests	Woods																			1 S	1 T		
18	Eastern Kingbird	*Tyrannus tyrannus*	---	---	S5B	PLS	---	Landbird	Neotropical	Grass/Agriculture/Open	Various Open															1 P						
19	Warbling Vireo	*Vireo gilvus*	---	---	S5B	---	---	Landbird	Neotropical	Woods/Forests	Woods Open											1 S		1 S								
20	Red-eyed Vireo	*Vireo olivaceus*	---	---	S5B	---	---	Landbird	Neotropical	Woods/Forests	Woods Deciduous	1 S						1 S												2 S	2 T		
21	Blue Jay	*Cyanocitta cristata*	---	---	S5	---	---	Landbird	Short Distance	Urban/Suburban	Various		1 S	1 S		1 S	1 T	1 S	1 T							2 S			1 S			
22	American Crow	*Corvus brachyrhynchos*	---	---	S5B	---	---	Landbird	Short Distance	Urban/Suburban	Various						1 S											2 S			1 S	1 T
23	Tree Swallow	*Tachycineta bicolor*	---	---	S5B	---	---	Landbird	Short Distance	Urban/Suburban	Various										1 T	1 P									1 P	
24	Barn Swallow	*Hirundo rustica*	---	---	S5B	---	---	Landbird	Neotropical	Grass/Agriculture/Open	Various Open		1 H				2 P					3 P		3 P	1 H			2 P	2 T			
25	White-breasted Nuthatch	*Sitta carolinensis*	---	---	S5	---	AS	Landbird	Resident	Woods/Forests	Woods Deciduous							1 S															
26	House Wren	*Troglodytes aedon*	---	---	S5B	---	---	Landbird	Short Distance	Shrubs/Early Succession	Early Succession						1 S	1 S	1 S	1 S	1 T			1 S		1 S	1T, 2S	2 S	1 T	1 S		1 S	
27	American Robin	*Turdus migratorius*	---	---	S5B	---	---	Landbird	Short Distance	Urban/Suburban	Various	1 S	1 T	1 S		1 S	1T, 1S			2 FY			1 S	1 S		2 S				2 S	2 T		1 S
28	Gray Catbird	*Dumetella carolinensis*	---	---	S5B	---	---	Landbird	Short Distance	Shrubs/Early Succession	Shrubs	1 S	1 T	1 S	1 T	1 S		2 S		1 S		1 S	1 T	1 S		1 S	1 T	1 S		1 S		1 S	
29	Northern Mockingbird	*Mimus polyglottos*	---	---	S4B	---	---	Landbird	Resident	Shrubs/Early Succession	Shrubs	1 S	1 T																	1 S			
30	Brown Thrasher	*Toxostoma rufum*	---	---	S5B	PLS	---	Landbird	Short Distance	Shrubs/Early Succession	Shrubs															1 P							
31	European Starling	*Sturnus vulgaris*	---	---	SE	---	---	Landbird	Short Distance	Urban/Suburban	Various		1 H																				
32	Cedar Waxwing	*Bombycilla cedrorum*	---	---	S5B	---	---	Landbird	Short Distance	Shrubs/Early Succession	Shrubs					1 P	2 S			1 P							1 P	1 P					
33	Yellow Warbler	*Dendroica petechia*	---	---	S5B	---	---	Landbird	Neotropical	Shrubs/Early Succession	Shrubs	1 S		2 S	2 T	2 S	2T, 1S	3 S	2 S	1 S	1 T		1 S	1 S	1T, 2S		2 S		1 S			1 S	
34	**Common Yellowthroat**	***Geothlypis trichas***	---	---	S5B	---	---	Landbird	Neotropical	Shrubs/Early Succession	Shrubs	1 S		1 S	1 T	1 S	1 T	1 S	1 T					1 S			1 S						
35	Song Sparrow	*Melospiza melodia*	---	---	S5B	---	---	Landbird	Short Distance	Shrubs/Early Succession	Shrubs	2 S	1 T	1 S	1T, 1S	2 S	2 T	2 S	2 T		1 S	1 S	1 T	1 S	1T, 2S	2 S	1 T	1 S					1 S
36	**Swamp Sparrow**	***Melospiza georgiana***	---	---	S5B	---	---	Landbird	Short Distance	Wetlands	marsh					1 S																	
37	Northern Cardinal	*Cardinalis cardinalis*	---	---	S5	---	---	Landbird	Resident	Shrubs/Early Succession	Shrubs	1 S	1T, 1S		1 S	1 S	1T, 1S	1 S	1 T							1 S		1 S	1 T	1 S	1T, 1S	1 S	1 T
38	Rose-breasted Grosbeak	*Pheucticus ludovicianus*	---	---	S5B	PLS	---	Landbird	Neotropical	Woods/Forests	Woods Deciduous											1 S				1 S			1 S			1 S	
39	Indigo Bunting	*Passerina cyanea*	---	---	S5B	---	---	Landbird	Neotropical	Shrubs/Early Succession	Woods Shrub					1 S																	
40	**Red-winged Blackbird**	***Agelaius phoeniceus***	---	---	S5B	---	---	Landbird	Short Distance	Wetlands	Marsh	4 P	3 S		2 S			2 S	2 T	2 S	2 S	1 S	1T, 1S	5 T	4 S, 3 H		4 S	2 S	2 T				10 P
41	Common Grackle	*Quiscalus quiscula*	---	---	S5B	---	---	Landbird	Short Distance	Grass/Agriculture/Open	Various Open		3 H		2 H			4 H		2 H	2T, 1H											2 H
42	Brown-headed Cowbird	*Molothrus ater*	---	---	S5B	---	---	Landbird	Short Distance	Grass/Agriculture/Open	Various Open										2 H									1 P			
43	Baltimore Oriole	*Icterus galbula*	---	---	S5B	PLS	---	Landbird	Neotropical	Woods/Forests	Woods Open							1 S				1 S				1 S				1 S	1 T		
44	American Goldfinch	*Carduelis tristis*	---		S5B	---	---	Landbird	Short Distance	Shrubs/Early Succession	Shrubs	1 P		1 S						1 T				1 S				1 S			2 P

LEGEND

General

--- = not significant ?? = unclear, not known bold highlighting = species most likely directly associated with the wetland communities along Lyon's Creek
n/a = not applicable # prefix = Number of individuals documented

Federal Conservation Status

1. Federal (COSEWIC) Status: Status assigned by the Committee on the Status of Endangered Wildlife in Canada. (COSEWIC, 2006)

EXT Extinct. A wildlife species that no longer exists.
EXP Extirpated. A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
END Endangered. A wildlife species facing imminent extirpation or extinction.
THR Threatened. A wildlife species likely to become endangered if limiting factors are not reversed.
SC Special Concern. A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
DD Data Deficient - A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.
NAR Not At Risk. A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Provincial Conservation Status

2. Provincial (MNR) Status: Status assigned by the Ontario Ministry of Natural Resources (OMNR, 2006).

EXT Extinct. A species that no longer exists anywhere.
EXP Extirpated. A species that no longer exists in the wild in Ontario but still occurs elsewhere.
END-R Endangered (Regulated). A species facing imminent extinction or extirpation in Ontario which has been regulated under Ontario's Endangered Species Act (ESA).
END Endangered (Not Regulated). A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.
THR Threatened. A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
SC Special Concern. A species with characteristics that make it sensitive to human activities or natural events.
DD Data Deficient. A species for which there is insufficient information for a provincial status recommendation.
NAR Not At Risk. A species that has been evaluated and found to be not at risk.

3 Provincial rarity ranks are assigned by the Ontario Natural Heritage Information Centre (NHIC, 2006)

SX = Presumed Extirpated — Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH = Possibly Extirpated (Historical) — Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
S1 = Critically Imperiled — Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2 = Imperiled — Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3 = Vulnerable — Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 = Apparently Secure — Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 = Secure — Common, widespread, and abundant in the nation or state/province.
SNR = Unranked — Nation or state/province conservation status not yet assessed.
SU = Unrankable — Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA = Not Applicable — A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S# = Range Rank — A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

Regional Conservation Status

4. Bird Conservation Region (BCR) 13 status designations have been prepared by Ontario Partner's in Flight (OPIF, 2006). They are currently in draft form. For a complete account on how species were evaluated, please refer to the Ontario Landbird Conservation (Draft) Plan cited above.

PLS = Priority Landbird Species for Conservation

Life History Information

6. Area sensitivity designations based on OMNR (2000) (See Appendix C & G)

AS = Area Sensitive

7. Group / Migration Strategy / Habitat Category / Habitat Subcategory Information obtained from the Ontario Breeding Bird Atlas (OBBA).

Breeding Evidence & Status

6. Breeding Evidence Codes and Status designations based on the Ontario Breeding Bird Atlas (OBBA, 2001).

Observed
X = species observed in its breeding season, but no evidence of breeding (*i.e.* flyover only)

Possible Breeding
H = Species observed in its breeding season in suitable nesting habitat
S = Singing male present, or breeding calls heard, in its breeding season in suitable nesting habitat

Probable Breeding
P = Pair observed in their breeding season in suitable nesting habitat
T = Permanent territory presumed through registration of territorial song on at least two days, a week or more apart, at the same place.

Confirmed Breeding
FY = Recently fledged young or downy young, including young incapable of sustained flight.

REFERENCES

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2006. Canadian Species at Risk. Committee on the Status of Endangered Wildlife in Canada. August 2006. 74 pp. **http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.pdf**
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