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**Grand Valley II Wind Farm
Characterization of Natural Environment**

Prepared for:

Grand Valley Wind Farms Inc.
c/o Environmental Business Consultants
Mississauga, Ontario

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NATURAL RESOURCE SOLUTIONS INC.

Aquatic, Terrestrial and Wetland Biologists

Grand Valley II Wind Farm, Existing Conditions

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1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained by Grand Valley Wind Farms Inc. in October 2006 to conduct a review of natural environment resource issues that might influence the location, potential impacts, and mitigation of a proposed wind power generating facility in the Townships of East Luther Grand Valley and Melancthon, Ontario. The analysis of biological factors affecting the proposed site is just one issue being considered. Other factors, such as wind dynamics, land ownership, and social impacts are also being considered.

This document is a compilation of preliminary terrestrial and aquatic field studies and background review conducted for this project since October 2006. Field studies included winter, spring and breeding bird surveys, herpetofaunal surveys, vegetation mapping of the study area and aquatic habitat and features mapping in the vicinity of proposed access road development. As well all evidence of wildlife observed during field investigations were recorded

A description of the study area is included in Section 2 and Section 3 includes an overview of soils, terrain and drainage characteristics. Designated natural areas in the regional study area are described in Section 4. Sections 5, 6, 7 and 8 contain information on vegetation, wildlife, aquatic habitat, fish community and opportunities and constraints respectively.

2.0 Methods

2.1 Study Areas

The study area is comprised of 9 farm properties located in East Luther Grand Valley, and Melancthon Townships, Dufferin County, Ontario. For the purposes of this report, these leased lands (or subject properties) are discussed. These lands, are bordered on the east by Amaranth-East Luther Townline, the south by Concession Road 8-9, and the west by Sideroad 24-25. While most of these lands are situated south of Highway 89 in East Luther-Grand Valley, one additional property is located north of Highway 89 on the east side of the intersection with 8th Line Southwest in Melancthon Township. For the purposes of this biological assessment additional work was completed on lands within 1km of the leased lands. Beyond this extending to approximately 5km,, a regional study area was used to identify any Provincially Designated Natural Areas, Provincially Significant Wetlands and Important Bird Areas.

The subject properties are composed primarily of agricultural fields in association with meadows, wetlands and woodlots. Likewise, the regional study area is also comprised of agricultural habitats interspersed with wetlands, woodlots and small conifer plantations. The leased lands and proposed turbine locations are shown on Figure 1.

2.2 Background Information

Relevant background information on the natural heritage features within the regional study area was reviewed prior to field investigations. The sources of this information included:

- Natural Heritage Information Centre (NHIC) database
- Ministry of Natural Resources (MNR)(Guelph and Midhurst District offices)
- Grand River Conservation Authority (GRCA)
- Ontario Breeding Bird Atlas (OBBA)
- Ontario Herpetofaunal Survey
- Ontario Mammals Atlas

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Figure 1. Study Area

The NHIC database was searched for significant species and natural areas in the regional study area. All natural heritage data from the MNR offices and GRCA was also reviewed for the regional study area. Atlas data for birds and mammals for southern Ontario is available in 10km squares. As such this data will encompass but not exclusively pertain to the subject properties, study area or even the regional study area.

Review and interpretation of aerial photographs of the regional study area was completed prior to field investigations.

2.3 Field Study

Field investigations were carried out on November 21, 2006, and January 10, April 26, May 5, 28, June 5, 7, 8, 27 and July 4, 5, 19, and 20 2007. They included vegetation mapping in and immediately adjacent to the 1km study area, aquatic habitat characterization in the 1km study area, herpetofaunal surveys, winter, spring and breeding bird surveys, and incidental wildlife observations in the regional study area. Detailed vegetation mapping was completed using the Ecological Land Classification (ELC) for Southern Ontario (Lee et al. 1998). For watercourses on the subject properties, aquatic habitat characterization included observations of surrounding landscape and land use, adjacent lands that function as buffers from agriculture, bank and instream vegetation, channel dimensions, channel substrate, and flow conditions. For watercourses in the 1km study area, but not on leased lands, an abbreviated assessment was conducted.

Additional details regarding methodologies are provided under each of the subsections in Sections 5 through 7.

3.0 Soils, Terrain, and Drainage

3.1 Soils

The undertaking is situated in the Dundalk Till Plain physiographic region of central Southern Ontario (Chapman and Putnam 1984). Shallow surficial deposits of loam and silt loam soils cover the area. Refer to Table 1 for the dominant soils found within the area, including their type, composition and drainage capabilities.

Table 1. Dominant Soil Types within the Study Area

Soil Series	Type	Parent Materials	Drainage
Parkhill	Loam	Loam till	Imperfect
Harriston	Loam	Loam and silt loam till	Good
Huron	Siltloam	Clay loam till	Good
Listowel	Loam	Loam and silt loam till	Imperfect
Gilford	Loam	Loam material over outwash gravel	poor
Muck			

3.2 Terrain

The landscape topography in this area ranges from shallow basins to level to smooth and gently sloping. The minor topographic variation in the regional study area is associated with the upper Grand River Valley. Soil stoniness within the area ranges from stone free to slightly stony (Hoffman et al. 1964).

3.3 Drainage

The lands within the study areas are located in the upper Grand River watershed. The Grand River extends 298km from its headwaters to its outlet at Lake Erie, and is the largest river system in southern Ontario with a watershed of approximately 6,500km². Drainage is provided by watercourses that have been created or modified as linear agricultural drains. These drains generally flow south and west to their outlets to the Grand River. Depression areas are typically poorly drained and contain a variety of wetland communities..

4.0 Designated Natural Areas

4.1 Background Review

Information on Areas of Natural and Scientific Interest (ANSIs), significant wildlife habitats such as deer yards, watercourses, and wetlands was obtained from the MNR- Midhurst and Guleph district offices, the GRCA and the NHIC website. See Figure 2 for a map of Natural Areas in the regional study area based on MNR's NRVIS and Ontario Base Maps databases accessed January 2007.

There are no designated natural areas on the subject properties. Within the 1km study area there is one Locally Significant Wetland (LSW). Within the regional study area there are Provincially Significant Wetlands (PSWs), LSWs, one known significant wildlife habitat (deer yard), and two ANSIs. Due to its significance as a PSW, Important Bird Area (IBA) and International Biological Program Site, Luther Marsh is discussed below; at its closest point it is roughly 2.5km southwest of the subject properties. The other natural areas occurring within the regional study area are listed in Table 2; see Appendix I for a map and regional Natural Areas Reports from NHIC.

Table 2. Designated Natural Areas in the Regional Study Area.

Natural Area	Natural Area Type
Bowling Green Swamp	Provincially Significant Wetland
Melancthon Wetland Complex #1	Provincially Significant Wetland
Keldon Swamp	Provincially Significant Wetland
Melancthon Wetland Complex #2	Locally Significant Wetland
Campania Fen	Locally Significant Wetland
Maple Grove Bog	Locally Significant Wetland
Jessopville North Wetland / Melancthon #16	Locally Significant Wetland
Tarbert Drift	Earth Science ANSI (Regional significance)
Luther Marsh	Life Science ANSI (Provincial significance)
Luther Marsh	Provincially Significant Wetland
Luther Marsh	Conservation Authority Area
Luther Lake Wildlife Management Area-North Bog Forest	International Biological Program Site
Luther Lake Wildlife Management Area- Wylde Lake Bog	International Biological Program Site

ANSI's are areas of land and water that encompass natural landscapes or features that have been identified by the MNR as having significance related to "natural heritage"

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Figure 2. Natural Areas

protection, appreciation, scientific study or education” (MNR 2005). ANSIs are subdivided into two types: earth and life science.

- Earth science ANSIs are protected for their physical elements created by geological processes within and on the earth’s surface.
- Life science ANSIs are significant because of the living species they contain, whether vegetation or animals.

ANSIs can be classified as either regionally or provincially significant, while wetlands can be locally or provincially significant. Provincially significant ANSIs and PSWs are protected from development or alteration by the Provincial Policy Statement (Ministry of Municipal Affairs and Housing 2005). Regionally significant ANSIs and LSWs are not afforded protection by the Provincial Policy Statement but are managed under Municipal planning policies.

4.1.1 Luther Marsh

The Luther Marsh wetland complex is approximately 3688ha, and forms a major headwater reservoir for the Grand River. This complex consists of six individual wetlands including a large man-made shallow, marshy lake surrounded by a low shrub hummock bog, mixed lowland and swamp forests, marsh and fen. The marsh is located approximately 2.5km west of the closest subject property and more than 5km southwest of the other subject properties.

Luther Marsh is recognized as an important breeding and staging area for many species of waterfowl and marsh birds. Historically the marsh also supported some grassland species such as Grasshopper Sparrow and Henslow’s Sparrow, however through succession and tree planting, habitats for these species have been lost. Nationally significant numbers, roughly 10 pairs or 1% of the Canadian population of breeding Least Bittern are known from this site (Cheskey and Wilson 2001). In addition, relatively large numbers of Great Egrets sometimes concentrate at the marsh in early fall. The wetland complex at Luther Marsh and Luther Lake provide excellent habitat for a number of waterfowl. At least 15 species have been recorded nesting at the marsh.

Wlyde Lake Bog, located at the south end of Luther Marsh, supports one of the most southern breeding populations of Lincoln's Sparrow in Ontario. The surrounding lowland grassy/sedge areas provide valuable breeding habitat for Short-eared Owl. There are also historic breeding records for Henslow's Sparrow and LeConte's Sparrow.

According to the Upper Credit Field Naturalists, waterbirds and waterfowl (especially geese, herons, and sandhill cranes) fly between Bowling Green Swamp and Luther Marsh (L. McLaren pers. comm. 2005). This east-west movement has been observed in previous studies, predominantly seen among waterfowl during daytime monitoring (NRSI 2006). Background information does not suggest that birds concentrate within the study area during migration- although 2 groups of up to 30 dabbling ducks (Mallard and Black Duck) were flushed from wet depression areas in agricultural fields during evening amphibian monitoring on April 26, 2007.

5.0 Vegetation

5.1 Study Methods

Initial ELC vegetation mapping was based on air photo interpretation. Field investigations were conducted by NRSI staff to confirm ELC vegetation type or ecosite on the subject properties. Roadside field surveys were undertaken throughout the regional study area to map vegetation communities at the ELC Community Series level. Field surveys of proposed turbine access roads and transmission facilities will be required in the future if any of these facilities are proposed in natural habitats.

5.2 Vegetation Communities

The regional study area is located within the Great Lakes Forest Region's Huron-Ontario Section (Rowe 1972). The natural forest cover for the area is a mix of upland communities consisting of sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), yellow birch (*Betula alleghaniensis*), eastern hemlock (*Tsuga canadensis*), and white pine (*Pinus strobus*), and lowland communities of silver maple (*Acer saccharinum*), balsam poplar (*Populus balsamifera*), white elm (*Ulmus americana*), black ash (*Fraxinus nigra*), and Eastern white cedar (*Thuja occidentalis*).

The 1km study area is primarily comprised of agricultural fields, interspersed with some small plantations, woodlots and wetland areas. Some early successional habitats such as cultural meadows and cultural thickets also exist. Numerous hedgerows occur between agricultural fields and are generally treed with shrubs. A total of 20 vegetation communities, not including agricultural lands, were identified and are listed in Table 3 and shown on Figure 3. See Appendix II for a description of the ELC vegetation communities.

According to the Natural Heritage Information Centre (NHIC) website (2006) and background information from the MNR, there are no rare plant species known from the study areas

Table 3. Vegetation Communities in the Study Area

Community Series	ELC Code
Fresh-Moist White Cedar Coniferous Forest Type	FOC4-1
Dry -Fresh Sugar Maple Deciduous Forest Ecosite	FOD5
Dry -Fresh Sugar Maple Deciduous Forest Type	FOD5-1
Dry -Fresh Sugar Maple-Beech Deciduous Forest Type	FOD5-2
Fresh-Moist Sugar Maple Deciduous Forest Ecosite	FOD6
Fresh-Moist Poplar Deciduous Forest Type	FOD8-1
European Larch Coniferous Plantation Type	CUP3-6
White Spruce Coniferous Plantation Type	CUP3-8
Dry – Moist Old Field Meadow Type	CUM1-1
Mineral Cultural Woodland Ecosite	CUW1
White Cedar-Hardwood Mineral Mixed Swamp Type	SWM1-1
Birch-Poplar Mineral Mixed Swamp Ecosite	SWM3
Birch Mineral Mixed Swamp Type	SWM3-1
Poplar Mineral Mixed Swamp Type	SWM3-2
Mineral Deciduous Swamp Ecosite	SWD4
White Birch Mineral Deciduous Swamp Type	SWD4-3
Willow Mineral Thicket Swamp Type	SWT2-2
Red-osier Mineral Thicket Swamp Type	SWT2-5
Mineral Meadow Marsh Ecosite	MAM2
Reed-Canary Grass Mineral Meadow Marsh Type	MAM2-2
Agricultural Field	Ag

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Figure 3. Vegetation Communities

5.3 Description of Proposed Turbine Sites

The proposed turbines were anticipated to be located within agricultural fields, however based on the 2007 field work it was determined that some of these lands have been left fallow and are regenerating as meadows (CUM1-1), or willow swamp thickets (SWT2-2).

Turbine 1

This turbine location is situated in a middle of a large pasture. Adjacent fields are either pasture or hay. The closest natural feature is a poplar swamp (SWD4-3) located roughly 300m to the east.

Turbine 2

This turbine location is situated along the edge of a hayfield. All surrounding fields are also used for hay. The closest natural habitat is a poplar swamp (SWD4-3) located roughly 500m to the east. An agricultural drain is situated roughly 100m to the north.

Turbine 3

This turbine location is situated near the edge of a soy bean field adjacent to the south west corner of mixed forested swamp (SWM3-1). The closest forest edge is roughly 25m away.

Turbine 4

This turbine is situated in an old meadow community (CUM1-1). Roughly 60m to the west is a mixed forested swamp (SWM3-1). Roughly 35m to the south is a willow swamp thicket (SWT2-2).

Turbine 5

This turbine is situated in a regenerating willow swamp thicket (SWT2-2). It appears as though these lands were left fallow and now have greater than 25% hydrophytic shrub cover. With the exception of one area that looks possibly like an old surface drain, this regenerating shrub canopy is less than 1m in height.

Turbine 6

This turbine is situated in an old meadow community (CUM1-1). Roughly 35m southeast of this turbine location is a willow swamp thicket (SWT2-2) bordering a poplar deciduous swamp (SWD4).

Turbine 7

This turbine location is situated in a transitional area between a hayfield and a willow swamp thicket (SWT2-2). Roughly 100m southwest of this location is sugar maple deciduous forest (FOD5). Along the close edge of this forest is an active Red-tailed Hawk nest.

Turbine 8

This turbine location is situated in a soy bean field roughly 20m northeast of an agricultural drain and 30m from a meadow (CUM1-1).

Turbine 9

This turbine location is situated in a large soy bean field. The closest natural habitat is the southern tip of a willow swamp thicket (SWT2-2) located roughly 250m to the north.

Turbine 10

This turbine location is situated in a large soy bean field. The closest natural feature is a cultural woodland (CUW1) located roughly 80m to the south.

Turbine 11

This turbine location is situated in a field of winter wheat. A sugar maple forest (FOD6) is roughly 100m to the south. A separate sugar maple forest is roughly 200m to the northwest.

Turbine 12

This turbine location is situated in large field of winter wheat. The closets natural features are a treed water course roughly 300m to the north, and a small sugar maple bush (FOD6) roughly 200m to the west..

6.0 Wildlife

Ontario breeding bird and mammal atlases and the Ontario Herpetofaunal Survey were used to determine wildlife species known from the vicinity of the project area. As the Atlases are completed for 10km squares, they include species that may or may not occur in the study area. A complete list of bird species from the Ontario Breeding Bird Atlas is found in Appendix III. The NHIC database was also searched for records of rare species.

6.1 Rare Species

No rare mammals are known from the regional study area according to the Mammal Atlas of Ontario. No rare species of herpetofauna area known from the regional study area according to the Ontario Herpetofaunal Survey, however NHIC database has records for two rare snake species in the vicinity (Oldham and Weller 2000). These records are from roughly 1-2km west of the subject properties from 1988 and 1997 respectively (see Figure 4).

Several rare bird species are known from the regional study area. Table 4 list the provincially significant species recorded during the 1st and 2nd OBBA that are not listed on the NHIC Rare Species map. Figure 4, and Table 5 provide the details of all significant species from the NHIC data base in the regional study area.

Table 4. Significant bird species from the OBBA not included in NHIC records

Common Name	Scientific Name	S-Rank	MNR Rank	COSEWIC	Record Date
Wilson's Phalarope	<i>Phalaropus tricolor</i>	S3B			1 st Atlas
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	S3B	SC	SC	1 st Atlas
Rough-legged Hawk	<i>Buteo lagopus</i>	S1B	NAR	NAR	2 nd Atlas

Figure 4. NHIC Geographic Query of Rare Species in the Regional Study Area

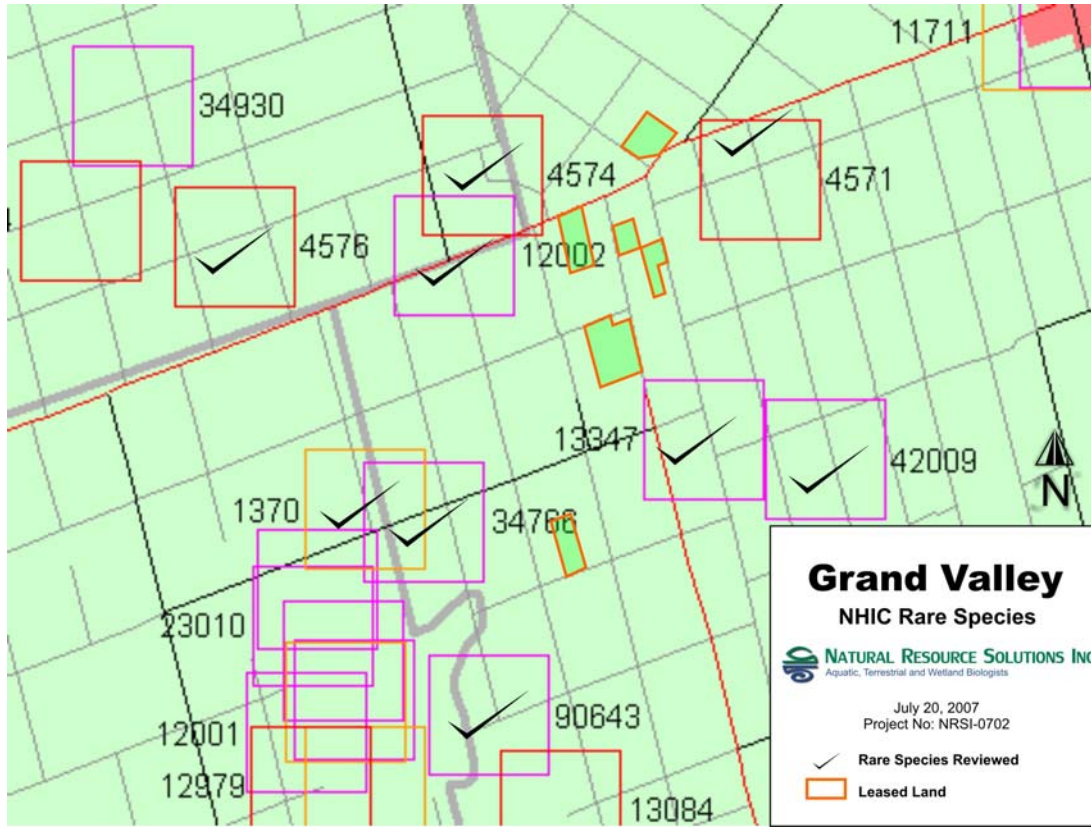


Table 5. NHIC Rare Species from the Regional Study Area

EO_ID	Scientific Name	Common Name	UTM Centroid (rounded)	Srank	MNR	COSEWIC	Date
1370	Sensitive species	A snake	17 546000 4870000	S2	THR	THR	1988
4571	<i>Ammodramus henslowii</i>	Henslow's Sparrow	17 556000 4877000	S1B,SZN	END- R	END	1988- 06-29
4574	<i>Ammodramus henslowii</i>	Henslow's Sparrow	17 549000 4878000	S1B,SZN	END- R	END	1986- 06-01
4576	<i>Ammodramus henslowii</i>	Henslow's Sparrow	17 543000 4876000	S1B,SZN	END- R	END	1989- 06-22
12002	<i>Chlidonias niger</i>	Black Tern	17 548000 4876000	S3B,SZN	SC	NAR	1989- 06-03
13347	<i>Icteria virens</i>	Yellow-breasted Chat	17 554000 4871000	S2S3B,SZN	SC	SC	1983- 06-21
34766	<i>Casmerodius albus</i>	Great Egret	17 547000 4869000	S2B,SZN			2001- 08-21
90643	Sensitive species	A snake	17 545000 4866000	S3	SC	SC	1984-?
90643	Sensitive species	A snake	17 548000 4864000	S3	SC	SC	1997- 06-19
42009	<i>Asio flammeus</i>	Short-eared Owl	17 557000 4870000	S3S4B,SZN	SC	SC	1987- 06-30

6.2 Birds

6.2.1 Breeding Birds

Breeding bird surveys were conducted throughout the regional study area in 2007. A combination of early morning point counts, behavioural studies (watch counts), area searches and evening searches were conducted to determine which species are currently using the areas at and around the proposed turbine locations for breeding and raising young (see Figure 5 for the locations of these monitoring stations).

6.2.2 Point Count Surveys

Twenty-four breeding bird point count stations were monitored twice at least ten days apart to determine bird breeding evidence in the regional study area. These point count surveys were completed on June 5, 7, 8 and July 3, and 4, 2007. A description of the monitoring stations is provided in Appendix IV and includes all species documented at each station and the highest level of breeding evidence documented over the two visits.

Point counts were performed according to Environment Canada's monitoring protocols (2007) (see Appendix V for a sample of the point count data sheet). Data recorded included bird species, number of individuals and activity to determine highest level of breeding evidence. Stations were monitored during early morning hours, from half an hour before sunrise to no later than 10:00 am. Each station was monitored for 10 minutes. The breeding evidence data was collected according to the Ontario Breeding Bird Atlas (OBBA) and used to determine observed, possible, probable or confirmed breeding.

Background data on breeding birds in the area was also extracted from the Ontario Breeding Bird Atlas (Cadman et al. 1987; OBBA 2005). Since this atlas provides data based on 10x10km survey squares, information on breeding birds from the squares that encompass the subject properties was compiled. The two squares that the subject properties are situated in are 17NJ56 and 17NJ57.

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Figure 5. Monitoring Stations

6.2.3 Behavioural Studies (watch counts)

Two behavioural study stations were established and monitored twice each, on June 7 and subsequently on July 5, 2007. The focus of these surveys was to supplement observations made during other field surveys and specifically to detect soaring birds, namely raptors in the study area that might not have been detected through the early morning surveys. The stations were situated at proposed turbine locations in open areas that afforded good views in all directions. Data recorded for each sighting included species, time, number of individuals, passes, height category, direction of flight, direction from observer and comments. Data recorded for each monitoring event included date, time, observer, project, location, weather and habitat (see Appendix VI for a sample of the point count data sheet).

6.2.4 Area Searches

Area searches were used as a tool to detect birds and breeding evidence that were not getting picked up by point counts and behavioural watches. All birds seen or heard while traveling between stations were recorded. In addition, the roads in the vicinity of the subject properties were driven with regular stops at all habitat types to document breeding evidence.

6.2.5 Evening Searches

In reviewing background information, it was learned that Henslow's Sparrow had been recorded in the vicinity of the subject properties during the 1980's. Evening searches for this species were completed because of the presence of hay and pasture fields on some of the subject properties and presence of other grassland species in the study area. The Henslow's Sparrow Recovery Team was contacted for direction. Ken Turningan from the Recovery Team provided us with the survey instructions (see Appendix VII); no pre-recorded songs were used. These searches were conducted on the evenings of May 28 and June 27, 2007; no evidence of Henslow's Sparrows were documented.

6.2.6 Breeding Bird Results

During the 1st and 2nd Ontario Breeding Bird Atlas, a total of 114 species was recorded in the two atlas squares that encompass the subject properties. A total of 65 species of birds were recorded by NRSI staff during the 2007 breeding season surveys in the vicinity of the subject properties. No Species at Risk were documented; however 12 conservation priority species were recorded (see Table 6) (Partners in Flight 2005)

Table 6. Conservation Priority Species documented by NRSI in the Study Area

Species	NRSI Breeding Evidence	Habitat Guild	# of Observations
American Kestrel	possible	grassland / agricultural	1
Baltimore Oriole	possible	other	2
Bobolink	probable	grassland / agricultural	91
Eastern Kingbird	probable	grassland / agricultural	11
Eastern Meadowlark	probable	grassland / agricultural	21
Eastern Wood Pewee	probable	forest	8
Grasshopper Sparrow	probable	grassland / agricultural	1
Northern Flicker	possible	forest	8
Northern Harrier	possible	grassland / agricultural	5
Savannah Sparrow	confirmed	grassland / agricultural	130
Vesper Sparrow	possible	grassland / agricultural	3
Willow Flycatcher	probable	shrubland / successional	1

6.2.7 Winter Birds

Winter birds were surveyed on January 10, 2007. This survey consisted of repeatedly driving the roads throughout the regional study area as well as stopping periodically to scan open fields or listen at roadside wooded areas. The survey was started at first light in the morning to potentially detect short-eared owls; none were seen although the habitat is suitable in that there are some hayfields, pastures and meadows scattered throughout the regional study area. Craig Potter, a Guelph based naturalist, had recently led a group of Guelph Field Naturalist to the Luther Marsh vicinity to see winter raptors including northern harriers, snowy owls, and short-eared owls. In communications with Mr. Potter, we were informed that through that field trip and several

other scouting trips in the general vicinity, he was regularly seeing the two owl species south and east of Luther Marsh at least 5km from the closest subject property.

A total of seven species were documented; the only species of raptor were 2 Rough-legged hawks. Additionally 2 Northern Shrikes were seen, one Downy Woodpecker, one ruffed grouse heard, small flocks of American Tree Sparrows seen along hedgerows, small flocks of Snow Buntings seen in fields, and Rock Pigeons around barns (see Appendix VIII).

6.2.8 Incidental Birds

A list of birds seen during other field visits to the study area was compiled for November 21, 2006, April 27, and May 5 and 28, 2007 (see Appendix IX). Four species seen on these dates were not recorded during either the winter or breeding season surveys; they include Golden Eagle, Pileated Woodpecker, Chestnut-sided Warbler, and Dark-eyed Junco. The Golden Eagle was a juvenile bird that was originally spotted soaring in a southwesterly direction through the study area in the afternoon of November 21. It was followed and observed perching for roughly 15 minutes in a mature sugar maple on the west side of Sideroad 27-28 just north of the Village of Colbeck.

One other observation of interest was a Rough-legged Hawk seen foraging over a field in the study area on May 5, 2007. While seemingly common in the vicinity during the winter months, this was the only one seen in May; none were detected through the course of the breeding season surveys, although there is a record of this species in the vicinity during the 1st Ontario Breeding Bird Atlas.

6.2.9 Bird Summary

A total of 72 species of birds were recorded by NRSI staff within the study areas during field investigations between November 27 2006 and July 4, 2007 (see Appendix X for the Complete List of NRSI Bird Observations)

Avian Level of Concern

The proposed Grand Valley II wind farm is a Category I Level of Concern based on Environment Canada's "Wind Turbines and Birds A Guidance Document for Environmental Assessment" report (2007). According to this document, Level of Concern is a function of facility size and site sensitivity. Grand Valley II with 12 proposed turbines is a medium sized facility. Site Sensitivity is low based on the following:

- Based on field surveys, at risk species are only known historically from the area, which include Red-headed Woodpecker (1st Atlas), Yellow-breasted Chat (1983), Short-eared Owl (1987), Henslow's Sparrow (1986, 1988, and 1989).
- At its closest point the study area is greater than 2km from Luther Marsh and greater than 2.5 km to the remaining land leases.
- Species known from field surveys that have aerial displays include Bobolink, Horned Lark, Woodcock, and Upland Sandpiper. These species are common throughout the regional study area and or have flight displays that are generally considered to be too low to create a high risk from turbines.

Based on these assumptions and the site not having any other elements listed from Table 1 in the EA Guidance Document (EC 2007), the site sensitivity of the Grand Valley II wind farm is low. Low site sensitivity in coordination with a medium sized facility results in a Category 1 Level of Concern wind farm.

6.3 Herpetofauna

A total of 5 herpetofaunal (reptiles and amphibians) monitoring stations, situated on the subject properties, were surveyed on April 27, May 28 and June 27, 2007. Additionally all observations of herpetofauna during NRSI field visits were recorded.

6.3.1 Results

According to the Ontario Herpetofaunal Summary Database (Oldham and Weller 2000), and Environment Canada's Species at Risk website 13 species are known from the study area and vicinity. Observations recorded during the field visits by NRSI have confirmed the presence of five of these species. All species known to exist within the

study area are classified as very common or common except for Butler's Gartersnake (*Thamnophis butleri*) which is an Imperiled (S2) species and Eastern Ribbonsnake (*Thamnophis sauritus*) which is Vulnerable (S3) (NHIC 2006). Both species are discussed in greater detail below. A complete list of herpetofauna known to exist within the regional study area, including the 5 species observed by NRSI staff, is included in Table 7.

The value of wetlands within the study area for amphibian breeding is limited by the brevity of time that they are flooded or have standing pools of water. As the area has been improved for farming many fields are either tile or surface drained. Even in some abandoned agricultural fields surface drains can be identified by rows of willows growing out of them. During spring 2007, none of the mixed or deciduous swamps, or willow or dogwood thickets had standing water on the May 28 or June 27 field investigations. In speaking with one of the subject property owners, we were informed that frogs in the area are only heard for a couple of weeks in early spring.

Table 7. Herpetofauna Species Known from the Vicinity of Grand Valley II

Common Name	Scientific Name	COSEWIC*	SRank**	OMNR Status	NRSI Observed
American Toad	<i>Bufo americanus</i>		S5		✓
Spring Peeper	<i>Pseudacris crucifer crucifer</i>		S5		✓
Western Chorus Frog	<i>Pseudacris triseriata</i>	NAR	S4	NAR	✓
Bullfrog	<i>Rana catesbeiana</i>		S4		
Green Frog	<i>Rana clamitans melanota</i>		S5		
Northern Leopard Frog	<i>Rana pipiens</i>	NAR	S5	NAR	✓
Mink Frog	<i>Rana septentrionalis</i>		S5		
Wood Frog	<i>Rana sylvatica</i>		S5		✓
Common Snapping Turtle	<i>Chelydra serpentina serpentina</i>		S5		
Red-bellied Snake	<i>Storeria occipitomaculata occipitomaculata</i>		S5		
Eastern Gartersnake	<i>Thamnophis sirtalis sirtalis</i>		S5		
Eastern Ribbonsnake	<i>Thamnophis sauritus</i>	SC	S3	SC	
Butler's Gartersnake	<i>Thamnophis butleri</i>	THR	S2	THR	

* According to COSEWIC <http://www.cosewic.gc.ca/eng/sct1> Last update 2006-07-07

** According to Natural Heritage Information Centre <http://nhic.mnr.gov.on.ca/MNR/nhic/elements/> Last update 2005-06-05

LEGEND

SRank	Definition
S1	Critically Imperiled
S2	Imperiled
S3	Vulnerable
S4	Apparently Secure
S5	Secure
SE1	Exotic
S3?	Not Ranked Yet
COSEWIC Rank	Definition
NAR	Not At Risk
SC	Special Concern
THR	Threatened
END	Endangered
XT	Extirpated
X	Extinct

6.3.2 Significant Herpetofauna Species

Species at Risk

Two species, Butler's Gartersnake and Eastern Ribbonsnake, are listed as a Species at Risk (Environment Canada 2007) and are known to have population ranges in the vicinity of the regional study area.

Butler's Gartersnake is listed as a Schedule 1 Threatened species by The Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Eastern Ribbonsnake is listed as a Schedule 1 Special Concern species by COSEWIC. These species and their habitats are discussed in more detail below:

Butler's Gartersnake

Butler's Gartersnake has 4 disjunct populations in southwestern Ontario, from the vicinity of Lake St. Clair, St. Clair River, the Detroit River; Lake Huron between Amherst Point and Errol; Skunk's Misery, Newburry Area; and Luther Marsh. Suitable habitat is generally considered areas of dense grasses, adjacent to ditches, wetland edges or seasonally dry marshes (Environment Canada 2007).

There is an abundance of suitable habitat for this species within the regional study area. Potentially suitable habitat also exists on the various subject properties in areas that are not forested, thicket, or cropped.

Eastern Ribbonsnake

In Canada, the Eastern Ribbonsnake is represented by a single subspecies, the Northern Ribbonsnake (*Thamnophis sauritus septentrionalis*). Populations of this snake in Canada are confined to the Great Lakes and Nova Scotia. The Eastern Ribbonsnake is semi-aquatic and most frequently found along wetland edges. Quiet, shallow water with low surrounding cover is preferred, although areas with good exposure to sunlight are also required (Smith 2002). Suitable habitat for this species on or near the study areas is largely confined to the vicinity of the various agricultural surface drains.

6.4 Mammals

Observations of mammals and signs were recorded while conducting all field surveys. Some distinctive signs used in mammal identification include nests, burrows, scat, tracks, and dams. Mammals such as white-tailed deer, coyote, and red fox likely use the agricultural fields as movement corridors. Significant mammal habitat includes areas such as winter deer yards, fawning/calving sites, denning sites, staging areas, mineral licks, bat hibernacula, and mammal movement corridors.

To date NRSI staff have not completed bat monitoring within the study area. In accordance with the draft MNR bat monitoring guidelines for wind farms (2007) having low site sensitivity, monitoring for bats is scheduled for 15 nights in August, 2007. The site sensitivity was determined by the fact that the study area is >50km from a known hibernacula, >5km from a major shoreline, >5km from a potential hibernacula, not associated with landscape features such as escarpments or ridges, and that turbines will not be located in forested environments. August 2007 monitoring work by NRSI staff will be documented in an addendum to this characterization.

6.4.1 Results

A total of 24 mammal species are known from the vicinity of Grand Valley II based on information from the Mammal Atlas of Ontario (Dobbyn 1994) (see Table 6). All species known to exist within the study area are classified as very common or common. NRSI staff observed 8 of these species during field surveys.

Table 8. Mammal Species known from the vicinity of Grand Valley II

Common Name	Scientific Name	SRANK	COSEWIC	OMNR	NRSI Observed
Northern Short-tailed Shrew	<i>Blarina brevicauda</i>	S5			
Coyote	<i>Canis latrans</i>	S5			✓
Beaver	<i>Castor canadensis</i>	S5			✓
Southern Red-backed Vole	<i>Clethrionomys gapperi</i>	S5			
Star-nosed Mole	<i>Condylura cristata</i>	S5			
Big Brown Bat	<i>Eptesicus fuscus</i>	S5			
Porcupine	<i>Erethizon dorsatum</i>	S5			
Snowshoe Hare	<i>Lepus americanus</i>	S5			
Woodchuck	<i>Marmota monax</i>	S5			✓
Striped Skunk	<i>Mephitis mephitis</i>	S5			
Meadow Vole	<i>Microtus pennsylvanicus</i>	S5			
House Mouse	<i>Mus musculus</i>	SE			
Mink	<i>Mustela vison</i>	S5			
Woodland Jumping Mouse	<i>Napeozapus insignis</i>	S5			
White-tailed Deer	<i>Odocoileus virginianus</i>	S5			✓
Muskrat	<i>Ondatra zibethicus</i>	S5			
Raccoon	<i>Procyon lotor</i>	S5			

Norway Rat	<i>Rattus norvegicus</i>	SE			
Eastern Cottontail	<i>Sylvilagus floridanus</i>	S5			✓
Eastern Chipmunk	<i>Tamias striatus</i>	S5			✓
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	S5			✓
Red Fox	<i>Vulpes vulpes</i>	S5			
Meadow Jumping Mouse	<i>Zapus hudsonius</i>	S5			
European Hare	<i>Lepus europaeus</i>	SE			✓

LEGEND

SRank	Definition
S1	Critically Imperiled
S2	Imperiled
S3	Vulnerable
S4	Apparently Secure
S5	Secure
SE1	Exotic
S3?	Not Ranked Yet
COSEWIC Rank	Definition
NAR	Not At Risk
SC	Special Concern
THR	Threatened
END	Endangered
XT	Extirpated
X	Extinct

7.0 Aquatic Habitat

The regional study area is located in the upper section of the Grand River, upstream of the Belwood Dam and the town of Grand Valley. Luther Marsh is to the west of the regional study area, and contributes flow to the upper Grand River. Additional watershed area extends to the north as far as the Town of Dundalk. From there, the Grand River flows south and southeast to its outlet into Lake Erie at Port Maitland, south of Dunnville. The entire Grand River watershed covers 6,500 square kilometers (GRCA & MNR 1998).

The *Grand River Fisheries Management Plan* (GRCA & MNR 1998) notes that the clayey to silty/clayey till plains and low moraines of the upper Grand River watershed typically have poor to very poor infiltration. This causes the watershed to have flashy floodflows and extremely low baseflows. As a result, many of the first order tributaries are intermittent, limiting overall productivity of these waters. Historical drainage practices have also left channels wide and shallow, which is not necessarily conducive to productive fish habitat. According to the *Grand River Fisheries Management Plan*, in general the “localized deposits of gravels and sands occur in large patches but are very shallow and contribute little to lowflow volumes in the tributaries or in the mainstem (GRCA & MNR 1998).” Nevertheless, there are cold-water habitats, as well as mixed-water and warm-water habitats in the upper Grand River watershed (GRCA & MNR 1998). The cold-water habitats are likely a result of the localized gravel and sand deposits in spite of their shallow depth.

These habitat types are exhibited in the aquatic habitats in the regional study area. Within the 1km study area, most of the watercourses have been created or modified to function as agricultural drains. The thermal regime, fish assemblage, and maintenance practices of most of the drains has been classified during the drain classification by the GRCA and DFO (DFO 1999). This information and other habitat details are provided below. The aquatic habitats are shown on Figure 6.

Figure 6. Aquatic Habitat

7.1 Aquatic Habitats on Leased Lands

7.1.1 Whitton Drainage Works

Whitton Drainage Works originates as three main drainage branches on the east side of the Amaranth-East Luther town line road. These branches originate north of Highway 89 and combine into one channel in Amaranth Township. The combined channel flows westerly through the study area. West of Sideroad 27-28 it turns and flows south for approximately 3km to its outlet to the Grand River.

Within the study area, Whitton Drainage Works is classified as a Class E drain (warm water, top predators present, no channelization within 10 years). It flows through a landscape of gently rolling topography with a broad floodplain in some locations. At one location midway between County Road 25 and Side Road 27-28, the floodplain extends approximately 60m to the north but only a few meters to the south. The floodplain on the north side has characteristics that make it suitable as spawning habitat for northern pike (*Esox lucius*) providing that spring floodwaters cover the floodplain with adequate depth and are sustained for a sufficient length of time. Upland habitat with deciduous and coniferous trees is found alongside south side of the channel opposite the floodplain to the north. The channel has a natural meandering form, and it has a low gradient that results in slow-moving water and a lack of pools or riffles. The channel is approximately 10m wide, and the banks are approximately 1m high. The substrate is composed of clay, silt, and muck. Two types of submergent aquatic vegetation provide instream habitat structure and cover. The bank vegetation is also abundant providing some overhead cover and shade. In this location on November 21, 2006, the water was visually estimated to be approximately 1.5m deep. The wetted width was approximately 9 to 10m.

At County Road 15 Whitton Drainage Works passes through gently rolling pasture, agricultural fields and coniferous woodlots. Herbaceous vegetation and a few cedar trees provide a buffer of about 10m on either side of the drain. The drain is a naturally occurring channel with large pools and small riffles. The substrate is dominated by large cobble and boulder. Small cobble, gravel and sand, as well as finer material, can be seen on the pool bottoms. The gradient in the vicinity of County Road 15 increases

downstream of the slow, depositional channel east of County Road 25. During the July 20, 2007 site visit, the wetted width of this channel spanned approximately 3m at the riffles to approximately 10m at the pools. Crayfish and many fish were observed during this visit, including minnows and one large fish, which was likely a sucker species.

7.1.2 Hansen Drainage Works

Hansen Drainage Works begins as two branches in the vicinity of Concession Road 12-13, midway between County Road 25 and Sideroad 27-28. It is classified as a Class A drain (cold/cool water with no trout/salmon present). The west and north branches merge and the combined channel flows southerly and westerly to its outlet to Whitton Drainage Works. All parts of the drain are located within the study area where they flow through a landscape of gently rolling topography. The channels have been excavated to function as a linear agricultural drain.

The west branch begins on the south side of Concession Road 12-13. It flows along the south side for approximately 60m, at which point it crosses to the north side through a CSP culvert approximately 1.0m in diameter, and continues easterly. The surrounding land is actively cultivated agricultural field on each side. The drain has been excavated as a linear channel with a trapezoidal cross-section, and the channel at the bottom is approximately 2m wide. The channel substrate is composed entirely of silt, and there is no habitat structure or cover. On November 21, 2006, the wetted width ranged from 0.5 to 2.0m, and the depths varied between approximately 10cm and 30cm.

Near Concession Road 12-13, the north branch and the combined channel have similar characteristics. The land to the west is used for agriculture, and a treed swamp dominates the east side. Beyond approximately 300m south of the road, the channel is bounded by agricultural fields. The land immediately adjacent to the channel forms a corridor of herbaceous vegetation. The width of this vegetated area on either side of the channel varies from 3 to 15m.

The combined channel has a typical trapezoidal form. The channel width ranges from approximately 2 to 3m at the bank-full level, and the top of the trapezoidal ditch is approximately 8m wide. The bank height of the channel varies between approximately 0.5 and 1.0m. The channel substrate is composed of mostly clay and silt, with some

organic soil at the edges of the base-flow wetted area. The bank vegetation provides some overhead canopy and cover along the edges, but there are no features that provide instream cover for fish. Tile drain outlets were observed on both sides of the channel.

On November 21, 2006, all sections of the drain had recently been cleaned out, making the bank vegetation sparse. The water in the combined channel was clear, and the flow appeared moderate for the size of the channel. The wetted width varied between 1.5 and 2.0m, and the maximum water depth ranged from 15cm to 25cm.

7.1.3 Phillips Drain

Phillips Drain is a Class C drain (warm water, no top predators present). Three branches extend toward or across the Amaranth - East Luther town line road. Downstream of their convergence, the combined channel flows southerly through a landscape of agricultural land, forest, and swamp on a gently rolling topography. It joins with Whitton Drainage Works approximately 900m south of Concession Road 12-13.

The most southern of the 3 branches flows as a linear drain alongside a fence row. It is approximately 2m wide, and a narrow corridor of herbaceous vegetation extends approximately 2m from either side. The land to the north is used as pasture, and an agricultural field lies to the south.

On the north side of Concession Road 12-13, it is surrounded by a forested swamp. A corridor of herbaceous vegetation and occasional shrubs extends a distance of 5 to 15m away from the watercourse on each side. The watercourse is an agricultural drain approximately 1.5m deep, and 1.5 to 2.0m wide at the bottom. The channel substrate is composed primarily of silt and soft clay, and there is also sand, gravel, and cobble along the edges. There is abundant submergent and emergent instream vegetation, which provides habitat structure and cover. The bank vegetation is dominated by herbaceous plants, which provides shade over much of the open water area. The Concession Road 12-13 crossing is achieved with a large corrugated steel pipe (CSP) culvert embedded into the substrate.

On November 21, 2006, the wetted width was approximately 1.5m, and the maximum depth ranged from 20cm to 30cm.

7.1.4 Unnamed Drain A

Unnamed Drain A is a small unnamed and unclassified drain that begins on the north side of Concession Road 12-13, approximately 600m west of the Amaranth – East Luther town line road. It crosses the road approximately 50m west of the Phillips Drain crossing, and outlets into Phillips Drain approximately 50m south of the road. There are agricultural fields on both sides of the drain. The land to the east has been left fallow, while the land to the west is actively cultivated. The channel is situated in a 5m-wide corridor of herbaceous grasses. The channel is fully vegetated, indicating that the channel flows intermittently. Upstream (north) of Concession Road 12-13, the channel is approximately 0.8m wide and 20cm deep, and has a soil substrate. There is a large pool on the downstream (south) side of the road, and the channel is slightly larger in the 50m section between the road and the outlet. The CSP culvert under the road is 0.5m in diameter.

On November 21, 2006, the pool on the south side contained water, and the channel contained more water than on the north side of the road.

7.1.5 Nather Drainage Works

Nather Drainage Works originates as two branches in the northeast part of the regional study area. The south branch begins approximately 900m northeast of the 8th Line SW. It is a linear drain that generally flows westerly making several turns within the study area. At the 8th Line SW, the channel turns 90 degrees to flow northwest along the road, receiving road drainage until its confluence with the north branch. The confluence coincides with the crossing of the 8th Line SW. The north branch acts as road drainage throughout its length. It originates adjacent to the 280 Sideroad, runs along the south side of the road, and turns to follow along the 8th Line SW to the confluence with the south branch. Downstream of the crossing of the 8th Line SW, the combined channel flows westerly for approximately 2km to its outlet at Mud Creek. Throughout most of its length, it is a Class B drain (warm water, top predators present, channelization within 10

years). The upper section of the south branch has not been assigned a drain classification.

The south branch is an excavated drain that is surrounded by pasture to the southeast and fallow agricultural land to the northwest. Within the pasture, livestock have full access to the channel. Mid-way between the channel's origin and the 8th Line SW, there is a grove of trees on the north side of the channel. Otherwise, herbaceous vegetation dominates the landscape, and aquatic vegetation grows throughout the channel providing some habitat structure and cover. The width of the top of the ditch is approximately 5m, and the bank height is approximately 0.5m. No overhead cover is provided by the bank vegetation. Upstream of the pasture and the grove of trees, the drain is more entrenched.

The wetted width within the pasture on the leased land was approximately 3m on November 21, 2006, and the maximum depth was approximately 25cm. Upstream of the pasture, the wetted width was approximately 2m. There was little to no observed flow throughout the channel.

The entire length of the north branch has roads on one side and a thicket swamp on the other side. In addition to acting as a roadside ditch, efforts to create surface drainage swales in the swamp indicate that the drain was constructed to drain the swamp. At its uppermost extent along the 280 Sideroad, the channel is approximately 0.5 to 1.0m wide. Along the 8th Line SW, it has a width of approximately 4 to 5m.

7.1.6 McFarlane Drainage Works

The McFarlane Drainage Works is a tributary to Mud Creek, and it does not have a drain classification. It originates at County Road 25, and flows westerly and northwesterly to its confluence with Mud Creek. It is a linear agricultural drain with a trapezoidal cross-sectional form.

Within the study area, it flows through a landscape with flat to gently rolling topography. West of County Road 25 for approximately 500m, there is a forested wetland to the north and agricultural field to the south. While the north side is bordered by herbaceous vegetation and the forest, there is only a 1m strip of uncultivated land along the south

side. The ditch is approximately 1.5m deep and 2m wide. There is herbaceous vegetation throughout the channel, including cattails. On January 10, 2007, the wetted width was approximately 2.0m, and the water depth was approximately 20cm.

West of the forest, there are agricultural fields on both sides of the channel. There is a 6m strip of uncultivated land along the south side, and the land is cultivated to the top of bank on the north side. The channel is wider here, with a width of 3 to 4m. In addition, the cattails and other herbaceous vegetation in the channel are more abundant in this section.

Approximately 850m west of County Road 25, the drain makes a 90° turn to the north. The channel extends in this direction approximately 300m north, and turns west at that point. In this 300m section, there are agricultural fields on both sides, with cultivated land encroaching on either side. The drain is approximately 1.0m deep in this location, and the channel substrate is clay-like with a hummocky surface. There is herbaceous vegetation on the banks and throughout the channel. On January 10, 2007, none of the instream vegetation emerged from the water; however, these appear to be emergent plants that would be taller during the growing season. The wetted width was 2.5 to 3.0m, and the water depth varied between 0.15 and 0.2m.

Further west toward Sideroad 27-28 and the outlet to Mud Creek, McFarlane Drainage Works is surrounded by agricultural fields on both sides. Here, there is a strip of uncultivated vegetation approximately 10 to 12m wide on each side of the drain. The channel is approximately 4m wide, and the bank height varies between approximately 1.0 and 1.5m. Instream vegetation is present. On January 10, 2007, the water was approximately 0.2m deep.

7.1.7 Black Creek

Black Creek is the main outlet from Luther Marsh to the Grand River. It flows easterly with wide arcs to the north and south on its way to the Grand River. It passes through flat to gently rolling land covered by agricultural fields. For most of its length it is a class E drain (warm water, top predators present, no channelization within 10 years). Near the Luther Marsh Black Creek is also known as Drain No. 33. From Drain No. 33 to the confluence with the Oosterhof Drainage Works it is known as Palmer Drain. Black

Creek is a class C Drain (warm water, no top predators present) downstream of the confluence with Oosterhof Drainage Works.

Downstream of Concession Road 8/9, the lands surrounding Black Creek include pasture, woodlot, agricultural field and an orchard. There is a naturally vegetated corridor of 2 to 3m on northwest side near the road. On the southeast side the corridor is more extensive covering more than 30 meters. The vegetation occurring is mostly woody shrubs with some trees and herbaceous vegetation. This waterway appears to be a natural channel, or possibly a naturalizing drain with a bank height of about 0.1 to 0.5m. Riffles, runs and pools exhibit substrates of gravel, cobble, boulder, sand, silt and hard clay. On July 20, 2007 the typical wetted width was 6m and a maximum depth of 56cm was recorded. Numerous minnows were observed,. At 16:10, the water and air temperatures were 24.5°C and 20°C, respectively.

Within the leased land, Black Creek is larger because it is downstream of the confluence with the Oosterhof Drainage Works. Natural vegetation extends more than 20m to the south and about 20m to the north of the drain. The gentle slope contains a corridor of trees and dense herbaceous vegetation which provides 25 to 50% shade. The meandering channel has a very stable bank about 0.2 to 0.5m high and is covered by very dense vegetation, predominately grasses. The channel is approximately 6 to 10m wide, and has runs, riffles, small mid-channel pools, and at least one backwater area. The substrate comprises boulder, cobble, pebble, gravel and sand. On July 20, 2007, the average wetted width was 7.5m with depths ranging from 11 to 51cm. Hundreds of crayfish were observed, and caddis cases were seen on the underside of the cobble stones. The cobble was coated by a thin film of slippery algae. At 5:25pm, the water and air temperatures were 25°C and 20°C, respectively.

Black Creek originates at the Luther Marsh dam, which has stop logs stacked approximately 4m in height. Water exits through a chute approximately 1.5m wide through the earthen dam. On July 20, 2007 the outlet was drawing through a square hole in the bottom, sized approximately 0.3m by 0.3m. No water was flowing over the top of the logs.

7.1.8 Unnamed Drain B

This tributary is a man-made drain that connects a forested swamp to Black Creek. This excavated drain is approximately 5m wide and is bordered by agricultural fields. The bank height is approximately 0.5m on the east side and 1m on the west side, and both sides are covered by herbaceous vegetation. The tributary spills over the edge of the valley through braided channels, creating a poor connection to Black Creek. There was no water or flow observed on July 20, 2007. Because of the poor connection and intermittent flow, fish habitat value is limited.

7.2 Aquatic Habitats in the Regional Study Area

7.2.1 Grand River

At County Road 15, the Grand River passes through a landscape with a gently rolling topography. Agricultural fields and coniferous woodlots lie to the east, and to the west are pasture and agricultural fields. There is an estimated 20m of naturally vegetated land on each side of the Grand River near County Road 15; however, the vegetation thins about 150m from the road on the western side. The channel at this site is estimated to be 8 to 12m wide with a bank height of approximately 0.5m and gentle to moderately steep valley slopes. Substrate is mostly cobble and boulder with some sand and gravel, with the pools likely containing finer material as well. The channel morphology in this location is characterized by large pools and small riffle areas. On July 20, 2007, the river was flowing at or near baseflow, and crayfish were observed.

At the intersection of Conc. Rd. 8/9 & Sideroad 27/28, the Grand River at this upstream location is about 14 to 18m wide, flowing through the gently rolling fields and woodlots that surround it. Residences are located to the west and a corridor of trees and herbaceous vegetation border the river. The Grand River in this location has moderately sloped banks and the river bed is dominated by boulder and cobble substrates. Near the bridge the maximum depth of the water was visually estimated to be as much as 1m on July 20, 2007.

7.2.2 Mud Creek

Mud Creek is a Class E drain (warm water, top predators present, no channelization within 10 years). In the regional study area, it has a natural meandering channel form

and flows through a landscape of flat topography. Its valley is very broad and flat, and the riparian corridor comprises herbaceous vegetation. The adjacent land is used as pasture and agricultural fields.

7.2.3 Unnamed Drain C

Unnamed Drain C is an unnamed and unclassified tributary to the Grand River. It originates within the regional study area and flows westerly to its outlet to the Grand River. In the regional study area, this excavated drain flows through a narrow corridor of herbaceous grasses that affords some shade over the channel. There is also aquatic vegetation within the channel.

7.2.4 Magulewski Drainage Works

Magulewski Drainage Works is a tributary to the Grand River, and is a Class A drain (cold/cool water with no trout/salmon present). It originates within the regional study area and flows northwesterly and westerly to its outlet to the Grand River. In the regional study area, it flows through a corridor of herbaceous vegetation that affords shade over the channel. Cattails are growing within the channel, indicating that the channel is wet throughout the year.

7.2.5 Martin Drainage Works

Martin Drainage Works is a tributary to the Whitton Drainage Works, and does not have a drain classification. It originates south of Whitton Drainage Works and west of the Amaranth-East Luther town line road, and has a total length of approximately 1km. Within approximately 400m of its outlet, the channel is surrounded by agricultural lands, while the upstream portion is surrounded by forest.

7.2.6 Leenders Drainage Works

Leenders Drainage Works does not have a drain classification. It drains the land to the west of the Amaranth - East Luther town line road, and south of the 25th Sideroad in Amaranth Township. Within the study area, the channel flows westerly for approximately 300m to its outlet to Martin Drainage Works. Near the town line road, the channel passes through a corridor of herbaceous vegetation bordered on both sides by forested swamp.

7.2.7 Brown Reid Drain

The Brown Reid Drain is a Class C drain (warm water, no top predators present) as classified by GRCA in the DFO drain classification program. According to the Midhurst MNR office, it is classified as cool water (Robinson 2006). The drain originates in the north part of the regional study area and flows southerly into Amaranth Township. It then combines with another drain, and its flow eventually joins Whitton Drainage Works. In the regional study area, Brown Reid Drain is surrounded by fallow and active agricultural land. The channel is approximately 2m wide and the bank height is approximately 0.5 to 1.0m.

7.2.8 Bruce Drainage Works

Bruce Drainage Works provides drainage in the south part of the regional study area. It flows until it joins Number 21 Drainage Works, which flows westerly into the Grand River. Bruce Drainage Works is a Class A drain (cold/cool water with no trout /salmon present). In the vicinity of County road 15, it has a channel width of approximately 2m, and a bank height of approximately 0.5m.

7.2.9 Mills Drainage Works

Mills Drainage Works provides drainage to the south end of the regional study area. It flows southerly into Number 21 Drainage Works, which flows westerly into the Grand River. Mills Drainage Works is a Class C drain (warm water, no top predators present).

7.2.10 Number 21 Drainage Works

Number 21 Drainage Works receives flow from Bruce Drainage Works and Mills Drainage Works and outlets to the Grand River. It is a Class D drain (cold/cool water with trout/salmon/top predators present).

7.2.11 Oosterhof Drainage Works

The upstream drainage area of Oosterhof Drainage Works includes at least 5 other drains. The Oosterhof Drainage Works enters the southwest part of the regional study area and outlets into Black Creek at the boundary of a leased land area. It is a class C Drain (warm water, no top predators present).

7.2.12 Hunter Drain

Drainage network mapping from the GRCA shows that this drain originates approximately 300m west of Sideroad 24/25, and flows east approximately 600m to the Grand River. On July 20, 2007 there was no channel observed on either side of the road. This drain was most likely replaced with a subsurface tile drain.

7.2.13 Hall's Drain

At Sideroad 27/28, there is a swale on the upstream side of the road and a channel on the west (downstream) side. The course of the drain travels across the gently rolling landscape, dropping away to the west into the Grand River valley, where it outlets into the Grand River. Hall's Drain does not have a drain classification.

7.2.14 Ebert's Drain Sideroad 27/28 to Grand River (location 8)

Drainage network mapping from the GRCA shows this drain originating east of Sideroad 27/28, and flowing southwest across the road and into the Grand River. There was no evidence of a channel at Sideroad 27/28. However, a small annex of surface drain remains and extends east from the Grand River, not more than 100m from the Grand River valley. The remainder of the drain has most likely been replaced with a subsurface tile drain.

7.3 Fish Community

According to the Ontario MNR, some groundwater inputs to watercourses are present in the study area. Accordingly, there are some cool-water and cold-water habitats, and mottled sculpins were found at one sampling site. However, there is generally not enough flow in the watercourses for trout habitation. Northern pike have been known to inhabit the area for a long time (Timmerman 2006). They are a cool-water top carnivore that prefer “clear, cool to warm, weedy bays of lakes and slow, meandering, heavily vegetated rivers (Eakins 2006).”

The Midhurst MNR office reported several fish species known to inhabit the Brown Reid Drain. They are: northern pike (*Esox lucius*), brook stickleback (*Culaea inconstans*), blacknose dace (*Rhinichthys obtusus*), creek chub (*Semotilus atromaculatus*), and johnny darter (*Etheostoma nigrum*).

The *Upper Grand River Aquatic Study, Preliminary Report for the 1996 Field Monitoring Program (Draft)* (GRCA 1996) provided information from sampling conducted at 17 stations in the upper Grand River and its tributaries. The fish species captured during the 1996 study are listed in Table 9.

Table 9. Fish Species Captured During the 1996 Upper Grand River Aquatic Study

Common Name	Scientific Name
blacknose dace	<i>Rhinichthys obtusus</i>
blacknose shiner	<i>Notropis heterolepis</i>
bluegill	<i>Lepomis macrochirus</i>
bluntnose minnow	<i>Pimephales notatus</i>
brassy minnow	<i>Hybognathus hankinsoni</i>
brook stickleback	<i>Culaea inconstans</i>
brown bullhead	<i>Ameiurus nebulosus</i>
central mudminnow	<i>Umbra limi</i>
central stoneroller	<i>Campostoma anomalum</i>
common shiner	<i>Luxilus cornutus</i>
creek chub	<i>Semotilus atromaculatus</i>
fantail darter	<i>Etheostoma flabellare</i>
fathead minnow	<i>Pimephales promelas</i>
finescale dace	<i>Phoxinus neogaeus</i>
hornyhead chub	<i>Nocomis biguttatus</i>
iowa darter	<i>Etheostoma exile</i>
johnny darter	<i>Etheostoma nigrum</i>
least darter	<i>Etheostoma microperca</i>
longnose dace	<i>Rhinichthys cataractae</i>
mottled sculpin	<i>Cottus bairdii</i>
northern hog sucker	<i>Hypentelium nigricans</i>
northern pike	<i>Esox lucius</i>
northern redbelly dace	<i>Phoxinus eos</i>
pearl dace	<i>Margariscus margarita</i>
pumpkinseed	<i>Lepomis gibbosus</i>
rainbow darter	<i>Etheostoma caeruleum</i>
river chub	<i>Nocomis micropogon</i>
rock bass	<i>Ambloplites rupestris</i>
rosyface shiner	<i>Notropis rubellus</i>
smallmouth bass	<i>Micropterus dolomieu</i>
striped shiner	<i>Luxilus chrysocephalus</i>
white sucker	<i>Catostomus commersoni</i>
yellow perch	<i>Perca flavascens</i>

None of the species captured during the 1996 study are considered rare in Ontario or Canada (Natural Heritage Information Centre 2006). Three of the species in the list

were found by the 1996 study to be establishing larger populations in the upper Grand River and tributaries. They are central stoneroller, northern pike, and smallmouth bass.

According to the 1996 study, the central stoneroller was at one time considered “vulnerable” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). However, the study cited a recommendation in a report by Holm and Crossman (1996, as cited in GRCA 1996) that the status of the central stoneroller should be changed from vulnerable to “*No Status Designation Required.*” Reference to the MNR’s Natural Heritage Information Centre (NHIC 2006) website found that the current status in Ontario is “S4”, and the designation given is “*Not At Risk*”. According to NHIC, it was “*(r)ecently discovered to be (a) frequent component of live bait shipments within the province. As such, apparent range extensions north and east to Northumberland and Victoria Cos. may be the result of introductions*” (NHIC 2006).

The 1996 study highlighted northern pike as a species that had increased in numbers since a similar study that was conducted in 1983. Most were captured in “*municipal drain-type waterbodies with a muck/silt substrate, abundant aquatic vegetation, and deeper holes which would provide cooler water temperatures during the summer months*” (GRCA 1996).

In 1996, smallmouth bass was a new species in the upper Grand River system. The 1983 study did not find any smallmouth bass, but they were captured at 9 stations in 1996, 7 of which were located in the main stem of the Grand River.

8.0 Opportunities and Constraints

8.1 Management Objectives for the Upper Grand River Fisheries Resources

The *Grand River Fisheries Management Plan* (GRCA & MNR 1998) outlined objectives for fisheries management of the upper Grand River. There are three objectives for the main stem of the Grand River that apply upstream of the town of Grand Valley.

- The first is to achieve a diverse warmwater fish community dominated by top predators.
- The second is to maintain a stable forage base. An important part of maintaining a stable forage base is reflected in the objective for warmwater tributaries to have a “diverse warmwater fish community”.
- The third is to reintroduce and manage brook trout in coldwater tributaries where the habitat is capable of supporting them (GRCA & MNR 1998).

8.2 Setbacks from Natural Features

The natural environment may pose constraints to developments in a number of ways. Constraints to turbine locations and the development of this proposed wind farm, that were identified through field surveys include setbacks from the construction footprint of access roads and turbine bases to forest edges, wetlands and watercourses. We recommend the following as typical:

- 30m from wetland communities,
- 10m from forest driplines, and
- 30m from watercourses.

8.2.1 Implication of Setbacks on Proposed Turbine Locations

These setbacks may affect 5 of the proposed turbine locations. The proposed turbine locations were verified in the field using handheld Garmin Etrex GPS which do not have high levels of accuracy. Additionally, the size of the turbine bases are not known at this time. That said the following turbines are in the vicinity of natural features that need to be buffered:

Turbine 3 is roughly 25m from a forested swamp (wetland).

Turbine 4 is roughly 60m forested swamp (wetland).

Turbine 5 is situated in a regenerating swamp thicket (wetland).

Turbine 6 is roughly 35m from a swamp thicket (wetland).

Turbine 7 is on the edge of a swamp thicket (wetland). Additionally there is a Red-tailed Hawk nest roughly 100m away along the forest edge, additional setbacks may be required for specific nesting periods (to be determined based on liaison with staff of the MNR)

Turbine 8 is situated adjacent to a Class A cool/cold-water drain (Hansen Drainage Works).

8.3 Access Road Crossing Locations

Access to several turbines will require watercourse crossings if the roads are to be constructed within the current land lease properties. Watercourse crossings will need to be permitted under the federal *Fisheries Act*, and an alteration to waterways permit will be required from the GRCA.

Turbine 2 will need to cross McFarlane Drainage Works. This is most likely achievable with a CSP or concrete box culvert.

Turbine 11 will need to cross Black Creek. This is a major watercourse that will require a span bridge.

9.0 Summary

This report discusses the natural environment characterization completed on the Grand Valley II Wind Farm by NRSI. This includes vegetation and wildlife. A number of designated natural areas are found in the regional study area, most notably Luther Marsh. None of these designated natural areas overlaps with the study areas.

Vegetation

The study areas are characterized by a mix of agricultural fields (crop, pasture and hay), forests, plantations, meadows, swamp thickets and forested swamps. No significant plant species are known from the vicinity in background sources.

Mammals

Twenty-four species are known from lands within the vicinity of the study area. Of these, none are listed as Species at Risk. No significant wildlife habitats are known from the study areas, however a deer wintering area is known from Bowling Green Swamp in the southwest corner of the regional study. Within the regional study area the main wildlife movement corridor or linkage is associated with the Grand River and adjacent riparian zones.

In accordance with the draft MNR bat monitoring guidelines for wind farms (2007) having low site sensitivity,

Reptiles and Amphibians

A total of 13 species of reptiles and amphibians (collectively called herpetofauna) are known from the vicinity of the study areas based on information from the Ontario Herpetofaunal Summary Atlas and NHIC (Oldham and Weller 2000). Two of these species, Eastern Ribbonsnake and Butler's Gartersnake are rare and listed as Special Concern and Threatened species respectively by COSEWIC. Five of the common species of herpetofauna (all frogs) were recorded in the study area during NRSI field surveys. Habitat for amphibians is abundant but not of high quality. Agricultural drains result in efficient drying of fields and at a regional scale have resulted in the lowering of the water table throughout the area (Erwin pers. comm. 2007). Habitat for reptiles is variable depending upon the specific requirements of each species.

Birds

A total of 72 species of birds were recorded by NRSI during field surveys between November 2006 and July 2007 in the vicinity of the study areas. Of these, 12 detected during the breeding season are Conservation Priority species as identified by Partners in Flight (Ontario Partners in Flight 2005). Notable species seen during either fall, winter, or spring before breeding season include Northern Shrike, Rough-legged Hawk and Golden Eagle.

Records of rare birds from the regional study area known from NHIC or the 1st and 2nd Breeding Bird Atlas include: Wilson's Phalarope, Red-headed Woodpecker, Rough-legged Hawk, Henslow's Sparrow, Great Egret, Black Tern, Yellow-breasted Chat and Short-eared Owl. Although many of these records date back to the 1980's, NRSI conducted general and species specific searches in all potential habitats within the vicinity. Despite extensive field surveys, none of these species were detected by NRSI.

Since the site does not have any of the elements listed from Table 1 in the EA Guidance Document (EC 2007), the site sensitivity of the Grand Valley II wind farm is low. Low site sensitivity in coordination with a medium sized facility results in a Category 1 Level of Concern wind farm.

Aquatic Habitat

The regional study area is located in the upper Grand River watershed where there are mostly mixed-water and warm-water habitats, as well as some cold-water habitats. The silty and clayey soils in the area generally impair subsurface drainage. This causes the watershed to have flashy floodflows and extremely low baseflows, particularly in the first-order tributaries.

A total of 22 watercourses in the study area have been documented. Of these, 8 have warm-water classifications under the DFO/GRCA drain classification, and 4 have cool/cold-water classifications. A total of 9 of the watercourses have not been classified, and most of these are minor features that can generally be expected to have warm-water characteristics. Two of them have been converted to subsurface tile drains under agricultural fields. The Grand River itself is a major aquatic habitat feature. It is the

main stem of large network of aquatic habitat that is the basis of a valuable fishery resource in southern Ontario.

A total of 33 fish species are known to occur in the upper Grand River watershed, none of which are considered rare. The populations of three species – central stoneroller, northern pike, and smallmouth bass – were increasing in numbers in the decade preceding 1996.

10.0 References

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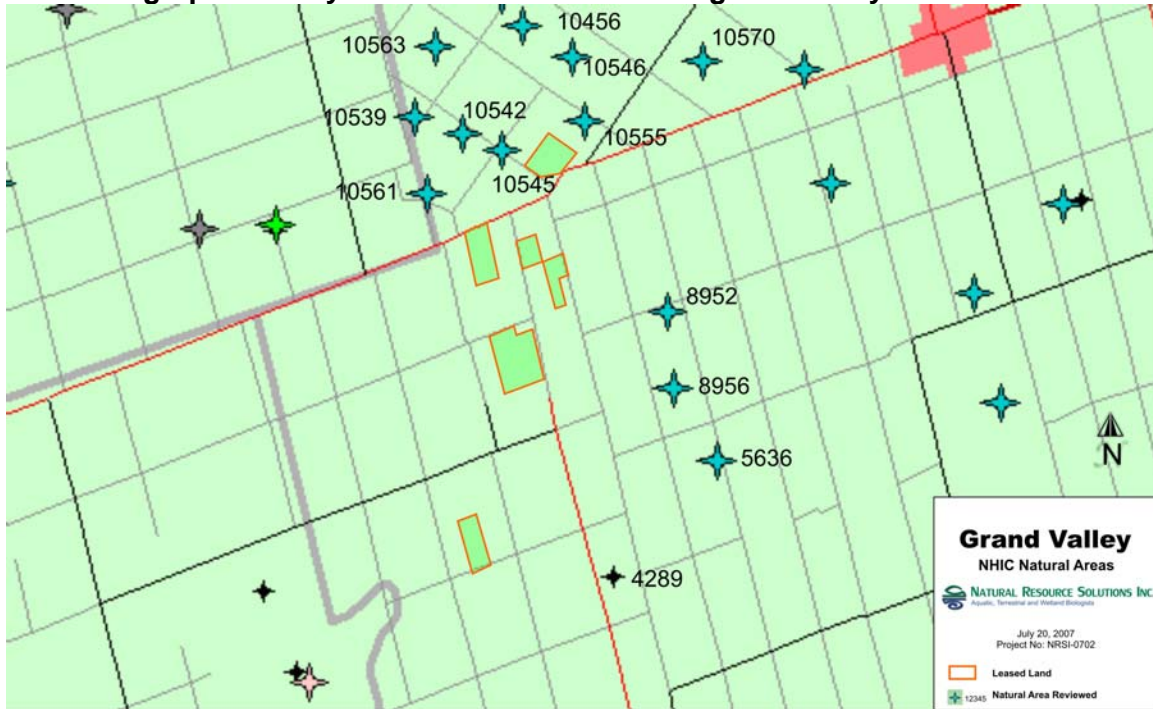
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APPENDIX I

NHIC Geographic Query and Natural Area Reports

NHIC Geographic Query of Natural Areas in the Regional Study Area



Number of natural areas selected: 13

10.1.1 MELANCTHON #2- WETLAND

AREA_ID: 10539

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	50.2 ha	17,549800,4879500	41A/1

Description

A Non-Provincially significant wetland, composed of three wetland types (86% carr, 9% swamp and 5% marsh) (Black and Uusoue, 1983).

Vegetation

The wetland is 86% carr, 9% swamp, and 5% marsh. (The Corporation of the County of Dufferin, 1995)

Vegetation Communities (Black and Uusoue, 1983):

Triple strata subforms (upper; middle; lower);
 trees; shrubs; herbs;
 shrubs; floating plants; submergents;
 high shrubs; low shrubs; herbs;
 emergents; floating plants; submergents;
 dead trees; shrubs; emergents;

Representation

Landform

Soils (Black and Uusoue, 1983): 100% loams, clays or silts (mineral);
Site Type (Black and Uusoue, 1983): 100% palustrine with intermittent outflow;

References

- Black, R., and D. Uusoue. 1983. Wetland Data Record and Evaluation- Dufferin 498795 (Melancton #2). First Edition. Sept 12, 1983. Ontario Ministry of Natural Resources. Manuscript. 20 pp.
- The Corporation of the County of Dufferin. 1995. Our Forest - Our Future; Dufferin County Forest Management Plan 1995-2015. The Corporation of the County of Dufferin.

10.1.2 MELANCTON #3- WETLAND**AREA_ID: 10561**

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	56.0 ha	17,550000,4877500	41A/1

Description

A Non-Provincially significant wetland, composed of two wetland types (49.6% carr and 50.4% swamp) (Black and Cook, 1983).

Vegetation

Vegetation Communities (Black and Cook, 1983):

Double strata subforms (upper; lower);
tall grass; herbs;

Triple strata subforms (upper; middle; lower);
high shrubs; low shrubs; herbs;
trees; shrubs; herbs;

Representation**Landform**

Soils (Black and Cook, 1983): 10% loams, clays or silts (mineral);
Site Type (Black and Cook, 1983): 100% riverine (near headwaters);

References

- Black, R. and G. Cook. 1983. Wetland Data Record and Evaluation- 500775 (Melancton #3). First Edition. August 23, 1983. Ontario Ministry of Natural Resources. Manuscript. 20 pp.

10.1.3 MELANCTHON #8- WETLAND

AREA_ID: 10563

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	21.0 ha	17,550500,4881300	41A/1

Description

A Non-Provincially significant wetland, composed of two wetland types (14.3% carr and 85.7% swamp) (Black and Cook, 1983).

Vegetation

Vegetation Communities (Black and Cook, 1983):

Triple strata subforms (upper; middle; lower);
trees; shrubs; herbs;
high shrubs; low shrubs; herbs;

Representation

Landform

Soils (Black and Cook, 1983): 100% loams, clays or silts (mineral);
Site Type (Black and Cook, 1983): 100% riverine (near headwaters);

References

- Black, R. and G. Cook. 1983. Wetland Data Record and Evaluation- 505813 (Melancthon #8). First Edition. August 31, 1983. Ontario Ministry of Natural Resources. Manuscript. 20 pp.

10.1.4 MELANCTHON #11- WETLAND

AREA_ID: 10542

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	53.4 ha	17,551000,4879000	41A/1

Description

A Non-Provincially significant wetland, composed of two wetland types (50% carr and 50% swamp) (Black and Cook, 1983).

Vegetation

Vegetation Communities (Black and Cook, 1983):

Double strata subforms (upper; lower);
emergents; submergents;
dead trees; grasses;

Triple strata subforms (upper; middle; lower);
high shrubs; low shrubs; herbs;

dead trees; grasses; herbs;
trees; shrubs; herbs;

Representation

Landform

Soils (Black and Cook, 1983): 100% organic;

Site Type (Black and Cook, 1983): 100% riverine (near headwaters);

References

- Black, R. and G. Cook. 1983. Wetland Data Record and Evaluation- Dufferin 510790 (Melancthon #11). First Edition. August 26, 1983. Ontario Ministry of Natural Resources. Manuscript. 20 pp.

10.1.5 MELANCTHON #16- WETLAND

AREA_ID: 10545

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	64.5 ha	17,552000,4878500	41A/1

Description

A Non-Provincially significant wetland, composed of one wetland type (100% carr/swamp) (Black and Cook, 1983).

Vegetation

Vegetation Communities (Black and Cook, 1983):

Double strata subforms (upper; lower);
low shrubs; herbs;

Triple strata subforms (upper; middle; lower);
trees; shrubs; herbs;
high shrubs; low shrubs; herbs;

Representation

Landform

Soils (Black and Cook, 1983): 100% organic;

Site Type (Black and Cook, 1983): 100% isolated;

References

- Black, R., and G. Cook. 1983. Wetland Data Record and Evaluation- Dufferin 520785 (Melancthon #16). First Edition. August 31, 1983. Ontario Ministry of Natural Resources. Manuscript. 20 pp.

10.1.6 MELANCTHON #20- WETLAND

AREA_ID: 10456

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	29.0 ha	17,552800,4881700	41A/1

Description

A Non- Provincially significant wetland composed of one wetland type (100% swamp) (Massey et al., 1990).

Vegetation

Vegetation Communities (Massey et al., 1990):

S1: coniferous trees; deciduous trees; herbs; narrow-leaved emergents;

S2: coniferous trees; deciduous trees; tall shrubs; herbs; narrow-leaved emergents;

Representation

Landform

Soils (Massey et al., 1990): 100% clays, loams or silts (mineral);

Site Type (Massey et al., 1990): 100% palustrine (permanent or intermittent outflow);

References

- Massey, M. (1990), R. Black (1983), and T. Leipens (1983). 1990. Wetland Data Record and Evaluation- Melancthon 20. Second Edition. Sept 14, 1983. Ontario Ministry of Natural Resources. Manuscript. 22 pp.

10.1.7 MELANCTHON #26- WETLAND

AREA_ID: 10546

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	24.4 ha	17,554000,4880800	41A/1

Description

A Non- Provincially significant wetland, composed of two wetland types (20% carr and 80% swamp) (Black and Cook, 1983).

Vegetation

Vegetation Communities (Black and Cook, 1983):

Double strata subforms (upper; lower);
dead trees; herbs;
herbs; mosses;

Triple strata subforms (upper; middle; lower);
trees; shrubs; herbs;
high shrubs; low shrubs; herbs;

Representation

Landform

Soils (Black and Cook, 1983): 100% organic;

Site Type (Black and Cook, 1983): 100% riverine (near headwaters):

References

- Black, R. and G. Cook. 1983. Wetland Data Record and Evaluation- Dufferin 540808 (Melancthon #26). First Edition. August 26, 1983. Ontario Ministry of Natural Resources. Manuscript. 20 pp + 4 pp supplement.

10.1.8 MELANCTHON #28- WETLAND

AREA_ID: 10555

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	76.1 ha	17,554200,4879100	41A/1

Description

A Non-Provincially significant wetland, composed of two wetland types (5.9% carr, and 94.1% swamp) (Black and Cook, 1983).

Vegetation

Vegetation Communities (Black and Cook, 1983):

Double strata subforms (upper; lower);
low shrubs; emergents;
trees; herbs;

Triple strata subforms (upper; middle; lower);
dead trees; shrubs; emergents;
trees; shrubs; herbs;
tall shrubs; low shrubs; herbs;

Representation

Landform

Soils (Black and Cook, 1983): 100% organic;

Site Type (Black and Cook, 1983): 100% isolated;

References

- Black, R. and G. Cook. 1983. Wetland Data Record and Evaluation- Dufferin 8 (Melancthon #28). First Edition. July 19, 1983. Ontario Ministry of Natural Resources. Manuscript. 20 pp.

10.1.9 CAMPANIA FEN

AREA_ID: 8967

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	16.1 ha	17,556000,4872000	41A/1

Description

A Non-Provincially significant wetland, composed of two wetland types (15% fen and 85% swamp) (Black and Simkins, 1984);

Vegetation

Vegetation Communities (Black and Simkins, 1984);

Two forms

1: narrow-leaved emergents; mosses;

Five forms

3: dead deciduous trees; robust emergents; narrow-leaved emergents; free-floating plants; herbs;

4: deciduous trees; tall shrubs; low shrubs; narrow-leaved emergents; herbs;

2: tall shrubs; dead shrubs; low shrubs; narrow-leaved emergents; submergents;

Representation

Landform

Soils (Black and Simkins, 1984): 100% organic;

Site Type (Black and Simkins, 1984): 100% palustrine (permanent or intermittent outflow);

References

- Black, R. and W. Simkins. 1984. Wetland Data Record and Evaluation- Campania Fen. Second Edition. June 14, 1984. Ontario Ministry of Natural Resources. Manuscript. 22 pp.

10.1.10 MAPLE GROVE BOG

AREA_ID: 8952

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	282.8 ha	17,556000,4874000	41A/1

Description

A Non-Provincially significant wetland complex, made up of three individual wetlands, composed of three wetland types (10% bog, 5% fen, and 85% swamp) (Ferguson et al., 1986).

Vegetation

Dominant Vegetation Forms (Ferguson et al., 1986):

60% deciduous trees, 25% tall shrubs, 9% coniferous trees, 5% dead deciduous trees, 1% robust emergents;

Vegetation Communities (Ferguson et al., 1986):

Two forms

5: dead shrubs; submergents;
7: coniferous trees; herbs;

Three forms

2: tall shrubs; low shrubs; herbs;
3: robust emergents; narrow-leaved emergents; mosses;
16: tall shrubs; low shrubs; herbs;
19: tall shrubs; low shrubs; herbs;

Four forms

1: tall shrubs; low shrubs; narrow-leaved emergents; herbs;
4: tall shrubs; low shrubs; narrow-leaved emergents; herbs;
6: coniferous trees; tall shrubs; low shrubs; herbs;
8: tall shrubs; dead shrubs; low shrubs; herbs;
9: coniferous trees; tall shrubs; low shrubs; herbs;
10: deciduous trees; tall shrubs; low shrubs; herbs;
11: deciduous trees; tall shrubs; low shrubs; herbs;
12: deciduous trees; low shrubs; herbs; mosses;
13: deciduous trees; tall shrubs; low shrubs; herbs;
14: deciduous trees; low shrubs; herbs; mosses;
15: deciduous trees; tall shrubs; low shrubs; herbs;
17: dead deciduous trees; deciduous trees; tall shrubs; herbs;
18: deciduous trees; tall shrubs; low shrubs; herbs;

Representation

Landform

Soils (Ferguson et al., 1986): 5% clays, loams or silts, 95% organic;
Site Type (Ferguson et al., 1986): 100% palustrine (permanent or intermittent outflow);

References

- Ferguson, M., R. Black and W. Simkin. 1986. Wetland Data Record and Evaluation- Maple Grove Bog. Second Edition. June 21, 1984. Ontario Ministry of Natural Resources. Manuscript. 17 pp.

10.1.11

BOWLING GREEN SWAMP

AREA_ID: 5636

Significance	Area Type	Size	Centroid UTM	Map #
Provincial	Wetland	503.0 ha	17,557000,4870000	40P/16

Description

A Provincially significant wetland, composed of three wetland types (20% bog, 1.6% fen and 78.4% swamp) (Black and Simkin, 1984).

Vegetation

Dominant Vegetation Forms (Black and Simkin, 1984):
47% tall shrubs, 34% deciduous trees, 9% low shrubs, 8% dead trees, 1% coniferous trees, and 1% narrow-leaved emergents;

Vegetation Communities (Black and Simkin, 1984):

One Form

25: narrow-leaved emergents- sedges;

Two Forms

17: tall shrubs- willow; herbs;

6: deciduous trees- Trembling Aspen; herbs;

11: coniferous trees- cedar; herbs;

3: tall shrubs- Swamp Birch; low shrubs;

16: low shrubs- Swamp Birch; mosses;

Three Forms

13: tall shrubs- Swamp Birch; low shrubs- blueberry; mosses;

19: low shrubs- willow; narrow-leaved emergents; robust emergents;

20: tall shrubs- Pin Cherry; low shrubs- Spiraea sp.; herbs;

22: dead deciduous trees; dead shrubs; low shrubs- willow;

Four Forms

4: tall shrubs- willow; low shrubs; mosses; herbs;

5: deciduous trees- willow; tall shrubs- Choke Cherry; low shrubs- dogwood; herbs;

7: low shrubs- willow; narrow-leaved emergents; ground covers; mosses;

12: tall shrubs- willow; narrow-leaved emergents; floating plants; submergents;

14: tall shrubs- willow; low shrubs- Spiraea spp.; herbs; mosses;

24: dead deciduous trees; dead shrubs; tall shrubs; herbs;

Five Forms

21: dead deciduous trees; low shrubs; narrow-leaved emergents; free-floating plants; submergents;

10: tall shrubs; low shrubs; herbs; narrow-leaved emergents; mosses;

Six or More Forms

1: dead deciduous trees- Balsam Poplar; deciduous trees; tall shrubs; low shrubs; narrow-leaved emergents; herbs;

2: dead deciduous trees; dead shrubs; tall shrubs; low shrubs; narrow-leaved emergents; free-floating plants;

8: dead deciduous trees; tall shrubs; low shrubs; narrow-leaved emergents; herbs; mosses;

9: deciduous trees- Balsam Poplar; coniferous trees; tall shrubs; low shrubs; narrow-leaved emergents; herbs; mosses

Representation

Landform

Soils (Black and Simkin, 1984): 12% clays, loams or silts, and 88% organic;

Site Type (Black and Simkin, 1984):100% palustrine (permanent or intermittent outflow);

References

- Black, R. , and W. Simkin. 1984. Wetland Data Record and Evaluation- Bowling Green Swamp. Second Edition. June 6-8, 1984. Ontario Ministry of Natural Resources, Midhurst. Manuscript. 22 pp + 1 map.

10.1.12 MELANCTHON #35- WETLAND

AREA_ID: 10570

Significance	Area Type	Size	Centroid UTM	Map #
Other	Wetland	33.5 ha	17,557400,4880400	41A/1

Description

A Non-Primarily significant wetland, composed of two wetland types (61.2% carr and 38.8% swamp) (Black and Cook, 1983).

Vegetation

Vegetation Communities (Black and Cook, 1983):

Triple strata subform (upper; middle; lower);
trees; shrubs; herbs;
high shrubs; low shrubs; herbs;

Representation

Landform

Soils (Black and Cook, 1983): 100% loams, clays or silts (mineral);
Site Type (Black and Cook, 1983): 10% palustrine with intermittent outflow;

References

- Black, R., and G. Cook. 1983. Wetland Data Record and Evaluation- 574804 (Melancthon #35). First Edition. August 25, 1983. Ontario Ministry of Natural Resources. Manuscript. 20 pp.

10.1.13 TARBERT DRIFT

AREA_ID: 4289

Significance	Area Type	Size	Centroid UTM	Map #
	Earth Science Site	ha	17,554100,4867200	40P/16

Description

The Tarbert Drift is an area of isolated kames or minor recessional moraine deposits indicating stagnant conditions during retreat of the Georgian Bay ice lobe during the Port Bruce Stadial. The Grand River flows in a valley that was once a meltwater channel.

Vegetation

Representation

Landform

APPENDIX II

ELC Vegetation Communities

APPENDIX III

OBBA and NRSI Breeding Bird Data

APPENDIX IV

Breeding Bird Evidence per Point Count Station and Habitat Descriptions

APPENDIX V

Sample Point Count Data Sheet

APPENDIX VI

Sample Behavioural Study Data Sheet

APPENDIX VII

Henslow's Sparrow Survey Instructions

APPENDIX VIII

Winter Birds

APPENDIX IX

Incidental Birds

APPENDIX X

Complete Bird List
