Environmental Characterization Report
St. Joseph Wind Energy Project

Prepared for:
Bowark Energy Ltd.
c/o Helimax Energy Inc.
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Project No. 0745 Date: July 22, 2008

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Environmental Characterization Report
St. Joseph Wind Energy Project

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Report submitted on July 22, 2008

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1.0 Introduction

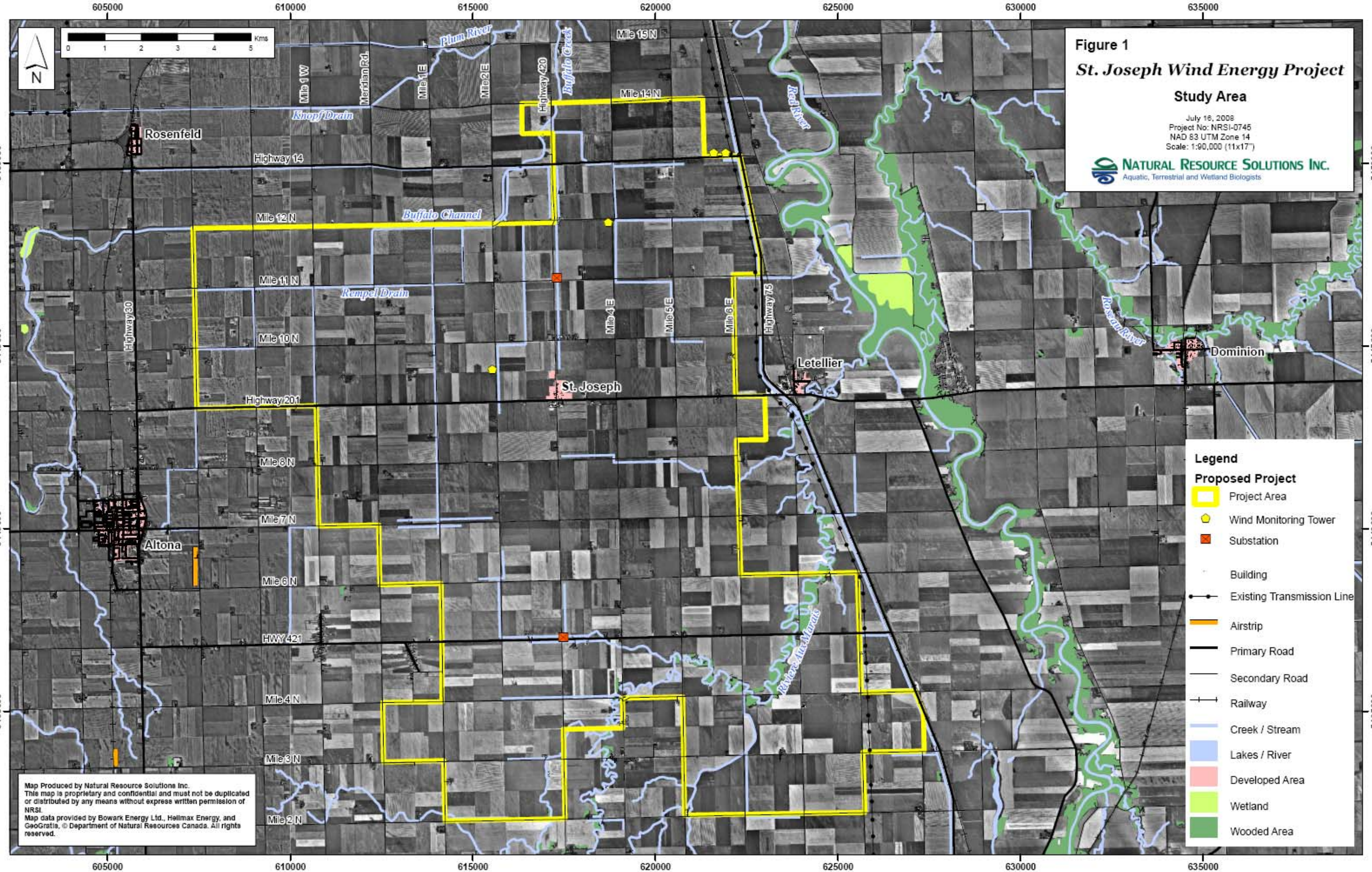
Natural Resource Solutions Inc. (NRSI) was retained in March 2007 by Helimax Energy Inc. on behalf of BowArk Energy Ltd. to conduct an assessment of natural environment features that might influence the location, potential impacts, and mitigation of a proposed wind power facility. The proposed St. Joseph Wind Energy Project is located approximately 85km south of Winnipeg, near the Town of St. Joseph, Manitoba.

A monitoring program for this project was developed, through consultation with appropriate agencies and review of applicable guidance documents (Environment Canada 2007; Environment Canada CWS 2007). Surveys of the following biological components were undertaken during the 2007 monitoring period: spring and fall bird migration, breeding birds, diurnal raptors, lek searches, calling amphibians, spring and fall bat migration, bat summer swarming, vegetation mapping, and aquatic habitat assessment. Following the completion of 2007 monitoring, an expansion to the study area was added, resulting in additional vegetation mapping and spring bird migration surveys. Avian and bat monitoring stations were selected to represent different habitat types and cover as much of the study area as possible. They were selected based on original project boundaries received in April 2007, with two additional bird migration monitoring stations added in spring 2008 to cover the expansion area. Changes to project area boundaries and turbine layouts resulted in a reduced monitoring effort in the southern extents of the project area.

This report summarizes the methodology and detailed findings of the biological surveys undertaken by NRSI in 2007 and 2008. Detailed species lists based on field observations and background review are appended to this report.

2.0 Study Area

The St. Joseph study area is located approximately 85km south of Winnipeg in the south central portion of the Red River Valley. This area has been heavily cultivated and a variety of agricultural crops are grown in the area. For the purposes of this report, the term “study area” refers to the project area plus a 1km buffer. It has to be noted that the initial project area was expanded to the south in 2008 and further field work was conducted in the spring of 2008 to characterize vegetation communities and bird migration through this expansion area. The entire project area is located west of Highway 75 and the Red River, and is bound by Mile 2 Road N. to the south, Mile 14 Road N. and Mile 12 Road N. to the north, Mile 1 Road W and Mile 3 Road W to the west and Highway 75 to the east (see Figure 1).


605000
610000
615000
620000
625000
630000
635000
5450000
5445000
5440000
5435000
N
0 1 2 3 4 5 Kms
Figure 1
St. Joseph Wind Energy Project
Study Area
July 16, 2008
Project No: NRSI-0745
NAD 83 UTM Zone 14
Scale: 1:90,000 (11x17")
Natural Resource Solutions Inc.
Aquatic, Terrestrial and Wetland Biologists
Plum River
Buffalo Creek
Knopf Drain
Buffalo Channel
Rempel Drain
Red River
Rosseau River
Riviere Aux Marais
Mile 15 N
Mile 14 N
Mile 12 N
Mile 11 N
Mile 10 N
Mile 8 N
Mile 7 N
Mile 6 N
Mile 4 N
Mile 3 N
Mile 2 N
Mile 1 W
Meridian Rd
Mile 1 E
Mile 2 E
Mile 3 E
Mile 4 E
Mile 5 E
Mile 6 E
Highway 420
Highway 75
Highway 30
Highway 14
Highway 201
HWY 421
Rosenfeld
Altona
St. Joseph
Letellier
Dominion
Legend
Proposed Project
Project Area
Wind Monitoring Tower
Substation
Building
Existing Transmission Line
Airstrip
Primary Road
Secondary Road
Railway
Creek / Stream
Lakes / River
Developed Area
Wetland
Wooded Area
Map Produced by Natural Resource Solutions Inc.
This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI.
Map data provided by Bowark Energy Ltd., Hellmax Energy, and GeoGratis, © Department of Natural Resources Canada. All rights reserved.

3.0 Soils, Terrain and Drainage

The study area is located within the Glacial Lake Agassiz Clay Plain. This Plain is characterized by massive deposits of clay, silt and a little sand which was deposited by glaciers into proglacial lakes during the Quaternary Period (Matile & Keller 2004).

The study area is located entirely within the Lake Manitoba Plain Ecoregion. No significant topographic features have been identified within the study area. The study area is nearly level to gently rolling plains consisting primarily of hummocky to kettled glacial moraine and lacustrine deposits.

The Canada Land Inventory (CLI) reports that the soil rating within the study area is Class 2 (moderate limitations that restrict range of crops or require special conservation practices) (Natural Resources Canada 2007).

The study area is almost entirely composed of agricultural fields that are drained by constructed linear drains. Most of this drainage flows north into the Buffalo River, which in turn enters Plum Creek and finally the Red River. The southeastern part of the study area is composed mainly of agricultural fields which drain into the Rivière aux Marais, which ultimately outlets into the Red River. The only natural wooded areas found within the study area are associated with this stream corridor.

4.0 Vegetation

4.1 Natural Areas

The study area is located within the Manitoba Plains Ecoregion. According to Manitoba Conservation (MB Conservation 2007a), no significant topographic features or Areas of Special Interest (ASI) are located near the study area. According to the Protected Areas Initiative (PAI), there are no protected areas in or around the study area (MB Conservation 2007b).

4.2 Study Methodology

The initial study area is comprised almost entirely of agricultural fields. The only naturally vegetated features, such as woodlots and wetlands, are associated with the riparian corridor of the Rivière aux Marais. As a result of turbines being proposed in areas of active agriculture, a detailed land classification system to document vegetation communities within the study area was not necessary. Alternatively, NRSI biologists mapped hedgerows and compiled a list of tree species present within the vegetated areas in the study area.

4.3 Results

Vegetation within the initial study area and the majority of the expansion consists of scattered hedgerows and pockets of vegetation associated with private residents (see Figure 2). Agricultural fields within the study area were planted with a variety of crops. Soybeans and canola were found to be most common but a variety of vegetables and grains such as beans, rye, carrots and wheat are also present. The majority of hedgerows in the study area are planted with deciduous tree species including Manitoba maple (*Acer* negundo), plains cottonwood (*Populus deltoides monilifera*), red ash (*Fraxinus pennsylvanica*), white elm (*Ulmus americana*), and trembling aspen (*Populus tremuloides*). There are also a few scattered white cedar (*Thuja occidentalis*) hedgerows. Occasional blue spruce (*Picea pungens*) and white spruce (*Picea glauca*) also occur within the study area. Besides hedgerows, treed and shrubby areas are exclusive to areas surrounding private residences and the borders of constructed ponds.

Vegetation within the southern portion of the project area consists of scattered hedgerows and wooded communities along the riparian corridor. These communities are shown on Figure 2 and described in more detail in Table 1

Table 1. Description of Vegetation Communities

Vegetation Community	Species
Community #1	This is the largest wooded community in the study area and is composed of bur oak (*Quercus macrocarpa*), Manitoba maple, willows (*Salix* sp.), plains cottonwood, sugar maple (*Acer saccharum*), balsam poplar (*Populus balsamifera*) and linden species (*Tilia* sp.).
Community #2	This is a small cultural community adjacent to the riparian corridor consisting of scattered bur oak and spruce species in grassy pasture
Community #3	This is a small cultural woodlot associated with a tributary of the Rivière aux Marais, consisting mainly of maples and willows.
Community #4	This community is a grassy marsh surrounded by deciduous trees in a low area adjacent to highway 75.

4.4 Significant Species

No plant species known to occur in the study area are considered significant or rare species.

605000 610000 615000 620000 625000 630000 635000

5450000 5445000 5440000 5435000

N

0 1 2 3 4 5 Kms

Plum River
Buffalo Creek
Red River
Roseau River
Knopf Drain
Buffalo Channel
Rempel Drain
Rivière aux Marais

Mile 15 N
Mile 14 N
Mile 12 N
Mile 11 N
Mile 10 N
Mile 8 N
Mile 7 N
Mile 6 N
Mile 4 N
Mile 3 N
Mile 2 N

Mile 1 W
Meridian Rd.
Mile 1 E
Mile 2 E
Mile 4 E
Mile 5 E
Mile 6 E

Highway 30
Highway 420
Highway 75
Highway 14
Highway 201
HWY 421

Rosenfeld
Altona
St. Joseph
Letellier

Figure 2

St. Joseph Wind Energy Project

Vegetation Communities

July 16, 2008
Project No: NRSI-0745
NAD 83 UTM Zone 14
Scale: 1:90,000 (11x17")

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Legend

Proposed Project
- Project Area
- Wind Turbine
- Wind Monitoring Tower
- Substation
- Above Ground Line
- Underground Cabling
- Access Road

- Vegetation Community 1
- Vegetation Community 2
- Vegetation Community 3
- Vegetation Community 4
- Hedgerow

- Building
- Existing Transmission Line
- Airstrip
- Primary Road
- Secondary Road
- Railway
- Creek / Stream
- Lakes / River
- Developed Area
- Wetland
- Wooded Area

NRSI_0745_StJosephWindfarm_VegCommunities_90k_16Jul08_LAD

5.0 Birds

5.1 Introduction

A number of bird monitoring and survey techniques were employed to characterize all aspects of bird behavior and movement within the study area. Bird studies began in April 2007 and finished in April 2008, occurring during each of the major periods of bird activity, including spring and fall migration, breeding birds, and summer raptor surveys. The 2007 avian monitoring stations were selected based on initial St. Joseph project area boundaries. Following the completion of the 2007 field work, an expansion area was added to the southern portion of the study area. Spring migration monitoring was conducted at two additional stations in spring 2008 in the southern portion of the study area to document movements within the updated project boundaries.

5.2 Daytime Migration Monitoring

5.2.1 Study Methodology

The spring and fall 2007 pre-construction daytime bird migration monitoring occurred at 4 stations (see Figure 3). The station locations were selected to provide good coverage across the initial study area. In order to provide a good representation of the dominant habitat and areas proposed for turbine placement, all 4 stations were located in agricultural habitat except for BMM-002 which was located near a small riparian area. In 2008, spring pre-construction daytime bird migration monitoring occurred at 2 stations within the expanded project boundaries. These additional stations were located within agricultural habitat adjacent to riparian and wooded areas. Locations and elevations of each of the six monitoring stations are listed in Table 2.

Table 2. Daytime Migration Monitoring Station Locations

BMM Station #	Elevation (m)	Station Location
BMM-001	237	Mile 12 Road North and Mile 5 Road East
BMM-002	244	Mile 12 Road North and Meridian Road
BMM-003	244	Mile 7 Road North and Highway 420
BMM-004	235	Meridian Road just south of Highway 201
BMM-005	668	Mile 4 Road North and Mile 5 Road East
BMM-006	635	Mile 3 Road North and Highway 420

Figure 3

St. Joseph Wind Energy Project

Bird Monitoring Stations

July 16, 2008
Project No: NRSI-0745
NAD 83 UTM Zone 14
Scale: 1:90,000 (11x17")

NATURAL RESOURCE SOLUTIONS INC.
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605000 610000 615000 620000 625000 630000 635000

5450000 5445000 5440000 5435000

N

0 1 2 3 4 5 Kms

Plum River
Buffalo Creek
Red River
Knopf Drain
Buffalo Channel
Rempel Drain
Rivière aux Marais

Mile 1 W
Meridian Rd.
Mile 1 E
Mile 2 E
Highway 420
Mile 15 N
Mile 14 N
Highway 14
Mile 12 N
Mile 11 N
Highway 30
Mile 10 N
Highway 20 1
Mile 8 N
Mile 7 N
Mile 6 N
HWY 421
Mile 4 N
Mile 3 N
Mile 2 N
Mile 4 E
Mile 5 E
Mile 6 E
Highway 75

Rosenfeld
Altona
St. Joseph
Letellier

BMB-031 BMB-030 BMB-032 BMB-028 BMB-029 BMB-025 BMB-027 BMB-035 BMB-034 BMB-026 BMB-024 BMB-038 BMM-002 HWK-001 BMM-001 BMB-037 BMB-036 BMB-033 BMB-023 BMB-018 BMB-020 BMB-016 BMB-019 BMB-021 BMB-017 BMB-022 BMB-015 BMB-014 BMM-004 BMB-012 BMB-008 BMB-009 BMB-013 BMB-039 BMB-040 BMB-007 BMB-011 BMB-010 BMM-003 HWK-002 BMB-006 BMB-002 BMB-004 BMB-001 BMB-003 BMM-005 BMM-006

Legend

Proposed Project
- Project Area
- Wind Turbine
- Wind Monitoring Tower
- Substation
- Above Ground Line
- Underground Cabling
- Access Road

- Breeding Bird Monitoring Station (BMB)
- Migratory Monitoring Station (BMM)
- Diurnal Raptor Monitoring Station (HWK)

- Building
- Existing Transmission Line
- Airstrip
- Primary Road
- Secondary Road
- Railway
- Creek / Stream
- Lakes / River
- Developed Area
- Wetland
- Wooded Area

NRSI_0745_StJosephWindfarm_BirdStations_90k_16Jul08_LAD

The spring 2007 daytime migration monitoring occurred between April 23 and May 25, 2007. This time period was chosen to accurately monitor spring migration activities in the study area. Monitoring occurred over a total of 10 days. Stations BMM-001 and BMM-004 were monitored a total of 2 days each and station BMM-002 and BMM-003 were monitored a total of three days each.

The spring 2008 daytime migration monitoring occurred between April 7 and April 22, 2008. Monitoring occurred over a total of 5 days to compare bird movements within the expanded study area with the extensive surveys completed in the initial study area. Station BMM-005 was monitored a total of 3 days and BMM-006 was monitored a total of 2 days. The fall daytime migration monitoring occurred between September 9 and October 24. This time period was chosen to accurately monitor fall migration activities in the study area. Monitoring occurred over a total of 10 days. Stations BMM-001 and BMM-002 were monitored a total of 3 days and stations BMM-003 and BMM-004 were monitored a total of 2 days.

A complete list of all species observed during migration monitoring is appended to this report (see Appendix I).

As recommended in Environment Canada's guidelines (Environment Canada 2007), NRSI conducted daytime migration monitoring from 0900hrs to 1500hrs. On some days, biologists arrived at the monitoring station before 0900hrs or remained at the station after 1500hrs. Data analysis therefore includes data for time periods between 0800hrs and 1600hrs. The monitoring time period was chosen to capture peak movement of birds in the morning and early afternoon. All bird observations were recorded, including the following information:

- Station Number
- Date
- Observers
- Elevation
- UTM Coordinates
- Air Temperature
- Cloud Cover (%)
- Visibility
- Precipitation
- Wind Speed
- Wind Direction
- Start/ Stop Time
- Bird Species
- Number of Birds
- Behaviour
- Height Category
- Distance from Observer
- Direction from Observer
- Direction of flight (if applicable)

A copy of the field datasheet is appended to this report (see Appendix I).

The data were recorded and analyzed according to three Height Categories (0- 39m, 40 – 120m and >120m). These height categories were used to provide an accurate representation of the flight altitude of birds with respect to the typical wind turbine blade sphere.

At each of the monitoring stations, all bird observations were recorded. However, only birds that were observed within a 200m radius of the observer were used in the analysis of migration data utilization rates. This value was chosen to ensure accurate representations of birds in each of the height categories. Birds at higher heights are easier to see at further distances, and therefore using a large (or unlimited) study radius would give a higher proportion of birds at greater heights than is representative of the actual distribution of the bird use. A 200m study radius gives equal opportunity to see and hear birds at all heights equally, giving a more accurate representation of birds observed.

Information on bird usage was converted to utilization rates based on total number of birds, time spent monitoring, and area surveyed. Calculation of utilization rates allows for a comprehensive understanding of bird densities under a variety of different circumstances and conditions. In addition to utilization rates, bird species composition and bird group composition were calculated as a percent of total observations. Flight direction radial graphs were also used to examine the primary flight directions during the study period. These graphs give an indication of the extent of migration during the monitoring period, and were further separated and analyzed by individual height zones. The results of daytime bird migration monitoring are provided below in Section 5.2.2.

5.2.2 Results

Over the course of the daytime bird migration monitoring in spring and fall 2007, a total of 6,428 individual birds were observed. Fifty-six species were confirmed during the monitoring period. During spring 2008 migration monitoring, an additional 647 birds were observed, representing 30 species. The study area is located in primarily agricultural habitat, and not surprisingly the most abundant species were landbirds such as blackbirds and sparrows. When observing members of these bird groups, especially at a distance, it can be very difficult to identify individuals to species. NRSI biologists recorded bird species whenever possible, however when an individual or flock could not be identified to species, it was recorded according to bird group or family. The results for the spring and fall 2007 monitoring periods and the spring 2008 monitoring period are discussed separately below.

5.2.2.1 Spring 2007

Species Composition and Abundance

During the spring 2007 migration monitoring period a total of 2,725 birds were recorded representing 42 different species. The majority of observations recorded over the monitoring period were individual birds or small flocks numbering less than 20 individuals. The majority of species identified were horned lark (*Eremophila alpestris*), red-winged blackbird (*Agelaius phoeniceus*), snow bunting (*Plectrophenax nivalis*), tundra swan (*Cygnus columbianus*), and brown-headed cowbird (*Molothrus ater*). A few large flocks of birds were observed, numbering between 220 and 350 individuals.

Figure 4 outlines the relative abundance of the five general bird groups observed. The most abundant bird group by number of observations was landbirds (89%). The remaining bird groups represented relatively low numbers- waterfowl represented 7% of individuals observed, followed by shorebirds (1.5%), waterbirds (1.3%), unknown species (1%) and raptors (0.3%). No owls were observed during the monitoring period.

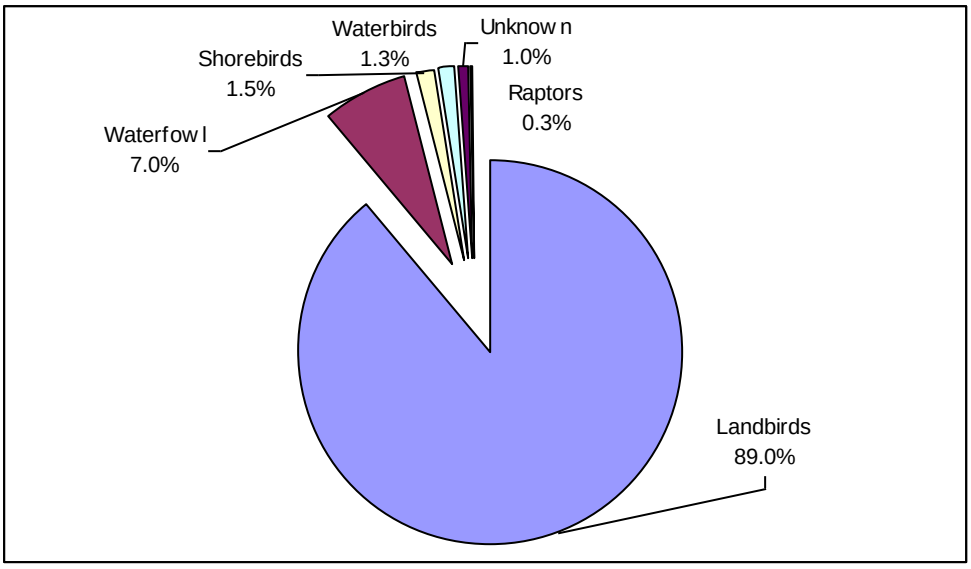


Figure 4. Relative Abundance of Bird Groups During the Spring Monitoring Period.

A total of 2,425 landbirds, the most abundant bird group, were observed representing 30 species. The most abundant landbirds observed were horned lark, red-winged blackbirds, snow buntings and brown-headed cowbird.

A total of 191 waterfowl were observed representing 3 species, the most abundant being tundra swan which were all observed in small flocks.

Thirty-six waterbirds were observed representing 4 species, the most abundant being gull species, half of which were ring-billed gulls (*Larus delawarensis*).

Forty shorebird observations were recorded of two species. The killdeer (*Charadrius vociferus*) represented all shorebird observations except for one of the spotted sandpiper (*Actitis macularia*).

Raptors were the least abundant group observed during spring migration monitoring with only seven raptors observed representing four different species.

One percent of the total observations were of unidentified species observed in small flocks which could not be classified based to bird group.

Distribution by Date and Time

Most of the birds observed in the study area during the spring monitoring period were observed in late April and early May (Figure 5). The highest utilization rate (0.1256 birds/ha/min) was recorded on April 24 when a total of 1,136 individuals were observed. This increase in activity at the end of April suggests a slight peak in spring migration movements through the area.

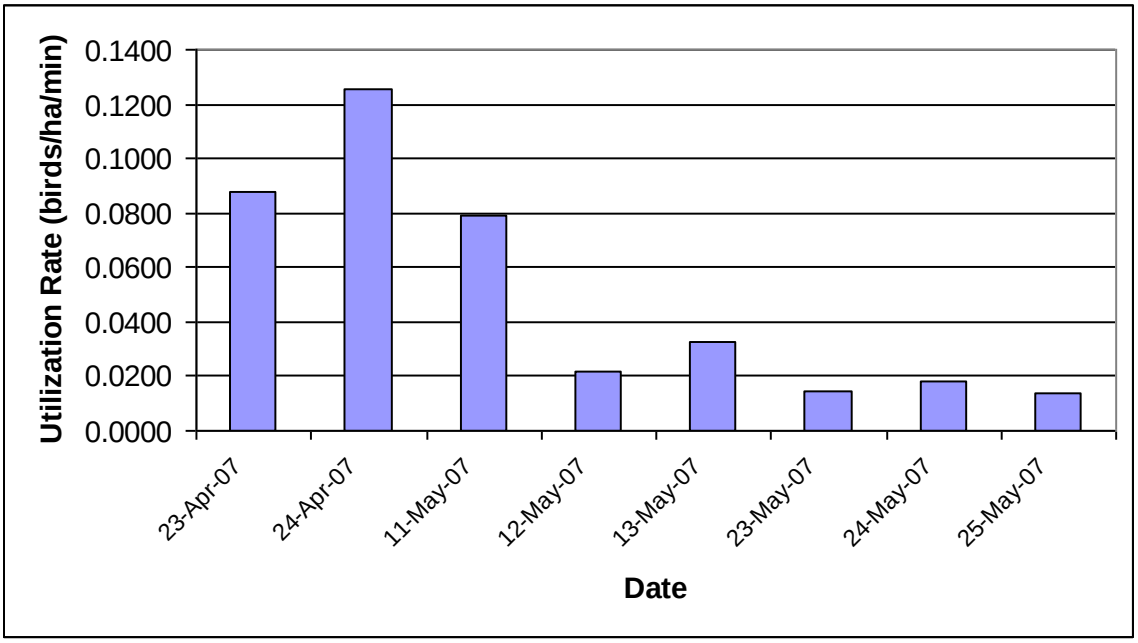


Figure 5. Average Utilization Rates by Date for the Spring Monitoring Period.

Figure 6 displays the average utilization rate at each bird migration monitoring station by time of day. More than 30% of all bird observations were between 0900hrs and 0959hrs (1,259 individuals). For the remainder of the monitoring period, utilization rates were comparable except for a peak in activity around 1100hrs at station BMM-004. This peak in activity at BMM-004 was due to the observation of two large flocks of passerines, totaling 330 birds, on April 24 around 1130hrs.

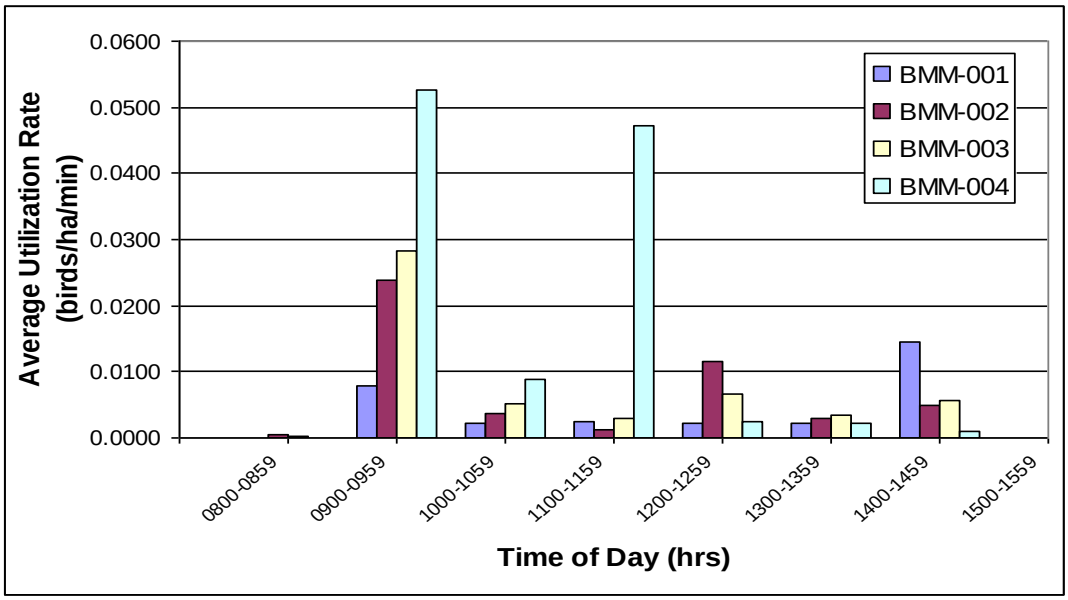


Figure 6. Average Utilization Rates for Spring 2007 by Time of Day and Station

Distribution by Station

Table 3 lists the average utilization for each of the migration monitoring stations during the spring monitoring period. Utilization rates were variable, with BMM-004 showing the highest overall average utilization rate, 0.1145 bird/ha/min. The single highest average utilization rate was observed on April 24, 2007 at BMM-004. This utilization rate of 0.2154 birds/ha/min, represents a date when 8 flocks of 10 or more birds and three large flocks numbering 100-350 birds were observed.

Table 3. Average Utilization Rates (birds/ha/min) by Station and Date for Spring 2007

Date	Station			
	BMM-001	**BMM-002**	**BMM-003**	**BMM-004**
23-Apr-07	**----**	**0.0548**	**0.1194**	**----**
24-Apr-07	**0.0358**	**----**	**----**	**0.2154**
11-May-07	**----**	**0.0792**	**----**	**----**
12-May-07	**----**	**----**	**0.0221**	**----**
13-May-07	**0.0330**	**----**	**----**	**----**
23-May-07	**----**	**0.0146**	**----**	**----**
24-May-07	**----**	**----**	**0.0179**	**----**
25-May-07	**----**	**----**	**----**	**0.0135**
Overall Average	**0.0344**	**0.0489**	**0.0525**	**0.1145**

Note: ---- station not monitored

Distribution by Height

Table 4 summarizes the overall average utilization rates that were observed at each station within the three height categories (0-39m, 40-120m and >120m). The three height categories were used to estimate flight heights below, within, and above the approximate blade sphere. No birds were observed above 70m. The first height category (0-39m), which is below the approximate blade sphere, had the highest average utilization rate of 0.0516 bird/ha/min. The second height category (40 -120m), which is within the approximate blade sphere had an average utilization rate of 0.0082 birds/ha/min. No birds were observed flying in the last height category (>120m) which is above the approximate blade sphere.

Table 4. Average Utilization Rate (birds/ha/m) by Station and Height Category for Spring 2007

BMM Station	Height Zone		
	0 - 39m	**40 -120m**	**>120**
001	0.0339	0.0004	0
002	0.0449	0.0039	0
003	0.0307	0.0217	0
004	0.1129	0.0015	0
Overall	**0.0516**	**0.0082**	**0**

Table 5 shows the average utilization rates by height category relative to the time of day. Height Category 0-39m was observed to have the highest average utilization rate throughout the day. Height category 40-120m had variable utilization rates which fluctuated throughout the course of the day, with no observations in height category

>120m. In general, the utilization rates were observed to steadily decline through the daily monitoring period and were the highest at 0900hrs decreasing in the afternoon after 1200hrs.

Table 5. Average Utilization Rates by Height Category by Time of Day for Spring 2007

Height Category in (m)	0800 hrs	0900 hrs	1000 hrs	1100 hrs	1200 hrs	1300 hrs	1400 hrs	1500 hrs
0-39	0.0584	0.1271	0.0273	0.0673	0.0410	0.0151	0.0342	0.0159
40-120	0.0000	0.0398	0.0019	0.0000	0.0005	0.0016	0.0056	0.0000
>120	0	0	0	0	0	0	0	0

Flight Directions

Flight directions and the numbers of birds (expressed as percent of total individuals observed) are summarized in Figure 7 through Figure 10 below. At BMM-001 (Figure 7) flight directions were variable with large flocks of sparrows moving southwest and northeast. Flight directions were also variable at BMM-002 (Figure 8) with large flocks of sparrows observed heading north, northwest and east. At stations BMM-003 (Figure 9) and BMM-004 (Figure 10) the general trend of bird observations indicate that the majority of birds were observed to be heading in a northeastern direction toward the Red River.

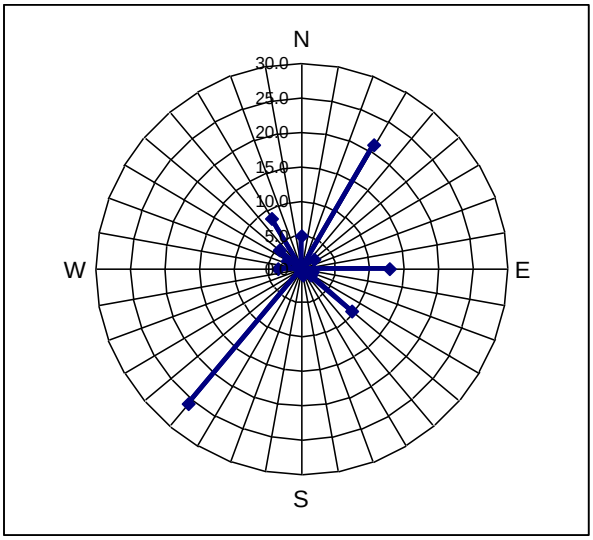


Figure 7. Spring 2007 Flight Directions and Percentages for Station BMM-001

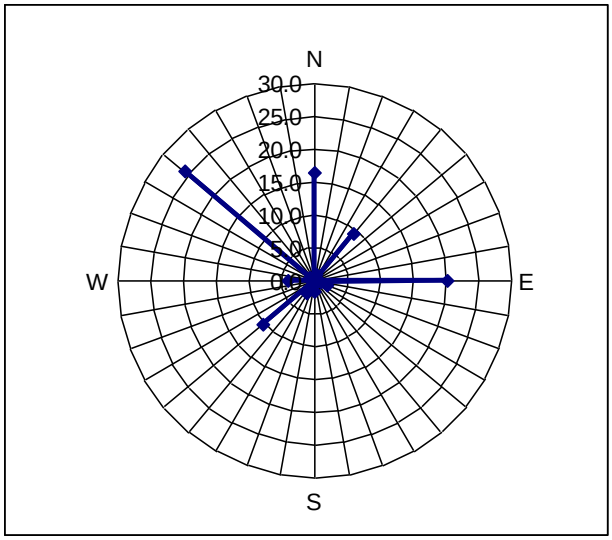


Figure 8. Spring Flight 2007 Directions and Percentages for Station BMM-002

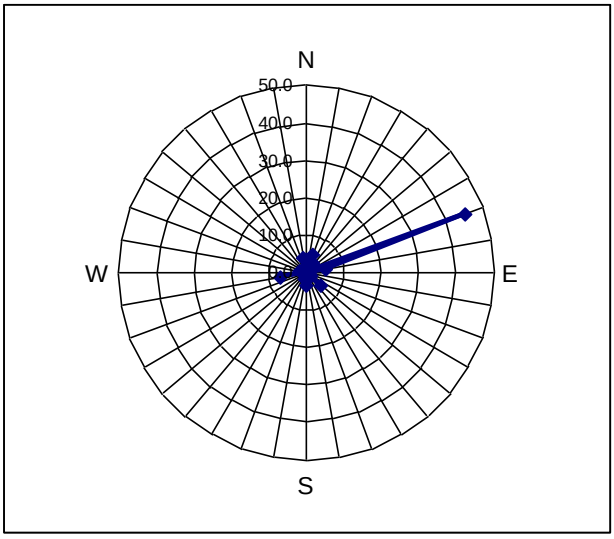


Figure 9. Spring 2007 Flight Directions and Percentages for Station BMM-003

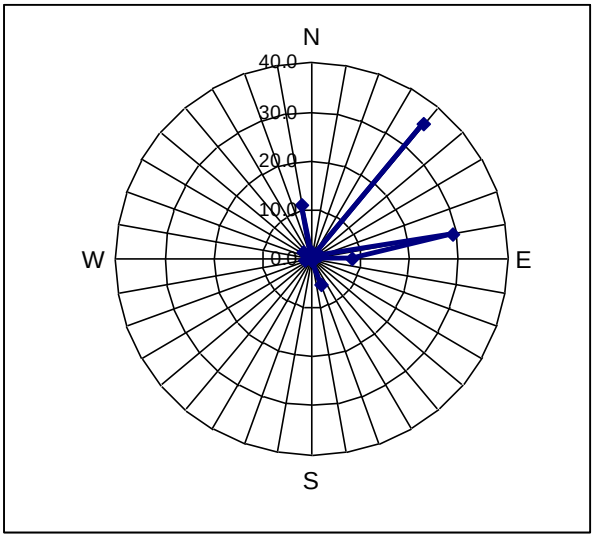


Figure 10. Spring 2007 Flight Directions and Percentages for Station BMM-004

Weather

Over the course of the monitoring period, a total of 10 days were monitored. Seven of these days were conducted in ideal weather conditions (no precipitation), and the remaining three monitoring days were conducted in fair weather conditions, with light rain or fog during portions of the monitoring period. In addition to general weather conditions, the temperature was also recorded at the beginning of each monitoring day, and ranged from 4 to 20ºC during the entire 2007 spring migration monitoring period.

Incidental Observations

Birds that were observed at a distance greater then 200m were recorded as incidentals and were not included in the data analysis. A total of 3,845 individuals representing 38 species were recorded as incidental observations because they were more then 200m from the observer. Many of these observations were small to large flocks of geese, passerines, and sparrows migrating through the area.

A complete list of all birds observed during the spring monitoring period can be seen in Appendix I.

5.2.2.2 Fall 2007

Species Composition and Abundance

During the fall monitoring period a total of 3,703 birds were recorded representing 38 different species. The majority of observations recorded over the monitoring period were individual birds or small flocks numbering 20 or less individuals. Of the small flocks that were observed flying through the area, the majority were passerines, consisting of 10-20 individuals, mostly sparrow and warbler species. A few larger flocks of birds were observed, including blackbirds (304 individuals) and other passerines (400 individuals).

The most abundant species recorded during the fall monitoring period were Canada geese (*Branta canadensis*), rock pigeons (*Columba livia*), barn swallows (*Hirundo rustica*), and European starlings (*Sturnus vulgaris*).

Figure 11 outlines the relative abundance of the five general bird groups observed. The most abundant bird group by number of observations was landbirds (92%). Shorebirds (4.3%), waterfowl (2.6%), raptors (1%), and waterbirds (0.1%) all represented relatively low percentages of the total bird observations during fall 2007 monitoring. No owls were observed during the monitoring period.

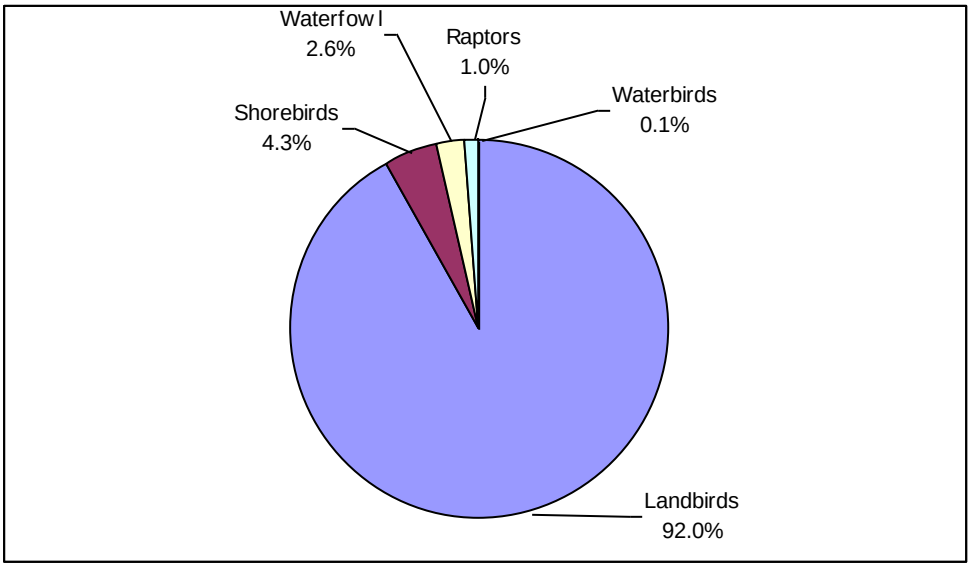


Figure 11. Relative Abundance of Bird Groups during the Fall Monitoring Period.

A total of 3,407 landbirds, representing 23 species, were recorded. The most abundant landbird observed were rock pigeons. A total of 161 shorebirds were observed

representing 4 species, which were observed in flocks ranging from 9 to 60 individuals. Several large flocks of shorebirds were observed flying through the study area and foraging in nearby fields.

Ninety-five waterfowl were observed representing 4 species, the most abundant being Canada geese. Snow geese were also relatively common but relatively few flocks of ducks were observed.

Thirty-seven raptor observations were recorded of 4 species. Red-tailed hawk (*Buteo jamaicensis*) represented 46% of all raptor observations and northern harrier (*Circus cyaneus*) represented 30% of the raptor observations. Additional raptors observed in small numbers included 2 merlins (*Falco columbarius*) and 1 prairie falcon (*Falco mexicanus*) foraging near the ground. The remaining raptor observations consisted of unidentified raptor and buteo species. Raptors were observed to be more abundant within the study area when winds were conducive to fall migration movements, blowing from the north. When strong winds were coming from the north, raptors were observed to be flying in a southern direction and passing through the study area very quickly.

Waterbirds were the least abundant group observed during fall migration monitoring with only 3 individuals observed, 2 sandhill cranes (*Grus canadensis*) and 1 great blue heron (*Ardea herodias*).

Distribution by Date and Time

Most of the birds observed in the study area during the fall monitoring period were observed in October (Figure 12). The highest utilization rate (0.2408 birds/ha/min) was recorded on October 23, when a total of 1,089 individuals were observed. This increase in activity at the end of October suggests a slight peak in fall migration movements through the area.

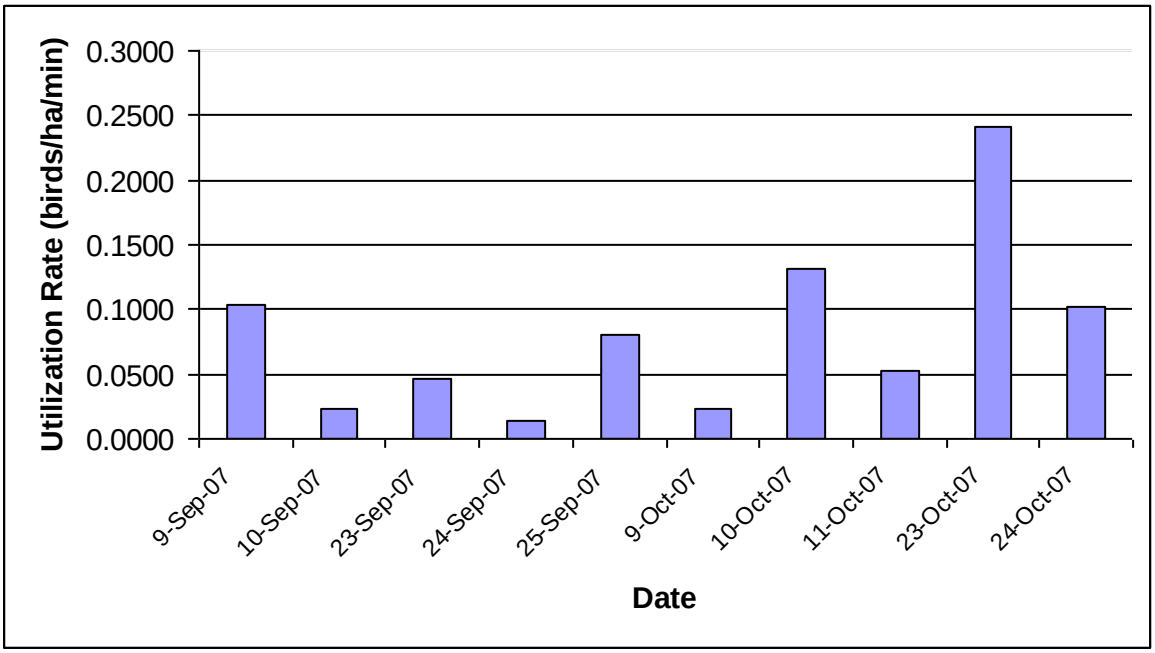


Figure 12. Average Utilization Rates by Date for the Fall Migration Monitoring Period.

Figure 13 displays the average utilization rate at each bird migration monitoring station by time of day. All monitoring conducted in the fall took place between 0900hrs and 1500hrs, following Environment Canada's recommended guidelines for migration monitoring. More than 37% of all bird observations occurred between 0900hrs and 0959hrs (1,384 individuals). The huge spike in activity at station BMM-002 during this time period was due to the observation of two large flocks (304 birds on September 9 and 400 birds on October 23). For the remainder of the monitoring period, utilization rates were fairly consistent.

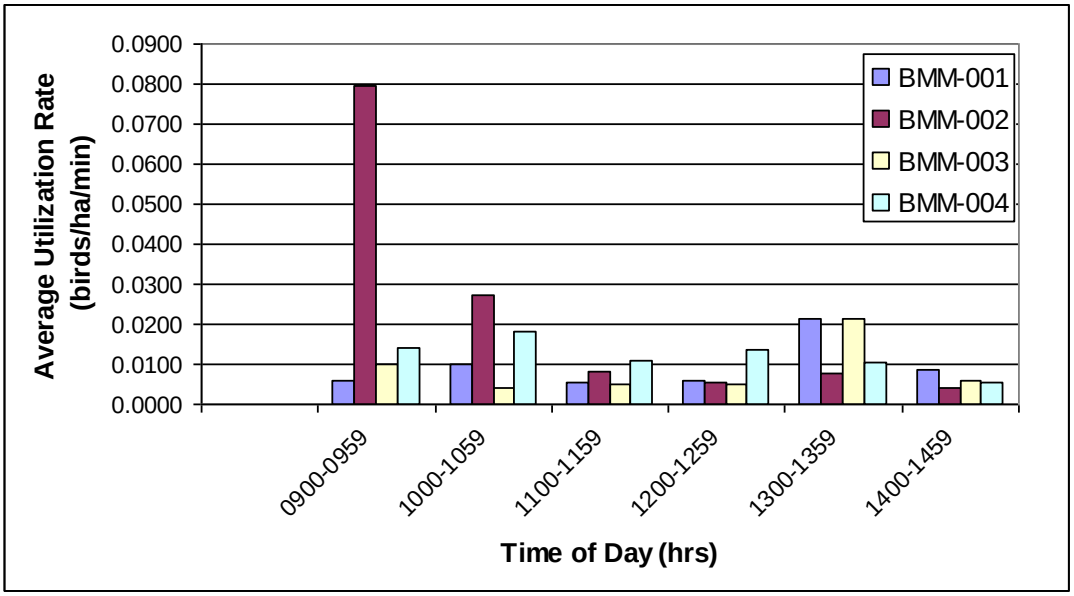


Figure 13. Average Utilization Rate for Fall 2007 by Station and Time of Day

Distribution by Station

Table 6 lists the average utilization rates for each of the bird migration monitoring stations for the fall monitoring period. Utilization rates were variable, with BMM-002 showing the highest overall average utilization rate, 0.1325 bird/ha/min. The single highest average utilization rate was observed on October 23, 2007 at BMM-002. This high utilization rate, 0.2408 birds/ha/min, represented a date when large numbers of bird flocks were observed including 14 flocks of 10 or more birds, two flocks of more than 100 birds and one flock of 400 birds.

Table 6. Average Utilization Rates (birds/ha/min) by Station and Date for Fall 2007

DATE	Station			
	BMM-001	**BMM-002**	**BMM-003**	**BMM-004**
9-Sep-07	-------	0.1042	-------	-------
10-Sep-07	-------	-------	0.0226	-------
23-Sep-07	0.0458	-------	-------	-------
24-Sep-07	-------	-------	-------	0.0144
25-Sep-07	-------	-------	0.0807	-------
9-Oct-07	0.0237	-------	-------	-------
10-Oct-07	-------	-------	-------	0.1320
11-Oct-07	-------	0.0524	-------	-------
23-Oct-07	-------	0.2408	-------	-------
24-Oct-07	0.1024	-------	-------	-------
Overall Average	**0.0573**	**0.1325**	**0.0516**	**0.0732**

Distribution by Height

Table 7 summarizes the overall average utilization rates that were observed at each station within the three height categories (0-39m, 40-120m and >120m). The first height category (0-39m), which is below the approximate blade sphere, had the highest overall average utilization rate of 0.0779 bird/ha/min. The second height category (40 -120m), which is within the approximate blade sphere had an average utilization rate of 0.0036 birds/ha/min. The third height category (>120m), which is above the approximate blade sphere, had the lowest utilization rate (0.0003 birds/ha/min).

Table 7. Average Utilization Rate (birds/ha/min) by Station and Height Category

BMM Station	Height Zone		
	0 - 39m	**40 -120m**	**>120 m**
001	0.0512	0.0060	0.0000
002	0.1311	0.0007	0.0007
003	0.0453	0.0060	0.0002
004	0.0708	0.0022	0.0002
Overall	**0.0779**	**0.0036**	**0.0003**

Table 8 shows the average utilization rates by height category relative to time of day. Height category 0-39m was observed to have the highest average utilization rate for all of the times during the day. This is likely due to the high numbers of birds that were foraging in, and flying between, the agricultural fields. Height category 40-120m had low, but fairly consistent utilization rates throughout the course of the day. There were few observations in height category >120, resulting in relatively low utilization rates at

every station. In general, utilization rates were observed to be highest around 0900 hrs and decline throughout the rest of the day. This pattern is consistent with observations during spring 2007 bird migration monitoring. The spike in activity around 1300hrs in height category 0-39m is due to the observation of several small flocks (10-50 individuals) and one large flock (150 individuals) on several different days.

Table 8. Average Utilization Rates by Height Category by Time of Day for Fall 2007

Height Category in (m)	0800 hrs	0900 hrs	1000 hrs	1100 hrs	1200 hrs	1300 hrs	1400 hrs	1500 hrs
0-39	0.0000	0.1823	0.0916	0.0395	0.0417	0.0843	0.0281	0.0000
40-120	0.0000	0.0011	0.0024	0.0028	0.0011	0.0062	0.0084	0.0000
>120	0.0000	0.0003	0.0003	0.0013	0.0000	0.0000	0.0000	0.0000

Flight directions and the numbers of birds (expressed as percent of total individuals observed) are summarized below in Figure 14 through Figure 17. At station BMM-001 (**Figure 14**) flight directions were variable with a flock of sparrows (75 individuals) and flock of Canada geese (43 individuals) observed flying northwest and a large flock of sparrows (150 individuals) moving southeast. Flight directions were also variable at station BMM-003 (**Figure 17**) with the majority of birds observed moving west and northwest. At stations BMM-002 (**Figure 15**) and BMM-004 (**Figure 17**) the general trend of bird observations indicate that the majority of birds were observed to be heading north or southeast.

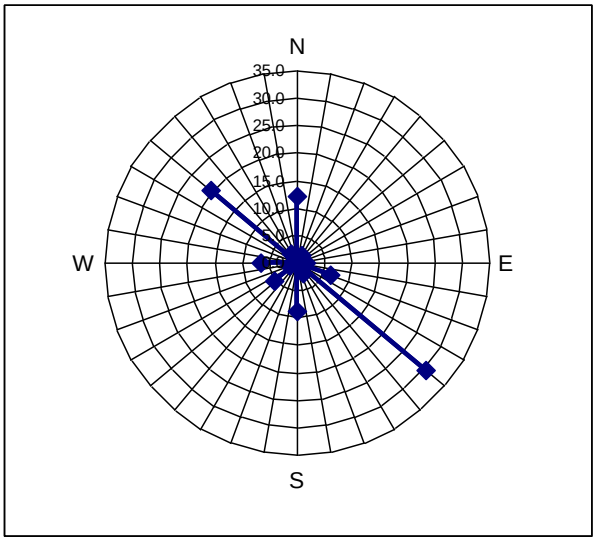


Figure 14. Fall 2007 Flight Directions and Percentages for Stations BMM-001

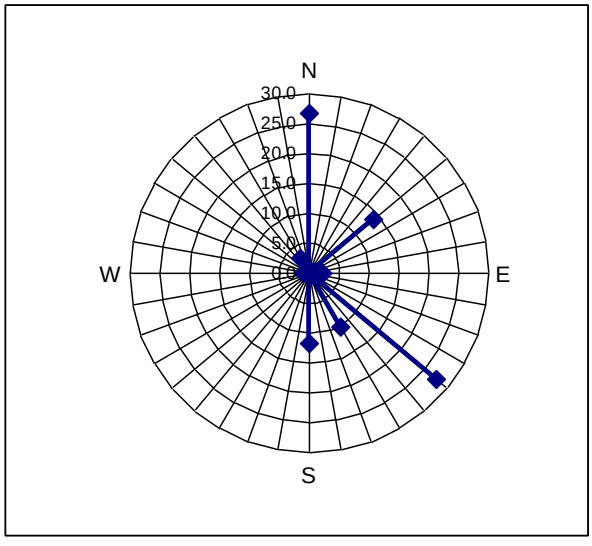


Figure 15. Fall 2007 Flight Directions and Percentages for Stations BMM-002

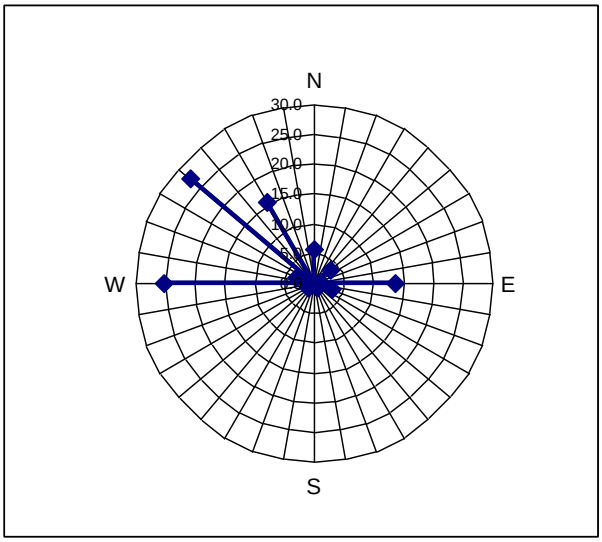


Figure 16. Fall 2007 Flight Directions and Percentages for Stations BMM-003

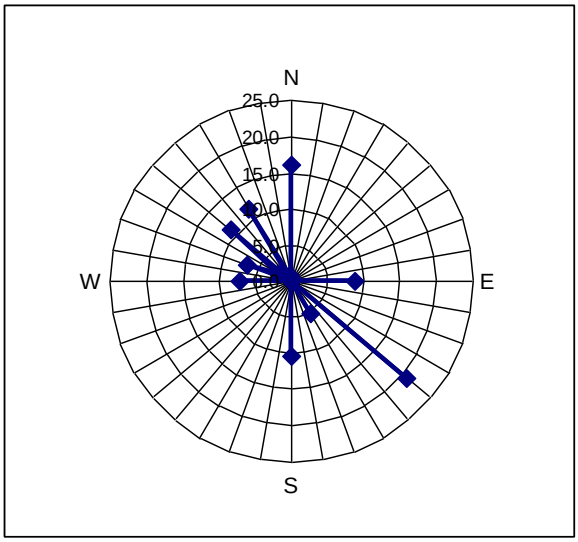


Figure 17. Fall 2007 Flight Directions and Percentages for Stations BMM-004

Incidental Observations

Birds that were observed at distances greater then 200m were recorded, but not included in the data analysis. A total of 7,304 individuals were representing 32 species were recorded as incidental observation because they were further than 200m from the observer. Many of these observations were small to large flocks of blackbirds, geese, and passerines flying through the area. A large number of individual raptors were also observed flying and foraging at great distances.

Local and migratory movements of geese were observed on a number of occasions during the fall monitoring period. Large flocks of Canada geese were observed foraging in fields just outside the project boundary, near BMM-001, and swimming in the ponds at the Miller Environmental Site. Migratory movements of geese were observed outside the study area along the Red River but also within the study area at great distances from the observer. Observations during daily travel to and from the study area indicate that Red River is an important staging area for geese and a potential migration corridor for raptors.

Large flocks of passerines, mainly sparrows, blackbirds or warblers, numbering as many as 400 individuals, were observed perched on the ground and foraging south of BMM-002 and northeast of BMM-003.

A complete list of all birds observed during the fall monitoring period may be seen in Appendix I.

Weather

Over the course of the monitoring period a total of 10 days were monitored. Eight of these days were conducted in good weather condition, with no precipitation. The remaining 2 days of monitoring were conducted in fair weather conditions, with periods of light rain or fog. In addition to general weather conditions, the temperature was also recorded at the beginning of each monitoring day and ranged from 4 to 32ºC over the entire monitoring period.

5.2.2.3 Spring 2008

Species Composition and Abundance

During the spring 2008 migration monitoring period a total of 647 birds were recorded representing 30 different species. The majority of observations recorded over the monitoring period were individual birds or small flocks numbering less than 30 individuals. The majority of species observed were snow bunting, red-winged blackbird, American white pelican (*Pelecanus erythrorhynchos*), Canada geese, horned lark, and killdeer. No large flocks of birds were observed. These species observations are similar to the spring 2007 monitoring period although no large flocks of birds were observed in 2008.

Figure 18 outlines the relative abundance of the five general bird groups observed in 2008. The most abundant bird group by number of observations was landbirds (78.7%). As in 2007, the remaining bird groups in 2008 monitoring represented relatively low numbers- waterfowl represented 10.4% of individuals observed, followed by shorebirds (3.4%), waterbirds (6.5%) and raptors (1.1%). No owls were observed during the monitoring period.

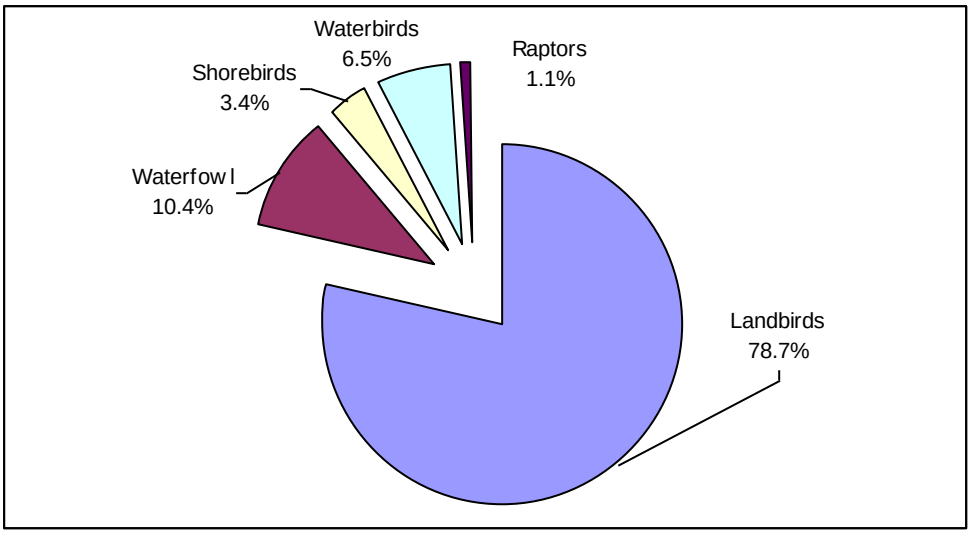


Figure 18. Relative Abundance of Bird Groups During the Spring 2008 Monitoring Period.

A total of 509 landbirds, the most abundant bird group, were observed representing 18 species. The most abundant landbirds observed were snow buntings which were most often seen foraging in fields in small to medium sized flocks (20-40 individuals). Also abundant were horned lark, red-winged blackbirds, and European starlings.

A total of 67 waterfowl were observed representing 4 species. The most abundant waterfowl species was Canada goose due to a flock of 38 individuals flying through the study area. Forty-two waterbirds were observed representing 3 species, the most abundant being American white pelicans. Twenty shorebird observations, all of killdeer were recorded. Similar to the 2007 monitoring period, raptors were the least abundant group observed with only seven raptors observed representing four different species.

The spring 2008 migration monitoring results were very comparable to the 2007 monitoring period. The percentages of bird groups and the most commonly observed species were very similar. The only notable exception was the difference in waterbird species observed. During the 2007 spring migration monitoring, gull species were the most abundant species observed and no pelicans were recorded during the spring 2007 monitoring period.

Distribution by Date, Time, and Station

As in 2007, most of the birds observed in the study area during the spring monitoring period were observed in late April. The highest utilization rate (0.0845 birds/ha/min) was recorded on April 22 when a total of 329 individual birds were observed. This increase in activity at the end of April is consistent with the 2007 monitoring results which suggested a slight peak in spring migration movements through the area at this time.

Figure 6 displays the average utilization rate at each bird migration monitoring station by time of day. The majority of bird observations were between 0900hrs and 1059hrs (400 individuals). For the remainder of the monitoring period, utilization rates were comparable for each station. However, utilization rates between stations were notably different, with BMM-005 having consistently more activity than BMM-006. This increased activity at BMM-005 was due to the observation of several flocks of snow buntings, totaling 314 birds, as well as the stations proximately to the wooded riparian corridor.

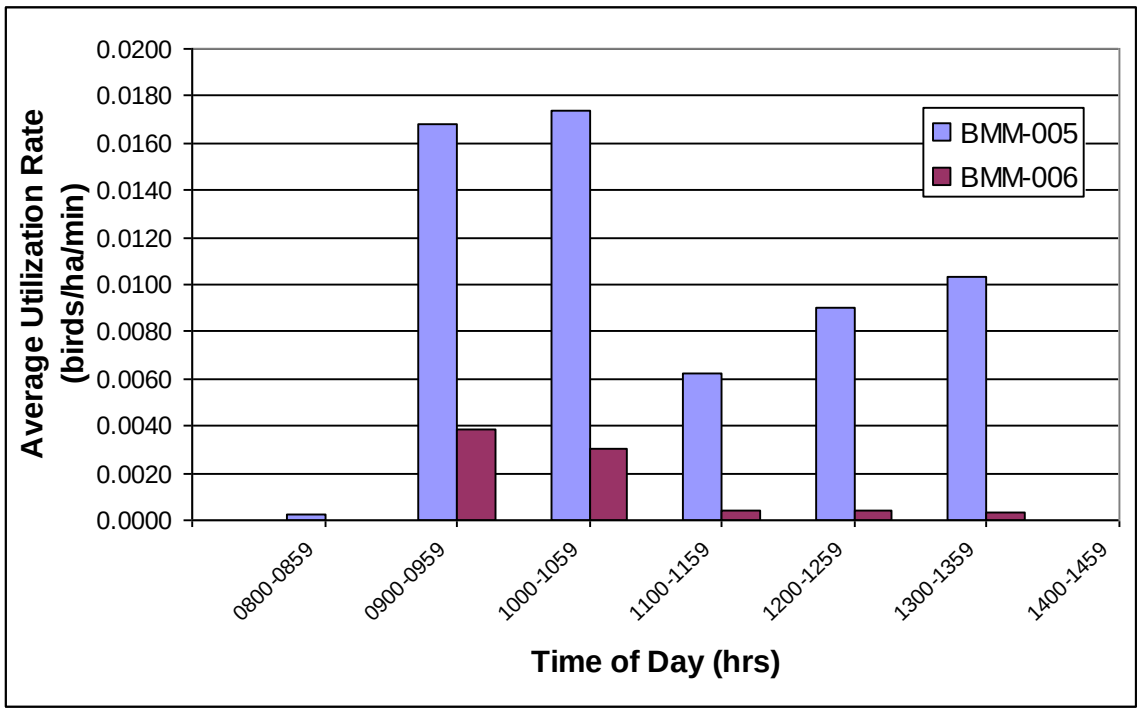


Figure 19. Average Utilization Rates for Spring 2008 by Time of Day and Station

Distribution by Height

Table 9 summarizes the overall average utilization rates that were observed at each station within the three height categories (0-39m, 40-120m and >120m). Flight heights observed in spring 2008 were very similar to spring 2007. The first height category (0-39m), which is below the approximate blade sphere, had the highest overall average utilization rate of 0.0337 bird/ha/min. The second height category (40 -120m), which is within the approximate blade sphere had an average utilization rate of 0.0069 birds/ha/min and the last height category (>120m) which is above the approximate blade sphere has an average utilization rate of 0.0056.

Table 9. Average Utilization Rate (birds/ha/m) by Station and Height Category for Spring 2008

BMM Station	Height Zone		
	0 - 39m	40 -119m	>120m
005	0.0414	0.0099	0.0042
006	0.0204	0.0014	0
Overall	**0.0337**	**0.0069**	**0.0056**

Table 10 shows the average utilization rates by height category relative to the time of day. Height Category 0-39m was observed to have the highest average utilization rate throughout the day. Height category 40-120m had variable utilization rates which fluctuated throughout the course of the day, and as previously mentioned, height category >120m had the lowest utilization rates that were highly variable throughout the day. The peak in activity at 1300hrs in height category >120m is due to a flock of Canada geese flying through the area. In general, the utilization rates were observed to be fairly constant throughout the day, but slightly higher in the morning.

Table 10. Average Utilization Rates by Height Category by Time of Day for Spring 2008

Height Category in (m)	0800	0900	1000	1100	1200	1300
0-39	0.0159	0.0541	0.0436	0.0088	0.0314	0.0155
40-119	0.0000	0.0016	0.0027	0.0186	0.0066	0.0106
120+	0.0000	0.0000	0.0118	0.0000	0.0000	0.3025

Flight Directions

Flight directions and the numbers of birds (expressed as percent of total individuals observed) are summarized in Figure 20 and Figure 21. At BMM-005 (Figure 20) flight directions were variable with several flocks of snow buntings observed moving northeast. Flight directions were less variable at BMM-006 (Figure 21) with a flock of 40 snow buntings observed heading south. As in spring 2007, flight directions were highly variable, and consistent flight patterns were not observed through the study area.

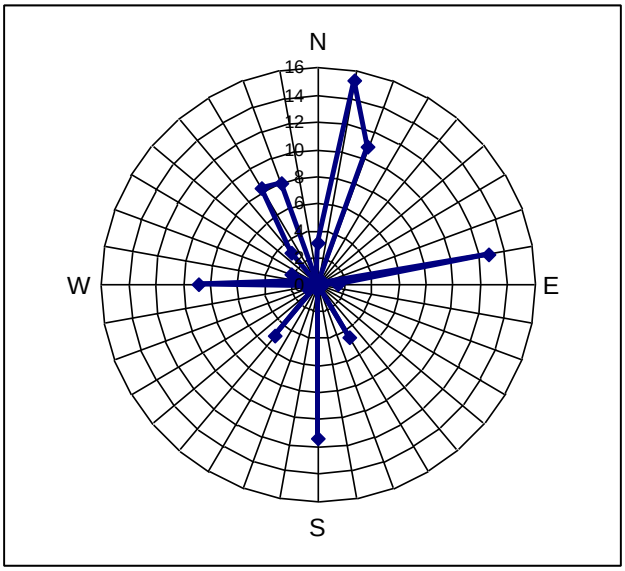


Figure 20. Spring 2008 Flight Directions and Percentages for Station BMM-005.

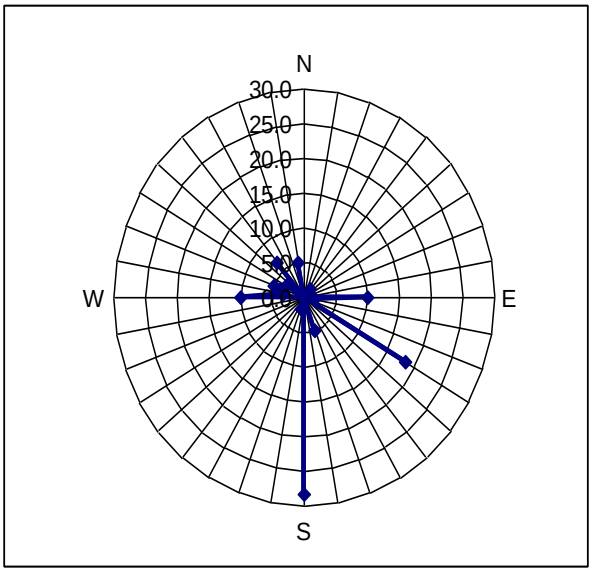


Figure 21. Spring 2007 Flight Directions and Percentages for Station BMM-006

Weather

Over the course of the monitoring period, a total of 5 days were monitored. Three of these days were conducted in ideal weather conditions (no precipitation), and the remaining two monitoring days began in fair weather conditions (fog and light precipitation), and ended on the onset of heavy rain and inclement weather. The ambient temperature was also recorded at the beginning of each monitoring day, and ranged from 0-10ºC.

Incidental Observations

Birds that were observed at a distance greater then 200m were recorded as incidentals and not included in the data analysis. A total of 549 individuals representing 16 species were recorded as incidental observations because they were more then 200m from the observer. Many of these observations were small to large flocks of geese species and snow buntings moving through the area. Additionally, NRSI biologists noted several groups of tundra swans (20 or more individuals) flying from the Red River in a northwestern direction over the study area when driving to and from the project area.

A complete list of all birds observed during the spring monitoring period can be seen in Appendix I.

5.3 Diurnal Raptor Monitoring

5.3.1 Study Methodology

Daytime raptor monitoring occurred at two stations (HWK-001 and HWK-002), which correspond to two of the migration monitoring stations (see Figure 3). These stations were selected to be representative of the habitat within the study area but are also expected to record any raptor movement between the study area and the Red River.

Monitoring occurred on 6 days between June 3 and June 22, 2007. Monitoring began between 0900hrs and 1000hrs, often immediately following breeding bird surveys. Raptor monitoring lasted an average of 5.5hrs, lasting well into the early afternoon.

At each of the monitoring stations all bird observations were recorded. Non-raptor birds observed during these surveys were recorded and discussed as incidentals. Data was recorded using the same data sheet used for collecting bird migration data (Appendix I).

5.3.2 Results

During the daytime raptor surveys, a total of 10 raptors were observed representing 3 species. Northern harriers represented half of all individuals observed. Four unidentified raptor species and one red-tailed hawk were also observed. Raptor observations occurred on 3 of the 6 monitoring days with the majority occurring on June 3 (4 individuals) and June 20 (5 individuals). No raptors were observed during surveys conducted on June 7, 19 or 22nd.

Half of all raptors observed were observed flying below the approximate blade sphere (Height Category 0-39m) and half were observed flying within the approximate blade sphere (Height Category 40-120m). However, it should be noted that the raptors observed flying within the blade sphere were observed at distance of 600m or more, making an accurate estimate of flight height difficult for the observer. Seven of the 10 raptors observed were seen soaring or circling. There was no indication that raptors regularly fly between the study area and the Red River.

Weather conditions during the raptor surveys varied. Temperatures ranged from 10ºC to 22ºC with rain occurring on one of the survey days (June 7).

Incidental Observations

A total of 282 birds representing 24 species were recorded as incidental observations during the diurnal raptor surveys. The majority of these observations were landbirds (74.5%). Shorebirds, composed entirely of killdeer, made up 11.7% of all incidental observations while waterfowl represented the remaining 13.8% of observations.

For a complete list of species observed during diurnal raptor monitoring refer to Appendix I.

Additional Raptor Observations

A number of raptor observations occurred during different bird surveys throughout the monitoring period. To ensure that raptors occurring in the study area are accurately represented in this report, raptor observations for the entire monitoring period are summarized below.

Table 11 displays all raptors observed during the 2007 and 2008 monitoring periods, including incidental observations, and during which surveys they were observed. A total of 7 species were identified in the study area, none of which are considered a conservation priority in Manitoba or a significant species by COSEWIC (Committee of the Status of Endangered Wildlife in Canada). Preferred habitat for 6 of the 7 raptor species observed is present in the study area.

Preferred habitat for the bald eagle (*Haliaeetus leucocephalus*), such as large bodies of open water, is not present in the study area. One bald eagle was observed on October 9 and another on October 24, both observed from migration station BMM-001 during the fall migration surveys. In both instances, bald eagles were recorded as incidental observations as a result of their distance from the observer. Station BMM-001/HWK-001 is the closest bird monitoring station to the Red River which provides ideal feeding habitat for the eagles.

Preferred foraging habitat for the northern harrier, sharp-shinned hawk (*Accipiter striatus*), red-tailed hawk, prairie falcon (*Falco mexicanus*) and merlin (*Falco columbarius*) exists within the study area. These species all prefer areas of open field or edge habitat such as hedgerows. The northern harrier was the only raptor species observed during the breeding bird surveys, and it is the only raptor species for which appropriate breeding habitat occurs in the study area.

Results of raptor spring migration counts in 2005 and 2006 by A Rocha Canada near the study area (approximately 50km southwest) have indicated that large numbers of raptors migrate through the area from March to April (Schritt et al., 2007). During these counts, a total of 17,580 individuals were counted during the two spring counts, the most common species being red-tailed hawk. Additional species observed during these raptor counts that were not observed in the study area include: turkey vulture (*Cathartes aura*),

osprey (*Pandion haliaetus*), Cooper's hawk (*Accipiter cooperii*), northern goshawk (*Accipiter gentilis*), Swainson's hawk (*Buteo swainsoni*), Ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), American kestrel (*Falco sparverius*), and peregrine falcon (*Falco mexicanus*).

Table 11. Raptor Observations in the St. Joseph Study Area

HAWKS, KITES & EAGLES	Spring 2007 Migration	Fall Migration	Breeding Birds	Diurnal Raptor surveys	Spring 2008 Migration	Nest Site	Habitat Preference
Bald Eagle		2				TR	L
Northern Harrier	9	32	2	5	5	GR	OP
Sharp-shinned Hawk	2					TR	M, ED
Red-tailed Hawk	3	35		1		TR	M, ED
Rough-legged Hawk	1				1	CL, TR, AN	OP
Raptor Sp.	2	15		4	1		
Buteo Sp.	15	72			1		
Accipiter Sp.		2					
Eagle Sp.		2					
CARACARAS & FALCONS							
Merlin		3				TR, AN	OP, M, ED
Prairie Falcon		2					OP

LEGEND

Nest Site	Habitat Preference
TR-Tree	**ED-edge, hedgerow, scattered trees**
GR-Ground	L-lakes, ponds, calm water
CL-Cliff	M-mature dense woodland
AN-Abandoned Nest	OP-open field

5.4 Breeding Birds

5.4.1 Study Methodology

Breeding bird monitoring stations were set up independently of the bird migration and diurnal raptor monitoring sites (see Figure 3). A total of 40 breeding bird point count stations were monitored to observe evidence of breeding in the initial study area. Station selection followed Environment Canada's recommended protocols (Environment Canada 2007), with 21 stations placed in the dominant habitat type, agricultural. Based

on the limited extent of riparian and hedgerow habitat, an additional 10 and 9 stations were respectively placed in these two habitat types. All 40 stations had a radius of approximately 100m and were distributed equally throughout the study area.

The surveys occurred on June 3, 4, 6, 7, 19, 20, 22, and 23, 2007. These dates are within the peak period for assessing breeding birds in this portion of Manitoba. Each station was surveyed twice at least 10 days apart, following Environment Canada's recommended protocols (2007), with the exception of BMB-004 and BMB-024. These two stations were only surveyed once because poor weather resulted in very poor road conditions, making these stations inaccessible.

The activity of bird species encountered during these surveys was noted using a standard breeding bird monitoring methodology, recording the highest breeding evidence observed during the field visit. A data sheet and complete list of all species observed during breeding bird surveys are appended to this report (see Appendix I). Point counts were performed according to the Environment Canada Guidelines (Environment Canada 2007). Bird species, activity, number of individuals and distance from the observer were recorded. Stations were monitored during early morning hours, beginning a half hour before sunrise and ending before 1000hrs. Each station was monitored for 10 minutes. The data were then analyzed to determine the relative abundance of species within the study area based on the individuals recorded within the 100m point count radius. The remaining individuals beyond this distance were recorded as incidental observations.

5.4.2 Results

During the 2007 breeding bird surveys, a total of 1,693 individual birds, representing 38 species were observed by NRSI. The three most abundant species observed were red-winged blackbird, representing 38% of all observations, followed by brown-headed cowbird (*Molothrus ater*) and Brewer's blackbird (*Euphagus cyanocephalus*) which represented 12.6% and 6.5% of all observations respectively. All observations were of individual birds or small groups of birds (2-30 individuals). No large flocks were observed during the breeding bird surveys.

All observations were classified according to bird group (Table 12). Landbirds represented over 90% of all individuals observed. These observations were expected given that the majority of habitat in the study area is active agricultural land or meadow, and is very attractive to landbirds. The remaining groups were represented by much smaller numbers of individuals. Waterfowl, mostly consisting of Canada geese and mallards, represented 5.2% of all individuals observed and shorebirds represented 3.7%. Raptors and waterbirds represented the two lowest percentages of total birds observed at 0.3% and 0.2% respectively.

Table 12. Observations During Breeding Bird Surveys by Bird Group

Bird Group	# of Individuals	# of Species	% of Total Observation
Landbird	1536	31	90.7
Waterfowl	85	3	5.0
Shorebird	64	1	3.8
Raptor	5	1	0.3
Waterbird	3	2	0.2
TOTAL	**1693**	**38**	**100.0**

Table 13 displays the habitat type at each breeding bird station. Monitoring stations were classified as agricultural (A), hedgerow (H), or riparian (R). The number of observations between habitat types was comparable. Table 13 also displays the number of individuals observed at each station by visit, and the total number of species observed at each station.

The highest single visit number of individuals was observed during the first visit to station BMB-028 on June 8, with 61 birds observed. This relatively high number of observations was the result of 25 brown-headed cowbirds and 10 red-winged blackbirds being present at the station. Large numbers of birds were also observed at BMB-019 (60 individuals) on June 23, when in addition to many individuals, a flock of 32 Brewer's blackbirds was recorded. In contrast, the lowest number of individuals was observed at station BMB-035 (1st visit) on June 6 when only 2 savannah sparrows (*Passerculus sandwichensis*) were observed, and at station BMB-017 (2nd visit) on June 19 when only 1 American crow and 1 killdeer were observed.

The greatest diversity of species was observed in hedgerow habitat, which averaged 10.6 species per station. The highest single station species diversity was recorded at station BMB-041, a hedgerow station, where a total of 16 species were recorded over two visits. Riparian habitat had the second highest species diversity, averaging 9.2 species per station, and agricultural habitat had the lowest diversity, averaging 8.8 species per station.

Out of the 38 species observed during the breeding bird surveys, 36 displayed some evidence of breeding in the study area. Breeding evidence was recorded as possible (PO), probable (PR) or confirmed (CO). Twenty one species displayed possible breeding evidence which included observing them in their preferred breeding habitat and/or hearing males singing. Eight species were recorded as probable breeders in the study area because they were observed in pairs or demonstrated some form of territorial behaviour. The remaining seven species were confirmed to be breeding in the study area through observations of distraction displays, adults carrying food, adults occupying a nest, or observation of a nest containing eggs.

For a complete list of species observed during the breeding bird surveys refer to Appendix I. Appendix II lists the birds observed during breeding bird surveys and the highest evidence or breeding they exhibited.

Incidental Observations

All birds observed during the breeding bird surveys were recorded, however, only birds observed within 100m were included in analysis. An additional 639 birds were observed during these surveys greater than 100m from the observer. One species, the double-crested cormorant (*Phalacrocorax auritus*), was observed outside the survey area but not within the 100m to be included in the analysis. All other incidental observations were of species that were also observed within the 100m survey area.

Table 13. Number of Individual Birds Observed by Habitat Type and Station

BMB Station #	Habitat Type	Total # of Birds		Total Number of Species
		Visit #1	Visit #2	
001	A	20	24	9
002	A	10	37	8
003	A	24	33	8
004	H	------	57	5
006	A	14	30	12
007	A	19	16	8
008	H	29	31	13
009	A	23	12	10
010	A	15	8	9
011	A	32	40	9
012	A	22	46	12
013	H	35	28	13
014	A	16	15	7
015	H	16	32	9
016	A	18	42	9
017	A	7	2	4
018	A	15	17	10
019	H	26	60	12
020	R	9	18	8
021	A	17	14	8
022	A	11	12	6
023	R	8	11	8
024	H	------	7	4
025	R	20	29	9
026	A	10	19	5
027	A	6	14	10
028	A	61	23	12
029	R	14	26	8
030	H	13	19	14
031	A	7	37	7
032	R	27	16	7
033	R	30	25	10
034	R	39	20	11
035	H	2	16	6
036	R	31	20	9
037	H	21	21	11
038	A	3	19	12
039	H	27	38	14
040	R	25	34	13
041	H	10	39	16

* ---- Station not monitored due to road conditions

5.5 Lek Surveys

5.5.1 Study Methodology

Some ground birds, such as sharp-tailed grouse (*Tympanuchus phasianellus*), are known to gather in groups called leks to perform courtship displays. Lek surveys can be conducted from mid-March to May, depending on spring weather conditions. Peak activity at the leks begins in mid-April. Under ideal conditions (e.g., cool, no wind, no hills, no trees), dancing behaviour can be heard at distances up to 1000m (A.S.R.D. 2005). Surveys were conducted along transects throughout the study area to determine if any leks were actively using land within the study area for breeding.

Lek surveys occurred on May 11, 12, 13, 24, and 25. NRSI biologists drove along transect routes looking and listening for any evidence of leks in the area on mornings prior to migration monitoring. Transects were searched in the early morning hours when activity at leks would be at its peak. Birds are known to start arriving at the dancing ground one hour before sunrise and stay until two or three hours after sunrise (Ministry of Environment BC 1997). The surveys were conducted between 0700hrs and 0900hrs in order to observe this activity. All non-ground bird observations were recorded as incidental observations during lek surveys. Results of the lek surveys are provided in Section 5.3.4.

5.5.2 Results

Over the course of the 2007 monitoring period no leks were observed in the initial study area. Lek surveys within the study area were focused on searching for sharp-tailed grouse. During focused lek surveys no partridges, grouse or turkeys were observed.

Incidental Observations

All birds observed incidentally during lek transect surveys were recorded. A total of 291 birds were observed, representing 23 species. The majority of these observations (61.9%) were of landbirds, mostly consisting of blackbird species. Waterfowl represented 35.7% of all observations, the majority of which was due to the observation of a large flock of tundra swans (98 individuals). A few raptors and shorebirds were also observed representing 1.4% and 1% of observations respectively.

For a complete list of species observed during lek surveys refer to Appendix I.

5.6 Significant Species

No birds observed within the study area in 2007 are considered a conservation priority (Manitoba Conservation Data Centre 2001) or a Species at Risk (Manitoba Conservation 2008a and Government of Canada 2007). During the spring 2008 monitoring period, American white pelicans were observed within the study area. This species is considered uncommon in the province (Manitoba Conservation Data Centre 2001) but Not at Risk (Manitoba Conservation 2008a and Government of Canada 2007).

The study area is located in the Lake Manitoba Plain Ecoregion of Manitoba (Manitoba Conservation 2001). Within this Ecoregion, Manitoba Conservation lists 12 species of birds to be species of conservation concern. These species, their Sub-national ranks (Srank) and their provincial and national Species at Risk designations are listed in Table 11. Habitat for five of these species potentially exists within the study area which is discussed below in more detail.

Table 14. Significant Bird Species of the Lake Manitoba Plain Ecoregion

Common Name	Scientific Name	Srank*	Provincial Rank**	National Rank***	Habitat Found Within Study Area?
American White Pelican	*Pelecanus erythrorhynchos*	S3B	NE	NAR	N
Baird's Sparrow	*Ammodramus bairdii*	S2S3B	END	NAR	P
Barred Owl	*Strix varia*	S3S4	NE	NE	N
Black-crowned Night Heron	*Nycticorax nycticorax*	S3S4B	NE	NE	N
Burrowing Owl	*Athene cunicularia*	S1B	END	END	P
Caspian Tern	*Sterna caspia*	S3B	NE	NAR	N
Least Bittern	*Ixobrychus exilis*	S3B	NE	THR	N
Loggerhead Shrike	*Lanius ludovicianus migrans*	S3S4B	END	END	P
Loggerhead Shrike	*Lanius ludovicianus excubitorides*	S1B	END	THR	P
Piping Plover	*Charadrius melodus*	S2B	END	END	N
Red-headed Woodpecker	*Melanerpes erythrocephalus*	S3S4B	NE	THR	P
Sprague's Pipit	*Anthus spragueii*	S2S3B	THR	THR	N

*Designated by the Manitoba Conservation Centre (Manitoba Conservation 2001)

**Designated by the Manitoba Species at Risk Act (Manitoba Conservation 2008)

***Designated by COSEWIC (Environment Canada 2006)

LEGEND

Srank	Provincial and National Rank	Habitat Found
1- Very Rare	END- Endangered	N-No
2- Rare	THR- Threatened	P- Potentially
3- Uncommon	NAR- Not at Risk	
B- Breeding Status	NE- Not Evaluated	

Baird's Sparrow

Status: Rare to uncommon in Manitoba. Provincially Endangered, nationally Not at Risk.

Habitat: The Baird's sparrow prefers native grasslands and open fields. This species would prefer areas with long grass and scattered shrubs over the agricultural fields in the study area. Habitat for this species could potentially exist in the southern portion of the study area.

Burrowing Owl

Status: Very rare in Manitoba. Provincially and nationally Endangered.

abitat: The burrowing owl requires treeless plains largely free of visual obstructions, such as grasslands grazed by livestock. As well, grasslands with thicker vegetation which support the small mammals they eat need to be close by (Environment Canada 2006). It uses burrows abandoned by ground-dwelling mammals to nest in and is sometimes found in agricultural areas. This species could locate potential habitat in the study area.

Loggerhead Shrike (*migrans* subspecies)

Status: Uncommon or possibly secure in Manitoba. Provincially and nationally Endangered.

Habitat: The loggerhead shrike *migrans* subspecies prefers open, grazed habitat for feeding with scattered trees and shrubs for perching and nesting (Environment Canada 2006). Intensive agriculture and the resulting reduction in the land used for grazing has decreased habitat for this species substantially. Although the study area is comprised mainly of agricultural fields, the scattered hedgerows and abundant open areas may provide adequate habitat for this species.

Loggerhead Shrike (*excubitorides* subspecies)

Status: Very rare in Manitoba. Provincially Endangered and Nationally Threatened.

Habitat: The loggerhead shrike *excubitorides* subspecies prefers open habitats, including grasslands, sagebrush stands, pastures, agricultural areas and thinly wooded areas. It nests in small bushy trees and dense or thorny shrubs (Environment Canada 2006). Suitable habitat for nesting occurs within the study area but the required native grassland component of required habitat is missing. It is therefore unlikely that this subspecies would be found in the study area.

Red-headed Woodpecker

Status: Uncommon or possibly secure in Manitoba. Provincially has not been evaluated, nationally Threatened.

Habitat: The red-headed woodpecker is found in a variety of habitats including thinly treed deciduous forests, woodland and field edges, but also urban parks,

farmyards and marsh (Environment Canada 2006a). Habitat for this species potentially exists along the wooded riparian corridor in the southern portion of the study area however, it prefers savanna-like grasslands with forest edges and scattered trees.

According to the Species at Risk Public Registry, two of these species, the least bittern and Sprague's pipit, have range maps that overlap with the study area (Environment Canada 2006b). Additionally, the Species at Risk Public Registry (Government of Canada 2007) indicates that the yellow rail (*Coturnicops noveboracensis*) also has range map that overlaps with the study area. The yellow rail is considered Special Concern by COSEWIC but is not considered at this time to be provincially significant by Manitoba Conservation. Suitable habitat for the yellow rail, which prefers wet habitat such as marshes, wet meadows and floodplains, does not occur within the study area.

NRSI biologists observed American white pelicans flying through the study area, although it is unlikely this species would utilize habitat within the study area. One flock of 40 pelicans was observed flying approximately 150m in the air, indicating they were traveling through the area. The American white pelican prefers habitat near lakes in treed and treeless areas. It nests in colonies on islands of interior lakes. Suitable habitat for this species does not exist within the study area.

No rare bird species were recorded by NRSI biologists during the 2007 or 2008 monitoring periods, and Manitoba Conservation has no records of any rare or endangered species within the boundaries of the study area (Firlotte 2008).

5.7 Partners in Flight Priority Species

The study area is located within Conservation Region (BCR) 11 in Canada Landbird Conservation Plan (Canadian Prairie Partners in Flight 2004). Twenty-five priority bird species are found within the Canadian Portion of BCR 11 (Table 15) which merit conservation concern due to large or important populations within the region or overall global or regional, importance due to declining populations. NRSI observed four of these priority species within the study area: northern harrier, prairie falcon, clay-colored sparrow (*Spizella pallida*), and bobolink (*Dolichonyx oryzivorus*).

Table 15. Priority Landbirds in Bird Conservation Region 11

Scientific Name	Common Name	Habitat Requirements	Reason for Concern
Centrocercus urophasianus	Great Sage-Grouse	Sagebrush Stands, lek sites	Habitat loss
Tympanuchus phasianellus	Sharp-tailed Grouse	grassland, wetland, WD, lek sites	Habitat disturbance, particularly at leks
Circus cyaneus	Northern Harrier	open habitat	Habitat disturbance
Buteo swainsoni	Swainson's Hawk	open habitat	loss of prey availability
Buteo regalis	Ferruginous Hawk	open habitat, grassland	Habitat loss and disturbance
Aquila chrysaetos	Golden Eagle	grasslands, thickets	Collision with infrastructure, lead poisoning, and habitat loss
Falco mexicanus	Prairie Falcon	open habitat, grassland	Human disturbance, management of prey
Coccyzus erythropthalmus	Black-billed Cuckoo	thicket	Habitat disturbance, management of prey
Nyctea scandiaca	Snowy Owl	open habitat, thicket	Knowledge deficiency
Athene cunicularia	Burrowing Owl	open habitat	management of prey, habitat fragmentation
Asio otus	Long-eared Owl	wetland and grassland	Habitat loss
Asio flammeus	Short-eared Owl	open habitat, wetland	habitat loss
Lanius ludovicianus	Loggerhead Shrike	open habitat	habitat loss due to agricultural practices
Cistothorus platensis	Sedge Wren	open habitat	Habitat loss and disturbance
Anthus spragueii	Sprague's Pipit	grassland	Habitat loss due to invasives, pesticide use
Bombycilla garrulus	Bohemian Waxwing	Fruit-bearing trees or shrubs	Knowledge deficiency
Spizella pallida	Clay-colored Sparrow	thicket, open habitat	habitat disturbance
Calamospiza melanocorys	Lark Bunting		Knowledge deficiency
Ammodramus savannarum	Grasshopper Sparrow	grassland	habitat disturbance, pesticide use?
Ammodramus bairdii	Baird's Sparrow	grassland	Habitat loss and disturbance, pesticide use
Ammodramus leconteii	Le Conte's Sparrow	open habitat, grassland	habitat loss
Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	Wetland	Habitat loss
Carcarius mccownii	McCown's Longspur	grassland	habitat disturbance, pesticide use?
Calcarius ornatus	Chestnut-collared Longspur	grassland	habitat disturbance
Dolichonyx oryzivorus	Bobolink	grassland	habitat disturbance

5.8 Aerial Flight Displays

Several species of birds are known to perform aerial flight displays, which may put them at higher risk of collision with operational turbines. During the bird monitoring period, 3 species known to perform aerial flight displays were observed. These birds include bobolink (*Dolichonyx oryzivorus*), horned lark (*Eremophila alpestris*), and vesper sparrow (*Pooecetes gramineus*).

Bobolinks perform song flights which can reach 2-40m in height which is just below the height of the turbine blades. These song flights are frequent during the breeding season (Martin and Gavin 1995). Horned larks song flight can be as high as 80-250 m in height and can last from less than a minute to 8 minutes in length. Because of the height of their flight, they run the risk of collision with turbine blades (Beason 1995). Vesper sparrows ascend to approximately 25-75m before flying horizontally for approximately 100-200m. These activities put them into the blade sphere of the turbine range and therefore run the risk of collision with turbine blades (Jones and Cornely 2002).

5.9 Significant Bird Areas

There are no Important Bird Areas (IBA's) in or around the study area (IBA Canada 2004).

5.10 Discussion

In order to record an accurate representation of local and migratory bird abundance and activities within the study area several different survey techniques were employed. These surveys included spring and fall migration monitoring, breeding bird surveys, daytime raptor surveys and lek transects. Over the course of the 2007 and 2008 monitoring period a total of 21,006 birds were observed representing 88 different species.

The majority of observed species observed were landbirds, the most abundant species being sparrows and blackbirds. Large flocks of geese were also observed during most surveys. It is apparent through observations while driving to and from the study area that the Red River is an important staging area for waterfowl and an important migratory corridor for birds.

The majority of the species observed within the study area are likely local residents of the area, and therefore displayed evidence of breeding in the area. Small passerines were often observed foraging within hedgerows and farm fields.

Manitoba Conservation lists 11 species of birds as a “conservation concern” within the Lake Manitoba Plain Ecoregion. Suitable habitat for 5 of these species potentially exists within the study area. NRSI biologists did not observe any significant bird species within the study area during the 2007 surveys.

6.0 Bats

6.1 Introduction

There are six species of bats that are indigenous to Manitoba, all of which have ranges that overlap with the study area. Review of background sources, topographic mapping, aerial photographs, on-site vegetation mapping, and agency consultation were all used to analyze the habitats within the study area for the potential to concentrate bat activity. Additionally, NRSI biologists conducted acoustic bat monitoring from May to September 2007 in order to collect data on spring migrants, summer swarming and fall migration activities. Following the 2007 monitoring period the study area was extended to include lands south and east of the initial study area.

6.2 Study Methodology

To date, the Province of Manitoba has not produced any recommended guidelines for monitoring bats at potential wind farm sites (Watkins *pers. comm*. 2008). Therefore, recommended protocols developed in Ontario (OMNR 2007) and Alberta (AFWD 2005) were consulted to guide bat monitoring at the St. Joseph Wind Farm study area. Monitoring was conducted at six stations (see Figure 22) on a total of 33 nights (from dusk to dawn), beginning on May 21st and lasting through September 9th, focusing on the known periods of increased bat activity. Monitoring occurred on the following nights in 2007:

- May 21/22, 22/23, 23/24, 24/25
- July 23/24, 24/25,
- August 1/2, 2/3, 6/7, 7/8, 18/19, 19/20, 29/30, 30/31
- September 6/7, 7/8, 8/9

On all of the above dates except one, monitoring occurred at more than one station on the same night, contributing to the overall 33 nights of monitoring.

The monitoring stations were selected based on initial project boundaries in habitats that appeared to be representative of the habitat found within the initial study area, and were located near areas proposed for turbine placement. Descriptions of each of the monitoring stations including general location and habitat type are provided below.

BAT-001

This station is located on the south side of Mile 8 Road North, east of Mile 1 Road East. The station was set up adjacent to a pond surrounded by scattered deciduous trees. It is located approximately 450m from the nearest proposed turbine.

BAT-002

This station is located on the north side of Mile 10 Road north, between Mile 2 Road East and Highway 420. It is located along a hedgerow of deciduous trees, adjacent to a riparian area, surrounded by agricultural fields. This station is approximately 760m from proposed turbines to the north.

BAT-003

This station is located north of Highway 201, east of Meridian Road. It is located along a young coniferous hedgerow surrounded by agricultural fields. It is located approximately 1.4 km from the nearest proposed turbine.

BAT-004

This station is located north of Highway 201, just west of Mile 5 Road East. It is located on the edge of an agricultural field approximately 1.5km from the nearest proposed turbine.

BAT-005

This station is located south of Mile 7 Road North, just east of Mile 4 Road East. It is located along a deciduous hedgerow adjacent to a riparian area, surrounded by agricultural fields. The nearest proposed turbine is approximately 660m to the north of the station.

BAT-006

This station is located north of Mile 11 Road North, east of Mile 1 Road West. It is located along a mature deciduous hedgerow surrounded by agricultural fields. It is located less then 1.1km from the nearest proposed turbine location.

During the monitoring period, all six species of Manitoba bats are known to be active and all have ranges that overlap with the proposed study area. This chosen monitoring period corresponded to the anticipated periods of summer swarming and peak migration of Manitoba's bat species.

Acoustic monitoring was used to gather information on usage rates of bats in different areas and habitats within the study area. Data was collected and analyzed for the presence of bat passes, and total passes through the night. Passage rates (passes/hr) were calculated based on total number of passes recorded and length of monitoring period, which give an indication of total activity recorded through the night. Bat 'calls' were also recorded directly into laptop computers using Pettersson D240x ultrasonic monitoring devices. The calls were recorded using a time expansion of 10x, and were

analyzed with SonoBat software, and compared with recorded calls of known species. Call sonograms were compared on the basis of peak frequency, call length, call shape, harmonics, and other acoustic attributes.

Bat call sonograms are often extremely variable and may share attributes with multiple species. It has been well documented that even expert bat researchers may misidentify bat species based on call sonograms. NRSI biologists have used large call libraries from various sources, including previous projects, as a basis for call analysis.

In addition to acoustic monitoring, point counts along transects were conducted using a handheld BATBOX III Ultrasonic Detector, to locate any large concentrations of bat activity. No such large concentrations were found within the study area.

Figure 22

St. Joseph Wind Energy Project

Bat Monitoring Stations

July 16, 2008
Project No: NRSI-0745
NAD 83 UTM Zone 14
Scale: 1:90,000 (11x17")

Natural Resource Solutions Inc.
Aquatic, Terrestrial and Wetland Biologists

605000 610000 615000 620000 625000 630000 635000

5450000 5445000 5440000 5435000

N

0 1 2 3 4 5 Kms

Plum River
Buffalo Creek
Knopf Drain
Buffalo Channel
Rempel Drain
Red River
Riviere Aux Marais
Rosenfeld
Altona
Letellier
St. Joseph
Highway 14
Highway 20
Highway 75
Highway 201
HWY 421
Meridian Rd.
Mile 1 W
Mile 1 E
Mile 2 E
Mile 3 E
Mile 4 E
Mile 5 E
Mile 6 E
Mile 15 N
Mile 14 N
Mile 12 N
Mile 11 N
Mile 10 N
Mile 8 N
Mile 7 N
Mile 6 N
Mile 4 N
Mile 3 N
Mile 2 N
BMB-032
BAT-001
BAT-002
BAT-003
BAT-004
BAT-005
BAT-006

Legend

- Proposed Project
- Project Area
- Wind Turbine
- Wind Monitoring Tower
- Substation
- Above Ground Line
- Underground Cabling
- Access Road
- Bat Monitoring Station (BAT)
- Building
- Existing Transmission Line
- Airstrip
- Primary Road
- Secondary Road
- Railway
- Creek / Stream
- Lakes / River
- Developed Area
- Wetland
- Wooded Area

NRSI_0745_StJosephWindfarm_BatStations_90k_16Jul08_LAD

6.3 Results

Brief natural history information for each of the six bats with ranges that overlap the study area is provided below. Information is based on Banfield (1974), Gerson (1984), Barclay (1984), Van Zyll de Jong (1985), Firlotte (2008) and Asmundson and Larche (1996).

Little Brown Bat (*Myotis lucifugus*)
Manitoba Conservation has indicated that breeding occurrences of this species are common in Manitoba, while non-breeding occurrences are rare. In general for this species; winter concentrations may include tens of thousands but summer home range is poorly understood. Little brown bats will use a variety of different habitats, usually preferring forests with nearby rivers, creeks, or meadows. This species has also adapted to urban settings and will regularly roost in buildings. Little brown bats emerge relatively late at dusk and forage most actively for the first few hours following sunset. After this initial feeding period they congregate in night roosts, emerging again later in the night for a second foraging period.

Little brown bats will return to hibernacula in September, congregating in caves and mines. Females will move from hibernation sites to nurseries in April, while males will remain in hibernation until mid-May. Little brown bats may move hundreds of kilometers to return to hibernacula from summer roosts. This species has secure populations in Manitoba.

Big Brown Bat (*Eptesicus fuscus*)
Found throughout southern Manitoba, big brown bats are the most urbanized of any Manitoba bat species, and are frequently found near cities and towns, foraging along streetlamps. They can be found in wooded and semi-open habitats and are the bat species most closely associated with buildings.

Big brown bats often forage above meadows, ponds, rivers, and along streetlights in towns and cities. Roosting of this species regularly occurs in barns and other buildings. Occasionally they will roost under bark or within small rock crevices. They emerge early at dusk for an initial feeding period within 5 hours of sunset after which they return to their night roosts.

Big brown bats are very cold tolerant, and will often not begin hibernation until late in the fall, sometimes as late as early December. Hibernation of this species occurs within Manitoba, often in close proximity to summer roosting sites. Of the three species known to hibernate in Manitoba, the big brown bat is the only one that has not been found to use caves. Big brown bats are usually the first bat to emerge from hibernation in early April. The population status of this species is unknown in Manitoba.

Red Bat (*Lasiurus borealis*)
Red bats are a very distinctive, medium-sized, bat species. They are found throughout southern Manitoba during migratory periods but uncommon in mid summer. Isolated sightings of this species have been recorded as far north as the Northwest Territories. Red bats are known to be strong fliers and many records of this species have been found well outside of its distribution range.

Red bats are one of Manitoba's three migrating bat species. During fall migration, they pass through southern Manitoba from late July to the end of September, returning in May during spring migration. Foraging of this species often occurs at or above tree height, sometimes as high as 200 m above the ground. Preferred foraging habitats include hilly forest, streams, ponds, and can sometimes be found foraging in towns near streetlights. Roosting of this species will usually occur solitarily in trees. They typically emerge 30 minutes after sunset and peak activity occurs 2-3 hours after sunset. The population status of this species is unknown in Manitoba.

Hoary Bat (*Lasiurus cinerus*)
Hoary bats are Manitoba's largest species of bats, and one of the most distinctive. They are a solitary species, often roosting high in the trees, usually on the edge of clearings or fields. Hoary bats will emerge from their daytime roosts late in the evening to forage among forested habitats, often near open meadows or lakes within a forested community. In Manitoba they are active from 30 minutes after sunset until just before sunrise.

As one of Manitoba's three migratory bat species, hoary bats do not usually arrive in Manitoba until late May or early June. In Canada, fall migration takes place from mid-August to October, and peaks in Manitoba during the first week of September. The majority of hoary bats will over winter in the United States or Mexico. Migratory populations of hoary bats are abundant and secure in Manitoba.

Silver-haired Bat (*Lasionycteris noctivagans*)
As one of Manitoba's three migrating species, silver-haired bats will usually remain in Manitoba until August and September before migrating south to the United States. After hibernation, silver-haired bats will usually return to Manitoba in late May to early June. Distribution of this species stretches north of Lake Winnipeg, with the majority of the known populations occurring in southern Manitoba.

Silver-haired bats can often be found foraging near forested habitats, above lakes and streams for aquatic insects. They prefer wooded habitat but may be found in open areas during migration. Summer roosting will usually occur in hollow trees, loose bark, or large, abandoned bird nests. In Manitoba, this species is active from 30 minutes after sunset until just before sunrise. Migratory populations of this species are abundant and secure in Manitoba.

Northern Long-eared Bat (*Myotis septentrionalis*)
Northern long-eared bats can be found foraging in forested areas with nearby meadows and rivers. They emerge shortly after sunset in the summer to forage, with a secondary peak in activity 7-8 hours after sunset. Roosting habitats of this species can include under tree bark, rock crevices, and sometimes behind shutters or under shingles. In winter they commonly hibernate in caves or old mines but never in large numbers.

This species can be found within much of southern Manitoba. Northern long-eared bats will often use the same hibernation sites as little brown bats and begin hibernation in late October, emerging again in early May. The population status of this species is unknown in Manitoba.

NRSI biologists identified the presence of hoary bat, red bat, and big brown/silver-haired bat within the St. Joseph study area. Big brown and silver-haired bats are often difficult to differentiate based on recordings as they are known to have very similar call characteristics (OMNR 2006). These two species are often combined together when analyzing bat sonograms. At least two of Manitoba's three migratory bat species, red bat and hoary bat, have been identified within the study area. The third species, silver-haired bat may also be present, but separation of silver-haired bat from the common big brown bat based on call sonogram is very difficult.

Of the three bat species known to over-winter in Manitoba, (little brown bat, big brown bat and northern long-eared bat), only the big brown bat was recorded within the study area. The closest known caves that act as bat hibernacula in Manitoba are located more then 270km north of the study area. There are no known bat hibernacula or caves in or near the study area (Asmundson and Larche 1996; Firlotte 2008). The lack of forest cover may discourage resident species, particularly little brown bats and northern long-eared bats, from occurring in the study area.

The most commonly recorded calls were of big brown/silver-haired bats. Although difficult to distinguish between the later two species, based on the habitat within the study area and the availability of barns for roosting in the area, it is expected that a majority of these calls are of local populations of big brown bats. Red bat and hoary bat calls were recorded in late July and August. This time period corresponds to a time period when bats are expected to be migrating through the area, and may suggest that some bat migration occurs through the study area at this time.

Abundance results for the spring migration period and the summer swarming/fall migration period are discussed separately below.

6.3.1 Spring Migration

The Alberta Fish and Wildlife Department recommend that bat monitoring be conducted between May and September in their pre-construction protocols (AFWD 2005). The St. Joseph Wind Farm study Area is considered a "Medium Sensitivity" site according to the criteria in the Ontario government's guidelines for monitoring potential impacts to bats at wind power locations and therefore the Ontario guidelines only recommend monitoring from August through mid-September (OMNR 2007).

Based on the little information available on bat movements through Manitoba, NRSI decided to conduct bat monitoring during the anticipated period of spring bat migration. However, based on the recommendations and guidelines for both Alberta and Ontario, the spring bat migration monitoring effort was considerably less then the summer and fall monitoring effort. Monitoring took place on four nights at the end of May, during which a total of 16 bat passes were recorded in 18.2 hours of acoustic monitoring, resulting in an overall passage rate of 0. 9 passes/hr.

Monitoring station BAT-001 had the highest passage rate of 1.8 passes/hr. This station is located near the edge of a pond, surrounded by deciduous trees which likely provides attractive foraging habitat for bats in the area. Passage rates varied considerably throughout the night with peaks in activity between 2030hrs and midnight and secondary peaks in activity between 0230hrs and 0530hrs.

No concentrations of bats were observed during the spring monitoring period.

6.3.2 Summer Swarming and Fall Migration

In order to accurately represent the periods of summer swarming and fall migration in the study area, bat monitoring was conducted from late July through mid-September. A total of 509 bat passes were recorded in 152 hours of acoustic monitoring, resulting in an overall passage rate of 3.3 passes/hr.

Monthly Abundance Trends

The chosen monitoring period of late July through mid September is expected to encompass peak periods of bat activity, including the summer swarming and fall migration periods of Manitoba bat species. Data collected during the entire monitoring period was analyzed by date to determine if periods of increased bat activity were recorded within the study area during expect periods of increased bat activity. Average passage rates in August (5.3 passes/hr) were noticeably higher then July or September which were 0.5 passes/hr and 1.1 passes/hr respectively. These trends in bat activity correspond to the period of summer swarming activity, overlapping with the initial stages of fall migration of Manitoba's migratory bat species.

Analysis by date revealed that consistent activity was recorded from late July through early August, peaking on August 18/19 (see Figure 23). During this time period, average passage rates were recorded between 0.1 and 1.4 passes/hr on 8 monitoring nights, peaking at 17.5 passes/hr. The remainder of the monitoring period had consistently lower average passage rates, with a small activity peak of 2 passes/hr in early September. These dates are more typical of fall migration of Manitoba's migratory bat species, and may suggest the presence of limited bat migration through the study area. Passage rates are lower than would be expected of an area of concentrated activity.

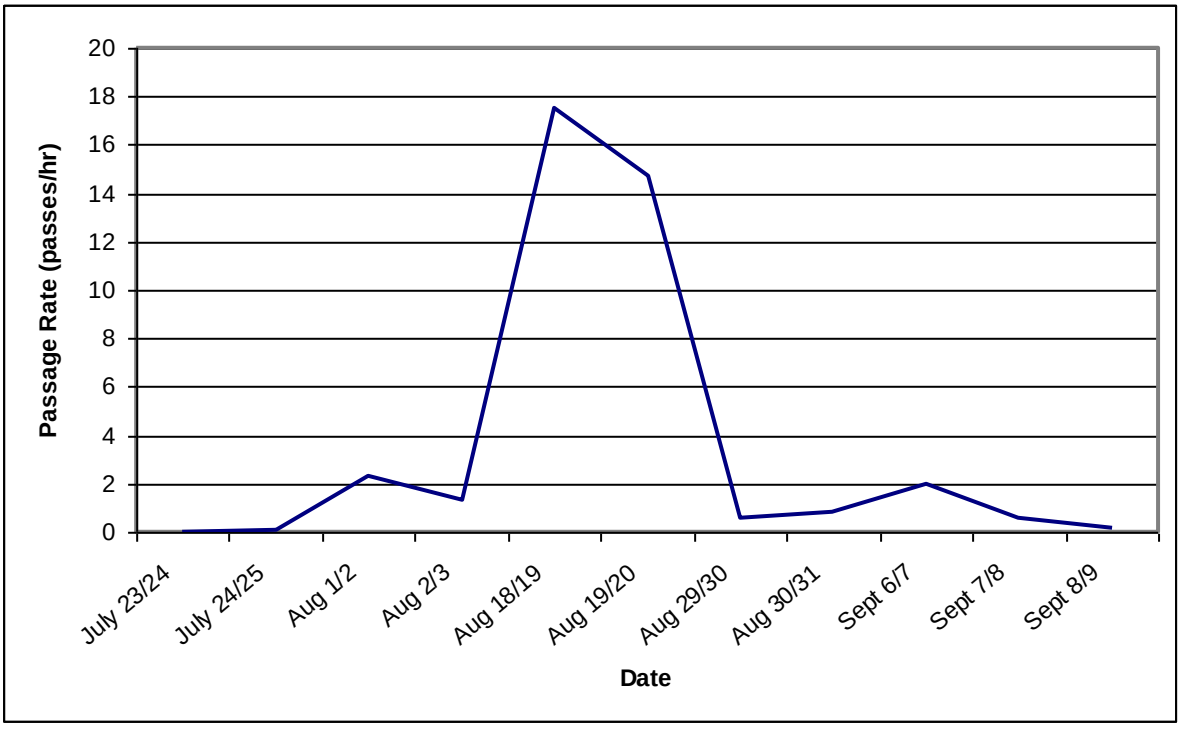


Figure 23. Observed Bat Passage Rates by Date

Nightly Abundance Trends

Bat abundance data was collected and analyzed by the time of night that each pass was recorded. At the St. Joseph study area, bat activity began to rise at approximately 2130hrs, which corresponds roughly to the same time as sunset. This is the time period when bats are preparing to leave their daily roosts to forage in nearby areas. Bat activity within the study area peaked between 2230hrs and 0230hrs, with an average passage rate of 5.8 passes/hr during this time period (see Figure 24). Following this peak, bat activity consistently declined until 0500hrs when a small, secondary peak in activity was observed. Following this secondary peak in activity, passage rates declined further before ending at approximately 0700hrs.

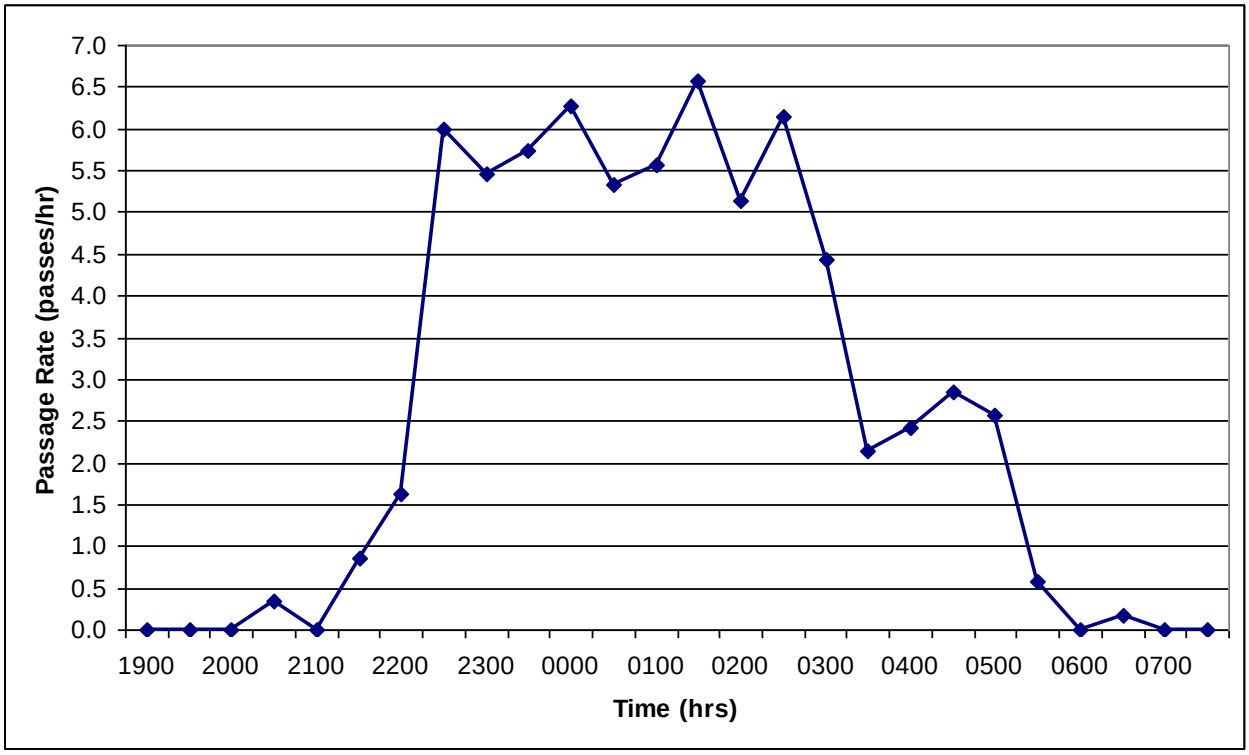


Figure 24. Bat Activity by Time of Night.

Abundance Trends by Location and Habitat

Four of the six bat stations were monitored at the St. Joseph Wind Farm study area during the summer swarming and fall migration period (BAT-001, 004, 005, and 006). The reduction in the number of stations monitored compared to the spring monitoring period, was due to changes to the proposed turbine layout and general project boundaries in mid summer. The four stations monitored were selected to represent a variety of habitat types and general locations within the study area, and where possible, stations monitoring in the spring were used again during the summer and fall monitoring periods. Abundance data was analyzed by monitoring station in order to determine if areas of concentrated bat activity are present within the study area. The highest passage rate of any station was 8.7 passes/hr observed at BAT-001, which is located near a pond surrounded by deciduous trees (see Figure 22). The other three stations had much lower passage rates compared to BAT-001 (see Figure 25). These stations were located along deciduous hedgerows and field edges.

The proximity to water and presence of suitable roosting habitat, in the form of nearby deciduous trees, at station BAT-001 is likely the cause of the increased passage rate observed at this station. All six bat species that occur in Manitoba are insectivorous, feeding primarily on mosquitoes and midges which congregate near open water.

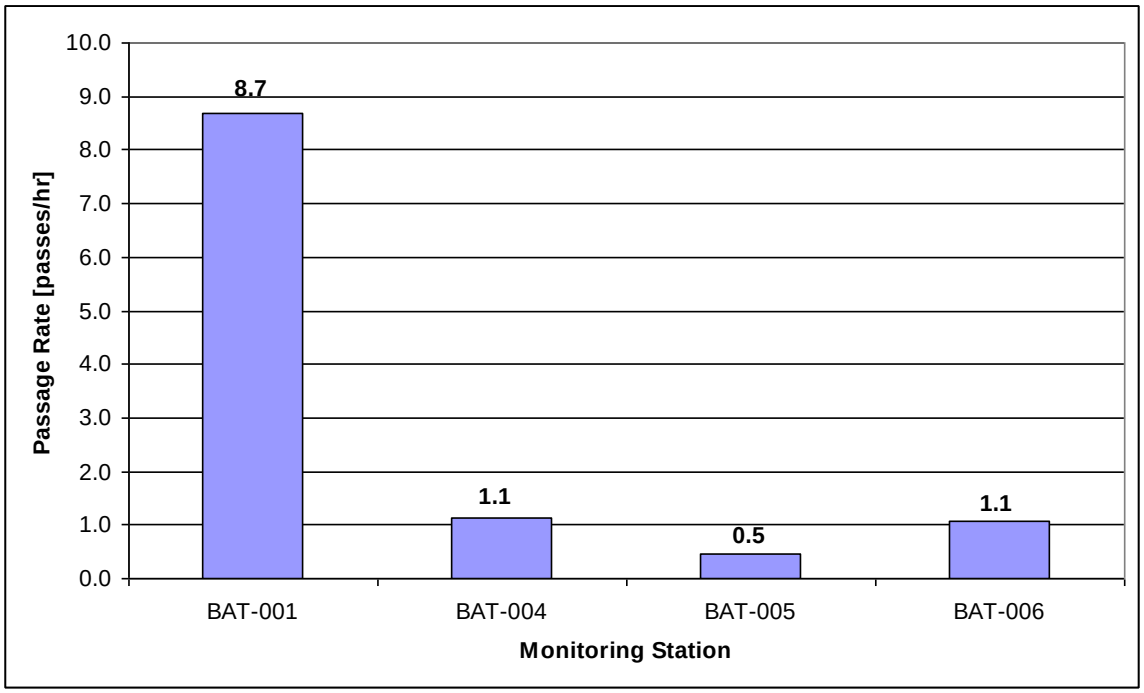


Figure 25. Average Bat Passage Rates by Station.

Distance from the shoreline of the Red River does not appear to influence bat activity within the St. Joseph study area. This trend is unlike other similar multi-station projects near major shoreline that appeared to be influenced by proximity to the shoreline, with higher passage rates observed at stations found closer to major shorelines. All monitoring stations, with the exception of BAT-001, had very similar passage rates, and represented varying distances from nearby large or small bodies of water. Monitoring station BAT-004, the closest to the Red River shoreline, had very few passes recorded, averaging 1.1 passes/hr. Passage rates observed at monitoring stations within the St. Joseph study area had much lower passage rates than would be expected of an area with concentrated bat activity, such as forested ridge, known hibernacula, or concentrated migratory pathway.

6.4 Significant Species

Currently, no bat species that occur in Manitoba are protected by Manitoba's *Endangered Species Act* or listed by COSEWIC. The little brown bat is considered to have widespread and secure breeding populations in the province (S5B) but its summer home range is poorly understood and considered rare in Manitoba (S2N) (MB Conservation Data Centre 2001).

6.5 Discussion

The preceding sections discuss the results of the bat monitoring conducted during the spring, summer and fall of 2007 at the St. Joseph Wind Farm by Natural Resource Solutions Inc. This included surveys of bat habitat, abundance trends, and bat species within the study area.

The monitoring periods of late May and July through late September correspond to the spring migration, summer swarming and fall migration periods of Manitoba's bat species. During these time periods, all six bat species known within Manitoba are expected to be present and active.

The habitat found within the initial study area consists primarily of active agricultural fields, mainly composed of rotational crops of canola, soy, and hayfields. Also present within the study area are scattered hedgerows, drainage ditches, farm structures, and agricultural ponds. These habitat types are expected to provide limited roosting habitat for local bat populations. Snags, buildings, and riparian and aquatic habitat are considered significant bat habitat (OMNR 2006) and are all present within the study area. Other significant bat habitats, caves and abandoned mines, are not present within the proposed study area (Asmundson and Larche 1996, Firlotte 2008). Two turbines are approximately 1 km from the shoreline of the Red River, which could be considered a concentrating factor for bat populations (OMNR 2007). Other concentrating factors, including forested ridges and known hibernacula or maternity roosts, are not present within the proposed study area.

During spring migration monitoring, bat activity was observed to be minimal and an average passage rate of 0.9 passes/hr was recorded. Station BAT-001 was observed to have a slightly higher passage rate then BAT-004 during this period.

During summer swarming and fall migration monitoring, an average passage rate of 3.3 passes/hr was recorded, peaking in mid-August. Bat activity began to peak prior to midnight at approximately 2200hrs with a plateau in activity from 2230 hrs to 0230 hrs.

Species analysis indicates the presence of hoary bat, red bat, and big brown bat/silver-haired bat. The latter two species have very similar call characteristics and are often lumped together during call analysis. Population statuses of the red bat and big brown are unknown in Manitoba, while the hoary bat and silver-haired bat are common with secure populations in Manitoba. Currently none of these species are considered a provincially or nationally rare species (MESA 2008a and Environment Canada 2006).

There is little known about bat passage rates and migration routes within Manitoba, making comparison of passage rates with known areas of concentrated bat activity difficult. Abundance trends and recorded species calls suggest that some bat migration and summer swarming does occur within the study area in mid-August, however, low overall passage rates indicate that significant numbers of bats do not occur within the initial study area.

7.0 Mammals

A total of 39 non-bat mammals have ranges that overlap with the study area (Banfield 1981, Environment Canada 2006, Watkins 2005). A complete list of these species is found in Appendix III. Bats are discussed separately in Section 6.0.

During the 2007 field surveys, NRSI biologists recorded all mammals observed within the study area boundary. Four species of mammals were observed within the study area by NRSI biologists, including coyote (*Canis latrans*), jack rabbit (*Lepus townsendii*), thirteen-lined ground squirrel (*Spermophilus tridecimlineatus*), and white-tailed deer (*Odocoileus virginianus*). Additionally, a den, likely belonging to a red fox (*Vulpes vulpes*) was observed within the boundaries of the study area and pocket gopher mounds and tunnels were observed in a number of locations. These mounds and tunnels are likely of the northern pocket gopher (*Thomomys talpoides*), common in the southern portions of Manitoba. NRSI biologists also observed raccoon (*Procyon lotor*) tracks near station BMM-001.

7.1 Significant Species

One species, the plains pocket gopher (*Geomys bursarius*), has been assigned a sub-national rank of S3 (uncommon) by the Manitoba Data Conservation Centre (Manitoba Conservation 2001). NRSI observed gopher mounds and tunnels throughout out the study area but it is unknown what species made them because the animals were not observed directly. The northern pocket gopher is much more common and widespread in southern Manitoba.

There are no provincially rare mammal species protected by the Manitoba Species at Risk act known to occur in the study area.

Nationally, COSEWIC has assessed the status of 7 species with ranges that overlap with the study area (Table 16). The status of the American badger (*Taxidea taxus*) and the plains pocket gopher have been evaluated by COSEWIC and designated as Not at Risk in Canada. During a study conducted on rare prairie rodents in Manitoba (Wrigley et al. 1991) fox squirrels (*Sciurus niger*) were recorded in the Town of Morris. This

species has been evaluated and ranked as Not at Risk by COSEWIC. Populations of fox squirrel have been rapidly expanding and dispersing in Manitoba in recent years.

The eastern cougar (*Felis concolor couguar)* is considered Data Deficient by COSEWIC and therefore its national status is still unknown. Records indicate that it has been seen as recently as 1996 in the vicinity of the study area, mainly along the Red River (Watkins 2005).

The plains bison (*Bison bison bison*) and the grey fox (*Urocyon cinereoargenteus*) are considered Threatened in Canada. Habitat for these two species does not occur within the study area. The plains bison requires meadow and grassland areas to graze and the grey fox prefers deciduous woodlands and marshes.

The eastern wolf (*Canis lupus lycaon*) is considered a Special Concern species and has been documented in the vicinity of the study area (within approximately 20km) by Environment Canada (2006b), however, the necessary forest cover that this species requires is not found within the study area.

No significant non-bat mammal species were observed by NRSI within the study area.

Table 16. Significant Mammal Species with Range Maps that Overlap with the Study Area

Scientific Name	Common Name	GRANK	SRANK	COSEWIC	Habitat Present in the Study Area?
Taxidea taxus	American Badger	G5		NAR	Y
Bison bison bison	Plains Bison	G4		THR	N
Felis concolor couguar	Eastern Cougar*	G5		DD	N
Urocyon cinereoargenteus	Gray Fox**	G5		THR	N
Canis lupus lycaon	Eastern Wolf**	G4		SC	N
Geomys bursarius	Plains Pocket Gopher	?	S3	NAR	Y
Sciurus niger	Fox Squirrel	G5		NAR	N

Note: Reference Banfield (1981) unless otherwise indicated with an astrix

*Watkins 2005

** Environment Canada 2006

LEGEND

Srank	**COSEWIC Designations**	**Habitat Presence**
S3- Uncommon	THR- Threatened	Y- Yes
	NAR- Not at Risk	N-No
G-Rank (Global Rank)	SC- Special Concern	
G4-Common	DD-Data Deficient	
G5-Very Secure		

8.0 Herpetofauna

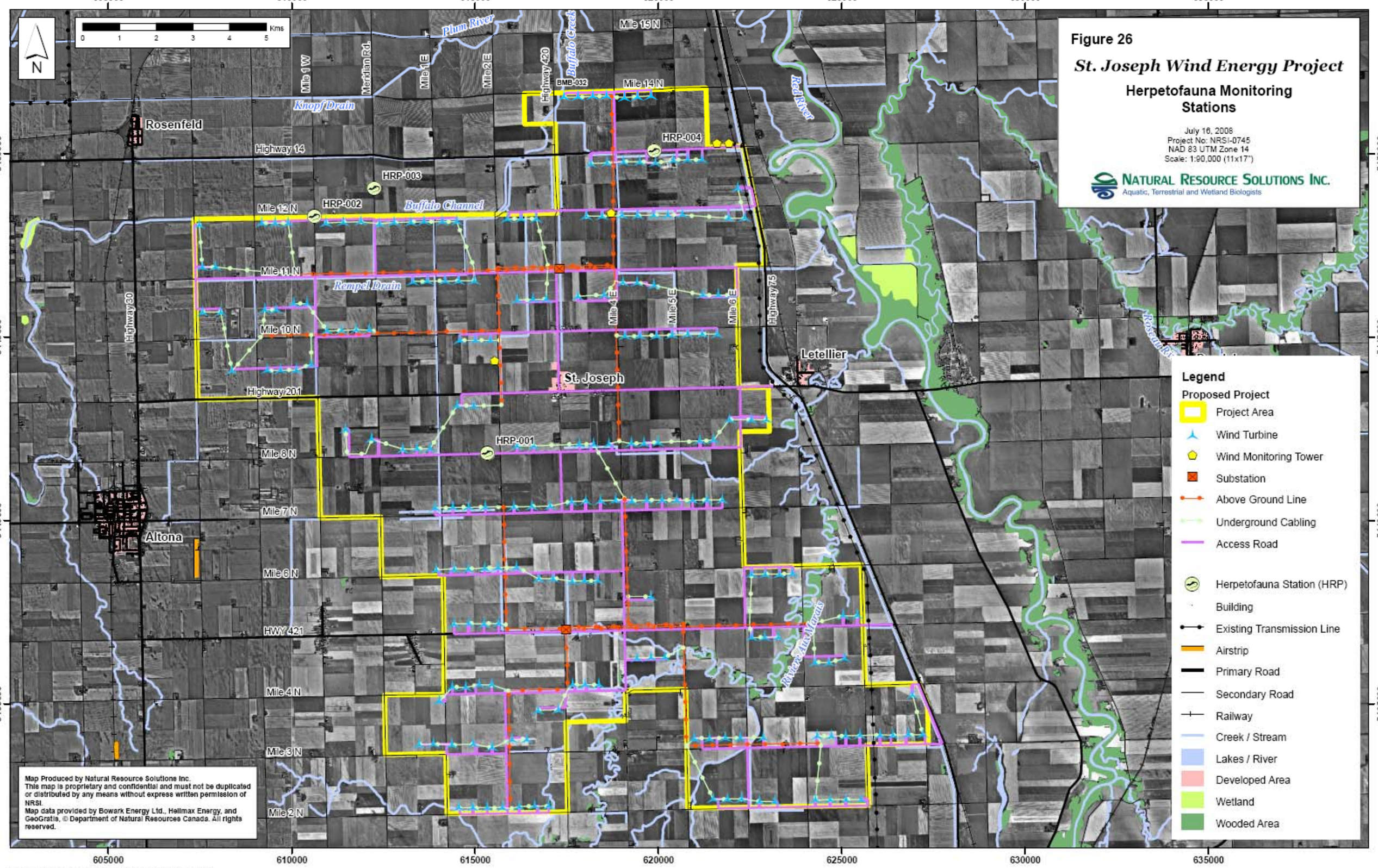
8.1 Study Methodology

Amphibian monitoring was conducted following the Marsh Monitoring Program guidelines (Bird Studies Canada 2003). Monitoring was conducted at 4 stations (Figure 26) which are described in Table 17. Each station was monitored 3 times, once in early spring (April 23, 2007), once in mid-spring (May 13, 2007) and once in late spring/early summer (June 4, 2007). Different species of amphibians are known to breed at different times of the year. The chosen monitoring period of April to June was selected to represent the peak breeding periods for species known to occur in the vicinity of the study area. Monitoring stations were chosen based on initial project boundaries.

Three minute point counts were performed at each station, starting a half hour after sunset and finishing prior to midnight. Call intensity and an estimated number of individuals were recorded. At each monitoring station a variety of environmental and weather conditions were also recorded, including air temperature, wind speed, and cloud cover (see Appendix IV for a sample data sheet).

Table 17. Descriptions of Amphibian Monitoring Station Locations

Station Number	Station Location	Habitat Type
HRP-001	South side of Mile 8 Road North between Mile 1 Road east and Mile 2 Road east	Storm water pond with mature deciduous trees
HRP-002	Intersection of Mile 12 Road North and Mile 1 Road west (facing east)	Controlled channel (Buffalo Channel) buffered by 10m of tall grass
HRP-003	East side of Meridian Road between Highway 14 and Mile 12 Road North	Storm water pond surrounded by scattered deciduous trees and shrubs
HRP-004	South side of Highway 14 between Mile 4 Road east and Mile 5 Road east	Large open water habitat associated with Miller Environmental Property


605000
610000
615000
620000
625000
630000
635000
5450000
5445000
5440000
5435000
N
0 1 2 3 4 5 Kms
Plum River
Buffalo Creek
Red River
Knopf Drain
Buffalo Channel
Rempel Drain
Rosenfeld
Altona
St. Joseph
Letellier
Highway 14
Highway 30
Highway 201
HWY 421
Highway 420
Highway 75
Mile 1 W
Meridian Rd.
Mile 1 E
Mile 2 E
Mile 15 N
Mile 14 N
Mile 12 N
Mile 11 N
Mile 10 N
Mile 8 N
Mile 7 N
Mile 6 N
Mile 4 N
Mile 3 N
Mile 2 N
Mile 4 E
Mile 5 E
Mile 6 E
BMB-032
HRP-001
HRP-002
HRP-003
HRP-004
Figure 26
St. Joseph Wind Energy Project
Herpetofauna Monitoring Stations
July 16, 2008
Project No: NRSI-0745
NAD 83 UTM Zone 14
Scale: 1:90,000 (11x17")
Natural Resource Solutions Inc.
Aquatic, Terrestrial and Wetland Biologists
Legend
Proposed Project
Project Area
Wind Turbine
Wind Monitoring Tower
Substation
Above Ground Line
Underground Cabling
Access Road
Herpetofauna Station (HRP)
Building
Existing Transmission Line
Airstrip
Primary Road
Secondary Road
Railway
Creek / Stream
Lakes / River
Developed Area
Wetland
Wooded Area
Map Produced by Natural Resource Solutions Inc.
This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI.
Map data provided by Bowark Energy Ltd., Hellmax Energy, and GeoGratis, © Department of Natural Resources Canada. All rights reserved.
NRSI_0745_StJosephWindfarm_HerpStations_90k_16Jul08_LAD

8.2 Results

A total of 11 species of reptiles and amphibians have ranges that overlap with the study area. A list of herpetofauna that have been documented in the general vicinity of the study area can be found in Appendix IV. Suitable habitat for these herpetofauna is present, but not overly abundant, within the study area due to the presence of agricultural drains and small ponds.

Table 18 presents the results of the 2007 monitoring by summarizing the species encountered during the evening amphibian call surveys by point count station. During the 2007 point count surveys, a total of five amphibian species were recorded.

Table 18. Amphibian Species Present During the 2007 Call Surveys by Station

Station Number	Boreal Chorus Frog	American Toad	Canadian Toad	Northern Leopard Frog	Wood Frog
HRP-001					X
HRP-002	X	X			
HRP-003	X				X
HRP-004	X	X	X	X	X

The species recorded calling most frequently was the boreal chorus frog (*Pseudacris triseriata maculate*), representing 56% of all observations. This species was only observed to be present in early (April 23) and mid spring (May 13). During these periods, the number of boreal chorus frogs was often large, making estimates of the total number of individuals extremely difficult. Found throughout central and southern Manitoba, chorus frogs are known to inhabit shallow, often temporary, bodies of water often concealing themselves among the grass (Conant & Collins 1991). The drainage ditches and storm water ponds found on the subject property provide abundant habitat for this species.

American toads (*Bufo americanus*) were recorded in varying numbers in both mid (May 13) and late spring (June 4). Found in southeastern Manitoba, the American toad is known to occur in a wide variety of habitat ranging from suburban yards to rustic wilderness. They require shallow bodies of water to breed, including temporary ditches or streams (Conant & Collins 1991).

Wood frogs (*Rana sylvatica*) were only recorded during the early spring visit on April 23, 2007. Found throughout Manitoba, they are usually encountered near moist woods but can wander considerable distances from water (Conant & Collins 1991).

The northern leopard frog (*Rana pipiens*) was only recorded calling once on May 13, 2007 at Station HRP-004. This species prefers grasslands and wet woods but can wander a considerable distance from water. Although the northern leopard frog used to be considered widespread in Manitoba (Preseton 1982) it is now a significant species (see Section 8.3).

The Canadian toad *(Bufo hemiophrys*) was also only recorded calling once on the May 13, 2007 visit at Station HRP-004. This species occupies a wide rang of habitats including prairie, aspen parkland, sandy beaches and boreal forest (Preston 1982).

Two species of salamander, the tiger salamander (*Ambystoma tigrinum*) and a sub-species, the gray tiger salamander (*Ambystoma tigrinum diaboli*), have ranges that overlaps with the study area. They prefer areas with an abundance of breeding ponds. No salamanders were observed by NRSI in the study area.

Three reptiles, including 2 snakes and 1 turtle, have range maps that overlap with the study area. Ideal habitat for these species, such as larger permanent bodies of water or rocky areas for basking, does not exist within the study area. No reptiles were observed by NRSI in the study area.

8.3 Significant Herpetofaunal Species

The northern leopard frog was previously widespread in Manitoba (Preston 1982); however, the western populations of this species are now designated as Special Concern by COSEWIC. The northern leopard frog is not ranked or protected provincially. It was heard calling by NRSI biologists during amphibian surveys in a drainage ditch near HRP-004. Near this drainage ditch are the large ponds associated with the Miller Environmental property. This observation was made approximately 500m from the nearest proposed turbine location.

9.0 Butterflies

As a result of comments received from Environment Canada, NRSI recorded all incidental butterfly observations during the monitoring period. Three species, the mourning cloak (*Nymphalis antiopa*), the red admiral (*Vanessa atalanta*), and the monarch (*Danaus plexippus*) were observed within the study area. The monarch butterfly is considered a significant species in Canada and has been ranked by COSEWIC as a species of Special Concern (Government of Canada 2007). Over the course of the 2007 monitoring period, 134 incidental observations of monarch were recorded within the study area, almost all of them within the month of June. It should also be noted that milkweed (*Asclepias* spp.), the host plant of the monarch butterfly, was observed to be plentiful within the study area, mainly confined to roadside ditches.

10.0 Aquatic Habitats

10.1 Introduction

The study area is almost entirely composed of agricultural fields that are drained by constructed linear drains. As a result, the majority of the aquatic habitat in the study area is found in constructed agricultural drains.

The drainage in the northern part of the study area flows into the Buffalo River, which in turn enters Plum Creek and ultimately the Red River. The southern part of the study area drains into the Rivière aux Marais, which also outlets into the Red River (Figure 27).

10.2 Study Methodology

The aquatic habitats in the study area were identified and mapped based on topographic mapping information from the National Topographic Database (Natural Resources Canada 2002) and direct observations in the field. Site visits were conducted on July 24 to 26, 2007, and on April 21 and 22, 2008.

Fish community information was obtained from Manitoba Conservation (2007). Significant species information was obtained from COSEWIC (Government of Canada 2007), Species at Risk listed under the Manitoba Endangered Species Act (Manitoba Conservation 2008a), and the Manitoba Conservation Data Centre (2001).

10.3 Results

10.3.1 Aquatic Habitat

The aquatic habitats in the study area are defined by the clay and silt of the Glacial Lake Agassiz Clay Plain (Matile & Keller 2004). In the last century, the poor drainage prompted the construction of numerous linear surface drains to facilitate drainage for agricultural purposes. Many of these drains are situated alongside the roads. The size of the drains varies from minor roadside ditches, to intermediate-size drains, to large drains and rivers. The intermediate and large features are shown on Figure 27.

Watercourses

The intermediate-size agricultural drains in the study area are generally situated in narrow corridors of grass and other herbaceous vegetation. There is typically a road along one side and a cultivated field on the other side. The channel widths of the intermediate-sized drains vary from approximately 2 to 7m (at the bottom of the drain). Vegetation within the channels varies. Some drains have submerged aquatic vegetation, and many have emergent cattails, sedges and rushes in sparse to high density. The intermittent drains typically have grasses and herbs growing throughout the channel. The substrates in the channels reflect the clay soils that characterize the study area. On July 24, and 25, 2007, some of the drains were flowing, some had standing water, and others were completely dry. Many of the drains had flowing or standing water on April 21 and 22, 2008 after a rain event during the morning of April 21.

Some of the intermediate-sized drains outlet to the larger watercourses through culverts with 1-way valves at their outlets. In the same way, minor drains outlet to intermediate-sized drains through 1-way valve systems. This is a characteristic of the land drainage scheme that prevents water from backing up through the system and flooding the landscape during high flows. These 1-way valves also have the effect of impeding upstream fish passage. The drainage from northern part of the study area flows northerly into the Buffalo Channel – Plum Creek system. Buffalo Channel has two separate channels that enter the study area from the west, and converge within the study area to become the Plum River. The Plum River exits the study area to the north and continues northeast to its outlet to

Figure 27

St. Joseph Wind Energy Project

Aquatic Habitat

July 16, 2008
Project No: NRSI-0745
NAD 83 UTM Zone 14
Scale: 1:90,000 (11x17")

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

605000 610000 615000 620000 625000 630000 635000

5450000 5445000 5440000 5435000

Kms 0 1 2 3 4 5

N

Plum River
Buffalo Creek
Red River
Knopf Drain
Buffalo Channel
Rempel Drain
Riviere Aux Marais
Rosseau River

Mile 15 N
Mile 14 N
Mile 12 N
Mile 11 N
Mile 10 N
Mile 8 N
Mile 7 N
Mile 6 N
Mile 4 N
Mile 3 N
Mile 2 N

Mile 1 W
Meridian Rd.
Mile 1 E
Mile 2 E
Highway 420
Mile 4 E
Mile 5 E
Mile 6 E
Highway 30
Highway 75
Highway 14
Highway 201
HWY 421

Rosenfeld
St. Joseph
Letellier
Dominion
Altona

CKC-001 CKC-002 CKC-003 CKC-004 CKC-005 CKC-006 CKC-007 CKC-008 CKC-009 CKC-010 CKC-011 CKC-012 CKC-013 CKC-014 CKC-015 CKC-016 CKC-017 CKC-018 CKC-019 CKC-020 CKC-021 CKC-022 CKC-023 CKC-024 CKC-025 CKC-026 CKC-027 CKC-028 CKC-029 CKC-030 CKC-031 CKC-032 CKC-033 CKC-034 CKC-035 CKC-036 CKC-037 CKC-038 CKC-039

Legend

- Proposed Project
- Project Area
- Wind Turbine
- Wind Monitoring Tower
- Substation
- Above Ground Line
- Underground Cabling
- Access Road
- New Creek Crossings (CKC)
- Building
- Existing Transmission Line
- Airstrip
- Primary Road
- Secondary Road
- Railway
- Creek / Stream / Drain
- Lakes / River
- Developed Area
- Wetland
- Wooded Area

NRSI_0745_StJosephWindfarm_Aquatic_90k_16Jul08_LAD

the Red River. The larger of the two channels associated with the Buffalo Channel flows along the south side of Mile 12 North, and varies in width from 6 to 23m. It flows in a very large bermed floodway corridor that is up to 100m wide in places. This corridor consists of grasses and other herbaceous vegetation, and some parts of it are harvested for hay. The smaller of the two channels enters the study area along Mile 10 North, and follows roadways northward and eastward to where it is parallel to the larger channel along Mile 12 North. The channel widths are 3.5 to 8m and the corridors range from 6 to 12m wide. The substrates are soft clay and soil. On July 24 and 25, 2007, these major watercourses were flowing.

The Plum River is a large natural feature that flows through agricultural fields, and is a much as 20 m wide within the study area. Grasses and sedges grow along the wetted margins, and there is abundant submergent aquatic vegetation in the channel. It was flowing during field investigations on July 26, 2007.

Drainage in the southern part of the study area flows into the Rivière aux Marais. This is a natural river that flows through the southeast corner of the study area. Much of the main stem is within a wooded corridor ranging from 20 to 100m wide. The vegetation in this corridor is characterized in Section 4.0. The trees are separated from the channel by a continuous grassy floodplain adjacent to the channel. Within the study area, the channel width varies from 6 to 20m wide. Instream vegetation includes emergent plants such as cattails and grasses, as well as submergent plants and floating duckweed of the family Lemnaceae. Vegetation on the banks is dominated by grasses and other herbs. On July 25, 2007 and April 22, 2008, the water was deep and flowing very slowly.

Tributaries of the Rivière aux Marais are much smaller and have little to no natural corridor. Some sections are channelized with a narrow corridor of grass and herbaceous vegetation, which is characteristic of the intermediate-sized drains in the study area. Many sections of the tributaries have a natural plan-form but lack a vegetated corridor. These meandering sections are typically swales in agricultural fields that are cultivated, which indicates that flow is intermittent. There are also locations where online ponds have been created, which may provide a refuge for fish when flow is absent.

Isolated Ponds

In addition to the linear drainage features, there are isolated ponds in the study area. These habitats are of secondary importance to the drains because they are disconnected from other habitats. Nevertheless, they provide aquatic habitat of varying quality. Many are constructed ponds intended for irrigation, aesthetic, or recreational uses, but they are also considered aquatic habitat.

10.3.2 Fish Community

Table 19 provides a list of fish species based on collection records provided by Manitoba Conservation (2007) for Buffalo Creek, Plum Creek, and the Rivière aux Marais. The watersheds of these rivers include the study area. In addition, the Red River has a diverse fish community, and there are many more species in or near the study area than those listed below. A list of species known from the Red River is provided in Appendix V (Manitoba Conservation 2007c). During field observations, schools of small fish of the catfish family (Ictaluridae) were observed in the Buffalo Channel.

Table 19. Fish Collection Records for Buffalo Cr., Plum R., and Rivière aux Marais

Common Name	Scientific Name	G-Rank*	S-Rank**	COSEWIC Status***
bigmouth buffalo	*Ictiobus cyprinellus*	G5	-	SC
black bullhead	*Ameiurus melas*	G5	-	-
black crappie	*Pomoxis nigromaculatus*	G5	-	-
blacknose shiner	*Notropis heterolepis*	G4	-	-
burbot	*Lota lota*	G5	-	-
common carp	*Cyprinus carpio*	G5	-	-
chestnut lamprey	*Ichthyomyzon castaneus*	G4	S3S4	SC
creek chub	*Semotilus atromaculatus*	G5	-	-
fathead minnow	*Pimephales promelas*	G5	-	-
northern pike	*Esox lucius*	G5	-	-
river darter	*Percina shumardi*	G5	-	NAR
sand shiner	*Notropis stramineus*	G5	-	-
white sucker	*Catostomus commersoni*	G5	-	-

* Source: Eakins 2007

**Designated by the Manitoba Conservation Centre (Manitoba Conservation 2001)

***Designated by COSEWIC and protected by the *Species at Risk Act* (Government of Canada 2007)

Legend	Srank (Provincial Rank)	COSEWIC Status
Grank (Global Rank)	S3- Uncommon	SC- Special Concern
G5- Very Common	S4- Apparently Secure	NAR-Not at Risk
G4- Common		

10.3.3 Significant Species

The significant species listed below are known from the Lake Manitoba Plain Ecoregion, the Red River or the Buffalo River. It is possible that they exist within the study area.

Chestnut Lamprey *(Ichthyomyzon castaneus)*

Status: The chestnut lamprey is a fish species of the lamprey family (Petromyzontidae). It is ranked S3S4 – uncommon to apparently secure in Manitoba, and G4 – globally common (MB Conservation Data Centre 2001). It has been given the status of Special Concern by COSEWIC (Gov't of Canada 2007), and is listed on Schedule 3 of the federal Species at Risk Act (Gov't of Canada 2008).

Habitat: The chestnut lamprey is a parasitic filterer that prefers "large creeks and main channels of small- to medium-sized rivers (Eakins 2007)." The "...ammocoetes inhabit sand- and silt-bottomed pools and backwaters (Eakins 2007)." The chestnut lamprey is known from the Lake Manitoba Plain Ecoregion (MB Conservation Data Centre 2001), and is known to occur in the Red River (MB Conservation 2007c). The aquatic habitat in the study area may be suitable for the chestnut lamprey.

Silver Chub *(Macrhybopsis storeriana)*

Status: The silver chub is a fish species of the carp and minnow family (Cyprinidae). It is ranked S3 – uncommon in Manitoba – and G5 – globally very common (MB Conservation Data Centre 2001). It has been given the status of Special Concern by COSEWIC (Gov't of Canada 2007), and is listed on Schedule 1 of the federal SARA (Gov't of Canada 2008).

Habitat: The silver chub is a benthic invertivore that prefers "sandy, silty pools and backwaters of small to large rivers, river mouths and warm shallows (<20 m) of lakes (Eakins 2007)." It is known from the Lake Manitoba Plain Ecoregion (MB Conservation Data Centre 2001), and is known to occur in the Red River (MB Conservation 2007c).

Bigmouth Buffalo (*Ictiobus cyprinellus)*

Status: The bigmouth buffalo is a fish species of the sucker family (Catostomidae). It is ranked G5 – globally common (Eakins 2007). It has been given the status of Special Concern by COSEWIC (Gov't of Canada 2007), and is listed on Schedule 3 of the SARA (Gov't of Canada 2008).

Habitat: The bigmouth buffalo is a benthic insectivore that prefers "main channels, deeper pools and backwaters of turbid vegetated rivers, lakes and impoundments; preferred water temperature range 18-26°C (Eakins 2007)." It is known from the Red River, and more specifically from Buffalo Creek, part of which is within the study area. The Buffalo Creek record is from August of 2005 (MB Conservation 2007c). The habitat in the larger drains and creeks of the study area is suitable for the Bigmouth Buffalo.

Mapleleaf *(Quadrula quadrula)*

Status: The Mapleleaf is a freshwater mussel species of the family Unionidae. It is ranked G5 – globally common, but does not have an S-Rank in Manitoba (MB Conservation Data Centre 2001). It has been given the status of Endangered by COSEWIC (Gov't of Canada 2007), but is not listed on Schedule 1 of the SARA (Gov't of Canada 2008).

Habitat: The Mapleleaf prefers "(m)edium-sized to large rivers and reservoirs where currents are slow to moderate in soft or coarse substrates (Metcalfe-Smith et al 2005)." It is known from the Lake Manitoba Plain Ecoregion (MB Conservation Data Centre 2001). The habitats in the drains and creeks of the study area have the characteristics preferred by the Mapleleaf.

11.0 Summary

Between April 2007 and April 2008 NRSI biologists conducted a number of field investigations to assess the natural environmental features within the proposed study area for the St. Joseph Wind Energy Project. Biological components surveyed during field investigations included spring and fall bird migration, breeding birds, diurnal raptors, leks, amphibians, spring and fall bat migration, summer bat swarming, vegetation mapping and aquatic habitat assessment.

Vegetation

The study area is almost entirely composed of agricultural lands with scattered deciduous and coniferous hedgerows. Small areas with an abundance of trees exist around private residents and constructed ponds. The only wooded area is a thin corridor along the Rivière aux Marais in the southern portion of the study area. This corridor is dominated by a number of common species such as bur oak, Manitoba maple, red ash, willows, and poplars.

Birds

Over the course of the spring 2007 bird migration monitoring period, a total of 6,526 birds were observed representing 42 species (including incidentals observed >200m from the observer). The majority of observations recorded during the monitoring period were of individual birds or small flocks. The most abundant species in the spring were horned lark, red-winged blackbird, snow bunting, tundra swan, and brown-headed cowbird. Not surprisingly, landbirds were the most abundant bird group, representing 90% of all observations. Migration activity peaked between late April and early May and the majority of observations were made before noon. Monitoring station BMM-004 was observed to have the highest overall utilization rate. The majority of birds that were observed flying during the spring monitoring period were recorded in Height Zone 0-39m, which is below the blade sphere. Flight directions were variable between stations but a general trend in a northern direction was observed at each station.

During the fall 2007 bird migration monitoring period a total of 11,008 birds were observed representing 38 species (including incidentals observed >200m from the observer). The majority of observations in the fall were also of individual birds or small

flocks. The most abundant species recorded in the fall were Canada geese, rock pigeons, barn swallows, and European starlings. Again, landbirds were found to be the most abundant bird group. Migration activity peaked in mid to late October and bird activity varied throughout the day. Monitoring station BMM-002 was observed to have the highest overall utilization rate. Similar to spring, the majority of birds observed flying were seen within Height Category 0-39m. Flight directions were found to be variable in the fall, however a general trend in a southern direction was observed at every station except BMM-004, where flight directions were toward the west and northwest.

Over the course of the spring 2008 bird migration monitoring period, a total of 1,196 birds were observed representing 30 species (including incidentals observed >200m from the observer). The majority of observations recorded during the monitoring period were of individual birds or small flocks. The most abundant species were snow buntings, red-winged blackbird, American white pelicans, Canada geese, horned lark, and European starling. As in the spring of 2007, landbirds were the most abundant bird group, representing 79% of all observations. Migration activity was observed to be highest at the end of April observations were made before 1100hrs. Monitoring station BMM-005 was observed to have the highest overall utilization rate. As in 2007, the majority of birds that were observed flying during the spring 2008 monitoring period were recorded in Height Zone 0-39m, which is below the blade sphere. Flight directions were highly variable between stations.

Breeding bird surveys were conducted in June and began a half hour before sunrise. Over the course of the breeding bird surveys, a total of 1,693 birds were recorded representing 38 species. The most abundant species observed were red-winged black-bird (38% of all individuals observed), brown-headed cowbird (12.6%), and brewer's blackbird (6.5%). The majority of species observed were landbirds (90%). The greatest diversity of species was observed in hedgerow habitat, followed by riparian habitat. The lowest species diversity was observed in agricultural habitat. A total of 36 species displayed some evidence of breeding, with 7 species confirmed to be breeding within the study area.

Only 10 raptors were observed during the diurnal raptor surveys. The three raptor species observed were northern harrier, which was most abundant, unidentified raptor species, and red-tailed hawk. Half of the raptors observed were flying below the blade sphere (Height Category 0-39m) and half were observed to be flying within the blade sphere (40-120m). Six additional species of raptor were recorded during other 2007 field surveys.

No significant bird species were observed by NRSI within the study area. However, habitat for five significant species (loggerhead shrike (both subspecies), burrowing owl, Baird's sparrow, and red-headed woodpecker potentially exists within the study area. Additionally, the least bittern, Sprague's pipit and yellow rail have been recorded by Environment Canada as having range maps that overlap with the study area.

Bats

Over the course of the 2007 monitoring period a total of 525 bat passes were recorded in over 170 hours of acoustic monitoring. The average passage rate during spring migration monitoring was 0.9 passes/hr and during summer swarming and fall migration the average passage rate was 3.3 passes/hr. The presence of hoary bats, red bats, and big brown and/or silver haired bats was confirmed in the study area. Hoary bats, red bats and silver haired bats all migrate to the southern United States during the Canadian winter. Big brown bats are the only species recorded in the study area known to over-winter in Manitoba.

Station BAT-001 had the highest overall passage rate during both spring migration (1.8 passes/hr) and summer swarming/fall migration (8.7 passes/hr). This station was located next to a pond surrounded by deciduous trees whereas the other monitoring stations were located adjacent to hedgerows or fields. Passage rates at the remaining stations were comparable, but generally lower than those found at station BAT-001.

During the summer swarming/fall migration monitoring period, a peak in bat activity was recorded in mid August which is consistent with fall bat migration patterns in Manitoba. Bats were most active between 2130 hrs and 0230 hrs, with an average passage rate of 1.1 passes/hr during this time period.

No caves or mines exist in or near the study area and none of the six bat species that occur in Manitoba are considered significant species. Based on the low passage rates recorded during the 2007 monitoring period, it is unlikely that any large concentrations of bats exist within the study area boundaries.

Mammals

A total of 39 non-bat mammals are known to have range maps that overlap with the study area. During field investigations, NRSI observed evidence of 7 of these mammal species. COSEWIC has assessed the status of 7 potentially rare mammal species that have range maps that overlap with the study area, resulting in two of these species being designated as Not at Risk and one as Data Deficient. Suitable habitat does not exist for the remaining species within the study area. One species which may have a range that overlaps with the study area, the plains pocket gopher, is listed as uncommon by the Manitoba Data Conservation Centre. Although evidence of pocket gophers was observed within the study area, the northern pocket gopher is much more common in southern Manitoba than the plains pocket gopher.

Herpetofauna

A total of 11 reptiles and amphibians have range maps that overlap with the study area. Amphibian monitoring occurred at four stations within the study area and each station was monitored on three separate occasions throughout the known breeding season for species in the area. During amphibian surveys a total of 5 species were confirmed. The boreal chorus frog was most commonly observed species in the study area. The American toad and wood frog were also fairly abundant. The northern leopard frog, which is considered a Special Concern species by COSEWIC, and Canadian toad were both recorded by NRSI biologists in a drainage ditch near station HRP-004. No snakes, salamanders or turtles were observed in the study area.

Butterflies

Specific surveys to record butterfly abundance and diversity were not undertaken, however all butterflies observed within the study area were recorded as incidental observations. Three species were recorded by NRSI biologists, including the monarch butterfly, a species listed as Special Concern by COSEWIC.

Aquatic Habitats

The characteristics of the aquatic habitats in the study area are defined by the Lake Agassiz Clay Plain, and most of the habitat is located in constructed agricultural drains. The habitat consists of roadside ditches, intermediate drains, and larger drains and rivers. The channels and vegetated corridors are generally very uniform, with clay and soil channel substrates and mostly herbaceous vegetation in the corridors. The watercourses in the northern part of the study area outlet into the Buffalo Channel – Plum Creek system. The watercourses in the southern part of the study area outlet into the Rivière aux Marais. These receiving watercourses in turn outlet into the Red River. There are also some isolated ponds in the study area that provide aquatic habitat.

The fish species known from the major watercourses of the study area reflect warm-water habitat characteristics, and consist of species also found downstream in the Red River. Three significant fish species and one significant freshwater mussel species have potential to be present in the study area. These include chestnut lamprey, silver chub, bigmouth buffalo, and Mapleleaf.

12.0 References

AFWD (Alberta Fish and Wildlife Division). 2005. Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta. Original prepared 2002, updated by Alberta Sustainable Resource Development and Alberta Bat Action Team in 2005.

A.S.R.D. (Alberta Sustainable Resource Development): Department of Fish & Wildlife. 2005. Sensitive species inventory guidelines. Draft. Retrieved online: http://www.srd.gov.ab.ca/fw/guidres/pdf/inventoryguide/sensitive_species_inventory_guidelines_January_2005.pdf

Asmundson, J.D. and R.A. Larche. 1996. Bat Hibernacula Management Guidelines. Manitoba Natural Resources, Wildlife Branch, December 1996.

Banfield A. W. F. 1981. The Mammals of Canada. University of Toronto Press, Toronto, Canada.

Barclay R.M.R. 1984. Observations on the Ecology and Behavior of Bats at Delta Marsh, Manitoba. Canadian Field Naturalist. Vol. 98, no. 3, pp. 331-336.

Beason, R.C. 1995. Horned Lark (*Eremophila alpestris*). *In* The Birds of North America, No. 195 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Bird Studies Canada. 2003. The Marsh Monitoring Program – Training Kit and Instructions for Surveying Marsh Birds, Amphibians and their Habitats 2003 Edition. Bird Studies Canada in Cooperation with Environment Canada and the U.S. Environmental Protection Agency. 40 pp.

Canadian Prairie Partners in Flight. 2004. Landbird Conservation Plan for Prairie Pothole Bird Conservation Region 11 in Canada. Canadian Wildlife Service, Edmonton, AB.

Conant, R. and J.T. Collins. 1991. Retiles and Amphibians: Eastern and Central North American. Peterson Field Guide Series, New York, New York.

CWS (Canadian Wildlife Service). 2001. Ontario Breeding Bird Atlas: Guide for Participants. Atlas Management Board, Federation of Ontario Naturalists, Don Mills.

Eakins, R. J. 2007. Ontario Freshwater Fishes Life History Database. Version 3.01. On-line database. (www.fishdb.ca), accessed 24 January and 4 February, 2008.

Ejeckam, R.B. 2007. Response to Work plan for Monitoring at the St. Joseph Wind Farm. Personal Communication. Environment Canada, Environmental Assessment Coordinator, Environmental Protection, Prairie and Northern Region.

Environment Canada. 2006a. Species at Risk. Online species search. Accessed January 21, 2008. http://www.speciesatrisk.gc.ca/search/default_e.cfm

Environment Canada. 2006b. Species at Risk. Online geographic query. Accessed on January 21, 2008. http://www.speciesatrisk.gc.ca/map/default_e.cfm

Environment Canada. 2007. Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds. Final February 19, 2007.

Environment Canada Canadian Wildlife Service (CWS). 2007. Wind Turbines and Birds: A Guidance Document for Environmental Assessment. Final February 2007.

Firlotte, N. 2008. Manitoba Conservation Data Centre. Personal Communication through Data Information Request. Received January 29, 2008.

Government of Canada. 2007. COSEWIC Species Search-Manitoba. Accessed January 21, 2007. http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm

Government of Canada. 2008. Schedules of the Species at Risk Act. Website: http://www.sararegistry.gc.ca/species/default_e.cfm. Accessed: 24 January, 2008.

Gerson, H. 1984. Habitat Management Guidelines for Bats of Ontario. Prepared for the Ontario Ministry of Natural Resources.

IBA Canada. 2004. Online geographic query-Manitoba IBA Network. Accessed January 22, 2007. http://www.bsc-eoc.org/iba/regional.jsp?region=MB

Jones, S. L., and J. E. Cornely. 2002. Vesper Sparrow (*Pooecetes gramineus*). *In* The Birds of North America, No. 624 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Manitoba Conservation. 2007a. Areas of Special Interest Map. Manitoba Protected Areas Initiative. Accessed February 2008. http://www.gov.mb.ca/conservation/pai/pai_material.html

Manitoba Conservation. 2007b. Protected Areas in Manitoba- Map. Manitoba Protected Areas Initiative. Accessed February 2008. http://www.gov.mb.ca/conservation/pai/pai_material.html

Manitoba Conservation. 2007c. Fish collection records provided by Wade Biggin, June & July 2007.

Manitoba Conservation. 2008a. Species at Risk: Species Listed under the Manitoba *Endangered Species Act*. Wildlife and Ecosystem Protection Branch. Accessed January 12, 2007. http://www.gov.mb.ca/conservation/wildlife/managing/sar_facts.html

Mantioba Conservation. 2008b. *The Wildlife Act*. C.C.S.M. c. W130. Accessed February 12, 2008. http://web2.gov.mb.ca/laws/statutes/ccsm/w130e.php.

Manitoba Conservation Data Centre. 2001. Lake Manitoba Plain- Species Information. Accessed January 12, 2007, and January 24, 2008. http://web2.gov.mb.ca/conservation/cdc/species/ecoregions/lakemb.php

Martin, S. G., and T. A. Gavin. 1995. Bobolink (*Dolichonyx oryzivorus*). *In* The Birds of North America, No. 176 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Matile, G.L.D. and G.R. Keller. 2004. Manitoba Geological Survey 2004. Map # NTS 62H. Manitoba Mineral Resource Division.

Metcalfe-Smith, Janice., Alistair MacKenzie, Ian Carmichael, & Daryl McGoldrick. 2005. Photo Field Guide to the Freshwater Mussels of Ontario. St. Thomas Field Naturalist Club Inc., St. Thomas, Ontario.

Ministry of Environment British Columbia. 1997. Version 1.1 Standardized inventory . methodologies for components of British Columbia's biodiversity: upland gamebirds. Retrieved online: http://ilmbwww.gov.bc.ca/risc/pubs/tebiodiv/gamebirds/gameml11.pdf

Natural Resources Canada. 2002. Centre for Topographic Information (Sherbrooke), National Topographic Data Base (NTDB) Vector Digital Data, Edition 3.1.

Natural Resources Canada. 2007. Online Mapping- Soil Capability for Agriculture. Accessed Jan. 21, 2007. http://geogratis.cgdi.gc.ca/CLI/frames.html

Ontario Ministry of Natural Resources. 2006. Wind Power and Bats: Bat Ecology Background Information and Literature Review of Impacts. December 2006. Fish and Wildlife Branch. Wildlife Section. Lands and Waters Branch. Renewable Energy Section. Peterborough, Ontario. 61 p.

OMNR (Ontario Ministry of Natural Resources). 2007 Guideline to Assist in the Review of Wind Power Proposals: Potential Impacts to Bats and Bat Habitats. Developmental Working Draft. August, 2007.

Preston, W.B. Amphibians and Reptiles of Manitoba. 1984. Manitoba Museum of Man and Nature, Winnipeg, Canada.

Schritt, A., D. Schritt, L. Blanchette, J.P. Goossen, and V. Goossen. 2007. The Pembina valley 2005 and 2006 Spring Raptor Migration. A Rocha Pembina Valley Biodiversity Report, Series No. 1.

Van Zyll de Jong, C.G. 1985. Handbook of Canadian Mammals. National Museum of Natural Sciences, National Museum of Canada, Ottawa, Canada.

Watkins, B. 2005. Cougars Confirmed in Manitoba. Wild Cat News. June Issue, pp. 6-8.

Watkins, B. 2008. Biodiversity Conservation Section, Wildlife and Ecosystem Protection Branch, Manitoba Conservation.

Wrigley, R.E., J.E. Dubois, and H.W.R. Copland. 1991. Distribution and Ecology of Six Rare Species of Prairie Rodents in Manitoba. The Canadian Field Naturalist. January- March 1991. Vol: 105: 1

APPENDIX I

Birds Observed in the Study Area and Data Collection Sheets

POINT COUNT

Station #: **Date:** **Project #:**

Length _____ Survey ☐ Breeding ☐ Migration ☐ Lek ☐ Daytime/ Raptor

Project St. Joseph Wind Farm DD/MM/YY _____

Start - End (24hr Clock) _____ Observers _____

Weather

Air Temp. _____ °C Wind Speed __ Wind Direction _____ (from)

Cloud Cover _____ % Cloud Height High ☐ Med ☐ Low ☐

Precipitation _____ Visibility High ☐ Med ☐ Low ☐

Station

Habitat

Elevation _____ ft / m Crop _____

Pressure _____ mb UTM _____

Turbine	yes	no	Rotation Speed	rpm
Operating	yes	no		

Behaviour should be recorded as: foraging, mobbing, migration, flying, perching, perched on ground, or swimming. Can also use to record breeding evidence

Height Category: 0=0-9m; 1=10-19m; 2=20-29m; 3 = 30-39m etc.

Wind speed (Beaufort): 0=calm; 1=smoke drifts; 2=wind felt on face; 3=leaves move; 4=sm.branches move; 5=sm.trees move; 6=lrg branches move; 7=lrg trees move; 8=twigs break off, hard to walk; 9=light structural damage; 10=trees uprooted

Station#: **Date:** **Project #: 745**

Species	Time	# of Indivuals	Behaviour	Passes	Height Category	Direction of Flight	Direction from Obs.	Distance from Obs.

									2007					2008
Group	Scientific Name	Common Name	GRANK	SRANK	COSEWIC	Nest Site	Habitat Preference	Overall Species List	Spring Migration	Fall Migration	Breeding Birds	Diurnal Raptor surveys	Lek Surveys	Spring Migration
		LOONS												
WB		Loon sp.						X						
		GREBES												
WB		Grebe sp.						X			X			
		PELICANS												
WBc	*Pelecanus erythrorhynchos*	American White Pelican	G3			C, GR	L, WT	X						X
		CORMORANTS												
WBc	*Phalacrocorax auritus*	Double-crested Cormorant	G5	S4B	NAR	C, GR, TR	L	X						
		HERONS & BITTERNS												
WBc	*Ardea herodias*	Great Blue Heron	G5			C, TR	SL	X		X	X			
		SWANS												
WF	*Cygnus columbianus*	Tundra Swan	G5			GR	L	X	X				X	X
		GEESE												
WF	*Chen caerulescens*	Snow Goose	G5			C, SH	L, WT, OP	X		X				X
WF	*Branta canadensis*	Canada Goose	G5			SH	GL	X	X	X	X	X	X	X
		DUCKS												
WF	*Anas platyrhynchos*	Mallard	G5			GR	SL, WT	X	X	X	X	X	X	X
WFg	*Anas discors*	Blue-winged Teal	G5			GR	SL, WT	X			X			
WFg	*Anas clypeata*	Northern Shoveler	G5					X						
WF	*Aix sponsa*	Wood Duck	G5					X						
WF		Duck sp.						X		X				
		HAWKS, KITES & EAGLES												
RA	*Haliaeetus leucocephalus*	Bald Eagle	G4		NAR	TR	L	X						
RAg*	*Circus cyaneus*	Northern Harrier	G5		NAR	GR	OP	X	X	X	X	X	X	X
RA	*Accipiter striatus*	Sharp-shinned Hawk	G5		NAR	TR	M, ED	X	X					
RAg	*Buteo jamaicensis*	Red-tailed Hawk	G5		NAR	TR	M, ED	X	X	X		X	X	
RA	*Buteo lagopus*	Rough-legged Hawk	G5		NAR	CL, TR, AN	OP	X						X
RA		Raptor Sp.						X	X	X		X		X
RA	*Buteo sp.*	Buteo Sp.						X		X				
		CARACARAS & FALCONS												
RA	*Falco columbarius*	Merlin	G5		NAR	TR, AN	OP, M, ED	X		X				
RAg	*Falco mexicanus*	Prairie Falcon	G5			CL	OP	X		X				
		PARTRIDGES, GROUSE & TURKEY												
LBg	*Perdix perdix*	Gray Partridge	G5					X			X			
		RAILS, GALLINULES & COOTS												
WB	*Fulica americana*	American Coot						X						

									2007					2008
Group	Scientific Name	Common Name	GRANK	SRANK	COSEWIC	Nest Site	Habitat Preference	Overall Species List	Spring Migration	Fall Migration	Breeding Birds	Diurnal Raptor surveys	Lek Surveys	Spring Migration
		CRANES												
WB	*Grus canadensis*	Sandhill Crane	G5		NAR	V	WT, OP	X	X	X				
		PLOVERS												
SB	*Pluvialis squatarola*	Black-bellied Plover	G5			GR	SH	X						
SB	*Charadrius vociferus*	Killdeer	G5			GR	OP	X	X	X	X	X	X	X
		SANDPIPERS & PHALAROPES												
SB	*Tringa melanoleuca*	Greater Yellowlegs	G5			GR	WT, SL, SH	X		X				
SB	*Tringa flavipes*	Lesser Yellowlegs	G5			GR	WT, SL, SH	X		X				
SB	*Actitis macularia*	Spotted Sandpiper	G5			GR	SH	X	X					
		GULLS												
WBc	*Larus delawarensis*	Ring-billed Gull	G5			C, GR	SH, L, OP	X	X					X
WBc		Gull sp.	GNR					X	X					X
		SKUAS, TERNS & SKIMMERS												
WBc	*Chlidonias niger*	Black Tern	G4		NAR	FL, V	WT	X	X					
		DOVES												
LB	*Columba livia*	Rock Pigeon	G5			B, CL	D	X		X	X	X		X
LB/LBg	*Zenaida macroura*	Mourning Dove	G5			TR	OP, ED	X	X	X	X	X	X	X
		WOODPECKERS												
LB	*Colaptes auratus*	Northern Flicker	G5			CA	OW	X	X	X				X
	Picoides villosus	Hairy Woodpecker	G5			CA	M, ED, B	X						X
		FLYCATCHERS												
LB	*Empidonax minimus*	Least Flycatcher	G5			TR	OW, SG	X			X			
LB	*Sayornis phoebe*	Eastern Phoebe	G5			B	SB	X			X			
LBg	*Tyrannus verticalis*	Western Kingbird	G5			TR	OP, SB	X	X					
LB	*Tyrannus tyrannus*	Eastern Kingbird	G5			TR	OP	X			X	X		
LB		Flycatcher sp.						X	X		X		X	
		LARKS												
LBg	*Eremophila alpestris*	Horned Lark	G5			GR	OP	X	X	X	X	X		X
		SWALLOWS												
LB	*Tachycineta bicolor*	Tree Swallow	G5			NB, CA	WT, L, WM	X			X			
LBg	*Hirundo rustica*	Barn Swallow	G5			B, CL	OP, WT, L	X	X	X	X	X		
LB	*Petrochelidon pyrrhonota*	Cliff Swallow	G5					X						
LB		Swallow sp.						X		X				
		CROWS & JAYS												
LB	*Cyanocitta cristata*	Blue Jay	G5			TR	M, ED	X	X		X			
LBg	*Pica pica*	Black-billed Magpie	G5			TR	SB, ED, OP	X						
LB	*Corvus brachyrhynchos*	American Crow	G5			TR	OP, M, ED, L, WM, SH	X	X	X	X	X		X
LB	*Corvus corax*	Common Raven	G5			TR, CL	OP, M, ED	X	X	X			X	X
LB	*Corvus sp.*	Corvid sp.						X		X				

									2007					2008
Group	Scientific Name	Common Name	GRANK	SRANK	COSEWIC	Nest Site	Habitat Preference	Overall Species List	Spring Migration	Fall Migration	Breeding Birds	Diurnal Raptor surveys	Lek Surveys	Spring Migration
		CHICKADEES												
LB	*Poecile atricapillus*	Black-capped Chickadee	G5			CA	M, ED, SG, SB	X		X		X		
		WRENS												
LB	*Troglodytes aedon*	House Wren	G5			CA	SB, OW, B	X						
		THRUSHES												
LB	*Turdus migratorius*	American Robin	G5			TR, BU	OW, OP, GL, SG	X			X	X	X	X
		MIMIDS												
LB	*Dumetella carolinensis*	Gray Catbird	G5			TR	SB, ED	X			X			
LB	*Toxostoma rufum*	Brown Thrasher	G5			TR	SB, ED, SG	X					X	
		STARLINGS												
LB	*Sturnus vulgaris*	European Starling	G5			CA, NB, B	D, OP	X	X	X	X			X
		VIREOS												
LB	*Vireo gilvis*	Warbling Vireo	G5			TR	OW, ED	X			X			
		WOOD WARBLERS												
LB	*Dendroica petechia*	Yellow Warbler	G5			TR	SB	X			X			
LB	*Dendroica coronata*	Yellow-rumped Warbler	G5			TR	OW, ED	X	X					
LB	*Mniotilta varia*	Black-and-white Warbler	G5					X						
LB	*Setophaga ruticilla*	American Redstart	G5			TR	OW, SG	X						
LB	*Wilsonia pusilla*	Wilson's Warbler	G5			GR	WT, SG	X						
LB		Warbler sp.						X		X	X			
		SPARROWS												
LB	*Spizella arborea*	American Tree Sparrow	G5			GR	SB, OP	X	X	X				
LB	*Spizella passerina*	Chipping Sparrow	G5			TR	SB, ED, OP	X	X				X	
LB	*Spizella pallida*	Clay-colored Sparrow	G5			TR	SB, OP	X			X	X	X	
LBg	*Pooecetes gramineus*	Vesper Sparrow	G5			GR	OP, ED	X	X	X	X	X	X	X
LBg*	*Passerculus sandwichensis*	Savannah Sparrow	G5			GR	OP, GL, WM	X	X	X	X	X	X	X
LB/LBg	*Melospiza melodia*	Song Sparrow	G5			GR, TR	SB, ED	X	X	X	X	X		
LB	*Calcarius lapponicus*	Lapland Longspur	G5			GR	OP	X	X					
LB	*Plectrophenax nivalis*	Snow Bunting	G5			CL, GR	OP	X	X	X				X
LB	*Zonotrichia leucophrys*	White-crowned Sparrow	G5					X						
LB	*Zonotrichia querula*	Harris's Sparrow	G5					X						
LB		Sparrow sp.						X	X			X	X	X
		BLACKBIRDS												
LBg*	*Dolichonyx oryzivorus*	Bobolink	G5			GR	GL, OP	X	X		X	X		
LBg	*Agelaius phoeniceus*	Red-winged Blackbird	G5			V	WT, OP	X	X	X	X	X	X	X
LBg*	*Sturnella neglecta*	Western Meadowlark	G5			GR	GL, OP	X	X	X	X	X	X	X
LBg	*Euphagus cyanocephalus*	Brewer's Blackbird	G5			GR, TR	OP, SB, WT	X	X		X	X	X	X
LB	*Quiscalus quiscula*	Common Grackle	G5			C, TR	OP, WT, OW	X	X		X	X	X	X
LBg	*Molothrus ater*	Brown-headed Cowbird	G5			P	OP	X	X		X	X	X	

									2007					2008
Group	**Scientific Name**	**Common Name**	**GRANK**	**SRANK**	**COSEWIC**	**Nest Site**	**Habitat Preference**	**Overall Species List**	**Spring Migration**	**Fall Migration**	**Breeding Birds**	**Diurnal Raptor surveys**	**Lek Surveys**	**Spring Migration**
LB		Blackbird sp.						X	X	X		X	X	X
		ORIOLES												
LB	*Icterus spurius*	Orchard Oriole	G5			TR	OP, OW	X						
LB	*Icterus galbula*	Baltimore Oriole	G5			TR	OP, OW	X			X			
LB		Oriole sp.						X			X			
		WINTER FINCHES												
LB	*Carduelis tristis*	American Goldfinch	G5			X	X	X	X	X	X	X	X	
		OLD WORLD SPARROWS												
LB	*Passer domesticus*	House Sparrow	G5					X						
LB		Unknown species							X	X				
		Passarine species							X	X				X

LEGEND

GROUP
WB non-colonial waterbird
WBc colonial waterbird
WF waterfowl
SB non-colonial shorebird
SBc colonial shorebird
RA raptor
O owl
LB landbird
g* grassland obligate
g grassland generalist

HABITAT PREFERENCE
B burntlands
D developed areas
ED edge, hedgerows, scattered trees
GL grassland
L lakes, ponds, calm water
M mature dense woodland
OP open field
OW open woodland
R rivers, streams, flowing water
SB shrubland, thickets
SG second growth, immature woods
SH shoreline
SL shallow water
WM wet meadows
WT wetlands - swamps, marshes, bogs, fens

NEST SITE
B building
BU burrow
C colonial
CA cavity
CL cliff ledge
FL floating
GR ground
NB nest boxes
P parasitic
PL platform
SH shoreline, close to water
TR tree
V in vegetation
AN abandoned nests

GRANK (Global Rank)
G5- Very Common
G4- Common
GNR- Globally Not Ranked

COSEWIC
NAR-Not at Risk

SRANK (Sub-national Rank)
S4B- Apparently Secure-Breeding

APPENDIX II

Breeding Bird Evidence Observations

Breeding Bird Evidence Observed in the Project Area							
				Highest Breeding Evidence			
Bird Group	Species Name	Total Individuals Observed in 100m	Percent of Total Observations	PO	PR	CO	Obs.
LB	American Crow	5	0.3	S			
LB	American Goldfinch	59	3.5		P		
LB	American Robin	9	0.5	S			
LB	Baltimore Oriole	3	0.2			CF	
LB	Barn Swallow	99	5.8		P		
LB	Blue Jay	1	0.1	S			
WFg	Blue-Winged Teal	1	0.1	H			
LB	Boblink	65	3.8		P		
LB	Brewer's Blackbird	111	6.5			CF	
LB	Brown-Headed Cowbird	213	12.6		P		
WF	Canada Goose	33	1.9				X
LB	Clay-Coloured Sparrow	14	0.8	S			
LB	Common Grackle	13	0.8			CF	
LB	Eastern Kingbird	17	1.0		P		
LB	Eastern Phoebe	2	0.1		P		
LB	European Starling	6	0.4	H			
LB	Flycatcher sp.	2	0.1	S			
LB	Gray Catbird	5	0.3	S			
LB	Gray Partridge	1	0.1	H			
WBc	Great Blue Heron	2	0.1				X
WB	Grebe sp.	1	0.1	H			
LB	Horned Lark	57	3.4	S			
SB	Killdeer	64	3.8			DD	
LB	Least Flycatcher	7	0.4	S			
WF	Mallard	51	3.0			NE	
LB	Mourning Dove	68	4.0	S			
RA	Northern Harrier	5	0.3	H			
LB	Oriole sp.	1	0.1	H			
LB	Red-Winged Blackbird	646	38.1		D		
LB	Rock Pigeon	20	1.2			AE	
LB	Savannah Sparrow	58	3.4			CF	
LB	Song Sparrow	9	0.5	S			
LB	Tree Swallow	2	0.1	H			
LB	Vesper Sparrow	3	0.2	H			
LB	Warbler sp.	1	0.1	S			
LB	Warbling Vireo	4	0.2	S			
LB	Western Meadowlark	27	1.6		P		
LB	Yellow Warbler	8	0.5	S			

Legend

Breeding Evidence Codes

Observed

X- No evidence of Breeding

PO-Possible

H- Suitable nesting habitat

S- Singing Male

PR- Probable

P- Pair

D- Courtship or display

CO-Confirmed

DD- Distraction display

CF- Carrying food

AE- Adults at Occupied Nest

NE- Nest containing eggs

APPENDIX III

Mammals with Range Maps that Overlap with the Study Area

Mammals with Range Maps Overlapping with the Study Area

Scientific Name	Common Name	NRSI Observations	GRANK	SRANK	COSEWIC
Taxidea taxus	American Badger		G5		NAR
Bison bison bison	Plains Bison		G4		THR
Sorex arcticus	Black-backed Shrew		G5		
Lynx rufus	Bobcat		G5		
Canis latrans	Coyote	X	G5		
Peromyscus maniculatus	Deer Mouse		G5		
Tamias striatus	Eastern Chipmunk		G5		
Sylvilagus floridanus	Eastern Cottontail		G5		
Felis concolor couguar	Eastern Cougar*		G5		DD
Cervus elaphus	Eastern Elk (Wapiti)		G5		
Mustela erminea	Ermine		G5		
Sciurus niger	Fox Squirrel		G5		NAR
Sciurus carolinensis	Gray Squirrel Black Phase		G5		
Sciurus carolinensis	Gray Squirrel Gray Phase		G5		
Urocyon cinereoargenteus	Gray Fox**		G5		THR
Tamias mimumus	Least Chipmunk		G5		
Mustela nivalis	Least Weasel		G5		
Mustela frenata	Long-tailed Weasel		G5		
Zapus hudsonius	Meadow Jumping Mouse		G5		
Microtus pennsylvanicus	Meadow Vole		G5		
Mustela vison	Mink		G5		
Ondatra zibethicus	Muskrat		G5		
Canis lupus lycaon	Eastern Wolf**		G4		SC
Thomomys talpoides	Northern Pocket Gopher	X	?		NAR
Blarina brevicauda	Northern Short-tailed Shrew		G5		
Geomys bursarius	Plains Pocket Gopher	?	?	S3	
Erethizon dorsatum	Porcupine		G5		
Microtus ochrogaster	Prarie Vole		?		
Sorex hoyi	Pygmy Shrew		G5		
Procyon lotor	Raccoon	X	G5		
Vulpes vulpes	Red Fox	X	G5		
Tamiasciurus hudsonicus	Red Squirrel		G5		
Spermophilus richardsonii	Richardson's Ground Squirrel		?		
Lepus americanus	Snowshoe Hare		G5		
Clethrionomys gapperi	Southern Red-backed Vole		G5		
Mephitis mephitis	Striped Skunk		G5		
Spermophilus tridecimlineatus	Thirteen-lined Ground Squirrel	X	G5		
Odocoileus virginianus	White-tailed Deer	X	G5		
Lepus townsendii	White-tailed Jackrabbit	X	G5		
Marmota monax	Woodchuck		G5		

Note: Reference Banfield (1981) unless otherwise indicated with an astrix
*Watkins 2005
** Environment Canada 2006

LEGEND

Srank	**COSEWIC Designations**
3- Uncommon	NAR- Not at Risk
	SC- Special Concern
G-Rank (Global Rank)	DD-Data Deficient
G4-Common	
G5-Very Secure	?-Unknown

APPENDIX IV

Herpetofauna with Range Maps that Overlap with the Study Area and Data Collection Sheets

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

RIM PARK

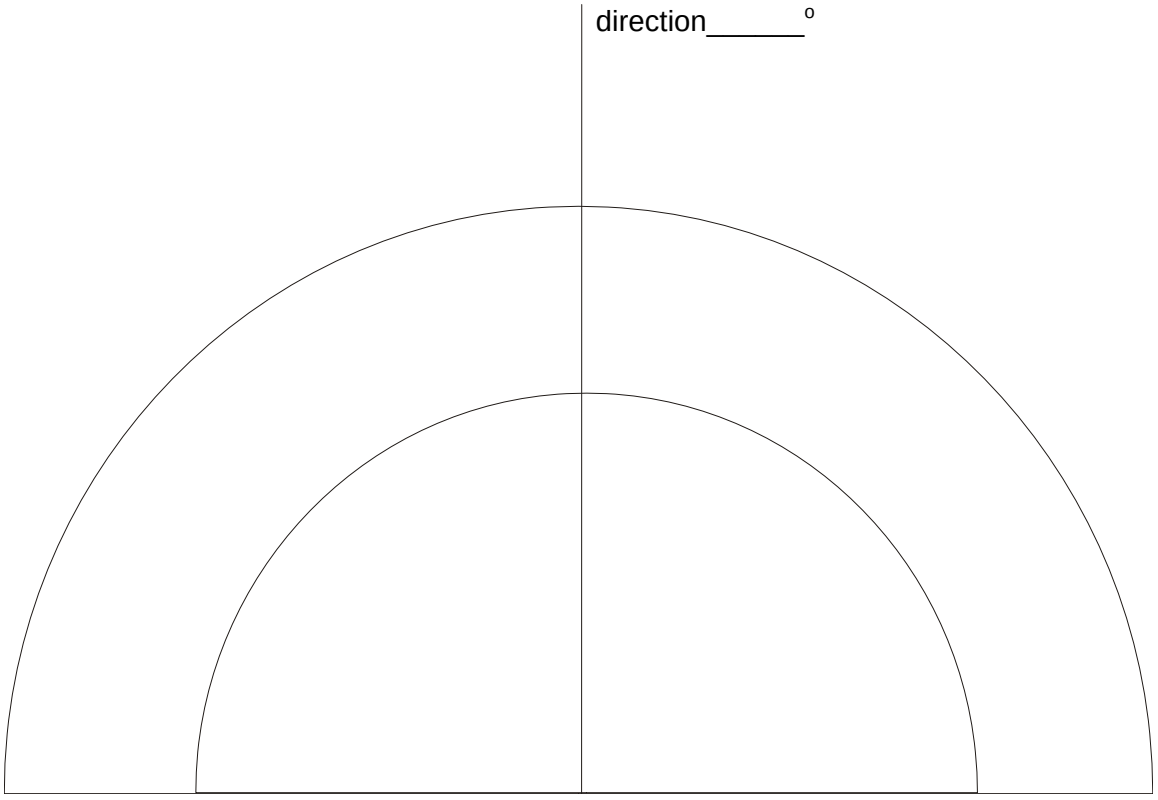
Amphibian Data Form

Observer:	Station Name: Visit #:		Date: Start time:	
Approx. wind speed:	% Cloud cover:	Air Temp:	Water Temp:	Water pH:
Precipitation Description:				
Construction Description:				
Remarks:				

CALL LEVEL CODES	
1	Calls can be counted; not simultaneous.
2	Some simultaneous calls; yet distinguishable
3	Calls not distinguishable Individually; overlapping

Beaufort

0	0-2	Calm
1	3 to 5	Light air movement
2	6 to 11	Slight Breeze
3	12 to 19	Gentle breeze
4*	20-30	Moderate breeze
5*	31-39	Fresh breeze
6*	40-50	Strong breeze



50 Westmount Rd. N., Unit 230, Waterloo, Ontario, N2L 2R5 Tel: (519) 725-2227 Fax: (519) 725-2575 Web: www.nrsi.on.ca

Reptiles and Amphibians with Range Maps that Overlap with the Study Area

SCIENTIFIC NAME	COMMON NAME	Observed by NRSI	GRANK	SRANK	COSEWIC
Turtles					
Chelydra serpentina serpentina	Common Snapping Turtle		G5T5		
Snakes					
Opheodrys vernalis	Smooth Greensnake		G5	S3S4	
Thamnophis sirtalis parientalis	Red-sided Gartersnake		G5T?		
Salamanders					
Ambystoma tigrinum	Tiger Salamander		G5		NAR
Ambystoma tigrinum diaboli	Gray Tiger Salamander		?		
Toads and Frogs					
Bufo americanus	American Toad	X	G5		
Bufo hemiophrys	Canadian Toad	X			NAR
Hyla chrysoscelis	Cope's Gray Treefrog		G5		NAR
Pseudacris maculata	Boreal Chorus Frog	X	G5		
Rana pipiens	Northern Leopard Frog	X	G5		SC
Rana sylvatica	Wood Frog	X	G5		

Legend

GRANK (Global Rank)
G5- Very Common

COSEWIC
NAR-Not at Risk
SC-Special Concern

APPENDIX V

Fish Species from Collection Records for the Red River

Fish Species Records for the Red River Near the Project Area

Common Name	Scientific Name
banded killifish	*Fundulus diaphanus*
bigmouth buffalo	*Ictiobus cyprinellus*
bigmouth shiner	*Notropis dorsalis*
black bullhead	*Ameiurus melas*
black crappie	*Pomoxis nigromaculatus*
blackchin shiner	*Notropis heterodon*
blacknose dace	*Rhinichthys obtusus*
blacknose shiner	*Notropis heterolepis*
blackside darter	*Percina maculate*
bluntnose minnow	*Pimephales notatus*
brassy minnow	*Hybognathus hankinsoni*
brook stickleback	*Culaea inconstans*
brown bullhead	*Ameiurus nebulosus*
burbot	*Lota lota*
(carp species)	
central mudminnow	*Umbra limi*
channel catfish	*Ictalurus punctatus*
chestnut lamprey	*Ichthyomyzon castaneus*
(cisco species)	
common shiner	*Luxilus cornutus*
creek chub	*Semotilus atromaculatus*
emerald shiner	*Notropis atherinoides*
fathead minnow	*Pimephales promelas*
flathead chub	*Platygobio gracilis*
freshwater drum	*Aplodinotus grunniens*
golden shiner	*Notemigonus chrysoleucas*
goldeye	*Hiodon alosoides*
hornyhead chub	*Nocomis biguttatus*
iowa darter	*Etheostoma exile*
johnny darter	*Etheostoma nigrum*
lake chub	*Couesius plumbeus*
lake whitefish	*Coregonus clupeaformis*
logperch	*Percina caprodes*
longnose dace	*Rhinichthys Cataractae*
longnose sucker	*Catostomus Catostomus*
mimic shiner	*Notropis volucellus*
ninespine stickleback	*Pungitius pungitius*
northern pike	*Esox lucius*
pearl dace	*Margariscus margarita*
quillback	*Carpiodes cyprinus*
river darter	*Percina shumardi*
river shiner	*Notropis blennius*
rock bass	*Ambloplites rupestris*
rosyface shiner	*Notropis rubellus*
sand shiner	*Notropis stramineus*
sauger	*Sander Canadensis*
shorthead redhorse	*Moxostoma macrolepidotum*
silver chub	*Macrhybopsis storeriana*
silver lamprey	*Ichthyomyzon unicuspis*
silver redhorse	*Moxostoma anisurum*
spottail shiner	*Notropis hudsonius*
stonecat	*Noturus flavus*
tadpole madtom	*Noturus gyrinus*
trout perch	*Percopsis omiscomaycus*
walleye	*Sander vitreus*
white bass	*Morone chrysops*
white sucker	*Catostomus commersoni*
yellow perch	*Perca flavescens*