February 2017

Lake St. Martin Outlet Channel Options: Wildlife Technical Report

Prepared for:
M. Forster Enterprises

For Submission to:
Manitoba Infrastructure

Prepared by:
EcoLogic Environmental Inc.
Wildlife, Aquatic & Geomatics Consulting

TABLE OF CONTENTS

1 INTRODUCTION 1

2 BACKGROUND 1

3 ABORIGINAL TRADITIONAL KNOWLEDGE 3

4 STUDY OBJECTIVES 3

5 METHODS 3

5.1 Desktop Studies and Analysis 3
5.2 Field Studies 5

6 STUDY AREA 5

6.1 Spatial Boundaries 5
6.2 Environmental Setting 7
6.2.1 Gypsumville Ecodistrict (720) 8
6.2.2 Ashern Ecodistrict (723) 8
6.2.3 Sturgeon Bay Ecodistrict (676) 9
6.2.4 Surficial Geology and Physiographic Setting 9
6.2.5 Forest Cover and Vegetation 10
6.2.6 Fire History 11
6.2.7 Wildlife and Habitat 11
6.2.8 Species at Risk and Species of Special Interest 15

7 KEY SPECIES FOR ANALYSIS 16

8 LAND AND RESOURCE USE 19

8.1 Forestry 19
8.2 Hydroelectric Transmission Development 19
8.3 Lodges and Outfitters 19
8.4 Quarries and Mining 19
8.5 Recreational Use Areas 20
8.6 Hunting 20
8.7 Trapping 21

9 BASELINE WILDLIFE DATA COLLECTION AND ANALYSIS 23

9.1 LCC – Habitat Evaluation Methods 24
9.1.1 Methods 24
9.1.2 Results 24
9.2 Moose 26
9.2.1 Aerial Moose Distribution Survey Conducted by MBSD Methods 27
9.2.2 Aerial Moose Distribution Survey Conducted by MBSD Results 28
9.2.3 Aerial Moose Distribution Survey Conducted by MI Methods 28
9.2.4 Aerial Moose Distribution Survey Conducted by MI Results 29
9.2.5 Moose Track and Sign Survey Methods 29

9.2.6 Moose Track and Sign Survey Results 30
9.2.1 Fire History 30
9.2.2 Moose Habitat Modelling Methods 31
9.2.3 Moose Habitat Modelling Results 31
9.2.4 Linear Density 33
9.3 Elk 34
9.3.1 Aerial Elk Distribution Survey Conducted by MBSD Methods 35
9.3.2 Aerial Elk Distribution Survey Conducted by MBSD Results 35
9.3.1 Aerial Elk Distribution Survey Conducted by MI Methods 35
9.3.2 Aerial Elk Distribution Survey Conducted by MI Results 36
9.3.3 Elk Track and Sign Survey Methods 36
9.3.4 Elk Track and Sign Survey Results 36
9.3.5 Elk Habitat Modelling Methods 36
9.3.6 Elk Habitat Modelling Results 37
9.4 White-Tailed Deer 37
9.4.1 Aerial White-Tailed Deer Distribution Survey Methods 38
9.4.2 Aerial White-Tailed Deer Distribution Survey Results 38
9.4.3 White-Tailed Deer Track and Sign Survey Methods 38
9.4.4 White-Tailed Deer Track and Sign Survey Results 38
9.5 Furbearers 39
9.5.1 Furbearers Winter Aerial Survey Methods 40
9.5.2 Furbearers Winter Aerial Survey Results 40
9.5.3 Furbearer Track and Sign Survey Methods 40
9.5.4 Furbearer Track and Sign Survey Results 41
9.5.5 Furbearer Habitat Modeling Methods 42
9.5.6 Furbearer Habitat Modeling Results 43
9.6 Bats 44
9.6.1 Elevation Assessment 49
9.7 Avian Species 50
9.7.1 Avian Species Habitat Modeling Methods 51
9.7.2 Avian Species Habitat Modeling Results 51
9.7.3 Manitoba Breeding Bird Atlas Surveys 72
9.7.1 Raptor Nest and Heron Rookery Search Methods 75
9.7.2 Raptor Nest and Heron Rookery Search Results 75
9.7.3 Pedestrian Bird Nest Search Methods 77
9.7.4 Pedestrian Bird Nest Search Results 77
9.7.1 Songbird and Waterbird Point Count Survey Methods 77
9.7.2 Songbird and Waterbird Point Count Survey Results 78
9.8 Reptiles and Amphibians 80
9.8.1 Amphibian Point Count Survey Methods 80
9.8.2 Amphibian Point Count Survey Results 81
9.8.3 Reptile Hibernacula Survey Methods 81
9.8.4 Reptile Hibernacula Survey Results 82

9.9 Ecologically Sensitive Sites 82

10 SUMMARY 86

11 REFERENCES 88

FIGURES

Figure 1: Fire History within the RSA 31

TABLES

Table 1: Summary of Key Species Selection and Rationale 17
Table 2: Trapper Permits issued by year for the Gypsumville RTL Block 22
Table 3: Annual number of animals trapped along the Gypsumville RTL Block from 1996 to 2012 23
Table 4: LCC Covertypes within the RSA and LSA 25
Table 5: LCC Covertype Loss/Alteration associated with the Reach 1, Reach 2, Reach 3 Johnson Beach, and Reach 3 Willow Point Project Alignments 25
Table 6: MBSD Aerial Moose Survey Results within GHA 21, 1992, 1995 and 2008 28
Table 7: Aerial Moose Distribution Survey Results within the RSA 29
Table 8: Moose Track and Sign Survey Results 30
Table 9: Potential Moose Summer Habitat within the RSA and the Amount of Potential Moose Summer Habitat Loss Associated with the Project Reach Features 32
Table 10: Potential Moose Winter Habitat within the RSA and the Amount of Potential Moose Summer Habitat Loss Associated with the Project Reach Features 32
Table 11: Baseline Linear Density within the RSA and LSA 33
Table 12: Comparison of Linear Density within the RSA and LSA including Future Project Development Routes 34
Table 13: MBSD Aerial Elk Survey Results, 2000, 2006 and 2013 35
Table 14: Aerial Elk Distribution Survey Results within the RSA 36
Table 15: Potential Elk Habitat within the RSA and the amount of Elk Habitat Loss associated with each LSMOC 37
Table 16: Aerial WTD Distribution Survey Results within the RSA 38
Table 17: White-tailed Deer Activcity Identified along LSMOC RoWs (Reach 1, Reach 2, Reach 3 Johnson Beach, and Reach 3 Willow Point) 39
Table 18: Aerial Furbearer Distribution Survey Results within the RSA 40
Table 19: Furbearer Track and Sign Survey Results 41
Table 20: Predator Activity identified during Ground Surveys 42

Table 21: Potential American beaver Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with the Project Reach Features 43
Table 22: Potential American beaver Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with the Project Linear Features 43
Table 23: Potential American marten Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with the Project Reach Features 44
Table 24: Potential American marten Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with the Project Reach Features 44
Table 25: Potential Hibernacula as well as Potential Large Mammals Dens Identified during Winter Aerial Survey Work 45
Table 26: Potentially Active Bat Hibernacula Identified during Field Investigations 45
Table 27: Elevation of Project Features within the LSA 49
Table 28: Potential American White Pelican Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 52
Table 29: Potential American White Pelican Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with the LSMOCs 52
Table 30: Potential Bank Swallow Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 53
Table 31: Potential Bank Swallow Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 53
Table 32: Potential Barn Swallow Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 54
Table 33: Potential Barn Swallow Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 54
Table 34: Potential Black-Crowned Night-Heron Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 55
Table 35: Potential Black-Crowned Night-Heron Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration with LSMOCs 55
Table 36: Potential Bobolink Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 56
Table 37: Potential Bobolink Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 56
Table 38: Potential Canada Warbler Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 57
Table 39: Potential Canada Warbler Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 57
Table 40: Potential Caspian Tern Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 58
Table 41: Potential Caspian Tern Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 58

Table 42: Potential Common Nighthawk Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 59
Table 43: Potential Common Nighthawk Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 60
Table 44: Potential Eastern Whip-Poor-Will Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 60
Table 45: Potential Eastern Whip-Poor-Will Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 61
Table 46: Potential Eastern Wood-Pewee Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 61
Table 47: Potential Eastern Wood-Pewee Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 62
Table 48: Potential Golden-Winged Warbler Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 62
Table 49: Potential Golden-Winged Warbler Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 63
Table 50: Potential Horned Grebe Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 63
Table 51: Potential Horned Grebe Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 64
Table 52: Potential Least Bittern Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 64
Table 53: Potential Least Bittern Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 65
Table 54: Potential Olive-Sided Flycatcher Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 65
Table 55: Potential Olive-Sided Flycatcher Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 66
Table 56: Potential Peregrine Falcon Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 67
Table 57: Potential Peregrine Falcon Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 67
Table 58: Potential Piping Plover Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 67
Table 59: Potential Piping Plover Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 68
Table 60: Potential Red-Headed Woodpecker Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 68
Table 61: Potential Red-Headed Woodpecker Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 69

Table 62: Potential Short-Eared Owl Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 70
Table 63: Potential Short-Eared Owl Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 70
Table 64: Potential Trumpeter Swan Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 71
Table 65: Potential Trumpeter Swan Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 71
Table 66: Potential Yellow Rail Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 72
Table 67: Potential Yellow Rail Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs 72
Table 68: MB Breeding Bird Survey Results for Avian Species at Risk (Table data corresponds with Map 42) 73
Table 69: Raptor and Bird Nest Search Results 76
Table 70: Avian Listed Species Identified within the LSA 78
Table 71: Piping Plover Survey Results 79
Table 72: Amphibian Point Count Survey Results 81
Table 73: Reptile Hibernacula Survey Results 82
Table 74: Ecologically Sensitive Site - Heron Rookery Location 83
Table 75: Ecologically Sensitive Sites Identified within the LSA and RSA 85

APPENDICES

Appendix A: Known Mammals for the Interlake Plain and Mid-Boreal Lowland Ecoregions 94
Appendix B: Known Amphibians and Reptiles for the Interlake Plain and Mid-Boreal Ecoregions 96
Appendix C: Known Birds for the Interlake Plain and Mid-Boreal Lowland Ecoregion 97
Appendix D: Avian Species at Risk Federal Recovery Documents 105
Appendix E: Song Bird and Water Bird Survey Results within the LSMOC LSA 110
Appendix F: Report Mapping 123

REPORT MAPPING

Map 1: Study Areas
Map 2: Ecoregions within the LSA and RSA
Map 3: Soil Classification within the LSA and RSA
Map 4: Land Cover Classificatoin (LCC) within the LSA and RSA
Map 5: Fire History within the LSA and RSA

Map 7: Forest Management Units (FMUs) within the LSA and RSA
Map 8: Hydroelectric Development within the LSA and RSA
Map 9: Lodge and Outfitters within the LSA and RSA
Map 10: Quaries and Mineral Exploration within the LSA and RSA
Map 11: Trails and Campgrounds within the LSA and RSA
Map 12: Game Hunting Areas (GHAs) within the LSA and RSA
Map 13: Registered Traplines (RTLs) within the LSA and RSA
Map 14: Manitoba Sustainable Deveolopment (MBSD) Aerial Moose Survey Area
Map 16: Manitoba Infrastructure 2016 Winter Aerial Moose Survey Area
Map 17: Manitoba Infrastructure 2016 Winter Aerial Moose Survey Results
Map18: Moose Track and Sign Survey Transects
Map 19: Modeled Moose Summer Habitat
Map 20: Modeled Moose Winter Habitat
Map 21: Manitoba Sustainable Deveolopment (MBSD) Aerial Elk Survey Area
Map 23: Manitoba Infrastructure 2016 Winter Aerial Elk Survey Area
Map 24: Manitoba Infrastructure 2016 Winter Aerial Elk Survey Results
Map 25: Elk Track and Sign Survey Transects
Map 26: Modeled Elk Habitat
Map 27: White-tailed Deer Survey Results
Map 28: Beaver Aerial Survey Results
Map 29: Marten Aerial Survey Results
Map 30: Otter Aerial Survey Results
Map 31: Hare Aerial Survey Results
Map 32: Lynx Aerial Survey Results
Map 33: Coyote Aerial Survey Results
Map 34: Furbearer Track and Sign Survey Transects
Map 35: Modeled Beaver Habitat
Map 36: Modeled Marten Habitat
Map 38: Bat Recorder Deployment Locations along the Proposed ASR
Map 41: Manitoba Breeding Bird Atlas (MBBA) Survey Grid
Map 42: Manitoba Breeding Bird Atlas (MBBA) Survey Results
Map 43: Raptor Nests Identified within the LSA
Map 44: Avian Point Count Locations within the LSA
Map 45: Point Count and Incidental Bird Observations within the LSA
Map 46: Point Count and Incidental Ampibian Observations within the LSA
Map 49: LSMOC Options 1 to 4

GLOSSARY OF TERMS

Alluvial* - Loose soil or sediment that is eroded, deposited, and reshaped by water.

Brunisols - Soil formed under forest and is bRoWn in color and may have either clay or aluminum and iron compounds, or both.

Calcareous – Soil containing sufficient calcium carbonate (or magnesium carbonate) to effervesce visibly when treated with hydrochloric acid.

Chernozems – Well to imperfectly drained soil with dark surface horizons comprised of decomposed organic matter from grassland or grassland-forest communities.

Dolomite - Sedimentary carbonate rock, which is composed predominantly of the mineral dolomite (calcium magnesium carbonate).

Ericaceous* – Plants in or related to the heather family (Ericaceae), typically found on acid soils.

Fibrosol - Organic soil contains mostly un-decomposed fibric organic material and occurs in peat deposits of Sphagnum mosses.

Glacial Till – unstraitified glacial deposits consisting of clay, sand, gravel, and boulders intermingled in any proposition.

Glaciolacustrine* – Pertaining to glacial lakes.

Gleysol - Soil developed under wet conditions and has a layer of mixed peat or a layer of fibric moss peat on the surface.

Luvisol - Well to imperfectly drained soil in sandy to loamy sites with a layer of silicate clay and are the base saturated parent material under forest vegetation.

Mesic - Organic material in an intermediate stage of decomposition with fibers present that can be identified to their botanical origin.

Mesisol – Organic soil found in peatlands at an intermediate stage of decomposition.

Organic Cryosol – Developed primarily from organic material and are underlain by permafrost within 1 m of the surface.

Physiography* – Pertains to the factors that influence the development of landforms or a landscape, such as relief and topography, bedrock geology and structure, and geomorphological history.

Surficial geology* – The geology of surficial materials.

*All definitions have been described in Dunster and Dunster (1996), the remainder as described in Smith et al. (1998).

1 INTRODUCTION

Manitoba Infrastructure (MI) is currently developing options to address ongoing flood issues in the Assiniboine River and Lake Manitoba watershed basins. As part of this endeavour, MI initiated the Assiniboine River & Lake Manitoba Basins Flood Mitigation Study. This study, which was completed in 2011, included several components. In particular, the "Assiniboine River & Lake Manitoba Basins Flood Mitigation Study Lake Manitoba & Lake St. Martin Outlet Channels Conceptual Design - Stage 1 - Deliverable No: LMB-01" (KGS Group 2014) and the "Assiniboine River & Lake Manitoba Basins - Flood Mitigation Study LMB & LSM Outlet Channels Conceptual Design - Stage 2" (KGS Group 2016) were key to identifying future flood protection initiatives for the Assiniboine River and Lake Manitoba watershed basins.

The Stage 1 and Stage 2 Conceptual Designs prepared by KGS and MI included the three following components:

- further development of the Lake St. Martin Outlet Channel (LSMOC), which involves development of a channel in the area referred to as Reach 2 and completion of the channel referred to as Reach 3;
- construction and operation of a new channel from Lake Manitoba (LM) to Lake St. Martin (LSM) to increase flow capacity and expedite movement of flood waters between these waterbodies; and
- construction and operation of an All Season Road (ASR) in the area of the Lake St. Martin Outlet Channels to facilitate year-round vehicle, crew and equipment access to the Lake St. Martin Outlet Channels.

These three main components formed the overall MI Lake Manitoba and Lake St. Martin Access Road and Outlet Channels Project (the Project) at the time of this writing.

This Wildlife Technical Report outlines the desktop review, field studies, and associated analysis conducted to describe existing environmental (baseline) conditions specific to wildlife populations and their habitat near the Lake St. Martin Outlet Channel (LSMOC) project components.

2 BACKGROUND

The following background information was obtained from the "*Assiniboine River & Lake Manitoba Basins - Flood Mitigation Study LMB & LSM Outlet Channels Conceptual Design - Stage 2*" (KGS Group 2016) and personal communications with MI.

The LSMOC extends approximately 27 km from LSM to Lake Winnipeg and consists of three linear sections referred to as reaches. The first reach (Reach 1) extends approximately 8 km from LSM to Big Buffalo Lake. The Reach 1 emergency outlet channel was constructed in 2011 in response to high water levels on LM and LSM. The existing LSMOC Reach 1 is about 6 km long, extending from LSM to the fen habitat surrounding Big Buffalo Lake. The proposed permanent

LSMOC Reach 1 outlet channel would consist of upgrading the existing emergency outlet channel to a permanent status with additional capacity to provide a net increase in flow to LSM above the base condition of the existing Reach 1 channel. The proposed works would consist of widening the existing channel and extending it by about 2 km downstream to Big Buffalo Lake. A control structure would be constructed at the inlet of Reach 1 that would also act as a bridge to provide vehicle access to the north west side of the channel.

The second reach (Reach 2) extends approximately 8.6 km from Big Buffalo Lake and the outlet of Reach 1 to the Inlet of Reach 3. The first half of Reach 2 is located within the fen habitat that surrounds Big Buffalo Lake, which becomes inundated with operation of the LSM outlet channel. Water then follows the natural drainage path into Big Buffalo Creek up to its diversion point into Reach 3.

Several options have been proposed for Reach 2. One option included the construction of a dike only, without the need for deepening or widening the existing natural channel. The proposed alignment of the Reach 2 dike would extend approximately 8 km and follow the high ground north of the fen area that surrounds Buffalo Lake and west of Big Buffalo Creek. The purpose of the dike would be to contain the inundation within the fen area and the flow within Buffalo Creek.

During meetings and discussions with MI in April 2016, MI indicated that the Reach 2 alignment and dike options described for the original September 2015 assignment were being revisited. Three other channel alignment and/or dike options were being investigated, in addition to the Reach 2 dike option. The Reach 2 dike was referred to as Option 1, and the additional alignments were referred to as Option 2, Option 3 and Option 4. The three new options were added to examine other routes that could be used to manage flows from LSM to Lake Winnipeg, and included the construction of a new emergency channel to the east of the existing Reach 1 channel, which would tie into Reach 3 at Big Buffalo Creek. Other than the proposed lengths and locations, there were no other data available for the additional conceptual options at the time of this writing. As such, any analyses that required spatial data for the proposed option could not be conducted for the three new conceptual options.

The third reach (Reach 3) extends approximately 10 km from Big Buffalo Creek to Lake Winnipeg. The Reach 3 Emergency Channel was partially constructed in 2012 to divert flows away from the Dauphin River. However, due to extremely mild winter conditions, operation of the Reach 3 channel was not required; therefore, this channel currently remains in an incomplete condition. The existing Reach 3 Emergency Channel starts at Buffalo Creek and extends about 6 km, exiting into a forested and bog area where the land slopes downwards to Lake Winnipeg.

The completion of the Reach 3 channel would require deepening, widening and lengthening of the existing incomplete channel. There were two alignment options proposed to lengthen Reach 3 to Lake Winnipeg: extending the existing channel straight to Johnson Beach, or extending the

existing channel to the east side of Willow Point. Map 1 provides an overview of the Project components and Map 49 provides an illustration of the location of the conceptual Options 1 to 4.

3 ABORIGINAL TRADITIONAL KNOWLEDGE

It is recognized that there are many wildlife species and areas of cultural significance to many First Nations peoples, and that these wildlife and areas of significance will vary by the practices of each First Nation, and their gathering locations. It is recognized that First Nations people have a special relationship with the earth and all living things in it. This relationship is based on a profound spiritual connection to the environment that guided indigenous peoples to practice reverence, humility and reciprocity. First Nations people have relied on many species of wildlife for subsistence needs and cultural values that extend back thousands of years. In regard to the collection and use of Aboriginal Traditional Knowledge (ATK) for the baseline investigations, MI and First Nations consultations were ongoing at the time of this writing, and ATK for wildlife and areas of cultural significance in the Project Study Area had yet to be compiled.

4 STUDY OBJECTIVES

The wildlife baseline desktop and field studies were conducted to:

1) gather and assess data derived from past studies conducted in the vicinity of the Project to provide historical mammal, avian, reptile, and amphibian distribution data;

2) determine mammal, avian, reptile, and amphibian habitat availability near, and potentially affected by, the Project;

3) gather and assess current mammal, avian, reptile, and amphibian distribution data and habitat use near the Project;

4) assess for the presence of invasive species (example: white-tailed deer);

5) determine the presence of Species At Risk and their habitat use in vicinity to the Project; and

6) inventory the presence and location of Ecologically Sensitive Sites in vicinity to the Project.

5 METHODS

5.1 Desktop Studies and Analysis

Historical and current wildlife (mammalian, avian, reptile, and amphibian) distribution data were obtained from Manitoba Sustainable Development (MBSD), the Manitoba Herps Atlas, Important Bird Area (IBA) databases, the Manitoba Breeding Bird Atlas, and through field studies. Spatial layers utilized for analysis include but are not limited to; the National Road Network (NRN), National Hydro Network (NHN), Forest Resource Inventory (FRI), and the Canadian Soil Info

Services (CanSIS). These layers were acquired through the publicly available Manitoba Lands Initiative (MLI) website. For additional habitat analysis, the Land Cover Classification of Canada (LCC) was obtained from the Geobase online data ware house. All spatial layers, other than the project features were obtained from publicly available data sources. Information collected was utilized for:

- The selection of spatial boundaries and selection of key species;
- Detailed listing of all wildlife species near the Project using available Provincial databases;
- Detailed literature reviews of life cycle and habitat requirements for key species;
- Review of species listings; Manitoba Endangered Species and Ecosystems Act (MESEA), Federal Species at Risk Act (SARA), Committee on the Status of Endangered Wildlife In Canada (COSEWIC) and the Manitoba Conservation Data Center (MBCD) listing of species of conservation concern;
- Produce a spatial database of known locations for species at risk;
- Historical fire analysis;
- Habitat mapping and spatial analysis using Land Cover Classification (LCC) for key species;
- Habitat modelling to identify potential habitat availability for key species and to guide field methods;
- Linear density analysis;
- Review of Provincial historical records of wildlife distributions within the Project study areas;
- Interviews with Resource Managers, Species Specialists (example: Dr. Craig Willis – Bat Specialist), and other information holders for important presence and absence information on key species; and
- Data collation with the development of a GIS database through acquisition of existing and available information. All spatial analysis and GIS data is compatible with ArcGIS 10.3. This database includes but is not limited to the following:
    - LCC;
    - Anthropogenic development inventories (nearby roads, transmission lines, communities);

- Elevation data; and
- Known wildlife distribution (terrestrial and aquatic wildlife include large mammals as well as small furbearers, avian (birds, bats), reptiles (snakes), and amphibian).

A detailed description of each of the desk top methods executed is provided within the related sections of this Terrestrial Wildlife Technical Report.

5.2 Field Studies

Geospatial habitat modelling and species locational information were used to plan for field studies. Numerous field studies were conducted, each a with specific method design, which are described in detail within the related section of this Terrestrial Wildlife Technical Report. The following is a list of the field studies conducted:

- Aerial moose (*Alces alces*), elk (*Cervus elaphus manitobensis*), and white-tailed deer survey (*Odocoileus virginianus*);
- Aerial multispecies survey;
- Aerial shoreline survey (piping plover survey);
- Avian Point Count survey;
- Bird nest (egg) searches;
- Raptor nest and heron rookery survey;
- Amphibian Point Count survey;
- Reptile Hibernacula survey;
- Bat Hibernacula survey; and
- Ecologically Sensitive Site investigations (mammal dens, mineral licks etc.).

The data gathered from these surveys were used to validate the habitat modelling conducted and were analyzed to provide a better understanding of existing environmental conditions specific to wildlife near the Project prior to construction.

6 STUDY AREA

6.1 Spatial Boundaries

Given that the information collected for the baseline studies will be used in the environmental assessment for the Project, the study design for the wildlife studies included the establishment of appropriate study area spatial boundaries. For the purposes of environmental assessment, the

spatial boundaries for a project are typically described for three spatial scales: a Project Footprint (PF), a Local Study Area (LSA) and a Regional Study Area (RSA). The PF is the physical space or directly affected area on which the Project components or activities are located; the LSA is the area beyond the Project footprint in which Project effects are measurable; and the RSA is the area beyond the LSA within which most indirect and cumulative effects would occur (CEAA 2015).

The conceptual design information provided in KGS Group (2016) indicated the following dimensions for the LSMOC channel options:

- Reach 1: length of about 6 km and Right of Way (RoW) width of 300 m;
- Reach 2 berm: length of about 8.6 km and RoW width of 500m;
- Reach 3 - Johnson Beach Option: length of about 9.7 km and RoW width of 200 m; and
- Reach 3 - Willow Point Option: length of about 10.6 km and RoW width of 275 m.

As such, the PF area for the LSMOC options was designated as the area encompassed by the total length of each of the LSMOC options and the total width of each of the LSMOC options, including the RoW.

As noted above in Section 4, a desktop review of the wildlife species and wildlife habitat potentially present in the Project Study Area was conducted as part of the wildlife baseline studies; this information was used to establish spatial boundaries that would be linked to the Project Study Area wildlife, their habitat and their movements in the Project Study Area. The desktop review showed that there was the potential for the presence of large ungulates such as moose and elk. These species typically range throughout a large area, as opposed to other wildlife species identified to be potentially present in the Project Study Area. As such, the boundaries for the LSA and RSA were selected to reflect the seasonal movements and home ranges of these large ungulates.

For the purpose of the wildlife studies, the LSA was defined as being the area within 5 km on either side of each of the LSMOC Options by the length of the channels RoWs as well as 5 km on either side of the proposed ASR RoW (Map 1). The size of the LSA was selected based on literature on the potential local disturbance effects of roads on moose (Laurian et al., 2008; Silverberg et al., 2003; Wasser et al., 2011; Yost et al., 2001). The rationale was that this area was large enough to capture the potential measurable effects on moose and their habitat, as well as the other wildlife species and their habitat in the Project Study Area, i.e., other mammals, reptiles, amphibians and birds.

The RSA for wildlife was designated as the total length of each of the LSMOC options with a width of 20 km from either side of the centreline of the LSMOC options (Map 1). This size for the RSA was selected based on a typical moose home range size of 40 square kilometres (km²) (Hundertmark, 1997). The rationale was that a 40 km^2 RSA would account for the potential indirect and cumulative effects on moose, and would also account for the potential indirect and cumulative

effects on a broad range of wildlife species. Elk, for example, have home range sizes that vary substantially, with small home ranges of approximately 50 km² and large home ranges in the hundreds of km² (Frair et al., 2005). Having a larger home range size offers elk more landbase within their home range to disperse to when disturbance events occur, thereby diminishing the impact of disturbance on elk in comparison to moose. As such, it was considered that the potential indirect and/or cumulative effects on elk would be effectively captured within the 40 km² RSA.

As noted in Section 1, the overall Project has three components and includes further development of the LSMOC; construction and operation of the LMOC; and the construction and operation of the proposed ASR. Although this report is focussed on the baseline information for the proposed LSMOC, the need to include the movements and spatial range of moose resulted in the 5 km LSA and 20 km RSA described above. The use of a 5 km LSA and 20 km RSA resulted in some overlap with the areas potentially affected by the existing and planned LSMOC, LMOC and the proposed ASR. Map 01 shows the designated PF, LSA and RSA for the LSMOC component of the Project, and illustrates the overlap in study areas that occurred due to the proximity of the other two Project components.

As noted in Section 1.1, MI was reviewing the proposed alignment for the Reach 2 dike option at the time of this writing. In addition to the Reach 2 dike option, three other channel alignment and/or dike options were being investigated. The Reach 2 dike was referred to as Option 1, and the additional alignments were referred to as Option 2, Option 3 and Option 4. The three new options were added to examine other routes that could be used to manage flows from LSM to Lake Winnipeg, and included the construction of a new emergency channel to the east of the existing Reach 1 channel, which would tie into Reach 3 at Big Buffalo Creek. Other than the proposed lengths and locations, there were no other data available for the additional conceptual options at the time of this writing. Map 49 provides an illustration of the location of the proposed lengths and locations for the conceptual Options 1 to 4.

6.2 Environmental Setting

The RSA is located within the Boreal Plains Ecozone in Canada, generally characterized by gently rolling plains, moderately well-drained loamy soils, and continental climatic conditions, with cold winters and moderately warm summers (Smith et al., 1998). The RSA lies within the Interlake Plain as well as the Mid-Boreal Lowlands Ecoregions. The top upper edge of the Lake Manitoba Ecoregion overlaps with the northwest boundary of the RSA; however, given the overlap is very small, the landscape is most representative of the Interlake Plains and Mid-Boreal Lowland Ecoregions. A majority of the RSA falls within the Interlake Plains Ecoregion, which occurs in a narRoW strip of area that arcs broadly from its base at the southeastern edge of the Manitoba-USA border (and eastern edge of the Manitoba plain) northwestward to the Saskatchewan border at Red Deer Lake (Smith et. al, 1998). The LSA traverses two Ecodistricts: Sturgeon Bay (676) and Ashern (723), and the RSA traverses three Ecodistricts: Sturgeon Bay (676); Gypsumville (720); and Ashern (723). The Rural Municipality (RM) that borders the Project on the western side

is the RM of Grahamdale. Four First Nations also occur within the LSM area: Little Saskatchewan; Dauphin River; Pinaymootang; and Lake St. Martin.

The RSA is located within the Boreal Plains Ecozone, which extends as a wide band from the Peace River, British Columbia to the southeast corner of Manitoba (Map 2). In Manitoba, it extends from the southeast and north to encompass the entire east shore of Lake Winnipeg, curving up through the southern Interlake to the Manitoba-Saskatchewan borders (Smith et al., 1998). The ecozone is dominated by gently rolling uplands and lowlands including wetland and peatland areas. The **surficial geology**[1] is deep, tending to mask the underlying bedrock layers of Cretaceous shales and Palaeozoic limestones and **dolomites** (Smith et al., 1998). The climate is continental, characterized by relatively warm but short summers and cold, snowy winters. Soils are dominated by **luvisols,** grading to **chernozems** in the south and **brunisols** and **organic cryosols** in the north (Zoladeski et al., 1995). The RSA lies within the Interlake Plain and mid-boreal lowland Ecoregions. A majority of the RSA lies within the Interlake ecoregion, which extends from the USA-Canada border at the southeastern edge of the Manitoba Plain in a broad arc northwestward to the Saskatchewan border at Red Deer Lake (Smith et al., 1998). The RSA traverses three Ecodistricts: Sturgeon Bay (676); Gypsumville (720); and Ashern (723), as described below.

6.2.1 Gypsumville Ecodistrict (720)

The Gypsumville (720) Ecodistrict is located within the RSA, but falls outside the LSA (Map 2). This ecodistrict occupies a small area surrounding LSM between Lake Winnipeg and Lake Manitoba (Smith et al., 1998). The mean annual temperature is 1.3 degrees Celsius (°C) with an average growing season of 173 days. The mean annual precipitation is approximately 520 millimetres (mm), of which about one-quarter falls as snow (Smith et al., 1998). The **physiography** of the region is mostly level to ridge till plain, partly covered with thin, **glaciolacustrine** clay deposits. Soils are typically imperfectly-drained, dark grey chernozems developed on strongly **calcareous**, loamy to clay **glacial till**; poorly-drained **gleysol** and black chernozem soils occur on shallower areas (Smith et al., 1998). Vegetation is dominated by forest stand mixtures of trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), and white spruce (*Picea glauca*), while Jack pine (*Pinus banksiana*) prevails on drier sites (Smith et al., 1998). The principal sources of water in the ecodistrict are groundwater and surface water from LSM.

6.2.2 Ashern Ecodistrict (723)

The Ashern (723) Ecodistrict is located within both the LSA and RSA (Map 2). The ecodistrict is between Lake Manitoba to the west and Lake Winnipeg to the east in the Interlake region (Smith

[1] Words in bold are defined in the Glossary of Terms

et al., 1998). The mean annual temperature is 1.2°C with an average gRoWing season of 175 days. The mean annual precipitation is approximately 510 mm, of which about one-quarter falls as snow (Smith et al., 1998). The ecodistrict is slightly higher topographically than the surrounding area and slopes very gently eastward toward Lake Winnipeg and westward toward Lake Manitoba (Smith et al., 1998). The physiography is the outcome of Glacial Lake Agassiz's retreat; wave action and iceberg scouring resulted in ridges of coarse-textured small rock (cobble and gravel) and finer-textured depressions (Smith et al., 1998). Dominant soils in the higher ridges are imperfectly-drained, dark chernozems developed on strongly calcareous, loamy to clay loam glacial till, while the low areas are dominated by poorly-drained gleysols to shallow, slightly decomposed organic soils (Smith et al., 1998). Forest stand vegetation is dominated by trembling aspen in the ridge areas, but often associated with balsam poplar and white spruce whose distribution is much affected by forest fires (Smith et al., 1998). Willow, sedge, and meadow grass occur in the poorly-drained depressions. Groundwater, the principal source of water in the ecodistrict, is from shallow sand and gravel aquifers associated with the glacial till deposits (Smith et al., 1998).

6.2.3 Sturgeon Bay Ecodistrict (676)

The Sturgeon Bay (676) Ecodistrict is located within both the Local and RSAs (Map 2). The ecodistrict encompasses most of the North Basin of Lake Winnipeg (Smith et al., 1998). The mean annual temperature is 0.3°C with an average gRoWing season of 166 days. The mean annual precipitation is approximately 510 mm, of which slightly above one-quarter falls as snow (Smith et al., 1998). The ecodistrict slopes gently northeastward toward Lake Winnipeg (Smith et al., 1998). The physiography is the outcome of Glacial Lake Agassiz's retreat; wave action and iceberg scouring resulted in ridges of coarse-textured small rock (cobble and gravel) and finer-textured depressions (Smith et al., 1998). Soils of very poorly-drained shallow to deep moderately-decomposed **mesisols** dominate, but local areas of very poorly-drained sphagnum **fibrosols** and imperfectly-drained brunisols on glacial till ridges also occur (Smith et al., 1998). Black spruce *(Picea mariana*) dominates forest stands due to extensive bogs/fens (peatlands) and poorly-drained mineral soils (transitional areas) (Smith et al., 1998). Associated vegetation varies from mosses (e.g., *Sphagnum* spp.), **ericaceous** shrubs (e.g. Labrador Tea [*Rhododendron groenlandicum*]), swamp birch (*Betula pumila*), sedge, willow, and tamarack (*Larix laricina*) depending if characterized as a peatland or as a transitional area. Groundwater, the principal source of water in the ecodistrict, is from shallow sand and gravel aquifers associated with the glacial till deposits (Smith et al., 1998).

6.2.4 Surficial Geology and Physiographic Setting

Geologic events during Manitoba's Paleozic Era, which influenced many of the landforms in the RSA, were less dramatic than those events that shaped the older bedrock-forming Precambrian Era (Bannatyne and Teller, 1984). Shallow seas periodically covered the continent, depositing many layers of limestone and other sediments (Bannatyne and Teller, 1984). The geology of the Interlake–and specifically the LSM–region can be further subdivided by age of the rocks; the late

Ordovician and early Silurian periods resulted in layers of shale and dolomitic limestone. The Paleozoic boundaries mainly encompass the Interlake Plain (155), Mid-Boreal Lowlands (148), and a small portion of the Lake Manitoba Plain (162) Ecoregions, as defined by Smith et al. (1998).

The RSA is located just south of the localized permafrost zone (Lockery, 1984). The surficial geology can be described as very calcareous, stony (cobble or gravel), water-worked glacial till that is deep to shallow (20 to 30 m) over limestone bedrock (Smith et al., 1998). Soils within the RSA are heavily influenced by the geology of the area. Chernozemic dark grey surface horizons result as well as soils composed of luvisol, brunisol and organic matter (Mills, 1984). Map 3 presents the soil landscapes of the RSA.

6.2.5 Forest Cover and Vegetation

The RSA is located in the Boreal Forest Region. The Boreal Forest forms a continuous belt from Newfoundland to the Rocky Mountains and comprises the greater part of the forested area of Canada. The Boreal Forest is primarily coniferous with white and black spruce, jack pine, and tamarack as characteristic species (Zoladeski et al., 1995). There is an admixture of broadleaf trees such as white birch (*Betula papyrifera*), trembling aspen, and balsam poplar that play an important part in central portions of the region, particularly in the zone of transition to the prairie (Smith et al., 1998). Within the RSA, the Boreal Forest Region is further classified into the Manitoba Lowlands (B15) (Rowe, 1972).

The Manitoba Lowlands (B15) Forest Section surrounds Lake Winnipeg and therefore occurs along the entire Interlake Plain within the RSA; it is a low, level basin bounded by Lake Winnipeg on the west and the Precambrian Shield on the east (RoWe, 1972). The area consists of flat, poorly drained land with forested patches of black spruce and tamarack occurring with intervening swamps and meadows. Stands of white spruce, trembling aspen, and balsam poplar, sometimes intermixed with white birch and balsam fir (*Abies balsamea*), occur on the better-drained **alluvial** areas bordering creeks and rivers. Other tree species, such as white elm (*Ulmus laevis*), green ash (*Fraxinus pennsylvanica*), Manitoba maple (*Acer negundo var. interius*) and eastern white cedar (*Thuja occidentalis*) also occur locally. The effects of repeated fires and poor shallow limestone sites, in the central Interlake specifically, is reflected in stands of scrubby aspen (Rowe, 1972).

Some of the high till areas have been cleared in the Interlake Plain for arable agriculture, but many areas remain as forest and wetlands, and significant areas have reverted back to shrubland after clearing (Smith et al., 1998). In the ecoregion, closed cover of dominant trembling aspen stands (often of poor growth due to highly calcareous soils), mixed with balsam poplar, tend to have an understory of mixed herbs and tall shrub; open stands of jack pine occur on dry, sandy sites; white spruce and balsam fir are less prominent due to fire, but do occur throughout the area except on very dry sites or those with shallow soils; and poorly-drained, depression areas are covered with sedges, willow and black spruce and tamarack (Smith et al., 1998). The *Forest Ecosystem Classification for Manitoba, Field Guide* (Zoladeski et al., 1995) provides a detailed species

relationship, for productive forest types, in terms of their commercial tree species compositions and common relationships for understory shrubs, herbs, and mosses.

The Federal Government has developed a Land Cover Classification (LCC) spatial database. The LCC is a national database map layer that has been harmonized across the major federal departments involved in land management and land change detection. These departments include the Agriculture and Agri-Foods Canada (AAFC), the Canadian Forest Service (CFS), and the Canadian Centre for Remote Sensing (CCRS). Existing forest classifications and inventories are based primarily on aerial photography, whereas the development of the LCC was done using remotely sensed imagery (Landsat data) as part of the Earth Observation for Sustainable Development of Forests (EOSD) program. The EOSD program utilized a hybrid supervised-unsupervised classification methodology. This approach identified unique signatures using an automated algorithm (unsupervised spectral classification) that were subsequently linked to National Forest Inventory (NFI) equivalent classes (supervised classification). The LCC provides a series of vegetated and non-vegetated land cover classes that identify the vegetation/habitat conditions of an area. The LCC of the RSA is provided in Map 4.

6.2.6 Fire History

Natural disturbances, such as forest fires, are important for the health and succession of the boreal forest. Boreal forest fires play an important role in characterizing forest composition, energy cycles, and biochemical processes. Map 5 illustrates the fire activity within the RSA over the last 84 years. Much of the RSA was burnt in the 1970s and 1980s, with burns between 1960 and 2013 in smaller areas in the extreme north and south edge. Additionally, there is a portion to the north around Dauphin that has not been burnt at all within the last 84 years. In the LSA, the majority of the area was burnt in the 1970s and 1980s along with small patches between 1940 and 1949. Map 5 provides the fire history for the RSA.

6.2.7 Wildlife and Habitat

6.2.7.1 Mammals

The RSA, which occurs within the Manitoba Lowlands of the Boreal Forest, consists of flat, poorly drained land with forested patches of various deciduous and coniferous tree species, intermixed with swamps, meadows, and arable areas cleared for agriculture, as described in Section 2.1.5 (Rowe, 1972). Based on this diversity of habitat types, typical mammal species in the area include American marten (*Martes americana*), American beaver (*Castor canadensis*), black bear (*Ursus americanus*), coyote (*Canis latrans*), elk (Manitoba subspecies *Cervus elaphus manitobensis*), ermine (*Mustela erminea*), fisher (*Martes pennanti*), grey wolf (*Canis lupus*), least chipmunk (*Tamias minimus*), lynx (*Lynx canadensis*), mink (*Neovison vison*), moose (*Alces alces*), muskrat (*Ondatra zibethicus*), otter (*Lontra canadensis*), red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), and white-tailed deer (*Odocoileus virginianus*).

Moose are distributed across much of forested Canada (Banfield, 1974) and are common within the boreal forest, which covers many areas of Manitoba including the Project study area. Moose often select habitats of early successional vegetation such as shrubland areas and deciduous forests (Gillingham and Parker, 2008). Such successional vegetation frequently exists after disturbance, both natural (i.e. wildfire) and anthropogenic (i.e. forest removal). Moose are most commonly found in swampy areas with aquatic plants and willows, which make up the majority of their diet (Renecker and Schwartz, 1998). Moose are an integral component of the ecosystem in their predator/prey relationships.

Elk inhabit young coniferous tree stands and dense woodlands as well as meadows and valleys, including plains areas such as those found in the larger RSA. Elk are commonly found in early successional areas after disturbances such as fires where they find good foraging vegetation (Reid, 2006). This foraging preference correlates with the fire history described previously, where a number of fires have occurred in the area since the 1980s.

White-tailed deer are also present in the RSA. White-tailed deer tend to inhabit both woodland and open areas, which are used for cover and forage (Reid, 2006). The occurrence of higher ungulate populations in an area (increased prey) may result in increased predator populations. As a result, deer occurrence in areas near moose may result in higher wolf populations in the area and subsequent increases in predation.

Black bears are found across most wooded habitats in North America and are relatively common through northern mixed and eastern deciduous forests (Kolenosky and Strathearn, 1987; Reid, 2006). Black bear densities are highest in diverse forests at relatively early successional stages and lowest where soils are thinner and plant growth generally poorer (Kolenosky and Strathearn, 1987). Black bears can take advantage of anthropogenic landscape change such as agricultural lands and woodlots. Agricultural crops provide a variety of vegetation and insects to feed on, as do woodlots, given many small prey reside in woodlots, and they are typically comprised of a variety of tree seeds, new successional vegetation, and insects. Black bears are found in the RSA in some areas, but due to habitat needs, they tend to stay away from the wetter lowland areas and select denser areas of forest stands.

Coyote are a highly adaptable species found most commonly in mixed habitats versus dense unbroken forests (Reid, 2006). Coyotes are found throughout the RSA and feed upon small mammals and rodents, as well as predate on calves of deer and larger ungulates. Coyotes, when banding together, can also take down these large animals (Caras, 1967).

Grey wolves are also plentiful in most of Manitoba and in the RSA. They tend to inhabit forested areas with sufficient prey species such as moose, American beaver, and snowshoe hare.

The RSA offers suitable habitat to many furbearers. American beaver and muskrat provide valuable furs and good meat for eating, as do hare and “bush chickens” (spruce grouse

[*Falcipennis canadensis*] in particular). Ermine, fisher, American marten, mink, otters, red fox (*Vulpes vulpes*), and red squirrel are furbearers that are known to be present in the RSA.

Ermine habitat includes coniferous or mixedwood forests, fields, areas of dense vegetation and areas near wetlands, and can be found in most of these habitats in Manitoba, including the RSA (Reid, 2006). Both fisher and American marten can be found in most of Manitoba with American marten being limited to primarily boreal areas of the province. They generally inhabit mature coniferous or mixedwood forests and will feed on small mammals such as hares, some birds, fruit, nuts, and carrion (Reid, 2006). They also feed on rodents, hares, shrews, and insects. Mink inhabit areas along streams, lakes, and wooded cover. They can be found in all of Manitoba and will primarily feed on small to medium mammals, crayfish, frogs, snakes, and birds (Reid, 2006). Otters can be found in most of central/northern Manitoba and within the RSA near or in lakes, streams, rivers, or swamps. They feed on fish, frogs, crayfish, and shellfish (Reid, 2006).

There are several species of small mammals that can be considered to be within or at the edge of their natural range. These include the least weasel (*Mustela nivalis*), masked shrew (*Sorex cinereus*), meadow jumping mouse (*Zapus hudsonius*), northern bog lemming (*Synaptomys borealis*), pygmy shrew (*Sorex hoyi*), raccoon (*Procyon lotor*), short-tailed shrew (*Blarina brevicauda*), striped skunk (*Mephitis mephitis*), and woodchuck (*Marmota monax).*

There are also several species of bats that reside within and migrate through the RSA. These include the big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), little brown myotis (*Myotis lucifugus*), northern long-eared (*Myotis septentionalis)* also called the northern myotis, eastern-red bat *(Lasiurus borealis)* and silver-haired bat (*Lasionycteris noctivagans*). The Silver-haired, the eastern-red and the hoary species are migratory species while the northern long-eared, big and little brown bat species are hibernacula dwelling species. The little brown bat is listed as Endangered- Schedule 1 and as S2N by the Manitoba Conservation Data Centre (MBCDC, 2015).

SARA currently has a proposed Recovery Strategy for little brown bat: http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=2A04680B-1, with three critical habitat areas for little brown bat identified in the Interlake area of Manitoba (Norquay et al., 2013). The proposed SARA Recovery Strategy for little brown bat identifies several potential threats to little brown bat with accidental mortality resulting from vehicle collisions listed as an unknown level of concern (SARA, 2015). Sensory/vibration disturbance is another potential effect to these bats and their critical habitat. Both migratory and hibernacula dwelling bats are known to use road ROWs as flight corridors, resulting in an increase in bat mortality due to bat-vehicle collisions (SARA, 2015).

A list of known mammals that can be found in the Interlake Plain and the Mid-Boreal Lowland ecoregions is presented in Appendix A.

6.2.7.2 Reptiles and Amphibians

The RSA provides habitat for a number of reptile and amphibian species. The red-sided garter snake (*Thamnophis sirtalis*) has the northernmost distribution of any species of snake in North America and, along with the smooth green snake (*Liochlorophis vernalis)* and the western plains garter snake (*Thamnophis radix*), are the only snake species to inhabit this area (Cook, 1984; Conant and Collins, 1991; Nature North, 2014; Preston, 1982). The red-sided garter snake prefers mesic woodlands where they can be often found at the margins of ponds (Preston, 1982). They will often hibernate within crevices in upland areas. The range of the red-sided garter snake extends throughout much of the RSA (Conant and Collins, 1991). The limestone substrate found within the LSA is characterized by crevices and cavernous formations that make for suitable habitat for snake hibernacula. The smooth green snake is the only snake species listed as a species of conservation concern by MBCDC and is ranked S3S4 by MBCDC (MBCDC, 2015).

The species of frogs and toads that may occur within the area include: boreal chorus frog (*Pseudacris maculata*), Canadian toad (*Anaxyrus hemiophrys*), grey tree frog (*Hyla versicolor*), northern leopard frog (*Lithobates pipiens*), and wood frog (*Lithobates sylvaticus*) (Conant and Collins, 1991). These species generally require shallow ponds and puddles for breeding and moist environments in shrubby and wooded areas for the rest of the year. Of these frog and toad species, only the Northern Leopard frog is a species of conservation concern. The northern leopard frog requires several habitat types to meet its needs throughout the year, using different sites for overwintering, breeding, and foraging. The overwintering sites for northern leopard frogs need to be well-oxygenated bodies of water that do not freeze to the bottom (SARA, 2015).

The Eastern tiger salamander (*Ambystoma tigrinum*) and the Blue-spotted salamander (*Ambystoma laterale)* are two salamander species of concern found within the RSA. Both the eastern tiger salamander and the blue-spotted salamander prefer moist woodlots and wetland edge habitats (Nature North, 2014).

A list of known amphibians and reptiles that can be found in the Interlake Plain and Mid-Boreal Lowland ecoregions is presented in Appendix B.

6.2.7.3 Birds

There are a wide variety of bird species present in the Mid-Boreal Lowland and Interlake Plain Ecoregions including numerous raptor species such as bald eagles (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*). Bald eagles nest in tall shoreline trees along lakes, rivers, and open areas and primarily feed on water birds, small mammals, fish, and carrion (Bezener and De Smet, 2000). Osprey can be found in most of Manitoba, in habitat located along slow flowing rivers, streams as well as lakes, where they nest in tall trees or on artificial platforms. Their diet consists mostly of fish, though they will also take rodents, birds, and small vertebrates (Bezener and De Smet, 2000).

A variety of owl species can also be found within the RSA including but not limited to: the great grey owl (*Strix nebulosi*), great horned owl (*Bubo virginianus*), northern hawk owl (*Surnia ulula*), and short-eared owl (*Asio flammeus*).

Some of the forest birds that can be found within the RSA include: the bobolink (*Dolichonyx oryzivorus*), Canada warbler (*Cardellina canadensis*), common nighthawk (*Chordeiles minor*), eastern whip-poor-will (*Astrotomus vociferous*), eastern wood-pewee (*Contopus virens*), golden-winged warbler (*Vermivora chrysoptera*), gray jay (*Perisoreus canadensis*), olive-sided flycatcher (*Contopus cooperi*), ovenbird (*Seiurus aurocapilla*), red-headed woodpecker (*Melanerpes erythrocephalus*), and rusty blackbird (*Euphagus carolinus*), among others (Bezener and De Smet, 2000; Peterson and Peterson, 2002; Manitoba Avian Research Committee, 2003; MBBA, 2015).

Geese, ducks, and other waterfowl are also plentiful in the RSA. The RSA supports a variety of waterbirds and waterfowl such as the American white pelican (*Pelecanus erythrorhynchos*), black-crowned night heron (*Nycticorax nycticorax*), great blue heron (*Ardea herodias*), horned grebe (*Podiceps auritus*), least bittern (*Ixobrychus exilis*), trumpeter swan (*Cygnus buccinators*), and yellow rail (*Coturnicops noveboracensis*), among others (Bezener and De Smet, 2000; Peterson and Peterson, 2002; Manitoba Avian Research Committee, 2003; MBBA, 2015).

Shorebirds and gulls are common along the shores and on the islands of Lake Manitoba, Lake St. Martin, and Lake Winnipeg, including species such as the Caspian tern (*Hydroprogne capsica*), herring gull (*Larus argentatus*), and the piping plover (*Charadrius melodus*). The piping plover uses low-gradient, un-vegetated, and wide shorelines with patchy gravel substrates (AESRD, 2013). In Manitoba, the piping plover is most consistently found on sandy beaches along Lake Manitoba and Lake Winnipeg. Piping plover nests are extremely vulnerable to predation and human disturbance. Threats to piping plovers include loss of nesting habitat due to cottage development, use of nesting beaches by cattle, all terrain vehicles, sunbathers, or other recreationalists, encroachment of vegetation, and flooding of nests or feeding areas by periodic high-water levels (MBSD, 2015).

Within the RSA, there is an Important Bird Area (IBA, 2016). Canada's IBA program aims to identify, conserve, and monitor important sites that provide essential habitat for Canada's bird populations. Canada's IBA program has nearly 600 sites, one of which is located around LSM (IBA, 2016).

A list of known birds that can be found in the Interlake Plain and Mid-Boreal Lowland Ecoregion is presented in Appendix C.

6.2.8 Species at Risk and Species of Special Interest

Species of special interest are defined to include Species At Risk and species referred to as "species of conservation concern". For the purpose of this Terrestrial Wildlife Technical Report,

Species at Risk were defined as all species federally listed by SARA (SARA, 2015), species listed provincially under MESEA (MESEA, 2015), as well as species listed as very rare (provincial status of S1) or rare (provincial status of S2) or uncommon (provincial status of S3) throughout their range as listed by the Manitoba Conservation Data Centre (MBCDC, 2015).

There are several mammal species listed under SARA, and/or by MESEA, and/or MBCDC of S3 or above that may have ranges that overlap with the Project Study Area (SARA, 2015; MESEA, 2015; MBCDC, 2015). Boreal woodland caribou (*Rangifer tarandus*) may have ranges that overlap with the Interlake Plain and Mid-boreal lowland ecroregions; however, their presence within the RSA is highly unlikely. During all field work, investigations included searches for any signs of caribou activity within the RSA. Similarly, wood bison (*Bison bison athabascae*) may have ranges that overlap with the Interlake Plain and Mid-boreal lowland ecroregions; however, their presence within the RSA is highly unlikely.

A number of bird species of conservation concern designated/assessed by COSEWIC, under SARA- federally, and/or MESEA- provincially, have ranges that do, or may, overlap with the Project Study Area (SARA, 2015). These species include bank swallow, barn swallow, bobolink, Canada warbler, common nighthawk, eastern whip-poor-will, eastern wood-pewee, golden-winged warbler, horned grebe, least bittern, olive-sided flycatcher, peregrine falcon, piping plover, red-headed woodpecker, rusty blackbird, short-eared owl, trumpeter swan and yellow rail (MBBA, 2015; MBCDC, 2015; SARA, 2015).

A list of known bird possibly found within the RSA is provided in Appendix C. Appendix D presents bird Species At Risk that are potentially found within the RSA and the federal recovery documents associated with the species.

Two species of bats are of conservation concern. The little brown myotis and the northern long-eared (northern myotis) are listed as Endangered under SARA under Manitoba's Endangered Species and Ecosystems Act (MESEA). The northern leopard frog is listed as Special Concern under SARA. The eastern tiger salamander and the blue-spotted salamander are two other amphibian species of concern found within the RSA.

The MBCDC provided a list of known locations of species of concern and special interest that had been identified within the RSA (MBCDC 2015; C. Friesen pers. comm.).

7 KEY SPECIES FOR ANALYSIS

The federal environmental assessment process typically includes the need for the identification of Valued Ecosystem Components (VECs) in the area of interest to focus the environmental assessment on key species or key components of the environment. The Canadian Environmental Assessment Agency (CEAA) defines a Valued Ecosystem Component as "the environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance" (CEAA 2006).

The selection of VECs is used to identify key species in the area of interest that can represent a trophic level or guild of species (e.g., selection of a key ungulate species that is also important for human consumption), rather than conducting an assessment of all individual species in an area. Key species are selected based on their biological and socio-economic role in the ecosystem, their ability to represent the habitat and/or life history requirements of similar species, and often include Species At Risk or species of conservation concern to ensure that protected and rare species are accounted for in an environmental assessment.

As such, the desktop and field studies for wildlife and wildlife habitat included the collection of baseline data for the wildlife species found in the RSA, followed by the identification of a number of key wildlife species of interest and/or importance in the RSA, to focus the analysis of potential habitat changes or other effects of the Project activities, and provide context for the future environmental assessment. Not all Species at Risk were selected as focal species. Using the available historical data, species that had not been documented within the RSA to date, were not included as focal species and/or trophic level and guild species were used to account for species not included as a focal species.

The following table (Table 1) provides a detailed breakdown of the key wildlife species in the Project Study Area that were selected for analysis. The key wildlife species included:

- Moose;
- Elk;
- American marten;
- American beaver;
- Bats;
- Migratory Birds (forest birds and water birds);
- Ecologically Sensitive Wildlife Sites (bat caves, snake hibernacula); and
- Reptiles and amphibians.

Table 1: Summary of Key Species Selection and Rationale

Group	Key Species	Rationale
Ungulates	Moose	Demonstrate large home ranges (~40 km²) Important prey species for large carnivores e.g. wolves Hunted by rights based and licensed hunters
	Elk	Demonstrate large home ranges (50-400 km²) Important prey species for large carnivores e.g. wolves Hunted by rights based and licensed hunters

Table 1: Summary of Key Species Selection and Rationale

Group	Key Species	Rationale
Furbearers	American marten	Commonly trapped furbearer Important trophic species Representative of mature forest habitat
	American beaver	Ecosystem engineer Representative aquatic furbearer
Bats	Little brown myotis Northern long-eared (northern myotis)	Listed as Endangered under SARA and/or under MESEA Critical habitat for these species already identified in the Interlake region Geology within the RSA is conducive to support these species – representative of karst habitat
Ecologically Sensitive Wildlife Sites	Bat and snake hibernacula, terrestrial mammal dens (e.g. bears, wolves), rookeries large stick nests, tern colony, mineral licks	Critical wintering habitat Critical breeding habitat Species fidelity to dens and nests Culturally significant sites
Migratory Birds	Forest Bird Species (including Barn Swallow, Bank Swallow, Bobolink, Canada Warbler, Common Nighthawk, Eastern Whip-Poor-Will, Eastern Wood-Pewee, Golden-winged Warbler, Olive-sided Flycatcher, Peregrine Falcon, Red-headed Woodpecker, Short-eared Owl)	Some species listed as "threatened" or "engangered" SARA and/or MESEA Key species selected as being representative of forest habitat types
	Water Bird Species (including American White Pelican, Black-cRoWned Night Heron, Caspian Tern, Horned Grebe, Least Bittern, Piping plover, Trumpeter Swan, Yellow Rail, ducks and geese)	Some species listed as "threatened" or "endangered" under SARA and/or MESEA Some species hunted by license and rights based hunters
Reptiles and Amphibians	Northern leopard frog, red-sided garter snake	Northern leopard frog Listed under SARA and MESEA Red-sided garter snake species most commonly found snake within RSA

8 LAND AND RESOURCE USE

To provide context to the findings presented, land and resource use have been described at a landscape scale, focusing on the RSA (Map 1).

8.1 Forestry

Administrative boundaries that best delineate the harvestable timber in the RSA are the MBSD, Forestry Branch, Forest Management Units (FMU) 41, 43, and 45 (MBSD, 2013). Included in this area is Integrated Wood Supply Area (IWSA) #2 that covers much of the RSA except for the southwest corner (Map 7).

There are four protected areas within the RSA where industrial activities are largely restricted: the Sturgeon Bay Provincial Park; and the Grahamdale, Mantagao Lake, and Little Birch Wildlife Management Areas (WMA) (Map 7).

A majority of the RSA is located within the IWSA #2. Within IWSA #2, the Pine Falls Paper Company has previously been given the first right of refusal for timber that is not allocated to quota holders of the IWSA and is still under the annual allowable cut levels for the area (Forest Resource Management, 2000). All harvest blocks identified within the publicly available land use data set (Manitoba Land Initiative) were not allocated a harvest year and therefore, differentiation is not possible from the cover classes within the LCC. Therefore, harvest cut blocks within the Land Use layer, were not used for analysis.

8.2 Hydroelectric Transmission Development

Within the RSA, there is one existing transmission line that enters the RSA in the south and parallels PTH 6 northwards towards Gypsumville and other communities (Map 8). There is also a proposed transmission line that would be located near the terminus of the existing winter road and Reach 1 of the LSMOC (Map 8). Additional hydro transmission development may be required to power the Water Control Structures associated with the Project.

8.3 Lodges and Outfitters

Map 9 shows the location of lodges and outfitters in the RSA and LSA. There were four lodges or outfitters identified: Einarsson's Guide Service, near Dauphin River; Bear Track Outfitters, northeast of Gypsumville; Steep Rock Canoe and Kayak, at Steep Rock; and Wildwood Outfitters near Moosehorn (Map 9). None of these lodges or outfitters are located within the LSA. Map 9 also presents hunting stands and hunting shacks that were identified in the LSA during field studies in 2016.

8.4 Quarries and Mining

There are many existing quarrying sites in the RSA, the majority being quarry withdrawal activity and the remainder are quarry lease, private quarry permit, mining claims and casual quarry

permits. Within the LSA there are two quarry withdrawals, one quarry lease and one casual quarry permit. Map 10 shows the locations of all publicly available quarry and current mining activity in the RSA.

8.5 Recreational Use Areas

There are a number of recreational and snowmobile trails located within the RSA. A spatial layer for the known and available recreational trails was acquired from the Natural Resources of Canada, Earth and Sciences Sector and the available snowmobile trail data was digitized from the Manitoba Provincial Snowmobile Trail Guide, 2015-2016 (Snowman, 2016). In addition to the publicly available data, the trail network was further enhanced with the digitization of access trails recorded with GPS units (Garmin Map 76csx) during 2016 winter aerial survey work. Map 11 presents the enhanced trail network of the RSA.

8.6 Hunting

The LSA is located within GHA 21 on the west side of Lake Winnipeg and is adjacent to GHA 25 to the west, and GHA 16 to the north (Map 12). Boreal woodland caribou hunting is not permitted in GHA 16, 21 or 25 (MBSDa, 2015).

Moose are important big game animals for hunting within the RSA. Moose are valued for licensed hunting and rights-based subsistence hunting within the Local Study Area (e.g., Game Hunting Area [GHA] 21), but moose hunting is closed to licensed hunters in certain areas of the RSA (GHA 16 and 25) (MBSDa, 2015). Moose are an integral component of the ecosystem in their predator/prey relationships. Moose population sustainability is a specific concern in several GHAs in western Manitoba. Map 12 provides the delineation of GHAs within the RSA. Currently, licensed moose hunting is closed in all of GHA 16 and 25.

Elk are valued for rights-based subsistence harvesting and licenses for recreational hunters can be purchased from Manitoba Conservation and Water Stewardship (MBSD) during certain times of year for GHAs 21 and 25 (MBSDa, 2016). GHA 21 and 25 season dates are late-September to mid-October for one bull elk in the general rifle draw and early- October to mid-October for one bull elk by general (rifle) draw. The archery draw is active in GHA 21 from early-September to mid-September, and GHA 25 is open for archery draw early-September to late-September for one elk.

White-tailed deer are valued for rights-based subsistence harvesting and licenses for recreational hunters can be purchased from MBSD during certain times of year for GHA 16, 21 and 25 (MBSDa, 2016). White-tailed deer in Zone B (including GHA 21 and 25) is open to deer harvest. An archery season for resident, non-resident, and foreign resident hunters is open for parts of September and again in late October to early November (MBSDa, 2016). A general rifle season for white-tailed deer in Zone B for resident, non-resident, and foreign resident hunters is open from early-November to mid-November (MBSDa, 2016). Zone C (GHA 16) is also open to deer

harvest; archery season is open to resident, non-resident, and foreign resident hunters from early-September to early November. General rifle is open for Zone C from early November to mid-November.

MBSD licenses hunters for resident, and non-resident bear hunting, along with registered outfitters for foreign resident bear hunting in GHA 16, 21, and 25 (MBSDa, 2016). GHA 16 and 21 are part of black bear hunting Zone B where licensed hunting is allowed between late April to end of June and late August to early October for one adult black bear (not female with cubs). GHA 25 is a part of Zone C where licensed hunting is allowed between late April to mid-June and then again in the beginning of September until mid-October.

Coyotes have been designated for recreational hunting by MBSD, and can be taken through the use of any big game tag which hunters can purchased for certain dates in GHA 16, 20, 21, and 25 (MBSD, 2016). MBSD licenses hunters for resident, non-resident, and foreign resident wolf hunting in GHA 16, 21, and 25 (MBSDa, 2016). GHA 16 and 21 are part of grey wolf and coyote Zone B for licensed-based hunting between late August and late March for one wolf. GHA 25 is a part of Zone C for grey wolf and coyote season between the same dates.

GHA 16, 20, 21, and 25 are a part of Game Bird hunting zone 3 (GBHZ3) has a grouse (ruffed grouse (*Bonasa umbellus*), spruce grouse, and sharp-tailed grouse (*Tympanuchus phasianellus*) hunting season between the beginning of September and mid-December with a possession limit of 12.

Other birds that can be hunted within GBHZ3 include ducks such as mallard (*Anas platyrhynchos),* coots such as, American coot (*Fulica Americana*), snipe, such as the common snipe (*Gallinago gallinago*), geese such as the Canada goose (*Branta canadensis*), and sandhill crane (*Grus canadensis*).

Vehicle regulations within GHA 16 allow the use of off-road vehicles (ORVs) as transportation from one hunting site to another. Within GHA 20 and 21, ORVs may only be used on roads, established trails, and waterways to access a hunting area. Map 12 represents with GHAs within the RSA.

8.7 Trapping

Commercial trapping of furbearers is administered by MBSD through the Registered Trapline (RTL) system (MBSDb, 2016). There are two RTL blocks that are intersected by the RSA, as well as one open trap area (Open Area #3). Map 13 provides an illustration of the RTLs within the RSA.

The Crane River RTL is intersected by the RSA, although it is located over water from the Project features. Given this RTL is located on a peninsula, the RTL is separated from the anticipated landscape change associated with the Project. Furbearers inhabiting the lands within the Crane

River RTL are not expected to be affected by the Project. Therefore, the Crane River RTL data is not included within the trapping data quantification as a result of it being separated from the lands altered by the project. As such, the only data with respect to an RTL within the RSA presented here, is the Gypsumville, RTL Section 270-00. The Gypsumville RTL is part of the Interlake RTL District (MBSD, 2016) (Map 13).

Each year, MBSD issues permits to trappers within the RTL block. Table 2 provides the number of permits issued by fiscal year for the Gypsumville RTL Block, located in the northeastern portion of the RSA (unpublished data, MBSD, 2016).

Table 2: Trapper Permits issued by year for the Gypsumville RTL Block

Fiscal Year	Gypsumville
1996/1997	6
1997/1998	20
1998/1999	19
1999/2000	9
2000/2001	11
2001/2002	11
2002/2003	8
2003/2004	8
2004/2005	9
2005/2006	10
2006/2007	13
2007/2008	10
2008/2009	14
2009/2010	8
2010/2011	5
2011/2012	7
2012/2013	6
2013/2014	12

The annual trapper data since 1996 for Gypsumville is provided in Table 3 (unpublished data, MBSDb, 2016). The highest number of species harvested from 1996 through to 2012 is muskrat, followed by American beaver and fisher. Coyotes were readily trapped as well as a small number of wolves. Also within the RSA is an Open block (Open block #3); however, MBSD does not track production within an open block. Therefore, production data for the Open Block #3 area are unavailable.

Table 3: Annual number of animals trapped along the Gypsumville RTL Block from 1996 to 2012

Year	Badger	American beaver	Coyote	Fox, Red	Fox, Cross	Lynx	American marten	Mink	Muskrat	Otter	Raccoon	Squirrel	Weasel	Wolf	Fisher
1996/ 1997		72	18	7				3	279	13		33	6		53
1997/ 1998		362	22	16	1	1	4	16	305	15	4	270	62	2	176
1998/ 1999		83					1	7	55	6		12	12		43
1999/ 2000		79		1			7		65	1					13
2000/ 2001		35	9	9			13		197						6
2001/ 2002		26	6	1		2	3	3	94	4	1		22		36
2002/ 2003		32	1	1			2	4			1	2	16		5
2003/ 2004	1	1	15	20	1	15	31	11		26	2	1	28		50
2004/ 2005		5	11	4		7	47	3		9		6	9		20
2005/ 2006		63	11	3		2	45	24	153	9	9	8	3		82
2006/ 2007		79	23	7		1	58	6	496	9	3	61	8		17
2007/ 2008		30	1	12			44	14	11	4		7	70		39
2008/ 2009		17	3	3		2	48	3	281			6	9		30
2009/ 2010		4	6	4		2	48	1	1562	1		3	11	1	12
2010/ 2011														1	
2011/ 2012			8	2			18	1	57		1		1		5
Total	1	888	134	90	2	32	369	96	3555	97	21	409	257	4	587

[+] Unpublished trapping data provided by Dean Berezanski, Provincial Furbearer Biologist, Manitoba Conservation

9 BASELINE WILDLIFE DATA COLLECTION AND ANALYSIS

Existing data derived from past studies conducted in the LSA and RSA, along with baseline data gathered during the current desk top analysis and field studies, provide present and historical mammal, avian, reptile, and amphibian distribution data. These data have been used to assess

native and invasive species (example: white-tailed deer) presence and the availability and location of high quality habitat for key wildlife species within the LSA and RSA. Distribution data for the wildlife populations in the LSA and RSA were acquired from a number of provincial and federal databases, such as Important Bird Areas of Canada, MBCDC, MBSD wildlife distribution survey databases, the Manitoba Herps Atlas, and the Manitoba Breeding Bird Atlas (MBBA), among others. From these data sources, a GIS database was developed of the existing and available information.

As discussed in Section 2, at the time of reporting, there were no spatial data available for the conceptual Options 1 to 4 other than the relative lengths and locations of the conceptual options. As such, ground surveys were conducted for the LSMOC reaches and in the area of the conceptual options; however, habitat modelling and analyses for the conceptual Options 1 to 4 could not be conducted as there were no spatial data available at the time of this writing for the conceptual options.

9.1 LCC – Habitat Evaluation Methods

During the projected life span of the Project, the dynamic ecosystem where the RoW is located will be undergoing continuous change from both natural (e.g. flood, fire) and human disturbance (e.g. logging, landscape change). To establish the baseline habitat conditions prior to construction, an evaluation of existing habitat conditions was conducted using the LCC to determine the type of habitat currently available within and adjacent to (5 km LSA) the LSMOC works. The LCC covertype analysis provides a quantitative assessment into the amount of habitat available within the LSA and RSA.

9.1.1 Methods

The overall LCC covertypes present within the LSA and RSA were calculated based on the spatial boundaries described in Section 5. The RSA LCC covertypes were calculated based on a buffer zone of 20 km on either side of the LSMOCs, LMOC, and the proposed ASR project features (the size of the RSA). The 20 km buffer zone represents the tract of land between two differently zoned areas, in this case, the LSMOC and LMOC project features and the area beyond the predicted zone of impact. The LSA LCC covertypes were calculated based on a buffer zone of 5 km on either side of the LSMOCs, the LMOCs, and the proposed ASR project features. The LCC was clipped (only data within the buffer zone was used for analysis) to the area and the results were summarized as percentages of LCC covertypes (habitat) within the RSA and the LSA.

9.1.2 Results

The LCC habitat analysis results showed water, wetland shrub, and grasslands as the most commonly occurring habitat covertypes within the LSA and RSA. There were very little (<1%) low shrub, tall shrub, developed or exposed land covertypes located within the LSA and RSA (Table 4).

Table 4: LCC Covertypes within the RSA and LSA

LCC-Cover Type	RSA		LSA (LSMOC)	
	Area km^2	Percent (%)	Area km^2	Percent (%)
100-Herb	118.26	1.74%	1.97	0.17%
110-Grassland	691.64	10.16%	6.06	0.52%
121-Annual crops	28.21	0.41%	0.06	0.01%
122-Perennial crops and Pasture	70.02	1.03%	0.56	0.05%
20-Water	1500.20	22.04%	97.25	8.33%
211-Coniferous - Dense	415.19	6.10%	83.55	7.16%
212-Coniferous - Open	82.87	1.22%	20.10	1.72%
221-BroadLeaf - Dense	376.68	5.53%	21.91	1.88%
222-BroadLeaf - Open	205.63	3.02%	33.15	2.84%
231-MixedWood - Dense	264.79	3.89%	45.90	3.93%
33-Exposed Land	17.74	0.26%	2.22	0.19%
34-Developed	43.20	0.63%	1.52	0.13%
51-Shrub -Tall	7.37	0.11%	0.91	0.08%
52-Shrub - Low	1.87	0.03%	0.00	0.00%
81-Wetland Treed	117.04	1.72%	22.29	1.91%
82-Wetland Shrub	1997.31	29.35%	611.24	52.38%
83-Wetland Herb	867.84	12.75%	218.34	18.71%
Total Area	6805.85	100.00%	1167.03	100.00%

The LCC covertypes associated with Reach 1, Reach 2, Reach 3 Johnson Beach, and Reach 3 Willow Point project alignments are provided in Table 5.

Table 5: LCC Covertype Loss/Alteration associated with the Reach 1, Reach 2, Reach 3 Johnson Beach, and Reach 3 Willow Point Project Alignments

LCC-Cover Type	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Johnson Beach Option (200 m RoW)		Willow Point Option (275 m RoW)	
	Area km^2	Percent (%)	Area km^2	Percent (%)	Area km^2	Percent (%)	Area km^2	Percent (%)
100-Herb	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
110-Grassland	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
121-Annual crops	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
122-Perennial crops and Pasture	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
20-Water	0.06	2.43%	0.00	0.00%	0.03	1.77%	0.04	1.29%
211-Coniferous - Dense	0.69	28.22%	1.76	38.36%	0.15	7.92%	0.23	7.06%
212-Coniferous - Open	0.03	1.10%	0.01	0.16%	0.00	0.00%	0.00	0.13%

Table 5: LCC Covertype Loss/Alteration associated with the Reach 1, Reach 2, Reach 3 Johnson Beach, and Reach 3 Willow Point Project Alignments

LCC-Cover Type	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Johnson Beach Option (200 m RoW)		Willow Point Option (275 m RoW)	
	Area km^2	Percent (%)	Area km^2	Percent (%)	Area km^2	Percent (%)	Area km^2	Percent (%)
221-BroadLeaf - Dense	0.03	1.06%	0.01	0.32%	0.00	0.00%	0.00	0.00%
222-BroadLeaf - Open	0.00	0.16%	0.00	0.00%	0.00	0.00%	0.00	0.00%
231-MixedWood - Dense	0.22	9.14%	0.18	3.89%	0.12	6.41%	0.19	5.82%
33-Exposed Land	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
34-Developed	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
51-Shrub -Tall	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
52-Shrub - Low	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
81-Wetland Treed	0.12	4.97%	0.28	6.08%	0.11	5.44%	0.16	5.09%
82-Wetland Shrub	0.66	27.11%	2.14	46.77%	1.45	74.54%	2.41	75.33%
83-Wetland Herb	0.63	25.80%	0.20	4.42%	0.08	3.92%	0.17	5.28%
Total Area	2.43	100.00%	4.58	100.00%	1.94	100.00%	3.21	100.00%

9.2 Moose

Moose are the largest member of the ungulate family in North America. Key forage for moose include willow (*Salix* spp.) and aquatic plants found in riparian habitats, along with early successional vegetation.

The range of moose is extensive in Manitoba and they are being observed more readily in the prairie region (Manitoba Conservation, n.d.). Moose are typically associated with riparian habitat, especially containing willow, but in the absence of such habitat they select stands that originate after fire or logging, which feature early successional vegetation (Doerr, 1983). Other important habitat qualities include areas for aquatic feeding, areas of coniferous cover, and mineral licks (Palidwor et al., 1995). Winter habitat is a critical component of moose range. Cover is beneficial given it helps reduce snow depths and provides relief from thermal stress associated with open areas (Bangs et al., 1985). Moose have been found to generally remain within 100 m of forest edge or cover when bRoWsing in open areas (Bangs et al., 1985). Moose populations in Manitoba are highly variable and have been reported at levels of 0.4 moose/km^2 in high-quality habitats (Palidwor et al., 1995). The provincial population has increased from 28,000 in 1992 to about 32,000 at the time of this writing (Manitoba Conservation, n.d.).

9.2.1 Aerial Moose Distribution Survey Conducted by MBSD Methods

Manitoba Sustainable Development completed aerial moose surveys within portions of the RSA in 1992, 1995, and 2008 (MBSD, unpublished data, 2008). The area surveyed was GHA 21, excluding the islands on Lake Winnipeg. The survey area covered a total of 6,530 square kilometres (km^2) and was overlain with a 3-minute grid (Gassaway et al., 1986), which consists of 3 by 5-km grid cells or sample units. Map 14 shows the 3-minute grid cells used within the survey area.

The area was first stratified meaning it was categorized into blocks of high, medium, and low densities of moose presence and signs of moose activity. The stratification survey was flown using a 337 Cessna fixed wing air craft, following a transect lines of 1.5 km apart travelling along the edge of one cell, up the middle of the cell, and then down the other side of the cell, with the maximum visibility of 500 m on either side of the air craft. All observations for the aerial survey included the age (adult vs. calf) and sex of each animal where possible, as well as tracks. Observations were recorded using a hand-held GPS unit (Garmin map 76 csx) and all survey data were entered into an Excel database.

Based on the observations, moose tracks and signs within each cell were assigned a high, medium, or low stratification rank (density prediction of animals) based on the amount of activity within each grid cell. This cell stratification of the survey area was completed before the second sampling flight could occur. The sampling of random high, medium, and low-density cell blocks was then completed with a Bell 206 helicopter, flying 500 m transects within each of the randomly selected cells, allowing for 250 m of visibility on either side of the aircraft to obtain 100% coverage of the cell being flown. All observations, moose tracks and signs, were again recorded during the survey process.

Based on the results of the sampled cells, a population estimate was generated with confidence intervals to include a p-value to determine the significance of the end result. The sampling of the random blocks was completed until a confidence interval of 95% or greater was achieved. The final result of the survey is a population estimate with a +/- value, the p-value, and the composition of the observations to include a cow/calf ratio, calf/adult ratio, and a bull/cow ratio to assist in predicting the viability of the moose population.

The age and sex data provide insights into the structure and health of the herd. Calculating Caughley's (1977) survival-fecundity rate of increase indicates the necessary recruitment rate for a stable moose population requires an annual adult female survival rate of 0.88 with 28 calves per 100 cows (i.e., a calf:cow ratio of 0.28).

9.2.2 Aerial Moose Distribution Survey Conducted by MBSD Results

Table 6 provides a summary of the MBSD aerial moose survey results for GHA 21 in 1992, 1995, and 2008. Moose population estimates from the 1992, 1995, and 2008 MBSD aerial moose surveys in GHA 21 showed a total of 789 moose in 1992, a total of 1230 moose in 1995, and a total of 346 moose in 2008. During the 2008 aerial moose survey completed by MBSD within GHA 21, a total of 346 moose +/- 21.52% (with 95% confidence intervals) were found to be within GHA 21, with 98 bulls, 188 cows, and 59 calves identified during the survey (Table 6). These observations resulted in an estimate of 52 bulls per 100 cows and 31 calves per 100 cows (a calf:cow ratio of 0.31). Of the 353 sample units 321 were classified as low, 16 as medium, and 16 as high-density sample units.

Table 6: MBSD Aerial Moose Survey Results within GHA 21, 1992, 1995 and 2008

Survey Year	Population Estimate	Confidence Interval	Population +/-	Bulls	Cows	Calves	Bulls/100 Cows	Calves/100 Cows
1992	789	95%	21.5	NA	NA	NA	NA	NA
1995	1230	95%	29.2	77	94	58	82	62
2008	346	95%	29.0	98	188	59	52	32

9.2.3 Aerial Moose Distribution Survey Conducted by MI Methods

A winter aerial moose survey was conducted from January 31, 2016 to February 6, 2016 using a Bell 206 Jet Ranger flown by Custom Helicopters Inc. The aerial moose survey design adopted the UTM grid survey methodologies used by MBSD. The aerial moose survey area conducted in 2016 was divided into two survey areas, one being an intensive survey area (the LSA) and a second area being a stratified random block survey area within the RSA. The study deign was adopted to determine the baseline distribution of moose in the LSA and RSA prior to construction.

The intensive survey area offers complete (100%) coverage of the LSA, achieved by using parallel aerial survey north-south transects, flown approximately 400 m Above Ground Level (AGL), spaced at 500 m intervals with 250 m of visibility on either side of the helicopter within the LSA. The stratified random block survey area was conducted on 5% of the remaining three-minute grid survey blocks within the RSA. Map 16 illustrates the aerial moose distribution survey area. A moose distribution map was prepared and estimates of the moose population and the calf/cow ratios were determined. Based on these results, areas of moose concentrations were developed using volume-density kernel estimates using the kernels analysis tool in the Home Range Tools for ArcGIS 10.3 (Rogers & Kie, 2011).

Kernel estimates are a form of analysis conducted on animal borne location points to determine the animals core use areas. Adaptive kernels are generating in ArcGIS using any one of, or a combination of incidental wildlife observations, wildlife GPS collar locations, locations identified

during track and sign surveys, or wildlife locations identified during aerial distribution surveys (ESRI, 2012). GPS locations or recorded observations are then used to generate the animals core use areas. Kernel analysis has been a widely used method for determining home range of wildlife populations (Rogers & Kie, 2011). Typically, the 95% isopleth is used to identify a home range of the species, for the purposes of the study, the 70% isopleth was used to identify moose core use areas. The 70% isopleth provides a further refined area where moose were observed. Core use areas were generated using the Home Range Tools (Rogers & Kie, 2011) within ArcGIS 10.3. A minimum sample size (GPS locations and/or observations) of 50 observations or more were used to generate the core use areas (Seaman et al., 1999). Any species where less than 50 observations were identified were not used for kernel analysis and core use areas were not generated.

9.2.4 Aerial Moose Distribution Survey Conducted by MI Results

The total length of survey area flown was 2,650 km with 14 moose observed (Table 7). Using observations and tracks, kernels of core use areas were identified and mapped (Map 17).

Table 7: Aerial Moose Distribution Survey Results within the RSA

Species	Observations	Tracks	Total Points used to make Kernels
Moose	14	158	172

Of the moose identified, there were 6 bulls, 3 cows, 2 calves, 2 unknown sex within the intensive survey area, and 1 cow identified in the random block survey area. If the moose of unknown sex were cows, the cow:calf ratio would be .40.

While habitat exists within the RSA and the moose fecundity rate is 0.4 (above the .28 indicative of a growing moose population), overall moose numbers within the RSA are low.

9.2.5 Moose Track and Sign Survey Methods

Multispecies ground surveys were conducted by two biologists to identify terrestrial mammals present near the LSMOC RoWs in June 2016. Based on moose habitat modelling conducted prior to field work, areas identified as representative of high quality moose habitat were investigated on foot by biologists on either side of the LSMOC RoWs along Reach 1 (300 m wide RoW), Reach 2 (500 m wide RoW), Reach 3 Johnson Beach Option (200 m wide RoW), Reach 3 Willow Point Option (275 m wide RoW), and Option 4 RoW. Biologists were taken by helicopter into areas that represented high-quality moose habitat that intersected the various LSMOC RoWs. In these modelled high-quality moose habitat areas 2 biologists in June 2016 (June 2-11) searched for moose signs by walking along either side of the RoW where overlap of quality moose habitat and the RoW existed. Map 18 presents the areas of modelled high-quality moose habitat that intersect with the various LMOC RoWs that were investigated by biologists. Tracks of all species, signs of

activity, and direct observations of wildlife were recorded on handheld GPS units (Garmin map 76csx) and on field data sheets.

9.2.6 Moose Track and Sign Survey Results

Based on the ground investigations along the LSMOC RoWs in high quality moose habitat areas, only two moose tracks observed, both along Reach 1 RoW (Table 8).

Table 8: Moose Track and Sign Survey Results

Type of Observation	Quantity	Location		
		UTM Y	UTM X	Area
Moose Tracks	1	5747650.46	566448.37	Reach 1
Moose Tracks	1	5747402.87	565417.83	Reach 1

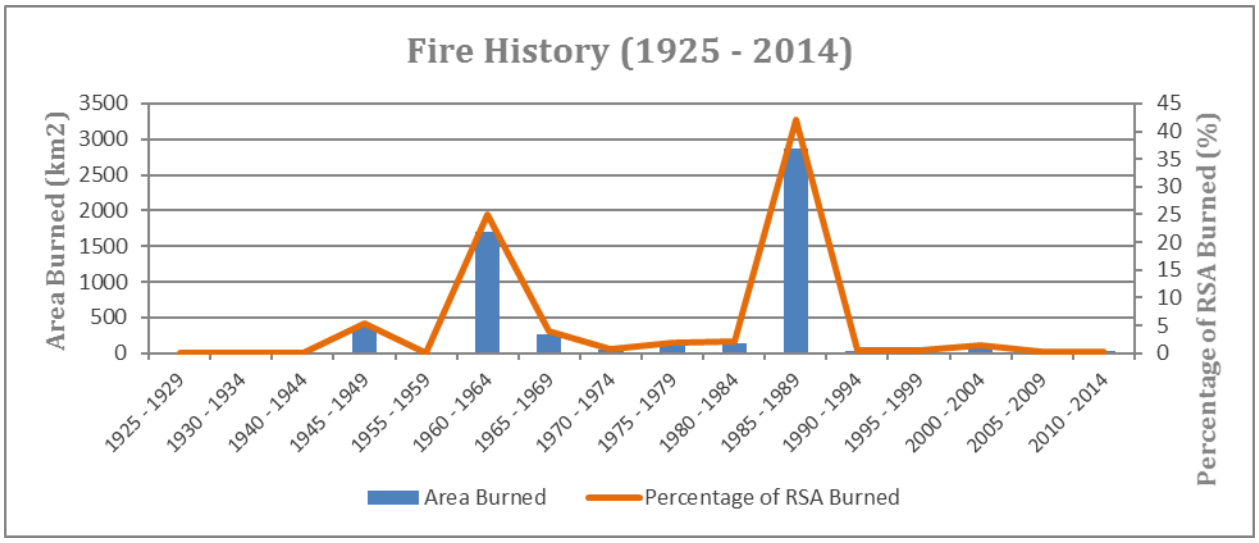
9.2.1 Fire History

The spatial fire history data for the RSA was mapped and assessed for the timeframe between 1928 and 2013. This time frame was used given it was the timeframe of consistent data collected by the province and available for analysis. These spatial fire data that were obtained from the Manitoba Land Initiative (MLI) website were clipped (constrained) to the RSA. Burn years were classified into 5 year periods (1930-34, 1935-39 etc.) with the total area burned calculated and expressed in km^2 (Figure 1), thus providing a 5-year fire trend for the RSA over the majority of the last century.

Within the RSA, based on the fire history collected between 1928-2013, it would appear that a major burn cycle occurs every 20-25 years with approximately 1500-3000 km^2 (32-55% of total area) of mature habitat being burnt. Smaller burns are occurring during that time; however, large landscape burns appear to be on a 20-25 year cycle. As a result, within 5 to 10 years following a major fire event, successional vegetation offers quality moose habitat on the landscape. Given the last major burn event occurred in 1985-89, if the 20-25-year cycle occurs again, another major burn event should occur in 2015-2019 within the RSA. However, given that the only available spatial fire history data were from 1928 onward, there is limited information available to determine burn cycle events beyond the last 90-year period.

The data collection from the 1950s onward is more accurate in comparison to the fire data collected prior to the 1950s as data collection, technological advances and reporting techniques had improved in the 1950s and onward. Moose populations thrive in areas of frequent fire (Gillingham and Parker, 2008). Given small burns occur on the landscape frequently, habitat is regenerated. However, based on the 90-year data, major large-scale burns are relatively infrequent within the RSA. In addition to fire suppression efforts in recent years, the combination of these two factors may influence the future availability of moose habitat within these areas (Table 4, Map 4, Map 5).

Figure 1: Fire History within the RSA



9.2.2 Moose Habitat Modelling Methods

Moose habitat was modelled using the LCC with the inclusion of any forest harvest block and fires data acquired from the Manitoba Land Initiative data warehouse. Fires less than 10 years of age were re-classified from the LCC classification into shrubs and used as a variable in the moose habitat model. The potential habitat for moose was modelled for both potential winter and summer habitat using mixed wood, broadleaf, and shrub stands with shrub stands less than 10 years of age (the age of the shrub and tree vegetation was determined by using burn data and harvest stand [logging] data). The availability of potential food sources for moose (successional vegetation) and dense vegetation cover for moose were incorporated into the model using queries that were developed within the Manitoba Model Forest Region for Habitat Suitability Index Moose Models (TAEM, 1995). Potential moose habitat models were created for the RSA (20 km buffer). These analyses were conducted to establish baseline potential summer and winter moose habitat prior to construction.

9.2.3 Moose Habitat Modelling Results

Potential moose summer habitat was modeled for the RSA (Map 19, Table 9). Potential moose winter habitat was modeled for the RSA (Map 20, Table 10). Based on the winter habitat model for moose, there are 648.84 km² of winter moose habitat within the RSA. The results of the moose habitat modelling show very little moose habitat may be lost or altered as a result of the LSMOC. Reach 1 is pre-existing with only little landscape change associated with making the Reach 1 option permanent, resulting in 0.12% of winter moose habitat loss/alteration. The Reach 2 option would result in 0.25% of loss or alteration to winter quality moose habitat, whereas Reach 3 with the Johnson Beach option would result in 0.04% of loss/alteration to winter quality moose habitat and Reach 3 with the Willow Point option would result in 0.05% of quality winter moose habitat loss or alteration.

Table 9: Potential Moose Summer Habitat within the RSA and the Amount of Potential Moose Summer Habitat Loss Associated with the Project Reach Features

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Shrub - Tall	7.37	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Broadleaf Dense	376.68	0.03	0.01%	0.01	0.004%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	264.79	0.22	0.08%	0.18	0.07%	0.12	0.05%	0.19	0.07%
Total	648.84	0.25	0.04%	0.19	0.03%	0.12	0.02%	0.19	0.03%

Table 10: Potential Moose Winter Habitat within the RSA and the Amount of Potential Moose Summer Habitat Loss Associated with the Project Reach Features

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Shrub - Tall	7.37	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Coniferous Sparse	82.87	0.03	0.03%	0.01	0.01%	0.00	0.00%	0.00	0.00%
Coniferous Dense	415.19	0.69	0.17%	1.76	0.42%	0.15	0.04%	0.23	0.05%
Mixedwood Dense	264.79	0.22	0.08%	0.18	0.07%	0.12	0.05%	0.19	0.07%
Total	770.22	0.94	0.12%	1.94	0.25%	0.28	0.04%	0.42	0.05%

9.2.4 Linear Density

Although moose have been extensively studied, little research has focused on the effects of habitat fragmentation and the habitat or landscape thresholds (boundary beyond which change occurs) in the management of the species. Salmo et al. (2004) compiled a table of management indicators and guidelines for moose based on studies across Canada and recommended that access density and stream crossing indices be used as land-use indicators, and that core areas and patch/corridor size be used as habitat indicators when conducting cumulative effects assessments. In summary, the authors identified a target threshold for linear disturbance for moose on a landscape scale at a density of 0.4 km/km^2 (i.e., linear disturbance features divided by the total area of interest) and a critical threshold density of 0.9 km/km^2. Analyses were conducted to determine the linear density within the LSA and RSA to identify the linear densities in these areas in comparison to the published Salmo et al. (2004) thresholds for moose.

9.2.4.1 Linear Density Methods

To assess the linear density within the LSA and RSA, the 50k National Road Network (NRN) was used, which is publicly available spatial dataset. The 50K NRN provides a homogeneous and normalized spatial dataset of the entire Canadian road network. All linear features within the NRN data set were classified into transmission lines, major and minor roads, local roads (including community driveways and local streets as well as additional access in residential areas), and the municipal road section. All features were clipped to the LSA and RSA within ArcGIS 10.3 and the linear lengths were calculated as linear kilometers. The linear distance was then divided by the area of the LSA and area of the RSA to determine the linear density of the area (km/km²).

9.2.4.2 Linear Density Results

The analyses conducted identified the current linear density for moose within the LSA and RSA to be 0.10 km^2 (LSA) and 0.22 km^2 (RSA) respectively (Table 11), both below the published Salmo et al. (2004) thresholds.

Table 11: Baseline Linear Density within the RSA and LSA

Linear Feature	RSA		LSA (LSMOC)	
	Linear Features (km)	Linear Density (km/km^2)	Linear Features (km)	Linear Density (km/km^2)
Minor Roads	818.44	0.12	10.47	0.01
Major Roads	245.57	0.04	7.59	0.01
Local Streets	31.24	0.00	0	0.00
Transmission Lines	335.19	0.05	0	0.00
Municipal Road	9.98	0.00	9.98	0.01
Idlewyld Road	48.12	0.01	48.12	0.04
Winter Road (proposed access)	34.72	0.01	34.72	0.03
Total	1523.26	0.22	110.88	0.10

The linear distance of other proposed Project-related linear developments within the LSA and RSA was also calculated to allow for comparisons in linear density of the area (km/km^2) with the various proposed LSMOC. The analyses identified that, regardless of which channel or reach route is selected, the linear density of the LSA and RSA will remain below the published Salmo et al. (2004) linear density thresholds for moose (Table 12). Given the RSA is based on a typical moose home range size of 40 km^2 (Hundertmark, 1997), linear density thresholds are best applied at the RSA scale.

Table 12: Comparison of Linear Density within the RSA and LSA including Future Project Development Routes

Linear Development	RSA		LSA (LSMOC)	
	Linear Features (km)	Linear Density (km/km^2)	Linear Features (km)	Linear Density (km/km^2)
LMOC Route C Channel	11.480	0.0017	0.000	0.000
LMOC Route D Channel	24.030	0.0035	0.000	0.000
Reach 3 Johnson Beach Option	9.540	0.0014	9.540	0.008
Reach 3Willow Point Option	11.420	0.0017	11.420	0.010
Reach 1	7.870	0.0012	7.870	0.007

9.3 Elk

Elk are the second largest ungulate species in North America behind moose. Elk feed on a variety of herbaceous species such as grasses, sedges, broad-leaved herbaceous plants, shrubs, tree twigs, leaves, and shoots in the warmer months of the year, and in winter, eat dry grasses and dry leaves they dig up in the snow.

Elk are a gregarious species and are commonly found in herds of seven individuals or more. They prefer areas of open country, but have been driven to parkland regions due to encroachment by humans (Collins & Urness,1983). Elk are known to have substantially variable home range sizes and these ranges can vary in size from a few square kilometers to hundreds of square kilometers. They use different parts of their home ranges at different times of the year, i.e. differences in summer vs. winter habitat, and will also switch from having small home ranges to very large home ranges from year to year (Childress & Lug, 2003). Cows will go off on their own to calve; some return to the same area every year and some cows will calve in nearby areas to where the herd is at the time. Following breeding season, the bulls will leave the females and move to areas of good foraging to regain body condition lost during the rut (Cranowski, 2009).

9.3.1 Aerial Elk Distribution Survey Conducted by MBSD Methods

In February 2013, an aerial elk survey was completed by MBSD (MBSD unpublished data, 2013) on the South Interlake Herd, which included areas of GHAs 21, 25, and 25A (Map 21). The elk survey area consisted of 6,714 km^2 and included agricultural land and forested lands, along with fen and muskeg habitat types. A total of 315 sample units covered the survey study area, which was also previously surveyed in 2000 and 2006 using the same study area and methodological design. The survey methods adopted for the aerial elk survey are similar to those used by MBSD for the aerial moose survey, involving the use of the 3-minute grid and the stratification using a fixed wing air-craft, followed by the intense random sampling of the classified high, medium, and low sample units. A population estimate is then generated upon the completion of the survey with a confidence interval based on the amount of observations identified within the random sampling.

9.3.2 Aerial Elk Distribution Survey Conducted by MBSD Results

Based on the initial 2013 stratification survey that had a total 315 sample units, 98 of the sample units were classified as low density, 152 were classified as medium density, and 65 of the sample units were classified as high density. A total of 809 elk were observed during the survey, producing a population estimate of 955 +/- 15.41% with a 95% confidence interval (Table 13). Within GHA 21, the population appeared to have decreased slightly from the 2006 survey results as the number of antlerless animals observed dropped by 56% (117/207). Of importance to note, however, was that the survey was conducted in February during winter conditions when it is difficult to determine cows from bulls due to antler drop.

Table 13: MBSD Aerial Elk Survey Results, 2000, 2006 and 2013

Survey Year	Population Estimate	Confidence Interval	Population +/-	GHA 21		GHA 25		GHA 25A	
				Antlered	Antlerless	Antlered	Antlerless	Antlered	Antlerless
2000	1119	NA	NA	NA	NA	NA	NA	NA	NA
2006	1180	95%	19.3	36	207	116	422	46	187
2013	955	95%	15.41	20	117	58	430	161	809

9.3.1 Aerial Elk Distribution Survey Conducted by MI Methods

An aerial survey in winter was conducted from January 31, 2016 to February 6, 2016. Winter aerial surveys have the advantage of improved detectability and permitting an assessment of annual calf recruitment through the identification of sex and age of animals (cows, bulls, calves). The aerial survey area was a sub-set of the MBSD survey area, with an intensive survey area comprised of 5 km on either side of the Route C, Route D, proposed ASR, and LSMOC RoWs. The intensive survey area offered complete (100%) coverage of the LSAs for these project linear features. The survey flight transects were spaced 500 m apart up to the 5km LSA boundary. Map 23 illustrates the intensive aerial distribution survey area for elk.

9.3.2 Aerial Elk Distribution Survey Conducted by MI Results

The total length flown during the aerial elk distribution survey was 2,650 km. There were 16 elk observed (Table 14). Using observations and tracks, kernels of high use areas were identified (Map 24) within the RSA. There was very little elk activity identified within the LSA. The elk activity identified within the LSA was in the southwest corner of the LSA near Spearhill and the most southern portions of the proposed ASR.

Table 14: Aerial Elk Distribution Survey Results within the RSA

Species	Observations	Tracks	Total Points used to make Kernels
Elk	16	58	74

9.3.3 Elk Track and Sign Survey Methods

Multispecies ground surveys were conducted by two biologists to identify terrestrial mammals present near the LSMOC RoWs in June 2016. Based on elk habitat modelling conducted prior to field work, there was little quality elk habitat identified to intersect with the LMOCs. In the few areas where modelled high-quality elk habitat did intersect with the LSMOC RoWs, biologists investigated the area on foot on either side of the LSMOC RoWs [Reach 1 (300 m wide RoW), Reach 2 (500 m wide RoW), Reach 3 Johnson Beach Option (200 m wide RoW), Reach 3 Willow Point Option (275 m wide RoW), and Option 4 RoW]. Biologists were taken by helicopter into areas that represented high-quality elk habitat that intersected the various LSMOC RoWs. In these modelled high-quality elk habitat areas 2 biologists in June 2016 (June 2-11) searched for elk signs by walking along either side of the RoW where overlap of quality elk habitat and the RoW existed. Map 25 presents the areas of modelled high-quality elk habitat that intersect with the various LMOC RoWs that were investigated by biologists. Tracks of all species, signs of activity, and direct observations of wildlife were recorded on handheld GPS units (Garmin map 76csx) and on field data sheets.

9.3.4 Elk Track and Sign Survey Results

There were no signs of elk presence along the LSMOC RoWs investigated.

9.3.5 Elk Habitat Modelling Methods

Elk habitat modelling was conducted using the LCC. The potential habitat for elk was modelled using a buffer of 300 m around all forested areas and selecting for all grasslands, annual crops, and perennial crops and pastures. Potential elk habitat models were conducted for the RSA (20 km buffer). These analyses were conducted based on the assumption that the existing Idlewyld forestry road and the municipal road were not expected to remove any additional habitat beyond the existing 20 m RoW within the RSA.

9.3.6 Elk Habitat Modelling Results

Potential elk habitat was modeled for the RSA (Map 26; Table 15). The potential modelled elk habitat loss associated with the LSMOC Reach Options (Reach 1, Reach 2, Reach 3 Johnson Beach, and Reach 3 Willow Point option) is less than 0.05% of the overall potential modelled elk habitat available within the RSA.

Table 15: Potential Elk Habitat within the RSA and the amount of Elk Habitat Loss associated with each LSMOC

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Johnson Beach Option (200 m RoW)		Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Annual Crop	10.14	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Broadleaf Dense	376.68	0.03	0.01%	0.01	0.004%	0.00	0.00%	0.00	0.00%
Broadleaf Open	205.63	0.004	0.002%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Grassland	450.28	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Perennial Crops and Pastures	29.13	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	1071.85	0.03	0.003%	0.01	0.001%	0.00	0.00%	0.00	0.00%

9.4 White-Tailed Deer

Although white-tailed deer (WTD) were not identified as a key species for the wildlife baseline work for the Project, understanding their current location and distribution within the RSA prior to construction is important for the future understanding of any potential effects of the Project on WTD movement and potential species interaction. Therefore, all observations and tracks of WTD that were observed during field work have been recorded and assessed. White-tailed deer movement northward raises concern over disease transmission from WTD to other ungulate species such as moose and elk (Wasel et al., 2003). These diseases may include the transfer of the parasite *Parelaphostrongylus tenuis* (*P.tenuis*) meningeal worm, also known as “brain worm”, which is a common parasitic nematode of the central nervous system whose natural host is WTD (Kopcha et al., 2012; Wasel et al., 2003). *P.tenuis* within WTD characteristically completes its life cycle without causing any significant adverse health effects (Kopcha et al., 2012). However, *P.tenuis* occurrence in other ungulates such as moose, elk and caribou (*Rangifer tarandus*), causes serious physical deterioration and eventual death.

Warning et al. (1991) demonstrated that WTD use RoWs to feed, especially when the available forage is more abundant or of better quality for deer than in adjacent landscapes. RoWs have the potential to provide WTD with good forage opportunities, given much of their diet consists of bRoWse such as grasses, forbs (i.e., flowering plants), mast (e.g., acorns), and young successional vegetation such as shrubs, many of which gRoW in RoW edge habitats. WTD, especially males, tend to disperse after their first year of age and may go as far as 25 km from

their original home range (Fulbright and Ortega-S, 2006). As a result of the optimal foraging found in RoWs and WTD natural dispersal behaviour, WTD may increase their range northward with the creation of linear RoW corridors. The potential northern range expansion of WTD may be positively correlated to the northern spread of disease and parasites, including *P.tenuis*. Therefore, WTD baseline presence within the LSA is important to understand prior to construction so future potential effects of the Project on WTD north movement and distribution can be determined.

9.4.1 Aerial White-Tailed Deer Distribution Survey Methods

WTD distribution relative to the Project was determined during a winter aerial survey conducted from January 31, 2016 to February 6, 2016 using a Bell 206 Jet Ranger operated by Custom Helicopters Inc. The aerial survey area was delineated as 5 km on either side of the proposed project linear features offering complete (100%) coverage of the LSA, achieved by using parallel aerial survey north- south transects, flown at approximately 400 feet AGL and spaced at 500 m intervals allowing for 250m visibility on either side of the helicopter. All results were assessed and mapped and a distribution map for WTD within the LSA was prepared.

9.4.2 Aerial White-Tailed Deer Distribution Survey Results

The total length flown during the aerial WTD distribution survey was 2,650 km. There were 628 WTD observed (Table 16). Using observations and tracks, kernels of high use areas were identified (Map 27). Within the LSA, WTD activity was identified along the proposed ASR; however, there were no signs of WTD activity identified near the LSMOC RoWs (Map 27).

Table 16: Aerial WTD Distribution Survey Results within the RSA

Species	Observations	Tracks	Total Points used to make Kernels
White Tailed Deer	628	3495	4123

9.4.3 White-Tailed Deer Track and Sign Survey Methods

Based on habitat use of WTD and their use of edge habitats, biologists searched for signs of WTD throughout all ground survey work along the LSMOC RoWs in conjuction with bird point counts and terrestrial mammal track and sign surveys. Further, given WTD often are found in areas occupied by both elk and moose, in areas where quality habitat for moose and elk were investigated, all incidental signs of WTD observations made were recorded.

9.4.4 White-Tailed Deer Track and Sign Survey Results

During the ground surveys conducted, there were several incidental signs of white-tailed deer activity and their presence identified (Table 17).

Table 17: White-tailed Deer Activcity Identified along LSMOC RoWs (Reach 1, Reach 2, Reach 3 Johnson Beach, and Reach 3 Willow Point)

Type of Observation	UTM Y	UTM X	Area
Deer Tracks	5715281.63	542336.69	LSM Shoreline
Deer Tracks	5738548.21	560468.71	Reach 1
Deer Tracks	5751079.66	572931.36	Reach 3
Deer Tracks	5753270.3	570517.76	Reach 3
Deer Tracks	5751870.3	569013.06	Reach 3
Deer Tracks	5747604.83	564751.96	Reach 1
Deer Tracks	5740552.75	554366.52	Reach 1
Deer Tracks	5736016.99	555521	LSM Shoreline

9.5 Furbearers

As noted, the RSA offers suitable habitat to many furbearers. The American American marten, representing a terrestrial furbearer, and the American beaver, representing an aquatic furbearer, have been selected as key species for the baseline data studies.

American marten is an economically important furbearer species for commercial trapping due to a relatively desirable coat and ease in capture. American marten is a solitary animal that spends most of its time in Manitoba's boreal forest. American marten is also an ecological indicator of mature coniferous forests featuring structural complexity, i.e. with high canopy closure and vertical and horizontal woody structure, and are abundant in undisturbed forests. American marten is carnivorous and will feed avidly on mice and other small rodents, utilizing coarse woody debris for foraging and to access prey. American marten has a very large home range sizes for its body mass, particularly for males versus females, and den in forest habitat with rock crevices, and large logs and snags (Caras, 1967). American marten play an important role in the predator/prey regime of an ecosystem and they are a valued economic species.

American beavers are a semi-aquatic furbearer species commonly found throughout Manitoba in riparian areas including lakes, creeks, rivers, and other water bodies. American beavers are known to be ecosystem engineers, creating and modifying habitat in significant ways, impacting species richness and landscape-level heterogeneity. As a keystone species, American beavers modify drainage regimes by cutting vegetation and building dams that have long-term effects on landscapes. American beavers feed on almost any herbaceous or wood plant but prefers willows, aspen, and other deciduous trees, and construct lodges/dams from mud and sticks. American beavers mate for life and can produce a breeding colony of 2-12 members including breeding pair, yearlings, and kits. American beaver is a primarily nocturnal and travels far from home to food, overwintering under the ice for up to 6 months within the protection of their lodge (Caras, 1967).

9.5.1 Furbearers Winter Aerial Survey Methods

An aerial multispecies distribution survey was flown between January 31, 2016 to February 6, 2016 within parts of the RSA to locate individuals and tracks to determine the distribution of wildlife species. Using a Bell 206 Jet Ranger Helicopter operated by Custom Helicopters Inc., transects were spaced 500 m apart and were flown in a north-south direction flying at an average speed of 100 km/hr. A crew of three biologists were on board plus the pilot allowing for three observers. Hand-held GPS units (Garmin map 76csx) were utilized to record locations of all tracks, animal observations, habitat type, and any other important points of interest.

Core use areas were developed using volume-density kernel estimates using the kernels analysis tool in the Home Range Tools for ArcGIS (ESRI, 2012). Winter volume-density kernels that depict the core use areas for a variety of furbearers were determined to be the boundary of the 70% contour using the same analyses as described in the moose Section 8.2.3.

9.5.2 Furbearers Winter Aerial Survey Results

Maps 28 to Map 33 show the core use areas (distribution) for American beaver, American marten, otter, hare, lynx, and coyote created from the aerial survey data. Table 18 shows the observation and tracks for all furbearer species within the RSA. American beaver activity (lodges and dams) was identified in abundance (107 observations) throughout the LSA (Map 28). Similarly, American marten tracks were also identified in abundance (1581 track observations) throughout the LSA, except for the most southern portion of the LSA along the municipal road (Map 29). Otter activity was identified most prominently in the northern portion of the LSA (Map 30), whereas, hare activity was identified in abundance (3254 tracks identified) and throughout the LSA (Map 31). Where hare activity was identified, lynx activity was also identified, covering a majority of the LSA (Map 32). Coyote observations and tracks were also identified along the LSA in both the southern and northern portions of the LSA (Map 33).

Table 18: Aerial Furbearer Distribution Survey Results within the RSA

Species	Observations	Tracks	Total Points used to make Kernels
American beaver Lodge/dam	107	0	107
American marten	0	1581	1581
Otter	0	188	188
Coyote	25	368	393
Lynx	3	177	180
Hare	3	3254	3257

9.5.3 Furbearer Track and Sign Survey Methods

Multispecies ground surveys were conducted by two biologists to identify terrestrial mammals present near the RoW. Based on habitat modelling conducted prior to field work, from June 2-

June 11, 2016, biologists were taken by helicopter to areas of high quality marten habitat that were identidied to intersect with the LSMOC RoWs. In areas where modelled high-quality marten habitat intersects the LSMOC RoWs, biologists walked transects on either side of the RoW, in search of signs of marten presence. Map 34 presents the modelled areas of high-quality marten habitat that intersect the LSMOC RoWs that were surveyed for signs of marten activity. Tracks of all species, signs of activity, and direct observations of wildlife were recorded on handheld GPS units (Garmin map 76csx) and on field data sheets.

In all areas where bird point counts and the terrestrial mammal track and sign surveys were conducted along the LSMOC RoWs, biologists looked for incidential signs of predator activity.

9.5.4 Furbearer Track and Sign Survey Results

During the ground-based surveys, there were several signs of furbearer activity and presence identified (Table 19).

Table 19: Furbearer Track and Sign Survey Results

Species Name	Quantity	Location		Area
		UTM Y	UTM X	
American beaver Lodge	1	5738548.21	560468.71	Reach 1
American beaver dam	1	5751175.37	568439.18	Reach 3 (Johnson Beach)
American beaver dam	2	5751789.42	569721.23	Reach 3 (Johnson Beach)
American beaver dam	1	5752304.18	570335.59	Reach 3 (Johnson Beach)
Fox track	1	5751870.3	569013.06	Reach 3 (Johnson Beach)
American beaver dam	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
Muskrat lodge	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
American beaver run	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
Shore den	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
American beaver lodge	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
Racoon tracks	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
Otter scat	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
Racoon scat	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
Muskrat lodge	5	5718220.53	539297.42	LSM Shoreline
American beaver lodge	2	5718220.53	539297.42	LSM Shoreline
American beaver lodge	2	5726030.01	542618.08	LSM Shoreline
Coyote tacks	1	5740552.75	554366.52	Reach 1
Fox track	1	5740552.75	554366.52	Reach 1

There were very few signs of bear and wolf presence identified during the ground searches (Table 20). Only three wolves were identified within the RSA during aerial survey, Lat 51.68165 and Long -98.231301). The aquatics team noted one wolf on April 29, 2016 on the proposed ASR (forestry road), approximately 9 km south of where the three wolves were sighted during the winter 2016 aerial survey (M. Lowdon, pers.comm., 2016). During the aerial survey conducted in October 2015, a large adult black bear was observed in the LSMOC and proposed ASR LSA.

Table 20: Predator Activity identified during Ground Surveys

Species Name	Observation Type	Quantity	Location		Area
			UTM Y	UTM X	
Bear Activity	Observation	1	5715393.01	542181.92	Lake SM Shoreline
Wolf tracks	Track	1	5751921.27	568943.3	Reach 3 (Johnson Beach)
Black bear track	Track	1	5751523.75	568438.04	Reach 3 (Johnson Beach)
Wolf tracks	Track	1	5751079.66	572931.36	Reach 3 (Willow Point)
Black bear tracks	Track	1	5751079.66	572931.36	Reach 3 (Willow Point)
Black bear tracks	Track	1	5753270.3	570517.76	Reach 3 (Johnson Beach)
Wolf tracks	Track	1	5753270.3	570517.76	Reach 3 (Johnson Beach)
Wolf tracks	Track	1	5751870.3	569013.06	Reach 3 (Johnson Beach)
Wolf tracks	Track	1	5747402.87	565417.83	Reach 3 (Johnson Beach)
Wolf tracks	Track	1	5747604.83	564751.96	Reach 3 (Johnson Beach)
Black bear track	Track	1	5740552.75	554366.52	Reach 1
Wolf tracks	Track	1	5740552.75	554366.52	Reach 1
Wolf tracks	Track	1	5742115.29	555545.49	Reach 1
Wolf tracks	Track	1	5743764.99	556828.59	Reach 1

9.5.5 Furbearer Habitat Modeling Methods

American beaver habitat, as our representative aquatic furbearer, and American marten habitat, as our representative terrestrial furbearer were modelled. Furbearer habitat modelling was conducted using the LCC. The potential habitat for American beaver was modelled using broadleaf and mixed wood stands, as well as stands dominated by willow understory. The habitat was selected within 200 m of creeks, rivers and water bodies that were less than 8 hectares (ha) in size. The potential habitat for American marten was modelled using mature coniferous and mixed wood stands that were older than 60 years. Fire layers were used to determine the age of the mature stands. The potential habitat for both of these species were modelled for the LSA as well as the RSA.

9.5.6 Furbearer Habitat Modeling Results

9.5.6.1 American beaver

Habitat for American beavers is abundant and not limiting within the LSA and RSA. The American American beaver habitat modeling conducted on the Reach Options in the LSA and RSA exposed only minor differences in the amount of potential habitat loss/alteration associated with each option (Table 21 and Table 22, Map 35). The most American beaver habitat loss is associated with Reach 2.

Table 21: Potential American beaver Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with the Project Reach Features

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Broadleaf Dense	24.99	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Broadleaf Open	9.26	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	17.30	0.00	0.00%	0.00	0.00%	0.01	0.05%	0.01	0.07%
Wetland Shrub	154.43	0.10	0.07%	0.81	0.58%	0.17	0.12%	0.23	0.16%
Total	205.98	0.10	0.05%	0.81	0.43%	0.18	0.10%	0.24	0.13%

Table 22: Potential American beaver Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with the Project Linear Features

Habitat Type	Total Modeled Habitat (LSM LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Broadleaf Dense	4.19	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Broadleaf Open	1.46	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	2.84	0.00	0.00%	0.00	0.00%	0.01	0.30%	0.01	0.44%
Wetland Shrub	43.67	0.10	0.33%	0.81	2.62%	0.17	0.55%	0.23	0.75%
Total	52.16	0.10	0.28%	0.81	2.27%	0.18	0.50%	0.24	0.68%

9.5.6.2 American marten

Based on habitat modelling, there is 81.72 km² of quality American marten habitat within the LSA (Map 36). No American marten habitat loss or alteration is anticipated as a result of the Project Reach features within the RSA and very little habitat loss within the LSA (Table 23 and Table 24).

Table 23: Potential American marten Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with the Project Reach Features

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Coniferous Dense	110.59	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Coniferous Open	43.65	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	94.59	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	248.83	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%

Table 24: Potential American marten Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with the Project Reach Features

Habitat Type	Total Modeled Habitat (LSM LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Coniferous Dense	34.87	0.57	1.68%	0.97	2.85%	0.00	0.00%	0.00	0.00%
Coniferous Open	18.86	0.02	0.12%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	27.99	0.19	0.76%	0.06	0.26%	0.00	0.00%	0.00	0.00%
Total	81.72	0.78	1.03%	1.03	1.36%	0.00	0.00%	0.00	0.00%

9.6 Bats

As noted earlier in this report, many of the known bat hibernacula present in Manitoba are found within the Interlake, Grand Rapids, and Gypsumville areas McRitchie and Monson (2000). Many bat species in Manitoba utilize hollow trees and forested areas for roosting habitats during summer months and then tend to swarm in middle to late August. Migratory bat species swam in fall during their migration south, while non-migratory bat species swarm near their hibernacula in preparation for the colder temperatures of fall and their eventual hibernation in winter (McRitchie and Monson, 2000).

During winter aerial survey work conducted January 31- February 6, 2016, potential bat and snake hibernacula and large mammal dens were identified visually by biologists onboard the helicopter. Biologists noted large rock outcrops with the appearance of hibernacula entries where snow was unable to accumulate and what appeared to be hot air was rising from the openings. Locations of these sightings were recorded within the RSA during the winter aerial survey for further investigation of these sights on foot during spring and summer field work, 2016 (Table 25)

Table 25: Potential Hibernacula as well as Potential Large Mammals Dens Identified during Winter Aerial Survey Work

Site	Location	Distance to Nearest Project Feature (km)	Nearest Project Feature
Potential Hibernacula 1	Northeast of Lake St. Martin FN	1.68	LSMOC Reach 1
Potential Hibernacula 2	Southeast of Lake St. Martin FN	3.41	Proposed ASR
Potential Hibernacula 3	Southeast of Lake St. Martin FN	3.32	Proposed ASR
Potential Hibernacula 4	Southeast of Lake St. Martin FN	3.47	Proposed ASR
Potential Hibernacula 5	Southeast of Lake St. Martin FN	4.09	Proposed ASR
Potential Hibernacula 6	Southeast of Lake St. Martin FN	1.44	Proposed ASR
Potential	Southeast of Lake St. Martin FN	2.62	Proposed ASR

In June 2016, two biologists were flown to each of the potential hibernaculum sites (Table 25) identified during the winter aerial surveys. Biologists searched each site in June 2016 recording their observations and findings at each site on hand-held GPS units (Garmin map 76 csx). Of the sites surveyed, two sites were determined to be potentially active snake hibernacula with one red-sided garter snake was identified in close proximity (Table 73 in Section 8.8.4). The remaining 5 sites were consistent with potential bat hibernaculum, with one large potential bat hibernaculum identified that was thought to have been previously active with possible bat guano noted and deep cavernous openings within the hibernacula that would support over-wintering (Table 26). Photographs 1 and 2 are of potential bat hibernacula identified in June 2016.

Table 26: Potentially Active Bat Hibernacula Identified during Field Investigations

Species Name	Observation Type	Quantity	Area
Potential bat hibernacula	Observation	1	Proposed ASR
Potential Bat quano matter	Observation	1	Proposed ASR
Potential bat hibernacula	Observation	1	Proposed ASR
Potential bat hibernacula	Observation	1	Proposed ASR
Potential bat hibernacula - Possible guano	Observation	1	Proposed ASR

Photograph 1: Possible bat hibernacula identified within the Access Road LSA. Photograph taken by EcoLogic Environmental Inc. on June 8, 2016

Photograph 2: Possible bat hibernacula identified within the Access road LSA. Picture of the opening of one potential hibernacula. Photography taken by EcoLogic Environmental Inc. on June 8, 2016

Given the identification of potential bat hibernaculum within the RSA and based on discussions and consultation with Dr. Craig Willis (pers. Comm., 2016), bat specialist at the University of Winnipeg, further investigation was undertaken. Bat recorders (specialized recording devices that identify bat presence by converting their emitted echolocation ultrasound signals to audible frequencies, each unique to different bat species) were deployed in areas where potential bat hibernaculum was identified. Bat recorders are an effective method used to investigate bat activity to locate potential bat hibernacula, bat species presence in an area, and to assess for presence of bat species at risk (Agrant, 2012).

SM4BAT bat recorders were deployed on August 2, 2016 in the areas where potential hibernaculum were identified (approximately 2.9 km to the west of the Proposed ASR). The bat recording devices were deployed in jackpine rock outcrop and were retrieved on September 14, 2016. The bat recorders were attached to large jack pine trees, approximately 5 m above the ground. The UHF microphones were attached to a branch with the actual microphone pointed in a 45-degree downward direction, as specified by the manufacture. This deployment method is undertaken in order prevent rain from entering the microphone.

Upon retrieval of the bat recorders, three biologists conducted pedestrian ground searches of the area to further investigate for the possibility of other potential hibernacula areas and possible active hibernacula.

Once retrieved, the data captured on the bat recorders were analyzed using the Kaleidoscope Pro 4 Analysis Software. The software reads and converts the collected .wav files to identify high frequency bat calls and an Auto ID function, providing a predicted species of bat for each of the

identified calls. The software uses a probability analysis to determine the species, producing a p-value. Those identified species with a p-value <0.05 are statistically significant in predicting the species of bat correctly. Those calls with a p-value are >0.05 are not necessarily the identified species. Having a p-value >0.05 can be due to small sample size (only having a few calls) or can be that the files recorded only have a few sound bursts recorded. When the p-value is >0.05, a manual identification of the call is required. The spectrogram is visually inspected by the biologist and is compared with the "training dataset", which is a database of recorded calls of bat species within optimal conditions. The training data set for North America consists of approximately 9,000 files (or calls) with over 200,000 bursts (or clusters of collected frequencies) (Agrant, 2012). The training data set generates a minimum and maximum value for each frequency and a likelihood, which when compared to the recorded call, can determine the identity of the species of bat (Agrant, 2012).

Based on the recorded files collected, four bat species were identified. All of the calls identified were assigned a highly statistically significant p-value reading (p-value <0.05), suggestive of a high degree of certainty of accurate species identification. The four species of bats that were identified on the recording devices were: the Silver-haired and Hoary species (both migratory species) and the big and little brown bat species (both hibernacula dwelling species).

Given little brown bats, listed as endangered under SARA, were identified on the bat recorders, a second deployment of the bat recorders (SM4BAT) was undertaken on September 26th, 2016. For this deployment, locations along the Idylwild Road (Map 38) were selected in habitat types (jack pine dominated and black spruce forested areas) consistent with the first bat recorder deployment sites. The locations for second deployment sites were along the proposed ASR in order to determine whether little brown bats may be swarming closer to the proposed ASR, which may be indicative of potential hibernaculum closer to the proposed ASR than the original recorder deployment sites located 2.9 km from the proposed ASR. The bat recorders were re-deployed using the same methodologies described for the first deployment. The bat recorders collected data from dusk to dawn for approximately 22 days and were retrieved on October 17th, 2016. Once recovered, the recorders were analyzed using the Kaleidoscope Pro 4 Analysis Software.

There were three bat species that were identified on the bat recording unit deployed.The species of bats identified were little brown bats, big brown bats, and northern long-eared bats. Northern long-eared bats, similar to little brown bats, are listed as Endangered – Schedule 1 under SARA (2015) and under MESEA (2015). All of the little brown bat calls recorded were identified with certainty by the software; however, only a portion the northern long-eared bats vocals could be identified with certainty. The number of suspected northern long-eared bat calls did not produce the clarity and/or a large enough sample size for the software to confirm the identity of the calls with statistical confidence (p-value>0.05). Additional study is required to confirm the presence of northern long-eared bats in the RSA. Given the timeline of these species identifications and given the hibernacula and hibernacula openings typical of the area, it is likely that little brown bats are

hibernating in the vicinity. If active little brown bat hibernaculum is identified, the area would fit the criteria for critical habitat under SARA.

The location of the first bat recorder deployment is 37 km to the west of the largest identified critical habitat area in the Interlake for little brown bats and is located 23 km to the southeast of the other two smaller critical habitat areas identified in the Interlake for little brown bats. The second bat recorder deployments along the LSM ASR were located 33 km to the southwest of the smaller known critical habitat area for little brown bats and 29 km to the west of the larger known critical habitat area for little brown bats.

Calculating the detection range for ultrasonic microphones (the type used in bat recorders), is highly variable and complex (Wildlife Acoustics, 2016). The bat recorder identifies that little browns are present but the recorder is unable to determine the distance and/or direction of the bats from the recorder. Given that little brown bats are present at a time of year consistent with hibernation, further investigation is required to determine whether little brown bats have indeed established hibernacula (critical habitat) within the RSA.

9.6.1 Elevation Assessment

To enhance our understanding of the relationship between landscape elevation and the potential effect that project related activities may have on any would-be bat hibernacula within the LSA, the elevation of project related features gathered and mapped (Table 27). Understanding the relationship of landscape elevation to potential hibernaculum assists in understanding potential hibernacula abiotic environmental changes (humidity, temperature, moisture) that may occur as a result of landscape change in the area, such as potential ground water/surface water fluctuations. The elevation data was gathered from the CanVec dataset created by Natural Resources Canada, Earth Sciences Sector (Natural Resources Canada, 2016). Table 27 provides the elevation of the area where potential hibernacula were identified in relation to the Proposed ASR, the LSMOCs, as well as other landscape features.

Table 27: Elevation of Project Features within the LSA

Location	Elevation Min (masl)	Elevation Max (masl)
Drill Hole 1	227	227
Quarry Withdrawal 1	240	240
Quarry Withdrawal 2	255	260
Quarry Withdrawal 3	260	280
Quarry Withdrawal 4	255	265
Quarry Withdrawal 5	290	290
Quarry Withdrawal 6	285	285
Quarry Withdrawal 7	285	285
Quarry Lease 1	270	270

Table 27: Elevation of Project Features within the LSA

Location	Elevation Min (masl)	Elevation Max (masl)
Quarry Lease 2	282	282
Quarry Lease 3	285	285
Quarry Lease 4	285	285
Quarry Lease 5	285	285
Quarry Lease 6	285	285
Private Quarry Permit 1	285	285
Casual Quarry Permit 1	260	260
Casual Quarry Permit 2	260	260
Casual Quarry Permit 3	285	285
Casual Quarry Permit 4	282	282
Casual Quarry Permit 5	282	282
Casual Quarry Permit 6	282	282
Potential Bat hibernacula /Bat Recorder	295	295
Reach 1 (Option L)	245	250
Reach 2	235	250
Reach 3 (Johnson Beach and Willow Pt)	220	235

The area where several hibernacula were identified is located at a higher elevation than the proposed ASR, however, given bats were also recorded along the proposed ASR. Given these species were heard during late September, early October, it is highly likely that these species are hibernating within the nearby area as bats do not tend to travel far from hibernacula at that time of year (Norquay, personal communication, September 2016). Therefore, further investigation is required to assess for the presence of bat hibernacula within the LSA and then, if hibernacula are present, to determine their elevation in relation to project related landscape features to assist with future potential effects assessment.

9.7 Avian Species

A suite of key avian species that were identified as key focal bird species for the baseline studies were modelled for potential habitat. Not all avian species at risk were modelled. Only avian species at risk that were identified during historical bird survey work within the RSA and/or habitat types that were consistent with the RSA were modelled. Table 1 provides the suite of migratory and forest birds that were selected as key species for the baseline studies. These species were selected given their status as either “threatened” or “endangered” under SARA (2015), MESEA (2015), and/or as being ranked as S3 or higher by MBCDC (2015) with historical data that has identified them within the RSA.

9.7.1 Avian Species Habitat Modeling Methods

A suite of bird species was modelled for potential habitat using the LCC for some species and the Manitoba Forest Resource Inventory (FRI) for other species. The FRI was used in cases where the avian species had a strong preference for water and wetland habitats. The FRI, although dated to 1980, was determined to be a better base layer for modelling for such species given the finer scale of the FRI and therefore enhanced detailed information on riparian vegetation species (such as cattails [*Typha* spp.]). For certain models, Ecologic's Geomatics team unioned various habitat layers to meet the specific habitat requirements for each species. A combination was used of the LCC, to include fire and any harvest data acquired, FRI, and the soil classification from CANSIS (Canadian Soil Information Service). LCC cover types, were joined with those FRI covertype to identify stand age, crown closure etc., at time of FRI data production. This allows Ecologic Biologists to create more comprehensive habitat models for the given species. Each key avian species was modelled for potential habitat within the Project Footprint area (20 m) and the LSA. The model parameters were developed by a team of wildlife biologists, based on their expertise and literature review of species habitat requirements.

9.7.2 Avian Species Habitat Modeling Results

9.7.2.1 American White Pelican

The American white pelican is a large white bird with a distinctive oversized bill and is listed as uncommon in Manitoba (MBCDC, 2015). The pelican frequents large lakes and marshes in western North American. The American white pelican forms foraging flocks with coordinated wing movements to drive fish into shallow water where they can be caught more easily (Vuilleumier, 2009).

The American white pelican potential habitat was modelled using the FRI with a focus on water, grassy marshes, and habitat dominated by grassy vegetation around American beaver floods.

Based on the habitat model, there is 729.98 km² of available American white pelican habitat within the RSA. The amount of potential American white pelican habitat that may be lost or altered as a result of the Project is a very small percentage of the overall American white pelican available within the LSA and RSA (Table 28 and Table 29).

Table 28: Potential American White Pelican Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km2)	Proportion (%)	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)
Grassy Marshes	68.60	0.02	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Floods	34.07	0.00	0.00%	0.06	0.17%	0.00	0.00%	0.00	0.00%
Water	627.32	0.03	0.01%	0.00	0.00%	0.23	0.04%	0.28	0.04%
Total	729.98	0.06	0.01%	0.06	0.01%	0.23	0.03%	0.28	0.04%

Table 29: Potential American White Pelican Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with the LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km2)	Proportion (%)	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)
Grassy Marshes	6.65	0.02	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Floods	8.66	0.00	0.00%	0.06	0.66%	0.00	0.00%	0.00	0.00%
Water	44.90	0.03	0.07%	0.00	0.00%	0.23	0.51%	0.28	0.62%
Total	60.21	0.06	0.09%	0.06	0.10%	0.23	0.38%	0.28	0.46%

9.7.2.2 Bank Swallow

The bank swallow listed as threatened by SARA and occupies a range in Manitoba that may include the LSA. The bank swallow has a recovery strategy under SARA for Ontario as well as several action plans in a number of National Parks in Canada (SARA, 2015).

Bank swallows are commonly found near water, fields, marshes, streams, and lakes. They are typically seen feeding in flight over (or near) water at all seasons, even in migration. The bank swallow nests in colonies in vertical banks of dirt or sand, usually along rivers or ponds, seldom away from water. Bank swallows nest in dense colonies, in holes in dirt or sand banks. Some of these colonies are quite large, and a tall riverine cut bank may be pockmarked with several hundred holes (MBBA, 2015).

The bank swallow potential habitat was modelled using the FRI focusing on all wetlands, river banks, rivers, lakes, and marsh areas. Based on the habitat model, there is 220.17 km² of habitat available for bank swallow within the RSA. There is extremely small to no bank swallow habitat potentially lost/altered by the LSMOC linear features (Table 30 and Table 31).

Table 30: Potential Bank Swallow Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Wet Meadow	109.03	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Marsh	68.60	0.02	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Townsites/Residential Sites	31.89	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Gravel Pits/Mine sites	8.73	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Fence lines (Community Pastures), fire guards	1.92	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	220.17	0.02	0.01%	0.00	0.00%	0.00	0.00%	0.00	0.00%

Table 31: Potential Bank Swallow Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Wet Meadow	0.40	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Marsh	6.65	0.02	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Townsites/Residential Sites	0.14	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Gravel Pits/Mine sites	1.11	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Fence lines (Community Pastures), fire guards	0.02	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	8.32	0.02	0.29%	0.00	0.00%	0.00	0.00%	0.00	0.00%

9.7.2.3 Barn Swallow

The barn swallow, listed as threatened under SARA, is readily adapted to nesting under eaves of houses, under bridges, and inside buildings such as barns. The barn swallow prefers agricultural regions and migrates over winter to sugar cane fields, grain fields and marshes.

The barn swallow potential habitat was modelled using the FRI focusing on all wet meadow, marsh, townsites/residential, fence lines, and gravel pits and mine sites. Based on the habitat model, there is 69.96 km² of habitat for the barn swallow within the RSA. There is no barn swallow habitat potentially lost/altered by the LSMOC linear features (Table 32 and Table 33).

Table 32: Potential Barn Swallow Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Precipitous Slopes/Fragile Sites	0.27	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Abandoned Cultivated Land	16.79	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Dry Upland Ridge Prairie	3.32	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Townsites/Residential Sites	31.89	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Gravel Pits/Mine Sites	8.73	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
River Banks	8.95	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	69.96	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%

Table 33: Potential Barn Swallow Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Precipitous Slopes/Fragile Sites	0.00	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Abandoned Cultivated Land	2.82	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Dry Upland Ridge Prairie	0.00	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Townsites/Residential Sites	0.14	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Gravel Pits/Mine Sites	1.11	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
River Banks	0.00	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	4.07	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%

9.7.2.4 Black-Crowned Night-Heron

The black-crowned night-heron is listed as widespread and abundant in Manitoba (MBCDC, 2015). The black-crowned night-heron can be found near waterbodies, such as lakes, ponds, streams; however, they are generally absent from waterbodies located in higher elevations. These herons often form colonies on islands or in marshes and have been known to have strong fidelity to colony sites (Vuilleumier, 2009).

Potential habitat for the black-crowned night-heron was modelled using the FRI with a focus on grassy marshes, drainage areas, American beaver floods and rivers. Based on the habitat model, there is 219.66 km2 of habitat for black-crowned night-heron within the RSA. The only potential black-crowned night-heron habitat lost/altered by the LSMOCs is associated with the development of Reach 1 and Reach 2 and the degree of loss/alteration associated with these options is a very small percentage of the overall black-crowned night-heron habitat available (Table 34 and

Table 35). There is very little black-crowned night heron habiat anticipated to be lost or alterned by Reach 3 Johnson Beack or Reach 3 Willow Point options at 0.05% and 0.005% respectively.

Table 34: Potential Black-Crowned Night-Heron Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Grassy Marshes	68.6	0.02	0.04%	0	0.00%	0	0.00%	0	0.00%
Mud/Salt Flats	31.4	0.01	0.03%	0	0.00%	0	0.00%	0	0.00%
Drainage Ditches	5.78	0	0.00%	0	0.00%	0	0.00%	0	0.00%
American beaver Flood	34.07	0	0.00%	0.06	0.17%	0	0.00%	0	0.00%
Dugouts/Water holes	1	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Rivers	8.95	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Shorelines/Islands	69.86	0.05	0.07%	0.06	0.09%	0.1	0.14%	0.01	0.01%
Total	219.66	0.08	0.04%	0.12	0.05%	0.1	0.05%	0.01	0.005%

Table 35: Potential Black-Crowned Night-Heron Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Grassy Marshes	6.65	0.02	0.36%	0	0.00%	0	0.00%	0	0.00%
Mud/Salt Flats	8.11	0.01	0.12%	0	0.00%	0	0.00%	0	0.00%
Drainage Ditches	0.02	0	0.00%	0	0.00%	0	0.00%	0	0.00%
American beaver Flood	8.66	0	0.00%	0.06	0.66%	0	0.00%	0	0.00%
Dugouts/Water holes	0.02	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Rivers	0	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Shorelines/Islands	6.92	0.05	0.72%	0.06	0.87%	0.1	1.45%	0.01	0.14%
Total	30.38	0.08	0.26%	0.12	0.39%	0.1	0.33%	0.01	0.03%

9.7.2.5 Bobolink

The bobolink occurs in Manitoba and may be found in the LSA. They primarily reside in hayfields and agricultural areas and are located in large flocks near marshes during the fall (MBBA, 2015). They are listed as threatened under SARA (SARA, 2015).

The bobolink potential habitat was modelled using the FRI focusing on cultivated lands, pasture lands, and marshes.

Based on the habitat model, there is 671.25 km² of habitat available for the bobolink within the RSA. The only potential habitat lost/altered by the LSMOCs is associated with the development of Reach 1 and the degree of loss/alteration with the Reach 1 option is a very small percentage of the overall bobolink habitat available (Table 36 and Table 37). There is no anticipated loss or alteration of bobolink habitat associated with Reach 2, Reach 3 Johnson Beach, or Reach 3 Willow Point.

Table 36: Potential Bobolink Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Hayland - Cultivated	292.97	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Cropland - Cultivated	59.69	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Pastureland - Domestic Animals	233.20	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Abandoned Cultivated Land	16.79	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Marsh	68.60	0.02	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	671.25	0.02	0.004%	0.00	0.00%	0.00	0.00%	0.00	0.00%

Table 37: Potential Bobolink Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Hayland - Cultivated	2.18	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Cropland - Cultivated	0.39	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Pastureland - Domestic Animals	2.16	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Abandoned Cultivated Land	2.82	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Marsh	6.65	0.02	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	14.20	0.02	0.17%	0.00	0.00%	0.00	0.00%	0.00	0.00%

9.7.2.6 Canada Warbler

Canada warbler is a migratory songbird listed as threatened under SARA (2015), threatened under MESEA (2015), and ranked S3B under MBCDC (2015). It is found in various forest types, but is most abundant in wet, deciduous-coniferous forest with thick underbrush (MBBA, 2015). Generally, this species is uncommon in Manitoba, but has been found breeding throughout the southern boreal forest (along the Manitoba Escarpment in western Manitoba to the Whiteshell and Nopoming Provincial Park boundaries in the southeast) and north toward The Pas in scattered locations. This species may spend no more than a few months on its summer breeding grounds (i.e. it is one of the last species to arrive and the first to leave), then rapidly migrating in pairs (males typically arrive slightly ahead of females), and at night to wintering grounds in southern Mexico and northwestern South America.

The Canada warbler potential habitat was modelled using the LCC focusing on all dense broadleaf and mixedwood stands found on mineral soils. Based on the habitat model, there is 498.18 km² of Canada warbler habitat available within the RSA. The amount of potential Canada warbler habitat loss/alteration associated with the project is a very small percentage of the overall Canada warbler habitat available within the RSA and LSA (Table 38 and Table 39).

Table 38: Potential Canada Warbler Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Broadleaf Dense	346.94	0.01	0.002%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	151.24	0.002	0.001%	0.00	0.00%	0.05	0.03%	0.09	0.06%
Total	498.18	0.01	0.002%	0.00	0.00%	0.05	0.01%	0.09	0.02%

Table 39: Potential Canada Warbler Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Broadleaf Dense	18.48	0.01	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	18.76	0.002	0.01%	0.00	0.00%	0.05	0.26%	0.09	0.45%
Total	37.24	0.01	0.03%	0.00	0.00%	0.05	0.13%	0.09	0.23%

9.7.2.7 Caspian Tern

The Caspian tern is the world's largest tern and is listed as uncommon in Manitoba (MBCDC, 2015). This species is an aggressive bird occurring in a variety of aquatic habitats including both freshwater and marine ecosystems. The Caspian tern is rare offshore, it breeds in interior lakes and frequents marshes and wetlands (Vuilleumier, 2009).

The Caspian tern potential habitat was modelled using the FRI with a focus on wet marshy areas, dominated by grassy vegetation around American beaver floods and wet treed areas, small lakes and shorelines of larger lakes. Based on the habitat model, there is 327.45 km² of Caspian tern habitat available within the RSA. The degree of potential loss/alteration with the LSMOCs is a very small percentage of the overall Caspian tern habitat available (Table 40 and Table 41).

Table 40: Potential Caspian Tern Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Marsh	68.60	0.02	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Drainage Ditches	5.78	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Flood	34.07	0.00	0.00%	0.06	0.17%	0.00	0.00%	0.00	0.00%
Dugouts/Water Holes	1.00	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Water	218.01	0.21	0.09%	0.00	0.00%	0.11	0.05%	0.14	0.06%
Total	327.45	0.23	0.07%	0.06	0.02%	0.11	0.03%	0.14	0.04%

Table 41: Potential Caspian Tern Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Marsh	6.65	0.02	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Drainage Ditches	0.02	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Flood	8.66	0.00	0.00%	0.06	0.66%	0.00	0.00%	0.00	0.00%
Dugouts/Water Holes	0.02	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Water	18.89	0.21	1.09%	0.00	0.00%	0.11	0.60%	0.14	0.74%
Total	34.24	0.23	0.67%	0.06	0.17%	0.11	0.33%	0.14	0.41%

9.7.2.8 Common Nighthawk

Common nighthawk is a migratory songbird listed as threatened under MESEA (2015), SARA (2015) and uncommon (S3B) by the MCDC (2015). The common nighthawk can be found in most of Manitoba except the northern extremity of the province and is highly likely to be found within

the LSA (Bezener and De Smet, 2000). There is a recovery strategy for the common nighthawk in Canada (SARA, 2015) which highlights the threat assessment associated with accidental mortality of common nighthawk with vehicles as medium level of concern and habitat loss resulting from development as an unknown level of concern.

This species breeds in a wide range of open habitats (e.g. dunes, beaches, burnt, logged or recently harvested areas, rocky outcrops, rocky barrens, grasslands, pastures, or riparian areas), along with mixed and coniferous forests. Less common in southern Manitoba, it is still quite common in parts of northern Manitoba, and typically arrives late to spring breeding grounds (MBBA, 2015). It winters in the tropics, but migratory patterns are difficult to distinguish from other nighthawks, as they mix together with other nighthawks in parts of the winter range; uniquely, females usually arrive several days ahead of males.

For the common nighthawk, using the LCC, dense and open coniferous stands with areas of open rock outcrop and exposed land were used to model potential habitat.

Based on the habitat model, there is 119.19 km² of common nighthawk habitat available within the RSA. The degree of potential habitat loss/alteration associated with the LSMOCs is a very small percentage of the overall common nighthawk habitat available (Table 42 and Table 43).

Table 42: Potential Common Nighthawk Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Coniferous Open	82.87	0.03	0.03%	0.01	0.01%	0	0.00%	0.004	0.01%
Exposed Land	17.74	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Grassland	18.58	0	0.00%		0.00%	0	0.00%	0	0.00%
Total	119.19	0.03	0.03%	0.01	0.01%	0	0.00%	0.004	0.00%

Table 43: Potential Common Nighthawk Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Coniferous Open	20.1	0.03	0.13%	0.01	0.04%	0	0.00%	0.004	0.02%
Exposed Land	2.22	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Grassland	0	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Total	22.32	0.03	0.12%	0.01	0.03%	0	0.00%	0.004	0.02%

9.7.2.9 Eastern Whip-Poor-Will

Eastern whip-poor-will is a migratory songbird listed as threatened under MESEA (2015), SARA (2015), and is uncommon (S3B) in Manitoba (MCDC, 2015). It prefers to breed in semi-open or patchy forests with clearings, such as regenerating disturbed areas, upland deciduous or mixed-wood forests; this species occurs in a variety of similar forest-structure areas in Manitoba, but not wide-open spaces or dense forests (MBBA, 2015). The northern border of the breeding range is a diagonal stripe along the aspen parkland transition zone from southeastern Manitoba to eastern central Saskatchewan. Wintering grounds are in Mexico and Central America.

For the Eastern whip-poor-will, the potential habitat was modelled using the LCC with a focus on broadleaf open and mixedwood dense. Based on the habitat model, there is 310.55 km² of Eastern whip-poor-will habitat available within the RSA. No Eastern whip-poor-will habitat loss/alteration is anticipated with the development of the LSMOCs (Table 44 and Table 45).

Table 44: Potential Eastern Whip-Poor-Will Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Broadleaf Open	185.82	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	124.73	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	310.55	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%

Table 45: Potential Eastern Whip-Poor-Will Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Broadleaf Open	30.92	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	12.34	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	43.26	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%

9.7.2.10 Eastern Wood-Pewee

Eastern wood-pewee is a common (S4B) (MCDC, 2015) migratory songbird not listed under SARA or MESEA, but assessed as Special Concern by COSEWIC. The eastern wood-pewee is common in mature mixedwoods and deciduous forests, often including aspen stands in Manitoba, and may be present in mature deciduous woods such as large aspen stands and along edges of fairly open woods; it also occurs in riparian forests, beach ridge forests, and sometimes well-wooded urban and rural parks, and southern boreal transitional forest, with a deciduous component, or sometimes jack pine and more open boreal forest types (MBBA, 2015). It is one of the last migrants in spring, and winters in the tropics of South America.

For the eastern wood pewee, using the LCC, dense broadleaf and mixedwood stands were used to model potential habitat. Based on the habitat model, there is 641.47 km² of eastern wood-pewee habitat available within the RSA. The degree of potential Eastern wood-pewee habitat loss/alteration associated with the LSMOCs is a very small percentage of the overall eastern wood-pewee habitat available (Table 46 and Table 47).

Table 46: Potential Eastern Wood-Pewee Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Broadleaf Dense	376.68	0.03	0.01%	0.01	0.004%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	264.79	0.22	0.08%	0.18	0.07%	0.12	0.05%	0.19	0.07%
Total	641.47	0.25	0.04%	0.19	0.03%	0.12	0.02%	0.19	0.03%

Table 47: Potential Eastern Wood-Pewee Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Broadleaf Dense	21.91	0.03	0.12%	0.01	0.07%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	45.90	0.22	0.48%	0.18	0.39%	0.12	0.27%	0.19	0.41%
Total	67.81	0.25	0.37%	0.19	0.28%	0.12	0.18%	0.19	0.28%

9.7.2.11 Golden-Winged Warbler

Golden-winged warblers, which are listed as threatened under MESEA (2015) and SARA (2015) and is uncommon (S3B) in Manitoba (MCDC, 2015). They are found in dry uplands, swamp forests, marshes, scrubby bur-oak woodland, young willow-tamarack stands, and other early successional habitats including the fringes of the boreal forest in Manitoba (MBBA, 2015). They are likely to be found in the LSA. Golden-winged warblers can be found on and near lakes, rivers, marshes, and prairie wetlands in Manitoba (MBBA, 2015). They are likely to be present in the LSA and are assessed as a species of special concern by COSEWIC.

For the golden-winged warbler, potential habitat was modelled using the FRI with a focus on tamarack, willow, birch, wet meadows and marshes. Based on the habitat model, there is 556.93 km^2 of golden-winged warbler habitat available within the RSA. The degree of potential loss/alteration with LSMOCs is a small percentage of the overall golden-winged warbler habitat available (Table 48 and Table 49).

Table 48: Potential Golden-Winged Warbler Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Tamarack Larch Treed Muskeg	58.03	0.00	0.00%	0.13	0.23%	0.04	0.07%	0.05	0.09%
Willow	198.78	0.02	0.01%	0.09	0.04%	0.04	0.02%	0.01	0.01%
Dwarf Birch	122.49	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Wet Meadow	109.03	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Marsh	68.60	0.02	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	556.93	0.04	0.01%	0.22	0.04%	0.08	0.01%	0.07	0.01%

Table 49: Potential Golden-Winged Warbler Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Tamarack Larch Treed Muskeg	5.73	0.00	0.00%	0.13	2.29%	0.04	0.74%	0.05	0.90%
Willow	29.70	0.02	0.06%	0.09	0.29%	0.04	0.13%	0.01	0.05%
Dwarf Birch	59.60	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Wet Meadow	0.40	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Marsh	6.65	0.02	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	102.07	0.04	0.04%	0.218	0.213%	0.081	0.080%	0.066	0.065%

9.7.2.12 Horned Grebe

The horned grebe is listed as a species of special concern by SARA (2015) but is listed as widespread and abundant in Manitoba (MBCDC, 2015). The horned grebe breeds in small freshwater lakes, ponds, and marshes, including man-made ponds. The horned grebe prefers areas with open water and patches of sedges, cattails, and other wetland vegetation (Vuilleumier, 2009). The horned grebe potential habitat was modelled using the FRI with a focus on marsh and water drainage areas, gravel pits and mine sites, as well as American beaver floods and rivers.

Based on the habitat model, there is 139.51 km² of horned grebe habitat available within the RSA. The potential habitat lost/altered by the LSMOCs is a small percentage of the overall horned grebe habitat available (Table 50 and Table 51).

Table 50: Potential Horned Grebe Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Marsh	68.6	0.02	0.04%	0	0.00%	0	0.00%	0	0.00%
Sand Beaches	5.07	0	0.00%	0	0.00%	0.01	0.19%	0	0.00%
Gravel Pits/Mine sites	8.73	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Drainage Ditches	5.78	0	0.00%	0	0.00%	0	0.00%	0	0.00%
American beaver Flood	34.07	0	0.00%	0.06	0.17%	0	0.00%	0	0.00%
Dugouts/Water Holes	1	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Rivers	8.95	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Small Lakes	7.31	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Total	139.51	0.02	0.02%	0.06	0.04%	0.01	0.01%	0	0.00%

Table 51: Potential Horned Grebe Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Marsh	6.65	0.02	0.36%	0	0.00%	0	0.00%	0	0.00%
Sand Beaches	0.32	0	0.00%	0	0.00%	0.01	2.96%	0	0.00%
Gravel Pits/Mine sites	1.11	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Drainage Ditches	0.02	0	0.00%	0	0.00%	0	0.00%	0	0.00%
American beaver Flood	8.66	0	0.00%	0.06	0.66%	0	0.00%	0	0.00%
Dugouts/Water Holes	0.02	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Rivers	0	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Small Lakes	0.98	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Total	17.76	0.02	0.14%	0.06	0.34%	0.01	0.06%	0	0.00%

9.7.2.13 Least Bittern

Least bittern is a migratory marsh bird listed as threatened under SARA (2015) and endangered under MESEA (2015). It prefers to breed only in marshes dominated by emergent vegetation such as cattails, surrounded by stable-level areas of open water, but will also breed in shrubby swamps. Dense vegetation is required for nesting to enable its nest to sit on a platform of stiff stems; open water is needed for foraging to allow it to ambush prey in shallow water near marsh edges; and access to clear water is essential to see its prey. Least bittern is secretive and most often detected only by its cuckoo-like call. It is found in southern Manitoba and winters mainly along the Gulf and Mexican coasts, south to Panama.

Based on the habitat model, there is 102.66 km² of least bittern habitat available within the RSA. The degree of potential loss/alteration associated with LSMOCs is a very small percentage of the overall least bittern habitat available (Table 52 and Table 53).

Table 52: Potential Least Bittern Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Marsh	68.60	0.02	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Floods	34.07	0.00	0.00%	0.06	0.17%	0.00	0.00%	0.00	0.00%
Total	102.66	0.02	0.02%	0.06	0.06%	0.00	0.00%	0.00	0.00%

Table 53: Potential Least Bittern Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Marsh	6.65	0.02	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Floods	8.66	0.00	0.00%	0.06	0.66%	0.00	0.00%	0.00	0.00%
Total	15.31	0.02	0.16%	0.06	0.38%	0.00	0.00%	0.00	0.00%

9.7.2.14 Olive-sided Flycatcher

Olive-sided flycatcher is a migratory songbird listed as threatened under SARA (2015), MESEA (2015), and is uncommon in Manitoba (S3B) (MCDC, 2015). It is found in open forest habitat (boreal wetland, western coniferous, or mixedwood forests), containing tall mature trees or snags for perching to enable foraging; open areas include natural forest-edge wetland areas, burned forest clearings, old-growth stand openings, or harvested areas such as logged areas (Bezener and De Smet, 2000; MBBA, 2015). Successful breeding habitat is more likely to be in natural openings rather than harvested areas. In Manitoba, it is located in lowland coniferous forest; from Riding Mountain National Park in the west to Moose Lake in the southeast, and up into the Interlake to Hecla Island and Mantagao Lake. This species has the longest migration of any North American flycatcher, travelling solitarily to its wintering grounds; the majority of this species migrates to Panama, and the northern Andes from northern Venezuela to western Bolivia, with high densities in Colombia.

Olive-sided flycatcher was modelled for potential habitat using the LCC with a focus on all coniferous and treed wet areas, and wooded to forested bogs that have greater than 10% tree cover. Based on the habitat model, there is 2,197.22 km² of olive-sided flycatcher habitat available within the RSA. The overall potential habitat loss/alteration associated with the LSMOCs is a very small percentage of the overall olive-sided flycatcher habitat available within the RSA (Table 54 and Table 55).

Table 54: Potential Olive-Sided Flycatcher Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Coniferous Open	82.87	0.03	0.03%	0.01	0.01%	0.00	0.00%	0.00	0.00%
Wetland Shrub	1997.31	0.66	0.03%	2.14	0.11%	1.45	0.07%	2.41	0.12%
Wetland Treed	117.04	0.12	0.10%	0.28	0.24%	0.11	0.09%	0.16	0.14%
Total	2197.22	0.81	0.04%	2.43	0.11%	1.55	0.07%	2.58	0.12%

Table 55: Potential Olive-Sided Flycatcher Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Coniferous Open	20.10	0.03	0.13%	0.01	0.04%	0.00	0.00%	0.00	0.02%
Wetland Shrub	611.24	0.66	0.11%	2.14	0.35%	1.45	0.24%	2.41	0.40%
Wetland Treed	22.29	0.12	0.54%	0.28	1.25%	0.11	0.47%	0.16	0.73%
Total	653.64	0.81	0.12%	2.43	0.37%	1.55	0.24%	2.58	0.39%

9.7.2.15 Peregrine Falcon

The peregrine falcon is listed by SARA (2015) as a species of special concern, as endangered under MESEA (2015) and as very rare in the province of Manitoba (MBCDC, 2015). The peregrine falcon is known to be a “wanderer” that can dive from great heights at speeds of up to 320 km/hr (Vuilleumier, 2009). The peregrine falcon occupies a wide variety of habitats, such as open valleys, cities with tall buildings, and along inland cliffs or mountain ranges, in all cases, requiring a high nesting perch for raising their young and hunting (Vuilleumier, 2009). For the peregrine falcon, using the LCC, dense broadleaf and mixedwood stands were used to model potential habitat.

Peregrines require open spaces consistent with much of the terrain in southern Manitoba and traditionally nest at cliff locations. In southern Manitoba, where there is an absence of high cliffs, urban centres provide an alternative nesting habitat. Hydro structures such as transmission line poles often serve as vantage points in these fairly open and relatively flat landscapes. The entire landscape of the RSA has an overall topography that ranges from 220 to 310 m asl with the winter road located along an upland glacial beach ridge. Historical accounts within the Heritage Resources technical report (NLHS, 2016) indicate a “big ridge” within the LSA; however, this is located along the winter road moraine. Therefore, there are no true cliffs or ridges that are tall enough within the RSA for peregrine falcon use. During migration, they may use wooded habitats to roost and rest as they fly through an area. Based on the habitat model, there is 641.47 km² of peregrine falcon habitat available within the RSA. The degree of potential loss/alteration with the LSMOCs is a very small percentage of the overall peregrine falcon habitat available within the RSA (Table 56 and Table 57).

Table 56: Potential Peregrine Falcon Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Broadleaf Dense	376.68	0.03	0.01%	0.01	0.004%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	264.79	0.22	0.08%	0.18	0.07%	0.12	0.05%	0.19	0.07%
Total	641.47	0.25	0.04%	0.19	0.03%	0.12	0.02%	0.19	0.03%

Table 57: Potential Peregrine Falcon Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Broadleaf Dense	21.91	0.03	0.12%	0.01	0.07%	0.00	0.00%	0.00	0.00%
Mixedwood Dense	45.90	0.22	0.48%	0.18	0.39%	0.12	0.27%	0.19	0.41%
Total	67.81	0.25	0.37%	0.19	0.28%	0.12	0.18%	0.19	0.28%

9.7.2.16 Piping Plover

The piping plover is very rare (S1B) in Manitoba (MCDC, 2015) and is listed as endangered under SARA (2015) and MESEA (2015). Piping plover habitat primarily consists of open sandy beaches or rocky shorelines, often in areas of the beach that are dry and away from the water. For the piping plover, the FRI was used, specifically modelling for sandy shores and/or mudflats/salt flats along shorelines within 150 m of LM, LSM, and Lake Winnipeg.

The amount of potential habitat for piping plover is limited to the shorelines of LM, LSM, and Lake Winnipeg within the RSA. The degree of loss/alteration with the LSMOC Reaches is very small to non-existent in the RSA (between 0.01 and 0.00 km2) and LSA (between 0.01 and 0.00 km2) (Table 58 and Table 59).

Table 58: Potential Piping Plover Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300m ROW)		Reach 2 (500m ROW)		Reach 3 Johnson Beach Option (200m ROW)		Reach 3 Willow Point Option (275m ROW)	
		Area (km2)	Proportion (%)	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)
Mud/Salt Flats	19.03	0.01	0.05%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Sand Beaches	4.65	0.00	0.00%	0.00	0.00%	0.01	0.21%	0.00	0.00%
Total	23.68	0.01	0.04%	0.00	0.00%	0.01	0.04%	0.00	0.00%

Table 59: Potential Piping Plover Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSM LSA) in Km²	Reach 1 (300m ROW)		Reach 2 (500m ROW)		Reach 3 Johnson Beach Option (200m ROW)		Reach 3 Willow Point Option (275m ROW)	
		Area (km2)	Proportion (%)	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)	Area (km2)	Proportion (%)
Mud/Salt Flats	2.77	0.01	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Sand Beaches	0.32	0.00	0.00%	0.00	0.00%	0.01	2.95%	0.00	0.00%
Total	3.10	0.01	0.32%	0.00	0.00%	0.01	0.31%	0.00	0.00%

9.7.2.17 Red-Headed Woodpecker

The red-headed woodpecker prefers a variety of habitat types: open oak, beech, or riparian forests, forest edges, orchards, grasslands, pastures, roadsides, urban green spaces, and beside American beaver ponds and brooks. They are uncommon in Manitoba (S3B) (MCDC, 2015), listed as threatened under MESEA (2015) and SARA (2015) and likely to be present in the LSA. The red-headed woodpecker was modelled for potential habitat using the FRI with a focus on all recreational sites, water drainage areas, fence lines, and American beaver floods.

Based on the habitat model, there is 38.3 km² of red-headed woodpecker habitat available within the RSA. The only habitat lost/altered by the LSMOCs is associated with the development of Reach 2, and the degree of loss/alteration with Reach 2 is a very small percentage of the overall red-headed woodpecker habitat available (Table 60 and Table 61).

Table 60: Potential Red-Headed Woodpecker Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Recreational sites	1.33	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Shelter Belts	0.83	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Fence lines (Community Pastures), fire guards	1.92	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Drainage Ditches	5.78	0	0.00%	0	0.00%	0	0.00%	0	0.00%
American beaver Flood	9.86	0	0.00%	0.06	0.17%	0	0.00%	0	0.00%
Grassland	18.58	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Total	38.3	0	0.00%	0.06	0.13%	0	0.00%	0	0.00%

Table 61: Potential Red-Headed Woodpecker Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Recreational sites	0	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Shelter Belts	0	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Fence lines (Community Pastures), fire guards	0.02	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Drainage Ditches	0.02	0	0.00%	0	0.00%	0	0.00%	0	0.00%
American beaver Flood	8.66	0	0.00%	0.06	0.66%	0	0.00%	0	0.00%
Grassland	0	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Total	8.7	0	0.00%	0.06	0.66%	0	0.00%	0	0.00%

9.7.2.18 Short-Eared Owl

Short-eared owl is a migratory marsh or open-grassland bird that is listed as special concern under SARA (2015). It is rare to uncommon in Manitoba (S2S3B) and threatened under MESEA (2015). It makes use of a wide variety of open habitats, including arctic tundra, grasslands, peat bogs, marshes, sand-sage concentrations, and old pastures, with preferred nesting sites found in dense grasslands, as well as tundra with areas of small willows (Bezener and De Smet, 2000; MBBA 2015). The main factor influencing the preference of short-eared owl for open habitat is believed to be the abundance of food, especially the presence of meadow voles in the south and collared lemmings in the north. Short-eared owl are often associated with spring concentrations of Rough-legged Hawks and Northern Harriers, which are also positive indicators of rodent abundance. Short-eared owls breed mainly in southern farmland and northern tundra in Manitoba; in the boreal plains, they are sparsely distributed and breed in extensive marshes and fens. Wintering grounds are located south throughout the United States to Central America. The short-eared owl was modelled for potential habitat using the LCC with a focus on all grasslands, croplands, and wetland herb.

Based on the habitat model, there is 1,747.76 km² of short-eared owl habitat available within the RSA. The degree of potential loss/alteration associated with the LSMOCs is a very small percentage of the overall short-eared owl habitat available within the RSA (Table 62 and Table 63).

Table 62: Potential Short-Eared Owl Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Herb	118.26	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Grassland	691.64	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Perennial Crops and Pasture	70.02	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Wetland Herb	867.84	0.63	0.07%	0.20	0.02%	0.08	0.01%	0.17	0.02%
Total	1747.76	0.63	0.04%	0.20	0.01%	0.08	0.004%	0.17	0.01%

Table 63: Potential Short-Eared Owl Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km^2	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)	Area (km^2)	Proportion (%)
Herb	6.06	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Grassland	1.97	0.00	0.00%	0.00	0.000%	0.00	0.000%	0.00	0.000%
Perennial Crops and Pasture	0.56	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Wetland Herb	218.34	0.63	0.29%	0.20	0.09%	0.08	0.03%	0.17	0.08%
Total	226.92	0.63	0.28%	0.20	0.09%	0.08	0.03%	0.17	0.07%

9.7.2.19 Trumpeter Swan

Trumpeter swan is a migratory water bird not listed under SARA (2015) but is very rare in Manitoba (S1B) (MCDC, 2015) and endangered under MESEA (2015). Despite its rarety, a number of sightings have occurred in Manitoba in recent years (MBBA, 2015). It prefers nesting is shallow wetlands with stable water levels, abundant and elevated nest sites, abundant and diverse aquatic invertebrates and/or plants, and low levels of human disturbance. Trumpeter swan typically mates for life, with females laying an egg every second day until they have a full clutch (average of five to six eggs). Migration to wintering grounds is complex and flown in short segments with long layovers and very few long flights; birds from western Canada fly east of the Rockies to the Yellowstone area following freeze up in late fall.

The trumpeter swan was modelled for potential habitat using the FRI. Boreal lakes, American beaver floods, and open wet marshes were used to highlight potential habitat. Topographic maps at the scale of 1:50,000 were used to identify lakes potentially inhabited by swans.

Based on the habitat model, there is 706.57 km² of trumpeter swan habitat available within the RSA. The potential habitat lost/altered in association with the LSMOCs is a small percentage of the overall trumpeter swan habitat available (Table 64 and Table 65).

Table 64: Potential Trumpeter Swan Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Marsh	68.60	0.02	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Flood	34.07	0.00	0.00%	0.06	0.17%	0.00	0.00%	0.00	0.00%
Water	594.96	0.24	0.04%	0.00	0.00%	0.11	0.02%	0.14	0.02%
Rivers	8.95	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	706.57	0.26	0.04%	0.06	0.01%	0.11	0.02%	0.14	0.02%

Table 65: Potential Trumpeter Swan Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Marsh	6.65	0.02	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Flood	8.66	0.00	0.00%	0.06	0.66%	0.00	0.00%	0.00	0.00%
Water	47.98	0.24	0.50%	0.00	0.00%	0.11	0.24%	0.14	0.29%
Rivers	0.00	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%
Total	63.29	0.26	0.41%	0.06	0.09%	0.11	0.18%	0.14	0.22%

9.7.2.20 Yellow Rail

Yellow rail is a migratory marsh bird listed as Special Concern under SARA (2015) but is not listed under MESEA (2015). It is ranked as uncommon in Manitoba (S3B) (MCDC, 2015) and typically found in marshes with little standing water (0 to 12-centimetre depth) and emergent vegetation (sedges, true grasses, and rushes, for example), but also inhabits damp fields and meadows, river and stream floodplains, herbaceous vegetation of bogs, and drier margins of estuarine- and salt marshes (MBBA, 2015).

The yellow rail potential habitat was modelled using the FRI with a focus on wet marshy areas, dominated by grassy vegetation around American beaver floods and wet treed areas.

Based on the habitat model, there is 541.49 km² of yellow rail habitat available within the RSA. The degree of potential loss/alteration associated with the LSMOCs is a very small percentage of the overall yellow rail habitat available within the RSA (Table 66 and Table 67).

Table 66: Potential Yellow Rail Habitat within the RSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (RSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Muskeg	438.83	0.70	0.16%	0.07	0.02%	0.11	0.02%	0.10	0.02%
Marsh	68.60	0.02	0.04%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Floods	34.07	0.00	0.00%	0.06	0.17%	0.00	0.00%	0.00	0.00%
Total	541.49	0.72	0.13%	0.13	0.02%	0.11	0.02%	0.10	0.02%

Table 67: Potential Yellow Rail Habitat within the LSA and the Amount of Potential Habitat Loss/Alteration Associated with LSMOCs

Habitat Type	Total Modeled Habitat (LSA) in Km²	Reach 1 (300 m RoW)		Reach 2 (500 m RoW)		Reach 3 Johnson Beach Option (200 m RoW)		Reach 3 Willow Point Option (275 m RoW)	
		Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)	Area (km²)	Proportion (%)
Muskeg	154.36	0.70	0.45%	0.07	0.04%	0.11	0.07%	0.10	0.07%
Marsh	6.65	0.02	0.36%	0.00	0.00%	0.00	0.00%	0.00	0.00%
American beaver Floods	8.66	0.00	0.00%	0.06	0.66%	0.00	0.00%	0.00	0.00%
Total	169.67	0.72	0.43%	0.13	0.07%	0.11	0.06%	0.10	0.06%

9.7.3 Manitoba Breeding Bird Atlas Surveys

The Manitoba Breeding Bird Atlas (MBBA) has conducted bird survey work within the RSA. Map 41 presents the grid Map used by the MBBA showing where survey work has been conducted within the RSA. A full listing of all of the birds identified by the MBBA surveys can be found at (MBBA, 2015) by downloading the survey data for each tile of interest. Map 42 and Table 68 provide the general location (by tile) and the bird species at risk that were identified during the MBBA surveys conducted within the RSA. The tiles that are colored red on the Map represent the areas with seven unique bird species at risk identified. The Project linear feature with the highest number of bird species at risk identified is the Route D alignment.

Table 68: MB Breeding Bird Survey Results for Avian Species at Risk (Table data corresponds with Map 42)

Region	Category	Square	Species1	Species2	Species3	Species4	Species5	Species6	Species7
7	Forest SAR	14MC90	Barn Swallow	Eastern Wood-Pewee					
7	Forest and Water SAR	14MC91	American White Pelican	Barn Swallow					
7	Forest and Water SAR	14MC92	American White Pelican	Barn Swallow	Eastern Whip-poor-will	Eastern Wood-Pewee	Red-headed Woodpecker		
7	Forest and Water SAR	14NB07	Barn Swallow	Caspian Tern	Eastern Wood-Pewee	Horned Grebe			
7	Forest and Water SAR	14NB09	Barn Swallow	Least Bittern					
6	Forest SAR	14NB16	Barn Swallow						
6	Forest and Water SAR	14NB18	American White Pelican	Barn Swallow	Bobolink	Eastern Wood-Pewee	Red-headed Woodpecker		
6	Forest and Water SAR	14NB19	American White Pelican	Bank Swallow	Barn Swallow	Bobolink	Horned Grebe	Red-headed Woodpecker	
6	Forest and Water SAR	14NB26	American White Pelican	Barn Swallow	Bobolink				
6	Forest and Water SAR	14NB28	American White Pelican	Barn Swallow	Bobolink				
6	Forest and Water SAR	14NB29	Barn Swallow	Bobolink	Horned Grebe	Red-headed Woodpecker			
6	Forest and Water SAR	14NB36	American White Pelican	Barn Swallow	Bobolink	Red-headed Woodpecker			
6	Forest SAR	14NB37	Barn Swallow	Bobolink	Eastern Whip-poor-will	Red-headed Woodpecker			
6	Forest and Water SAR	14NB38	American White Pelican	Barn Swallow	Bobolink	Eastern Whip-poor-will	Least Bittern		
6	Forest and Water SAR	14NB39	Barn Swallow	Eastern Whip-poor-will	Least Bittern				
6	Forest and Water SAR	14NB46	American White Pelican	Barn Swallow	Bobolink	Common Nighthawk	Eastern Whip-poor-will	Red-headed Woodpecker	
6	Forest SAR	14NB47	Barn Swallow	Bobolink	Eastern Whip-poor-will	Red-headed Woodpecker			
6	Forest SAR	14NB48	Barn Swallow	Red-headed Woodpecker					
6	Forest SAR	14NB49	Barn Swallow	Bobolink	Eastern Whip-poor-will				
6	Forest and Water SAR	14NB56	Bobolink	Eastern Whip-poor-will	Yellow Rail				

Table 68: MB Breeding Bird Survey Results for Avian Species at Risk (Table data corresponds with Map 42)

Region	Category	Square	Species1	Species2	Species3	Species4	Species5	Species6	Species7
6	Forest SAR	14NB57	Barn Swallow	Bobolink	Eastern Whip-poor-will				
6	Forest SAR	14NB58	Barn Swallow	Canada Warbler					
6	Forest SAR	14NB59	Canada Warbler						
6	Water SAR	14NB68	Yellow Rail						
6	Forest SAR	14NB77	Barn Swallow	Eastern Wood-Pewee	Golden-winged Warbler				
6	Forest SAR	14NB78	Golden-winged Warbler						
6	Forest SAR	14NB89	Barn Swallow	Golden-winged Warbler					
7	Forest SAR	14NC00	Barn Swallow						
7	Forest SAR	14NC01	Eastern Whip-poor-will						
6	Forest and Water SAR	14NC03	American White Pelican	Barn Swallow					
6	Forest and Water SAR	14NC10	American White Pelican	Bank Swallow	Barn Swallow	Bobolink	Caspian Tern	Common Nighthawk	Eastern Wood-Pewee
6	Forest and Water SAR	14NC11	American White Pelican	Barn Swallow	Eastern Whip-poor-will				
6	Forest and Water SAR	14NC12	American White Pelican	Barn Swallow	Bobolink	Common Nighthawk	Eastern Whip-poor-will		
6	Forest SAR	14NC13	Barn Swallow	Bobolink	Common Nighthawk	Eastern Wood-Pewee	Red-headed Woodpecker		
6	Forest SAR	14NC20	Bank Swallow	Barn Swallow	Bobolink	Common Nighthawk	Red-headed Woodpecker		
6	Forest and Water SAR	14NC21	American White Pelican	Barn Swallow	Horned Grebe				
6	Forest SAR	14NC22	Bobolink	Eastern Whip-poor-will					
6	Forest and Water SAR	14NC23	Barn Swallow	Eastern Whip-poor-will	Horned Grebe				
6	Forest and Water SAR	14NC30	American White Pelican	Barn Swallow	Bobolink	Caspian Tern	Eastern Whip-poor-will	Red-headed Woodpecker	Yellow Rail
6	Forest SAR	14NC32	Barn Swallow	Eastern Whip-poor-will					

Table 68: MB Breeding Bird Survey Results for Avian Species at Risk (Table data corresponds with Map 42)

Region	Category	Square	Species1	Species2	Species3	Species4	Species5	Species6	Species7
6	Forest and Water SAR	14NC33	Barn Swallow	Bobolink	Eastern Whip-poor-will	Yellow Rail			
6	Forest and Water SAR	14NC34	Common Nighthawk	Yellow Rail					
6	Forest and Water SAR	14NC42	American White Pelican	Caspian Tern	Olive-sided Flycatcher				
6	Forest SAR	14NC43	Canada Warbler	Eastern Whip-poor-will					
6	Forest and Water SAR	14NC44	American White Pelican	Barn Swallow	Canada Warbler				
6	Forest and Water SAR	14NC45	American White Pelican	Barn Swallow	Canada Warbler	Golden-winged Warbler	Yellow Rail		
9	Forest and Water SAR	14NC46	American White Pelican	Barn Swallow	Canada Warbler	Eastern Whip-poor-will			
6	Forest SAR	14NC53	Common Nighthawk	Eastern Whip-poor-will	Olive-sided Flycatcher				
6	Forest SAR	14NC55	Barn Swallow	Canada Warbler	Common Nighthawk	Eastern Whip-poor-will			
9	Forest SAR	14NC56	Common Nighthawk	Eastern Whip-poor-will					
6	Forest and Water SAR	14NC65	American White Pelican	Barn Swallow					
6	Forest SAR	14NC80	Eastern Wood-Pewee	Golden-winged Warbler					

9.7.1 Raptor Nest and Heron Rookery Search Methods

Aerial surveys for raptor stick nests were conducted in conjunction with the aerial multispecies and aerial moose surveys from Jan 31 – Feb 6, 2017 (winter) as well as during aerial survey flights conducted June 2-11, 2016 (spring/early summer). Raptor nest searches were conducted for bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), and great blue-heron (*Ardea herodias*) rookeries, among other raptor species nests. Pedestrian surveys for smaller raptor nest were conducted from June 2-11, 2016 in conjunction with bird point count surveys and terrestrial mammal track and sign surveys conducted along the LSMOC RoWs (See Section 8.2.4).

9.7.2 Raptor Nest and Heron Rookery Search Results

During the aerial surveys (both winter and spring/early summer) as well as the pedestrian ground-based surveys conducted along the LSMOC RoWs in June 2016, there were several nests identified (Table 69 Map 43).

There were several tern colonies and shorebird nesting islands and reefs identified during the aerial survey work conducted within the RSA during June 2016. Nesting islands for cormorants and shorebirds were identified in the north east portion of Lake St. Martin with the nesting islands and colonies located a linear distance of between 14.0-18.6 km from LSMOC Reach 1 and between 11.6-13.1 km from the proposed ASR.

A substantial heron rookery was identified on an island on Lake St. Martin located a linear distance of 15.78 km from LSMOC Reach 1 and 14.9 km from the proposed ASR

Table 69: Raptor and Bird Nest Search Results

Type of Observation	Quantity	Location		Project Area
		UTM Y	UTM X	
Nesting Island	1	5729852.96	542601.95	LSM Shoreline
Nesting Island	1	5726646.16	542856.99	LSM Shoreline
Bald Eagle Nest	1	5726267.98	542849.91	LSM Shoreline
Nesting Cormorant	1	5725373.62	541688.75	LSM Shoreline
Nesting Island	2	5725373.62	541688.75	LSM Shoreline
Nesting Pelicans	8	5726983.52	543330.19	LSM Shoreline
Goose Nests	10	5735148.85	555295.5	LSM Shoreline
Bald Eagle Nest	2	5735580.02	554131.14	LSM Shoreline
Small Stick Nest (4-6 inch diameter)	1	5735236.68	553610.92	LSM Shoreline
Eagle Nest	1	5734880.4	553379.68	LSM Shoreline
Raven Nest	1	5733955.87	552262.82	LSM Shoreline
Bald Eagle Nest	1	5733156.72	549867.13	LSM Shoreline
Medium Stick Nests (8-10 inch diameter)	3	5733818.85	549257.07	LSM Shoreline
Medium Stick Nests (8-10 inch diameter	2	5731756.1	549871.73	LSM Shoreline
Medium Stick Nests (8-10 inch diameter	1	5732087.62	548726.07	LSM Shoreline
Small Stick Nests (4-6 inch diameter)	2	5731893.21	548603.24	LSM Shoreline
Bald Eagle Nest	1	5731350.13	546274.27	LSM Shoreline
Small Stick Nests (4-6 inch diameter)	1	5733836.41	544651.19	LSM Shoreline
Bald Eagle Nest	1	5732963.09	543297.33	LSM Shoreline
Bald Eagle Nest	1	5753241	570568	Reach 3 (Johnson Beach)
Nesting Snag	1	5711007.37	554411.62	Proposed ASR
Nesting Snag	1	5710059.03	556811.29	Proposed ASR

9.7.3 Pedestrian Bird Nest Search Methods

Ground nest searches were conducted in conjunction with avain point counts and terrestrial mammal track and sign surveys between June 2, 2016 and June 11, 2016. Biologists travelled by helicopter to numberous locations along the LSMOC RoWs in association with avian point count surveys and the mammal track and sign surveys. Each biologist searched the tree line along the RoW (varying widths depending on the LSMOC) for signs of stick nests and nesting snags. In areas where biologists stopped to conduct terrestrial mammal track and sign surveys as well as to conduct avian point counts, biologists investigated those areas for nesting activity. Biologists recorded all incidental observations of birds made during the nest searches, as well as any incidental sightings of wildlife or wildlife signs.

During all avian surveys, birds that were seen were marked as observed on data recording sheets. If a species was heard (vocalization) but also confirmed with an actual sighting, the data is reflected as an observation (even if it is seen and heard). Data which indicates a vocalization of a species is an indication of a bird species being heard but with no corresponding direct visual observation of the species.

9.7.4 Pedestrian Bird Nest Search Results

Several nests were identified during the aerial nest searches within the LSA (conducted Jan-Feb 2016 and June 2016) as well as along the LSMOC RoWs during ground nest searches conducted in June 2016. Based on the collective results from these nest search survey types, Table 70 presents the nest type and the project feature the nest is closest to.

Many incidental bird observations and vocal calls were identified during the ground-based nest searches and the terrestrial mammal track and sign surveys. All bird species that were identified (both through incidental observation and/or through Point Count methodologies) are presented in Section 8.7.5 (Species At Risk identified) and Appendix E (complete listing of all birds identified within the LSA).

9.7.1 Songbird and Waterbird Point Count Survey Methods

Point count surveys are a common method used to identify the presence of a variety of song bird species (MBBA, 2015). Point count surveys have also been used successfully for waterfowl and water bird species (Abraham, 2014; Linz et al., 1998; Poysa & Nummi, 1992). Point count surveys provide an idea of bird presence and their relative habitat use (Ralph et al., 1993; Welsh, 1995). Point count surveys for songbirds, water birds, and waterfowl were conducted along the LSMOC RoWs from June 2, 2016 and June 11, 2016. There were 21-point count survey locations along the LSMOC RoWs (Reach 1 = 4, Reach 2 dike = 2, Reach 3 WP =1, Reach 3 JB = 4, and Reach 2 Option 4 = 10 and LSM Shoreline = 3). Map 44 presents the locations of the point count survey sites along the LSMOC RoWs.

Using the Point Count Survey methods of Ralph et al., 1993 and Welsh, 1995, surveys were conducted during periods of little wind (less than 20 km/hr) on a warm, clear morning (between

6:00-10:00 am). Given the remote location of the LSMOC RoWs with only helicopter access, evening point counts for species such as yellow rail could not be conducted.

Point counts sites were selected in a variety of habitat types including along waterbodies and wetlands to assess for the presence of water birds and waterfowl. After a 2-minute calming period, biologists, using a combination of naked eye, binoculars, and scopes (depending on point count location and habitat types) to recorded all birds heard and observed. Birds within an approximate 75 m radius at each survey plot center were recorded over a 10-minute period at each site.

Additional point count surveys were conducted along the proposed ASR within LSA.

9.7.2 Songbird and Waterbird Point Count Survey Results

Several bird species were observed and heard during the songbird and waterbird point count surveys as well as incidental bird observations while conducting the bird nest searches and the terrestrial mammal track and sign surveys along the LSMOC RoWs. All of the bird species identified during the point counts as well as all incidental bird observations made within the LSA are provided in Appendix E, Map 45.

Further, there were a few bird species at risk that were identified during the surveys within the LSA including: American white pelican, bank swallows, common nighthawk, and trumpeter swans. There were three trumpeter swans observed within the LSA along the proposed ASR. The trumpeter swan is not listed under SARA (2015) but is listed as very rare in Manitoba (S1B) (MCDC, 2015) and endangered under MESEA (2015). One swan was alone, while the other two appeared to be a pair, all three of which were swimming in a large pond alongside the proposed ASR. Table 70 presents the listed bird species identified within the LSA.

Table 70: Avian Listed Species Identified within the LSA

Common Name	Scientific Name	Observation Type	Quantity	Area
Bank swallow	*Riparia riparia*	Observation	1	LSA
Common nighthawk	*Chordeiles minor*	Observation	1	LSA
Trumpeter swan	*Cygnus buccinator*	Observation	1	Proposed ASR
Trumpeter swan	*Cygnus buccinator*	Observation	2	Proposed ASR
American white pelican	*Pelecanus erythrorhynchos*	Observation	1	Reach 1
American white pelican	*Pelecanus erythrorhynchos*	Observation	2	Reach 1
American white pelican	*Pelecanus erythrorhynchos*	Observation	6	Reach 1
American white pelican	*Pelecanus erythrorhynchos*	Observation	7	Reach 1

9.7.3 Piping Plover Survey Methods

Piping plover surveys were conducted along sandy beach shorelines where potential piping plover habitat exists by aerial survey on June 11, 2016. Locations for potential habitat were identified based on the habitat modeling conducted prior to the field surveys. This approach followed

accepted methodologies, within the acceptable window which occurs between May 1 and June 15, given this timeline coincides with their breeding period and follows the protocol suggested by the Sensitive Species Inventory Protocol Guidelines (AESRD, 2013). Aerial surveys were conducted on June 11, 2016, of sandy shorelines within the LSA and the RSA (along Lake MB, Lake Winnipeg, and Lake St. Martin). The aerial survey was flown using a helicopter at low height and low speed along all sandy beach shorelines as well as along the sparse vegetation above the high-water mark to investigate for piping plover nests. Observers searched the shorelines, documenting observations and/or sign of piping plover activity. All observations of findings, including other bird and wildlife sightings, were also recorded.

9.7.4 Piping Plover Survey Results

There were no piping plover observations or signs of their activity identified within the LSA or RSA. The birds that were observed and signs of bird activity that were observed during the piping plover surveys are provided in Table 71. The Caspian tern, a species of conservation concern, was identified during the piping plover surveys (Table 72) within the RSA but not within the LSMOC LSA.

Table 71: Piping Plover Survey Results

Point Count Number/Waypoint	Species Name	Observation Type	Quantity	Location			
				UTM Y	UTM X	Area	
W 047	Black Tern	Observation	20	5718978.63	538523.56	LSM Shoreline	RSA
W 202	Black Tern	Observation	1	5738616.91	553935.47	LSM Shoreline	LSA
W 302	Black Tern	Observation	1	5732897.69	542881.41	LSM Shoreline	RSA
W 052	Caspian Tern	Observation	10	5725373.62	541688.75	LSM Shoreline	RSA
W 054	Caspian Tern	Observation	100	5729852.96	542601.95	LSM Shoreline	RSA
W 047	Common Tern	Observation	20	5718978.63	538523.56	LSM Shoreline	RSA
W 054	Common Tern	Observation	100	5729852.96	542601.95	LSM Shoreline	RSA
PC 103	Common Tern	Observation	10	5739909.99	550476.50	LSM Shoreline	LSA
PC 105	Common Tern	Observation	2	5737432.00	556752.51	LSM Shoreline	LSA
PC 106	Common Tern	Observation	1	5736016.99	555521.00	LSM Shoreline	LSA
PC 107	Common Tern	Observation	1	5736537.00	552973.00	LSM Shoreline	LSA
W 203	Common Tern	Observation	1	5738393.75	554470.87	LSM Shoreline	LSA
W 204	Common Tern	Observation	1	5738384.69	554674.21	LSM Shoreline	LSA
W 207	Common Tern	Observation	4	5738370.81	555624.20	LSM Shoreline	LSA
W 225	Common Tern	Observation	1	5735128.12	556319.89	LSM Shoreline	LSA
W 229	Common Tern	Observation	1	5736322.35	555524.35	LSM Shoreline	LSA
W 242	Common Tern	Observation	1	5735273.86	553812.42	LSM Shoreline	LSA
W 243	Common Tern	Observation	1	5735236.68	553610.92	LSM Shoreline	LSA
W 249	Common Tern	Observation	1	5733624.70	551938.89	LSM Shoreline	RSA
W 254	Common Tern	Observation	1	5733085.55	550315.48	LSM Shoreline	RSA
W 266	Common Tern	Observation	1	5732124.17	550082.70	LSM Shoreline	RSA
W 270	Common Tern	Observation	1	5731806.05	549183.82	LSM Shoreline	RSA
W 276	Common Tern	Observation	3	5731537.99	548005.47	LSM Shoreline	RSA

Table 71: Piping Plover Survey Results

Point Count Number/Waypoint	Species Name	Observation Type	Quantity	Location			
				UTM Y	UTM X	Area	
W 286	Common Tern	Observation	1	5731911.20	545715.91	LSM Shoreline	RSA
W 302	Common Tern	Observation	1	5732897.69	542881.41	LSM Shoreline	RSA
W 046	Franklin's Gull	Observation	30	5720002.38	538467.51	LSM Shoreline	RSA
W 050	Franklin's Gull	Observation	1	5717394.10	539764.75	LSM Shoreline	RSA
W 052	Franklin's Gull	Observation	60	5725373.62	541688.75	LSM Shoreline	RSA
W 054	Franklin's Gull	Observation	1	5729852.96	542601.95	LSM Shoreline	RSA
PC 103	Franklin's Gull	Observation	2	5739909.99	550476.50	LSM Shoreline	LSA
PC 106	Franklin's Gull	Observation	4	5736016.99	555521.00	LSM Shoreline	LSA
PC 107	Franklin's Gull	Observation	50	5736537.00	552973.00	LSM Shoreline	LSA
W 193	Franklin's Gull	Observation	1	5709716.75	537150.20	LSM Shoreline	RSA
W 209	Franklin's Gull	Observation	1	5738294.11	556705.37	LSM Shoreline	LSA
W 211	Franklin's Gull	Observation	4	5737998.09	557049.10	LSM Shoreline	LSA
W 219	Franklin's Gull	Observation	3	5735768.41	557269.39	LSM Shoreline	LSA
W 246	Franklin's Gull	Observation	2	5734671.46	552934.37	LSM Shoreline	LSA
W 247	Franklin's Gull	Observation	2	5734089.55	552330.36	LSM Shoreline	RSA
W 264	Franklin's Gull	Observation	1	5732720.44	549634.44	LSM Shoreline	RSA
W 267	Franklin's Gull	Observation	30	5731756.10	549871.73	LSM Shoreline	RSA
W 294	Franklin's Gull	Observation	2	5732408.43	545546.83	LSM Shoreline	RSA
W 045	Herring Gull	Observation	1	5718925.15	538548.98	LSM Shoreline	RSA
PC 114	Herring Gull	Observation	1	5738234.90	556249.19	LSM Shoreline	LSA
W 245	Herring Gull	Observation	2	5734709.67	553229.84	LSM Shoreline	LSA

9.8 Reptiles and Amphibians

9.8.1 Amphibian Point Count Survey Methods

Point count surveys for amphibians were conducted between June 2 and June 11, 2016 along the LSMOC RoWs. Pre-determined sites for amphibians were selected based on specific habitat features such as wetlands, marshlands, beaver floods, potholes, and small waterbodies along the LSMOC RoWs. Point counts were conducted in the early morning (between 6:00-10:00 am) based on the methods of the Sensitive Species Inventory Protocol Guidelines (AESRD, 2013). Given the remote location of the LSMOC RoWs, only accessible by helicopter, evening surveys could not be conducted.

A series of factors affect when amphibians may call such as snow pack, rain events, elevation, and/or distance of travel between overwintering locations and breeding sites. Each species of amphibian will call during different timing windows (ASERD, 2013). The northern leopard frog typically calls between the middle of April and end of May. The timing window for amphibian point count surveys as suggested by AESRD, 2013 is between the second week in April until the second week in June (AESRD, 2013).

Based on the methods for Sensitive Species Inventory guidelines, biologists allowed for a 2-minute calming period at each amphibian point count location. Biologists recorded all amphibians heard and observed at each survey plot center during a 10-minute period (AESRD, 2013). There was a total of six amphibian point count locations conducted along the LSMOC RoWs.

During amphibian point count surveys, amphibians that were seen were marked as “observed” on data recording sheets. If a species was heard (vocalization) but also confirmed with an actual sighting, the data is reflected as an observation (even if it is seen and heard). Data which indicates a vocalization of a species is an indication of an amphibian species being heard but with no corresponding direct visual observation of the species.

9.8.2 Amphibian Point Count Survey Results

The results of the amphibian point count survey identified several observations and vocalizations of several species of amphibians (Table 72, Map 46), all of which are common species. There were no amphibian species of conservation concern identified within the LSMOC LSA.

Table 72: Amphibian Point Count Survey Results

Point Count Number/ Waypoint	Species Name	Observation Type	Quantity	Location		
				UTM Y	UTM X	Area
PC 87	Boreal Chorus Frog	Vocal	1	5753270.3	570517.76	Reach 3 (Johnson Beach)
PC 87	Wood Frog	Observation	1	5753270.3	570517.76	Reach 3 (Johnson Beach)
PC 111	Boreal Chorus Frog	Vocal	1	5749469.6	557058.53	Reach 2
PC 109	Wood Frog	Observation	1	5747604.8	564751.96	Reach 2
PC 102	Wood Frog	Vocal	2	5747604.8	564751.96	Reach 1
PC 90	Wood Frog	Observation	3	5747604.8	564751.96	Reach 1

9.8.3 Reptile Hibernacula Survey Methods

Suitable reptile hibernacula must offer reptiles an entry into a hibernacula space that is deep enough to be below the frost line during winter months. Reptiles often select for hibernacula within bedrock given rock offers reptiles protection from digging predators (Nature North, 2014). In conjunction with the bird nest searches and terrestrial mammal track and sign surveys, biologists looked for possible reptile hibernacula.

In addition to the ground based surveys conducted along the LSMOC RoWs, a combination of aerial and ground-based surveys were conducted within the LSA to investigate for potential bat hibernacula. Methods used for these studies are described in the bat Section 8.6. These searches allowed for additional investigation for reptile hibernacula.

9.8.4 Reptile Hibernacula Survey Results

Results from the reptile hibernacula surveys identified two areas of limestone depressions with multiple sinkholes that were considered to have high potential as snake hibernacula. A red-sided garter snake was also observed near one of the potential snake dens identified (Table 73). Photograph 3 represents a potential snake hibernaculum identified during the surveys. The linear distance of the potential snake hibernaculum is 14.4 km from Reach 1 and 4.1 km from proposed ASR. Further monitoring is required to confirm these sites as active snake hibernacula.

Table 73: Reptile Hibernacula Survey Results

Species Name	Observation Type	Quantity	Location		
			UTM Y	UTM X	Area
Garter Snake	Observation	1	5725598.44	550141.36	LSA
Potential Snake Den	Observation	1			LSA
Potential Snake Den	Observation	1			LSA

Photograph 3: Potential snake hibernacula identified within 5km of the Forestry Road. Photograph taken by EcoLogic Environmental Inc. on June 8, 2016

9.9 Ecologically Sensitive Sites

In consideration of a future EIA, baseline data were gathered on a number of ecologically sensitive sites such as mammal dens, large stick nests, tern colonies, mineral licks, rookeries, as well as

potential bat and snake hibernacula (Table 1). During all field surveys (winter aerial multi-species survey, ground based bird and amphibian surveys, and June 2016 aerial shoreline surveys), searches were conducted for the presence of these ecologically sensitive sites within the LSA and RSA.

A substantial heron rookery was identified on an island on Lake St. Martin located a linear distance of 15.78 km from LSMOC Reach 1 and 14.9 km from the proposed ASR (Table 74). Photograph 4 presents the blue heron rookery identified within the RSA on an island on Lake St. Martin.

Table 74: Ecologically Sensitive Site - Heron Rookery Location

Species Name	Observation Type	Quantity	Area
Heron Rookery	Observation	1	Lake St. Martin Island

Photograph 4: Heron Rookery identified on an island on Lake St. Martin. Photo taken by EcoLogic Environmental Inc. on June 9, 2016

There were also several tern colonies and shorebird nesting islands and reefs identified during the aerial survey work conducted within the RSA. Nesting islands for cormorants and shorebirds were identified in the north east portion of Lake St. Martin with the nesting islands and colonies located a linear distance of between 14.0-18.6 km from LSMOC Reach 1 and between 11.6-

13.1 km from the proposed ASR. Photograph 5 presents one of the cormorant nesting islands identified. Photograph 6 presents a bald eagle nest located where Reach 3 Willow Point intersects Lake Winnipeg.

Photograph 5: Cormorant nesting island identified on Lake St. Martin. Photo taken by EcoLogic Environmental Inc. on June 9, 2016

Photograph 6: Bald Eagle nest located at the end of Reach 3 (Willow Point) at the shoreline of Lake Winnipeg. Photograph taken by Ecologic Environmental Inc. on June 10, 2016

Table 75 presents the Ecologically Sensitive Sites identified witin the LSA and RSA.

Table 75: Ecologically Sensitive Sites Identified within the LSA and RSA

Species Name	Observation Type	Quantity	Area
Nesting Cormorants	Observation	1	LSM Shoreline
Nesting Pelicans	Observation	8	LSM Shoreline
Nesting Island	Observation	1	LSM Shoreline
Heron Rookery	Observation	1	LSM Shoreline
Nesting Island	Observation	1	LSM Shoreline
Rookery	Observation	1	LSM Shoreline
Otter run	Observation	1	Reach 3 (Willow Point)
Possible snake hiberncaula	Observation	1	LSA
Eagle Nest	Observation	1	LSM Shoreline
Bald Eagle Nest	Observation	2	LSM Shoreline
Large Eagle Nest	Observation	1	LSM Shoreline
Eagle Nest	Observation	1	LSM Shoreline

Table 75: Ecologically Sensitive Sites Identified within the LSA and RSA

Species Name	Observation Type	Quantity	Area
Stick Nest	Observation	1	LSM Shoreline
Stick Nest	Observation	2	LSM Shoreline
Eagle Nest	Observation	1	LSM Shoreline
Stick Nest	Observation	1	LSM Shoreline
Eagle Nest	Observation	1	LSM Shoreline
Eagle Nest	Observation	1	Reach 3 (Johnson beach)

There were no mineral licks identified during any field studies conducted within the LSM LSA or RSA.

10 SUMMARY

This Wildlife Technical Report was developed for the LSMOC component of the Project to provide a detailed summation of the wildlife data collection activities, methods, analyses, and results that were conducted to date within the RSA and LSA.

Data were gathered from various agencies providing historical context to mammal, avian, reptile and amphibian presence and distribution within the LSA and the RSA. Habitat modelling was conducted for moose, elk, and white-tailed deer. Despite moose summer and winter habitat not being limiting within the RSA, the number of moose identified (n=14) during the 2016 winter aerial survey was low. A considerable amount of access trails identified throughout the LSA and the RSA.

The analyses conducted identified the current linear density for moose within the LSA and RSA to be 0.10 km^2 and 0.22 km^2 respectively, both below the published Salmo et al. (2004) thresholds. The linear density analysis of Project-related linear developments within the LSA and RSA identified that, regardless of which channel or reach route option is selected, the linear density of the LSA and RSA will remain below the published Salmo et al. (2004) linear density thresholds for moose.

Elk habitat modelling revealed quality elk habitat was located in the southern portion of the RSA and was not significantly associated with the LSA or PF. During field investigations signs of elk activity were observed only in the southwestern portion of the LSA. White-tailed deer were found to be abundant within the south/central portion of the RSA with 628 individuals identified within the 2016 winter aerial survey area. WTD activity was abundant within the LSA, although not associated with the northern portion of the LSA – the LSMOC options area.

Habitat modelling on American beaver and American marten identified their habitat types were not limited within the LSA or the RSA. American beaver and American marten activity were found

to be abundant within the LSA, along with an abundance of hare and lynx. Otter activity was found most predominantly in the northern portion of the LSA.

Habitat modelling was conducted on 20 key avian species exhibiting the available habitat for these bird within the RSA and LSA. These models were validated during field surveys. Three avian Species At Risk were identified within the LSA: the bank swallow, the common night hawk, and the trumpeter swan.

Potentially active snake hibernacula were identified within the LSA, as well as potentially previous and currently active bat hibernacula. Bat recorders deployed within the LSA and along the existing LSMOC Access Road identified the presence of Little Brown and Northern Long-eared bats during the months of August, September, and October, suggesting the area is likely being used for hibernation. Further investigation of the area is required to determine the location and extent to which the LSA may be used for bat hibernation, specifically by Little Brown and Northern Long-eared bats, both Species At Risk.

There were no large mammal dens nor mineral lick identified within the LSA; however, a heron rookery and cormorant and gull nesting islands were identified on LSM, outside of the LSA but within the RSA.

Information derived from these baseline studies will have utility in route verification, offer comparative data for pre- and post construction analysis and monitoring, as well as assist with the future EIA process.

11 REFERENCES

Abraham, Ken. 2014. Waterfowl in Ontario's Boreal Region. Ducks Unlimited Canada. Available at: http://www.ducks.ca/assets/2012/06/Waterfowl-of-Ontarios-Boreal-Forest.pdf

AESRD (Alberta Environment and Sustainable Resource Development). 2013. Sensitive Species Inventory Guidelines. http://srd.alberta.ca/FishWildlife/WildlifeManagement/documents/SensitiveSpeciesInventoryGuidelines-Apr18-2013.pdf

Agrant, I. 2012. Bat Species Identification from Zero Crossing and Full Spectrum Echolocation Calls using HMMs, Fisher Scores, Unsupervised Clustering and Balanced Winnow Pairwise Classifiers. Wildlife Acoustics Inc. Sept.

Banfield, A.W.F. 1974. The Mammals of Canada. University of Toronto Press. Toronto, Ontario.

Bangs, E.E., S.A Duff, and T.N. Bailey. 1985. Habitat differences and moose use of two large burns on the Kenai Peninsula, Alaska. Alces, 21: 17-35.

Bannatyne, B.B. and J.T. Teller. 1984. Geology of Manitoba Before the Ice Age; in Teller J.T. (ed). Natural Heritage of Manitoba: Legacy of the Ice Age. ISBN 0-920704-14-X. Manitoba Museum of Man and Nature, and Manitoba Nature Magazine. Winnipeg, Manitoba.

Beyer, H. L., R. Ung, D. L. Murray and M.-J. Fortin. 2013. Functional responses, seasonal variation and thresholds in behavioural responses of moose to road density. Journal of Applied Ecology 50:286-294.

Bezener and De Smet. 2000. Manitoba Birds. Lone Pine Publishing, Edmonton, AB.

CEAA (Canadian Environmental Assessment Agency). 2012. Glossary – terms commonly used in federal environmental assessments. Public Works and Government Services Canada. Accessible on-line at: https://ceaa-acee.gc.ca/

CEAA. 2015. Guidelines for the Preparation of an Environmental Impact Statement.

Caras, R.A. 1967. North American Mammals- Fur-bearing Animals of the United States and Canada. Meredith Press. University of Minnesota, MN.

Caughley, G. 1977. Analysis of vertebrate populations. John Wiley and Sons Ltd., New York.

Conant, R. and J.T. Collins. 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co. Boston, MA.

Cook, F.R. 1984. Introduction to Canadian Amphibians and Reptiles. National Museums of Canada. Ottawa, Ontario.

Cranowski, D. 2009. Cow Ecology, Movements and Habitat use in the Duck Mountains of Manitoba. Master's Thesis. University of Manitoba.

Doerr, J.G. 1983. Home range size, movements and habitat use in two moose, *Alces alces*, populations in southeastern Alaska. Canadian Field-Naturalist, 97 (1): pp. 79-88.

Dunster, J. and K. Dunster. 1996. Dictionary of Natural Resource Management. ISBN 0-7748-0503-X. UBC Press. University of British Columbia. Vancouver, B.C.

ESRI. 2012. AcrGIS Desktop: Release 10.1 Redlands, CA: Environmental Systems Research Institute.

Forest Resources Management. June 6, 2000. "Integrated Wood Supply Area (I.W.S.A.)." Manitoba Conservation, Forest Resources Management.

Frair, J., et al. 2005. Scales of movement by elk (Cervus elaphus) in response to heterogeneity on forage resources and predation risk. Landscape Ecology Vol 20, pp.273-287.

Fulbright, T.E, and J.A. Ortega-S. 2006. White-Tailed Deer Habitat: Ecology and Management on Rangelands. College Station; Texas A&M University Press, USA.

Gasaway, W.C., S.D. DuBios, D.J. Reed, and S.J. Harbo. 1986. Estimating moose population parameters from aerial surveys. Biological Papers of the University of Alaska 22. 108 pp.

Gillingham, M. P., and K. L. Parker. 2008. The Importance of Individual Variation in Defining Habitat Selection by Moose in Northern British Columbia. Alces 44:7–20.

Hundertmark, K.J. 1997. Ecology and management of the North American moose. Edited by A.W. Franzmann and C.C. Shwartz. Wildlife Management Institute, Washington, DC. 733 pp.

Important Bird Areas. 2016. http://www.ibacanada.com

KGS Group. 2014. Assiniboine River & Lake Manitoba Basins Flood Mitigation Study Lake Manitoba & Lake St. Martin Outlet Channels Conceptual Design - Stage 1 - Deliverable No: LMB-01. Prepared for Manitoba Infrastructure and Transportation. KGS Group Report 12-0300-011. February 2014.

KGS Group. 2015. Assiniboine River & Lake Manitoba Basins - Flood Mitigation Study LMB & LSM Outlet Channels Conceptual Design - Stage 2. KGS Group Project 12-0300-011. DRAFT August 2015.

Kolenosky, G.B. and S.M. Strathearn. 1987. Black Bear; in Novak, M., J.A. Baker, M.E. Obbard and B. Malloch. (eds.). Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources. Toronto, Ontario. 443-454 pp.

Kopcha, M., J. S. Rook, and D. Hostetler. P. tenuis – The White-tailed Deer Parasite. Michigan State University. http://old.cvm.msu.edu/extension/Rook/ROOKpdf/brainwormkaren.PDF. Accessed April 25, 2016.

Laurian, C., C. Dussault, J.-P. Ouellet, R. Courtois, M. Poulin, and L. Breton. 2008. Behavior of moose relative to a road network. Journal of Wildlife Management 72: 1550.

LeClerc, M., J. Lamoureux and M.-H. St-Laurent. 2012. Influence of young black spruce plantations on moose winter distribution. Journal of Wildlife Management 76:1686-1693.

Linz, George, Curtis McMurl, Jeffery Homan, David Bergman. 1998. Comparison of Point Count and Wade Flush Methods for Counting Ducks. The Prairie Naturalist 30: 4.

Lockery, A.R. 1984. The Post-Glacial Period: Manitoba's Present Landscape; in Teller J. T. (ed.). Natural Heritage of Manitoba: Legacy of the Ice Age. ISBN 0-920704-14-X. Manitoba Museum of Man and Nature, and Manitoba Nature Magazine. Winnipeg, Manitoba.

Manitoba Avian Research Committee, Manitoba Naturalists Society. 2003. The Birds of Manitoba. Friesens Printers. Winnipeg, Manitoba.

Manitoba Conservation. n.d.a. Wild animals of Manitoba moose fact sheet [online]. at http://www/gov.mb.ca/conservation/wildlife/mbsp/fs/moose.html. [Accessed March 11, Available 2010].

MBBA (Manitoba Breeding Bird Atlas). 2015. Manitoba Species at Risk. Available at http://www.birdatlas.mb.ca/speciesatrisk/master.htm [Accessed October 10, 2015].

MBSD (Manitoba Sustainable Development) 2013. Manitoba Forest Management Units. Manitoba Conservation and Water Stewardship, Forestry Branch. Winnipeg, Manitoba.

MBSD. 2014. 2013-2014 Trapping Guide. Manitoba Conservation and Water Stewardship, Wildlife and Ecosystem Protection Branch. Winnipeg, Manitoba.

MBSD. 2015. 2015 Manitoba Hunting Guide. Manitoba Conservation and Water Stewardship, Wildlife and Ecosystem Protection Branch. Winnipeg, Manitoba.

MBCDC (Manitoba Conservation Data Centre). 2015. Interlake Plain Ecoregion list of species of conservation concern. http://www.gov.mb.ca/conservation/cdc/ecoreg/interlake.html

Manitoba Outfitters. 2014. Available at http://mloa.com/

McRitchie, W.D. and Monson, K.M. 2000. Caves and Karst In Manitoba's Interlake Region from survey conducted by the Speleological Society of Manitoba 2nd Edition.

Mills, G.F. 1984. Soils of Manitoba; in Teller J. T. (ed.). Natural Heritage of Manitoba: Legacy of the Ice Age. ISBN 0-920704-14-X. Manitoba Museum of Man and Nature, and Manitoba Nature Magazine. Winnipeg, Manitoba.

Nature North. 2014. The Manitoba Herps Atlas. Available at http://www.naturenorth.com/Herps/Manitoba_Herps_Atlas.html. [Accessed October 8, 2015].

Northern Lights Heritage Services Inc. (NLHS). 2016. Characterization Study of the Heritage Resources within the Lake Manitoba/St. Martin Access Roads Alignments. Draft report prepared for M. Forster Enterprises for submission to Manitoba Infrastructure.

Norquay, K.J. O., F. Martinez-Nunez, J. E. Dubois, K.M. Monson, and C. K. R. Willis. Long-Distance Movements of Little BRoWn Bats (*Myotis lucifugus*). Journal of Mammology 94(2):000-000, 2013.

Palidwor, D.L., D.W. Schindler, and B.R. Hagglund. 1995. Habitat Suitability Index Model - Moose Ver 2.0. Manitoba Model Forest: pp. 151

Peterson, R.T. and V.M. Peterson. 2002. A Field Guide to the Birds of Eastern and Central North America. Houghton Mifflin Harcourt. New York, NY.

Poysa. H and P. Nummi. 1992. Comparing Two Methods of Data Collection in Waterfowl Habitat Use Studies. Bird Study 39: 124-131.

Preston, W.B. 1982. The Amphibians and Reptiles of Manitoba. Manitoba Museum of Man and Nature. Winnipeg, Manitoba.

Ralph, J.C., G.R. Geupel, P. Pyle, T.E. Martin, D.F. DeSante. 1993. Handbook of field methods for monitoring landbirds. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, Department of Agriculture, 41p.

Renecker, L.A. and C.C. Schwartz. 1998. Food Habits and Feeding Behaviour *in* Ecology and Management of the North American Moose. Franzmann and Schwartz (eds.) Smithsonian Institution Press. Washington, U.S.A. p.403-439.

Reid, F.A. 2006. A Field Guide to the Mammals of North America. Houghton Mifflin Harcourt. New York, NY.

Rodgers A. R., Kie J. G., 2011. HRT: Home Range Tools for ArcGIS, Version 1.1 Center for Northern Forest Ecosystem Research, Ontario Ministry of Natural Resources.

Rowe, J.S. 1972. Forest Regions of Canada. Canadian Forest Service, Dept. of the Environment, Information Canada. Publication No. 1300. Ottawa, Ontario.

Salmo Consulting Inc., AXYS Environmental Consulting Ltd., Forem Technologies, and Wildlife & Company Ltd. 2004. Deh Cho Cumulative Effects Study Phase 1: Management Indicators and Thresholds. Calgary, AB. Prepared for Deh Cho Land Use Planning Committee. 172 pp.

SARA (Species at Risk Act). 2015. Species At Risk Public Registry. http://www.sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

SARA (Species at Risk Act). 2015. Proposed Recovery Strategy for the Little Brown Bat. http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=2A04680B-1#_04_1

Seaman D. E., Millspaugh, J. J., Kernohan B. J., Brundige G. C., Raedeke K. J., and Gitzen R. A. 1999. Effects of Sample Size on Kernel Home Range Estimates. Journal of Wildlife Management 63(2): 739-747.

Silverberg, J. K., P. J. Pekins, and R. A. Robertson. 2003. Moose responses to wildlife viewing and traffic stimuli. Alces 39:153–160.

Smith R.E., H. Veldhuis, G.F. Mills, R.G. Eilers, W.R. Fraser, and G.W. Lelyk. 1998. Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba, An Ecological Stratification of Manitoba's Natural Landscapes. Technical Bulletin 1998-9E. Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada. Winnipeg, Manitoba.

Snowman Trails. 2016. Available at: www.snoman.mb.ca

TAEM (Terrestrial and Aquatic Environmental Engineers). 1995. Habitat Suitability Index Models within the Manitoba Model Forest Region, Moose (*Alces alces*) Version 2.0 Final Report.

Vuilleumier, F. 2009. Birds of North America, Dorling Kindersley. Toronto, Ontario.

Waring, G.H., J.L. Griffis, M.E. Vaughn. 1991. White-tailed deer roadside behavior, wildlife warning reflectors, and highway mortality. Applied Animal Behavior Science. 29(1–4): 215-223.

Wasel, S. M., W. M. Samuel, and V. Crichton. 2003. Distribution and ecology of meningeal worm, Parelaphostrongylus tenuis (Nematoda), in northcentral North America. Journal of Wildlife Diseases. 39: 338-346.

Wasser, S. K., J. L. Keim, M. L. Taper, and S. R. Lele. 2011. The influences of wolf predation, habitat loss, and human activity on caribou and moose in the Alberta oil sands. Frontiers in Ecology and the Environment 9:546–551.

Welsh, D.A. 1995. An Overview of the Forest Bird Monitoring Program in Ontario, Canada. USDA Forest Service Gen. Tech. Rep. PSW-GTR-149. 93-97.

Wildlife Acoustics. 2016. Available at: http://www.wildlifeacoustics.com

Yost, A. C., and R. G. Wright. 2001. Moose, Caribou, and Grizzly Bear Distribution in Relation to Road Traffic in Denali National Park, Alaska. Arctic 54:41–48.

Zoladeski C.A., G.M. Wickware, R.J. Delorme, R.A. Sims, and I.G.W. Corns. 1995. Forest ecosystem classification for Manitoba: field guide. Natural Resources Canada, Canadian Forest Service's, Northwest Region, Northern Forestry Centre, Edmonton, Alberta. Special Report 2.

Personal Communications

Berezanski, Dean, Manitoba Conservation and Water Stewardship, Provincial Furbearer Biologist, 2015

Friesen, Chris, MBCDC, Request for Review of Manitoba Conservation Data Centre Rare Species Database, 2015.

Lowdon, Mark, AAE Owner and Aquatic Biologist, 2016.

Norquay, Kaleigh, University of Winnipeg, Bat Research Laboratory Manager, 2016.

Willis, Craig, University of Winnipeg Professor and Bat Species Specialist, 2015/2016.

Appendix A: Known Mammals for the Interlake Plain and Mid-Boreal Lowland Ecoregions

Common Name	Scientific Name	Conservation Listing (SARA, MESEA, MBCDC)
American beaver	*Castor canadensis*	S5
American deer mouse	*Peromyscus maniculatus*	S5
American marten	*Martes americana*	S5
American water shrew	*Sorex palustris*	S5
Arctic shrew	*Sorex arcticus*	S5
Big brown bat	*Eptesicus fuscus*	S4S5B
Black bear	*Ursus americanus*	S5
Woodland caribou	*Rangifer tarandus*	Threatened - S2S3
Coyote	*Canis latrans*	S5
Eastern heather vole	*Phenacomys ungava*	S5
Eastern fox squirrel	*Sciurus niger*	S3
Elk	*Cervus elaphus*	S4
Ermine (short-tailed weasel)	*Mustela erminea*	S5
Fisher	*Martes pennanti*	S5
Grey wolf	*Canis lupus*	S5
Hoary bat	*Lasiurus cinereus*	S3B
House mouse	*Mus musculus*	SNA
Least chipmunk	*Eutamias minimus*	S5
Least weasel	*Mustela nivalis*	S3S4
Litte brown myotis	*Myotis lucifugus*	Endangered- Schedule 1- S2N
Long-tailed weasel	*Mustela frenata*	S3
Lynx	*Lynx canadensis*	S5
Masked shrew	*Sorex cinereus*	S5
Meadow jumping mouse	*Zapus hudsonius*	S5
Meadow vole	*Microtus pennsylvanicus*	S5
Mink	*Neovison vison*	S5
Moose	Alces alces	S5
Muskrat	*Ondatra zibethicus*	S5
North American porcupine	*Erethizon dorsatum*	S5
Northern bog lemming	*Synaptomys borealis*	S5
Northern flying squirrel	*Glaucomys sabrinus*	S5
Northern myotis	*Myotis septentrionalis*	Endangered- Schedule 1-
Pygmy shrew	*Sorex hoyi*	S5

Common Name	Scientific Name	Conservation Listing (SARA, MESEA, MBCDC)
Raccoon	*Procyon lotor*	S5
Red fox	*Vulpes vulpes*	S5
Red squirrel	*Tamisciurus hudsonicus*	S5
River otter	*Lontra canadensis*	S5
Short-tailed shrew	*Blarina brevicauda*	S5
Silver-haired bat	*Lasionycteris noctivagans*	S3S4B
Snowshoe hare	*Lepus americanus*	S5
Star-nosed mole	*Condylura cristata*	S3
Striped skunk	*Mephitis mephitis*	S5
White-tailed deer	*Odocoileus virginianus*	S5
Woodchuck	*Marmota monax*	S5
Wood bison	*Bos bison athabascae*	Special Concern-Schedule 1-SNA

Sources: Caras (1967); Reid (2006); MBCDC (2015); and SARA (2015)

MBCDC (2015) Definitions for Status Listing:

1 Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.

2 Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.

3 Uncommon throughout its range or in the province (21 to 100 occurrences).

4 Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (>100 occurrences).

5 Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.

U Possibly in peril, but status uncertain; more information needed.

H Historically known; may be rediscovered.

X Believed to be extinct; historical records only, continue search.

SNR A species not ranked. A rank has not yet assigned or the species has not been evaluated.

SNA A conservation status rank is not applicable to the element.

S#S# Numeric range rank: A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species.

?* Inexact or uncertain; for numeric ranks, denotes inexactness.

SARA (2015) Definitions for Status Listing:

Schedule 1: is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.

Threatened: a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

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

Endangered: A wildlife species facing imminent extirpation or extinction.

Appendix B: Known Amphibians and Reptiles for the Interlake Plain and Mid-Boreal Ecoregions

Common Name	Scientific Name	Conservation Status (SARA, MESEA, MBCDC)
Blue-spotted salamander	*Ambystoma laterale*	S3S4
Eastern Tiger Salamander	*Ambystoma tigrinum tigrinum*	S2
Canadian Toad	*Anaxyrus hemiophrys*	S4
Grey tree frog	*Hyla versicolor*	S4S5
Boreal chorus frog	*Pseudacris maculata*	S5
Wood frog	*Rana sylvatica*	S5
Smooth green snake	*Liochlorophis vernalis*	S3S4
Northern leopard frog	*Lithobates pipiens*	Special Concern - Schedule 1 - S4
Western plains garter snake	*Thamnophis radix haydenii*	S4
Red-sided garter snake	*Thamnopis sirtalis parietalis*	S4

Sources: Conant and Collins (1991); Science Team Report (2002); MBCDC (2015); Nature North (2014); and SARA (2015)

MBCDC (2015) Definitions for Status Listing:

1 Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.

2 Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.

3 Uncommon throughout its range or in the province (21 to 100 occurrences).

4 Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (>100 occurrences).

5 Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.

U Possibly in peril, but status uncertain; more information needed.

H Historically known; may be rediscovered.

X Believed to be extinct; historical records only, continue search.

SNR A species not ranked. A rank has not yet assigned or the species has not been evaluated.

SNA A conservation status rank is not applicable to the element.

S#S# Numeric range rank: A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species.

?* Inexact or uncertain; for numeric ranks, denotes inexactness.

SARA (2015) Definitions for Status Listing:

Schedule 1: is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.

Threatened: a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

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

Appendix C: Known Birds for the Interlake Plain and Mid-Boreal Lowland Ecoregion

Common Name	*Scientific Name*	Conservation Listing (SARA, MESEA, MBCDC)
Alder flycatcher	*Empidonax alnorum*	S5B
American avocet	*Recurvirostra americana*	S4B
American bittern	*Botaurus lentiginosus*	S5B
American coot	*Fulica americana*	S5B
American crow	*Corvus brachyrhynchos*	S5B, SUN
American golden-plover	*Pluvialis dominica*	S4B, SUM
American goldfinch	*Spinus tristis*	S5B
American kestrel	*Falco sparverius*	S4B
American redstart	*Setophaga ruticilla*	S5B
American robin	*Turdus migratorius*	S5B
American three-toed woodpecker	*Picoides dorsalis*	S5
American tree sparrow	*Spizella arborea*	S5B, SUM
American white pelican	*Pelecanus erythrorhynchos*	S3S4B
American wigeon	*Anas americana*	S4B
American woodcock	*Scolopax minor*	S4B
Bald eagle	*Haliaeetus leucocephalus*	S5B, SUN
Baltimore oriole	*Icterus galbula*	S4B
Bank swallow	*Riparia riparia*	Threatened – no schedule
Barn swallow	*Hirundo rustica*	Threatened – no schedule – S4B
Barred owl	*Strix varia*	S4B
Bay-breasted warbler	*Setophaga castanea*	S5B
Belted kingfisher	*Megaceryle alcyon*	S5B
Black tern	*Chlidonias niger*	S4B
Black-and-white warbler	*Mniotilta varia*	S5B
Black-billed cuckoo	*Coccyzus erythropthaLMBus*	S5B
Black-billed magpie	*Pica hudsonia*	S4
Blackburnian warbler	*Setophaga fusca*	S5B
Black-capped chickadee	*Poecile atricapillus*	S5
Black-crowned night heron	*Nycticorax nycticorax*	S3S4B
Blackpoll warbler	*Setophaga striata*	S5B, SUM
Black-throated blue warbler	*Setophaga caerulescens*	SNA

Common Name	*Scientific Name*	Conservation Listing (SARA, MESEA, MBCDC)
Black-throated green warbler	*Setophaga virens*	S4B
Blue jay	*Cyanocitta cristata*	S5
Blue-headed vireo	*Vireo solitarius*	S5B
Blue-winged teal	*Anas discors*	S4B
Bobolink	*Dolichonyx oryzivorus*	Threatened – no Schedule– S4B
Bonaparte's gull	*Chroicocephalus philadelphia*	S5B
Boreal owl	*Aegolius funereus*	S4
Brewer's blackbird	*Euphagus cyanocephalus*	S5B
Broad-winged hawk	*Buteo platypterus*	S5B
Brown creeper	*Certhia americana*	S5B
Brown thrasher	*Toxostoma rufum*	S4B
Brown-headed cowbird	*Molothrus ater*	S5B
Bufflehead	*Bucephala albeola*	S4B
Cackling goose	*Branta hutchinsii*	S2B
California gull	*Larus californicus*	S3B
Canada goose	*Branta canadensis*	S5B
Canada warbler	*Cardellina canadensis*	Threatened – Schedule 1 – S4B
Canvasback	*Aythya valisineria*	S4B
Cape may warbler	*Setophaga tigrina*	S5B
Caspian tern	*Sterna caspia*	S3S4B
Cedar waxwing	*Bombycilla cedrorum*	S5B, SUN
Chestnut-sided warbler	*Setophaga pensylvanica*	S5B
Chimney swift	*Chaetura pelagica*	Threatened – Schedule 1 – S2B
Chipping sparrow	*Spizella passerina*	S5B
Clay-colored sparrow	*Spizella pallida*	S5B
Cliff swallow	*Petrochelidon pyrrhonota*	S4B
Common goldeneye	*Bucephala clangula*	S5B, SUN
Common grackle	*Quiscalus quiscula*	S5B
Common loon	*Gavia immer*	S5B
Common merganser	*Mergus merganser*	S5B
Common nighthawk	*Chordeiles minor*	Threatened – Schedule 1 – S3B
Common raven	*Corvus corax*	S5
Common redpoll	*Acanthus flammea*	S4B, S5N
Common tern	*Sterna hirundo*	S5B
Common yellowthroat	*Geothlypis trichas*	S5B

Common Name	*Scientific Name*	Conservation Listing (SARA, MESEA, MBCDC)
Connecticut warbler	*Oporornis agilis*	S4B
Cooper's hawk	*Accipiter cooperii*	S4S5B
Dark-eyed junco	*Junco hyemalis*	S5B, SUN
Double-crested cormorant	*Phalacrocorax auritus*	S5B
Downy woodpecker	*Picoides pubescens*	S5
Eared grebe	*Podiceps nigricollis*	S4S5B
Eastern bluebird	*Sialia sialis*	S4B
Eastern kingbird	*Tyrannus tyrannus*	S4B
Eastern phoebe	*Sayornis phoebe*	S5B
Eastern towhee	*Pipilo erythrophthalmus*	S4B
Eastern whip-poor-will	*Antrostomus vociferus*	Threatened – Schedule 1 – S3B
Eastern wood-pewee	*Contopus virens*	Special Concern – no schedule
Eastern-screech owl	*Megascops asio*	S4
European starling	*Sturnus vulgaris*	SNA
Evening grosbeak	*Coccothraustes vespertinus*	S3
Forster’s tern	*Sterna forsteri*	S4B
Fox sparrow	*Passerella iliaca*	S5B, S4M
Franklin’s gull	*Leucophaeus pipixcan*	S4B
Gadwell	*Anas strepera*	S5B
Golden-winged warbler	*Vermivora chrysoptera*	Threatened – Schedule 1 – S3B
Grasshopper sparrow	*Ammodramus savannarum*	S2B
Gray jay	*Perisoreus canadensis*	S5
Gray partridge	*Perdix perdix*	SNA
Great blue heron	*Ardea herodias*	S4S5B
Great crested flycatcher	*Myiarchus crinitus*	S4B
Great egret	*Ardea alba*	S2S3B
Great grey owl	*Strix nebulosa*	S4
Great horned owl	*Bubo virginianus*	S4
Greater scaup	*Aythya marila*	S5B, SUM
Greater white-fronted goose	*Anser albifrons*	SUM
Greater yellowlegs	*Tringa melanoleuca*	S5B, SUM
Green winged teal	*Anas carolinensis*	S4B
Grey catbird	*Dumetella carolinensis*	S5B
Hairy woodpecker	*Picoides villosus*	S5
Harris’s sparrow	*Zonotrichia querula*	S4B, S5M
Hermit thrush	*Catharus guttatus*	S5B

Common Name	*Scientific Name*	Conservation Listing (SARA, MESEA, MBCDC)
Herring gull	*Larus argentatus*	S4B
Hooded merganser	*Lophodytes cucullatus*	S5B
Horned grebe	*Podiceps auritus*	Special concern – no Schedule - S3B
Horned lark	*Eremophila alpestris*	S3B, SUM
House finch	*Haemorhous mexicanus*	S5B
House sparrow	*Passer domesticus*	SNA
Indigo bunting	*Passerina cyanea*	S4B
Killdeer	*Charadrius vociferus*	S5B
Lapland longspur	*Calcarius lapponicus*	S4B, SUM, SUN
Lark sparrow	*Chondestes grammacus*	S4B
Le Conte's sparrow	*Ammodramus leconteii*	S5B
Least bittern	*Ixobrychus exilis*	Threatened – Schedule 1 – S2S3B
Least flycatcher	*Empidonax minimus*	S5B
Least sandpiper	*Calidris minutilla*	S4B, SUM
Lesser scaup	*Aythya affinis*	S5B
Lesser yellowlegs	*Tringa flavipes*	S4B, SUM
Lincoln's sparrow	*Melospiza lincolnii*	S5B
Loggerhead shrike	*Lanius ludovicianus excubitorides*	Threatened – Schedule 1 – S1B
Long-eared owl	*Asio otus*	S4B
Magnolia warbler	*Setophaga magnolia*	S5B
Mallard	*Anas platyrhynchos*	S5B
Marbled godwit	*Limosa fedoa*	S4B
Merlin	*Falco columbarius*	S5B, SUN
Mountain bluebird	*Sialia currucoides*	S2S3B
Mourning dove	*Zenaida macroura*	S4B
Mourning warbler	*Geothlypis philadelphia*	S5B
Nelson's sparrow	*Ammodramus nelsoni*	S5B
Northern flicker	*Colaptes auratus*	S5B
Northern goshawk	*Accipiter gentilis*	S4B, S5N
Northern harrier	*Circus cyaneus*	S5B
Northern hawk owl	*Surnia ulula*	S4
Northern parula	*Setophaga americana*	S3B
Northern pintail	*Anas acuta*	S5B
Northern rough-winged swallow	*Stelgidopteryx serripennis*	S4B
Northern saw-whet owl	*Aegolius acadicus*	S4B

Common Name	*Scientific Name*	Conservation Listing (SARA, MESEA, MBCDC)
Northern shoveler	*Anas clypeata*	S5B
Northern waterthrush	*Parkesia noveboracensis*	S5B
Olive-sided flycatcher	*Contopus cooperi*	Threatened – Schedule 1 – S3S4B
Orange-crowned warbler	*Oreothlypis celata*	S5B
Orchard oriole	*Icterus spurius*	S5B
Osprey	*Pandion haliaetus*	S4B
Ovenbird	*Seiurus aurocapilla*	S5B
Palm warbler	*Setophaga palmarum*	S5B
Pectoral sandpiper	*Calidris melanotos*	S4M
Peregrine falcon	*Falco peregrinus anatum*	Special Concern- no Schedule – S1B
Philadelphia vireo	*Vireo philadelphicus*	S4B
Pied-billed grebe	*Podilymbus podiceps*	S5B
Pileated woodpecker	*Dryocopus pileatus*	S5
Pine grosbeak	*Pinicola enucleator*	S4
Pine siskin	*Spinus pinus*	S5
Pine warbler	*Setophaga pinus*	S3B
Piping plover	*Charadrius melodus*	Endangered – Schedule 1 – S1B
Purple finch	*Haemorhous purpureus*	S5B
Purple martin	*Progne subis*	S4B
Red crossbill	*Loxia curvirostra*	S4B, SUN
Red-breasted merganser	*Mergus serrator*	S4B
Red-breasted nuthatch	*Sitta canadensis*	S5
Red-eyed vireo	*Vireo olivaceus*	S5B
Redhead	*Aythya americana*	S4B
Red-headed woodpecker	*Melanerpes erythrocephalus*	Threatened – Schedule 1 – S2B
Red-necked grebe	*Podiceps grisegena*	S5B
Red-tailed hawk	*Buteo jamaicensis*	S5B
Red-winged blackbird	*Agelaius phoeniceus*	S5B
Ring-billed gull	*Larus delawarensis*	S5B
Ring-necked duck	*Aythya collaris*	S5B
Rock pigeon	*Columba livia*	SNA
Rose-breasted grosbeak	*Pheucticus ludovicianus*	S5B
Rough-legged hawk	*Buteo lagopus*	S3B, SUM
Ruby-crowned kinglet	*Regulus calendula*	S5B
Ruby-throated hummingbird	*Archilochus colubris*	S5B

Common Name	*Scientific Name*	Conservation Listing (SARA, MESEA, MBCDC)
Ruddy duck	*Oxyura jamaicensis*	S5B
Ruffed grouse	*Bonasa umbellus*	S4S5
Rusty blackbird	*Euphagus carolinus*	Special Concern –Schedule 1 -
Sanderling	*Calidris alba*	SUM
Sandhill crane	*Grus canadensis*	S5B
Savannah sparrow	*Passerculus sandwichensis*	S5B
Scarlet tanager	*Piranga olivacea*	S4B
Sedge wren	*Cistothorus platensis*	S5B
Semi-palmated Sandpiper	*Calidris pusilla*	S3B, SUM
Sharp-skinned hawk	*Accipiter striatus*	S4B
Sharp-tailed grouse	*Tympanuchus phasianellus*	S5
Short-billed dowitcher	*Limnodromus griseus*	S4B
Short-eared owl	*Asio flammeus*	Special Concern –Schedule 1 – S2S3B
Snow bunting	*Plectrophenax nivalis*	S4N, SUM
Snow goose	*Chen caerulescens*	S5B, S5M
Solitary sandpiper	*Tringa solitaria*	S4B, SUM
Song sparrow	*Melospiza melodia*	S5B
Sora	*Porzana carolina*	S5B
Spotted sandpiper	*Actitis macularius*	S5B
Sprague's pipit	*Anthus spragueii*	Threatened – Schedule 1 – S2B
Spruce grouse	*Falcipennis canadensis*	S4
Swainson's hawk	*Buteo swainsoni*	S4B
Swainson's thrush	*Catharus ustulatus*	S5B
Swamp sparrow	*Melospiza georgiana*	S5B
Tennessee warbler	*Oreothlypis peregrina*	S5B
Tree swallow	*Tachycineta bicolor*	S4B
Trumpeter Swan	*Cygnus buccinator*	S1S2B
Tundra swan	*Cygnus columbianus*	S4B, SUM
Turkey vulture	*Cathartes aura*	S4B
Upland sandpiper	*Bartramia longicauda*	S4B
Veery	*Catharus fuscescens*	S5B
Vesper sparrow	*Pooecetes gramineus*	S5B
Virginia rail	*Rallus limicola*	S5B
Warbling vireo	*Vireo gilvus*	S5B
Western grebe	*Aechmophorus occidentalis*	S4B
Western kingbird	*Tyrannus verticalis*	S5B
Western meadowlark	*Sturnella neglecta*	S3S4B

Common Name	*Scientific Name*	Conservation Listing (SARA, MESEA, MBCDC)
White-breasted nuthatch	*Sitta carolinensis*	S5
White-crowned sparrow	*Zonotrichia leucophrys*	S5B
White-throated sparrow	*Zonotrichia albicollis*	S5B
White-winged crossbill	*Loxia leucoptera*	S5
Willet	*Tringa semipaLMBata*	S4B
Wilson's phalarope	*Phalaropus tricolor*	S4B
Wilson's snipe	*Gallinago delicata*	S5B
Wilson's warbler	*Cardellina pusilla*	S5B, SUM
Winter wren	*Troglodytes hiemalis*	S5B
Wood duck	*Aix sponsa*	S5B
Yellow rail	*Coturnicops noveboracensis*	Special Concern –Schedule 1 – S3S4B
Yellow warbler	*Setophaga petechia*	S5B
Yellow-bellied flycatcher	*Empidonax flaviventris*	S5B
Yellow-bellied sapsucker	*Sphyrapicus varius*	S5B
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	S4B
Yellow-rumped warbler	*Setophaga coronata*	S5B
Yellow-throated vireo	*Vireo flavifrons*	S4B

Sources: Bezener and De Smet (2000); Peterson and Peterson (2002); Manitoba Avian Research Committee (2003); MBCDC (2015); SARA (2015); and MBBA (2015)

MBCDC (2015) Definitions for Status Listing:

1 Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.

2 Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.

3 Uncommon throughout its range or in the province (21 to 100 occurrences).

4 Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (>100 occurrences).

5 Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.

U Possibly in peril, but status uncertain; more information needed.

H Historically known; may be rediscovered.

X Believed to be extinct; historical records only, continue search.

SNR A species not ranked. A rank has not yet assigned or the species has not been evaluated.

SNA A conservation status rank is not applicable to the element.

S#S# Numeric range rank: A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species.

?* Inexact or uncertain; for numeric ranks, denotes inexactness.

B Breeding status of a migratory species. Example: S1B,SZN - breeding occurrences for the species are ranked S1 (critically imperilled) in the province, nonbreeding occurrences are not ranked in the province.

SARA (2015) Definitions for Status Listing:

Schedule 1: is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.

Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

Schedule 3: species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

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

Threatened: a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

Appendix D: Avian Species at Risk Federal Recovery Documents

Species	Federal Recovery Documents Available
American White Pelican	No Documents
Bank Swallow	11 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (5 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1233#ot10
Barn Swallow	18 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (12 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1147#ot10
Black-crowned night heron	Not Listed under SARA
Bobolink	12 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (5 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1087#ot10
Caspian Tern	No Documents
Canada warbler	28 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Recovery Strategies (1 record(s) found.) • Action Plans (7 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (12 record(s) found.) • Consultation Documents (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1008#ot10

Species	Federal Recovery Documents Available
Chimney Swift	21 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (4 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (8 record(s) found.) • Consultation Documents (1 record(s) found.) • Factsheet (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=951#ot10
Common Nighthawk	32 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Recovery Strategies (1 record(s) found.) • Action Plans (12 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (11 record(s) found.) • Consultation Documents (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=986#ot10
Eastern Whip-poor-will	21 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Recovery Strategies (1 record(s) found.) • Action Plans (5 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (7 record(s) found.) • Consultation Documents (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1047#ot10
Eastern Wood-pewee	13 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (7 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1198#ot10

Species	Federal Recovery Documents Available
Golden-winged Warbler	26 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Recovery Strategies (1 record(s) found.) • Action Plans (3 record(s) found.) • Orders (2 record(s) found.) • Permits and Related Agreements (14 record(s) found.) • Consultation Documents (1 record(s) found.) • Critical Habitat Descriptions in the Canada Gazette (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=942#ot10
Grasshopper Sparrow	7 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (1 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1241#ot10
Horned Grebe	9 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (2 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1045#ot10
Least Bittern	19 record(s) found. • COSEWIC Status Reports (2 record(s) found.) • COSEWIC Assessments (2 record(s) found.) • Response Statements (1 record(s) found.) • Recovery Strategies (1 record(s) found.) • Action Plans (3 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (7 record(s) found.) • Critical Habitat Descriptions in the Canada Gazette (2 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=51#ot10

Species	Federal Recovery Documents Available
Loggerhead Shrike	18 record(s) found. • COSEWIC Status Reports (2 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (2 record(s) found.) • Recovery Strategies (1 record(s) found.) • Action Plans (2 record(s) found.) • Orders (3 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (1 record(s) found.) • Consultation Documents (2 record(s) found.) • Critical Habitat Descriptions in the Canada Gazette (2 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=38#ot10
Northern Parula	No Documents
Olive-sided Flycatcher	35 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Recovery Strategies (1 record(s) found.) • Action Plans (17 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (8 record(s) found.) • Consultation Documents (1 record(s) found.) • Exceptions (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=999#ot10
Peregrine Falcon	7 record(s) found. • Orders (1 record(s) found.) • Permits and Related Agreements (6 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=29#ot10
Piping Plover	18 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • Response Statements (1 record(s) found.) • Recovery Strategies (1 record(s) found.) • Action Plans (5 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (6 record(s) found.) • Consultation Documents (1 record(s) found.) • Residence Description (1 record(s) found.) • Critical Habitat Descriptions in the Canada Gazette (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=686#ot10

Species	Federal Recovery Documents Available
Red-headed Woodpecker	14 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (2 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Permits and Related Agreements (4 record(s) found.) • Consultation Documents (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=57#ot10
Rusty Blackbird	18 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (9 record(s) found.) • Management Plans (1 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=907#ot10
Short-eared Owl	15 record(s) found. • COSEWIC Status Reports (1 record(s) found.) • COSEWIC Assessments (1 record(s) found.) • Response Statements (1 record(s) found.) • Action Plans (6 record(s) found.) • Management Plans (1 record(s) found.) • Orders (2 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) • Recovery Document Posting Plans (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=60#ot10
Trumpeter Swan	No Documents
Yellow Rail	8 record(s) found. • COSEWIC Status Reports (2 record(s) found.) • COSEWIC Assessments (2 record(s) found.) • Response Statements (1 record(s) found.) • Management Plans (1 record(s) found.) • COSEWIC Annual Reports (1 record(s) found.) • Consultation Documents (1 record(s) found.) http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=574#ot10

Appendix E: Song Bird and Water Bird Survey Results within the LSMOC LSA

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Alder flycatcher	Empidonax alnorum	Observation	1	5739875	558908	Option 4
112	Alder flycatcher	Empidonax alnorum	Observation	1	5739875	558908	Option 4
113	Alder flycatcher	Empidonax alnorum	Observation	1	5738965	557833	Reach 1
86	Alder flycatcher	Empidonax alnorum	Observation	1	5739779	556772	Reach 1
88	Alder flycatcher	Empidonax alnorum	Vocal	0	5751080	572931	Reach 3 (Willow Point)
87	Alder flycatcher	Empidonax alnorum	Vocal	0	5753270	570518	Reach 3 (Johnson Beach)
110	Alder flycatcher	Empidonax alnorum	Vocal	0	5747151	560447	Reach 2
93	Alder flycatcher	Empidonax alnorum	Observation	1	5733379	560604	Proposed ASR
99	Alder flycatcher	Empidonax alnorum	Observation	1	5703477	560140	Proposed ASR
100	Alder flycatcher	Empidonax alnorum	Vocal	0	5687199	558338	Proposed ASR
Incidental	American pelican	Pelecanus erythrorhynchos	Observation	2	5733757	550791	Lake SM Shoreline
Incidental	American pelican	Pelecanus erythrorhynchos	Observation	1	5733347	550837	Lake SM Shoreline
Incidental	American pelican	Pelecanus erythrorhynchos	Observation	1	5732344	549872	Lake SM Shoreline
Incidental	American pelican	Pelecanus erythrorhynchos	Observation	5	5733728	550941	Lake SM Shoreline
Incidental	American pelican	Pelecanus erythrorhynchos	Observation	1	5731886	547490	Lake SM Shoreline
Incidental	American robin	Turdus migratorius	Vocal	0	5687060	549112	Proposed ASR
116	American robin	Turdus migratorius	Vocal	0	5742214	560778	Option 4
103	American robin	Turdus migratorius	Observation	1	5739910	550477	Lake SM Shoreline
106	American robin	Turdus migratorius	Observation	1	5736017	555521	Lake SM Shoreline
111	American robin	Turdus migratorius	Vocal	0	5749470	557059	Reach 2
85	American robin	Turdus migratorius	Observation	1	5723591	553834	Proposed ASR
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5722839	543201	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5735768	557269	Lake SM Shoreline

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	2	5735244	555778	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5735504	554326	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	2	5735580	554131	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5731886	547490	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	2	5731153	546654	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5732963	543297	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5732221	542125	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5733188	549848	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5733086	545177	Lake SM Shoreline
Incidental	Bald eagle	Haliaeetus leucocephalus	Observation	1	5732428	543800	Lake SM Shoreline
102	Bald eagle	Haliaeetus leucocephalus	Observation	1	5740553	554367	Reach 1
106	Bald eagle	Haliaeetus leucocephalus	Observation	1	5736017	555521	Lake SM Shoreline
Incidental	Bank swallow	Riparia riparia┬á	Observation	1	5687031	546340	Proposed ASR
Incidental	Black-capped chickadee	Poecile atricapillus	Observation	1	5739875	558908	Option 4
Incidental	Black-capped chickadee	Poecile atricapillus	Observation	1	5714267	553269	Proposed ASR
112	Black-capped chickadee	Poecile atricapillus	Observation	1	5739875	558908	Option 4
113	Black-capped chickadee	Poecile atricapillus	Observation	1	5738965	557833	Reach 1
111	Black-capped chickadee	Poecile atricapillus	Vocal	0	5749470	557059	Reach 2
92	Black-capped chickadee	Poecile atricapillus	Observation	1	5736946	561827	Proposed ASR
85	Black-capped chickadee	Poecile atricapillus	Vocal	0	5723591	553834	Proposed ASR
Incidental	Blue heron	Ardea herodias	Observation	1	5710268	555098	Proposed ASR
Incidental	Blue heron	Ardea herodias	Observation	1	5738235	556249	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	1	5738361	556967	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	1	5737998	557049	Lake SM Shoreline

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Blue heron	Ardea herodias	Observation	1	5735838	557830	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	1	5736144	555941	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	1	5736322	555524	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	3	5732703	550301	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	1	5731591	548446	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	3	5731367	548438	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	1	5731165	547039	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	2	5735522	555489	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	1	5731652	545914	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	2	5733086	546008	Lake SM Shoreline
Incidental	Blue heron	Ardea herodias	Observation	2	5732408	545547	Lake SM Shoreline
95	Blue jay	Cyanocitta cristata	Observation	1	5730167	561347	Proposed ASR
85	Blue jay	Cyanocitta cristata	Observation	1	5723591	553834	Proposed ASR
85	Blue jay	Cyanocitta cristata	Vocal	0	5723591	553834	Proposed ASR
Incidental	Blue-winged teal	Anas discors	Observation	4	5734620	555387	Lake SM Shoreline
Incidental	Blue-winged teal	Anas discors	Observation	2	5733147	542143	Lake SM Shoreline
Incidental	Canada goose	Branta canadensis	Observation	2	5734671	552934	Lake SM Shoreline
Incidental	Canada goose	Branta canadensis	Observation	1	5732888	549509	Lake SM Shoreline
Incidental	Canada goose	Branta canadensis	Observation	2	5731583	546169	Lake SM Shoreline
Incidental	Canada goose	Branta canadensis	Observation	4	5731570	549601	Lake SM Shoreline
Incidental	Canada goose	Branta canadensis	Observation	2	5733250	545746	Lake SM Shoreline
Incidental	Canada goose	Branta canadensis	Observation	1	5733408	544582	Lake SM Shoreline
Incidental	Canada goose	Branta canadensis	Observation	2	5732232	544671	Lake SM Shoreline
85	Canada goose	Branta canadensis	Vocal	0	5723591	553834	Proposed ASR

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
92	Canada goose	Branta canadensis	Observation	1	5736946	561827	Proposed ASR
100	Canada goose	Branta canadensis	Observation	1	5694669	559679	Proposed ASR
99	Canada goose	Branta canadensis	Observation	1	5701527	559259	Proposed ASR
100	Canada goose	Branta canadensis	Vocal	0	5687199	558338	Proposed ASR
99	Canada goose gosling	Branta canadensis	Observation	1	5701527	559259	Proposed ASR
Incidental	Caspian Tern	Hydroprogne caspia	Observation	2	5738617	553935	Lake SM Shoreline
106	Cedar waxwing	Bombycilla cedrorum	Observation	1	5736017	555521	Lake SM Shoreline
102	Chestnut-sided warbler	Setophaga pensylvanica	Vocal	0	5691758	559058	Proposed ASR
Incidental	Chestunt sided warbler	Setophaga pensylvanica	Vocal	0	5698137	558770	Proposed ASR
116	Clay-colored sparrow	Spizella pallida	Vocal	0	5742214	560778	Option 4
100	Clay-colored sparrow	Spizella passerina	Vocal	0	5687199	558338	Proposed ASR
85	Clay-colored sparrow	Spizella passerina	Vocal	0	5723591	553834	Proposed ASR
97	Clay-colored sparrow	Spizella passerina	Vocal	0	5710417	556251	Proposed ASR
100	Clay-colored sparrow	Spizella pallida	Vocal	0	5687199	558338	Proposed ASR
Incidental	Common merganser	Mergus merganser	Observation	2	5735726	556073	Lake SM Shoreline
Incidental	Common raven	Corvus corax	Observation	1	5687120	554435	Proposed ASR
Incidental	Common raven	Corvus corax	Vocal	0	5687060	549112	Proposed ASR
Incidental	Common raven	Corvus corax	Observation	2	5738235	556249	Lake SM Shoreline
Incidental	Common raven	Corvus corax	Observation	4	5736448	557286	Lake SM Shoreline
Incidental	Common raven	Corvus corax	Observation	3	5734634	556861	Lake SM Shoreline
Incidental	Common raven	Corvus corax	Observation	1	5733956	552263	Lake SM Shoreline
Incidental	Common raven	Corvus corax	Observation	2	5732124	550083	Lake SM Shoreline
Incidental	Common raven	Corvus corax	Vocal	0	5687100	553225	Proposed ASR
112	Common raven	Corvus corax	Observation	1	5739846	558732	Option 4
121	Common raven	Corvus corax	Observation	1	5742390	559257	Option 4

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
114	Common raven	Corvus corax	Observation	1	5738235	556249	Option 4
107	Common raven	Corvus corax	Observation	1	5736537	552973	Lake SM Shoreline
100	Common raven	Corvus corax	Observation	1	5687199	558338	Proposed ASR
102	Common raven	Corvus corax	Observation	1	5691758	559058	Proposed ASR
105	Common sandpiper	Actitis hypoleucos	Observation	1	5737432	556753	Option 4
120	Common sandpiper	Actitis hypoleucos	Observation	1	5743765	556829	Reach 1
109	Common snipe	Gallinago gallinago	Observation	1	5747605	564752	Reach 3
Incidental	Common tern	Sterna hirundo	Observation	2	5738235	556249	Lake SM Shoreline
Incidental	Common tern	Sterna hirundo	Observation	1	5738617	553935	Lake SM Shoreline
Incidental	Common tern	Sterna hirundo	Observation	3	5738385	554674	Lake SM Shoreline
Incidental	Common tern	Sterna hirundo	Observation	4	5738371	555624	Lake SM Shoreline
Incidental	Common tern	Sterna hirundo	Observation	1	5735128	556320	Lake SM Shoreline
Incidental	Common tern	Sterna hirundo	Observation	1	5733625	551939	Lake SM Shoreline
Incidental	Common tern	Sterna hirundo	Observation	5	5731806	549184	Lake SM Shoreline
Incidental	Common tern	Sterna hirundo	Observation	3	5731538	548005	Lake SM Shoreline
Incidental	Common tern	Sterna hirundo	Observation	1	5732898	542881	Lake SM Shoreline
Incidental	Common yellowthroat	Geothlypis trichas	Vocal	0	5687060	549112	Proposed ASR
86	Common yellowthroat	Geothlypis trichas	Observation	1	5739779	556772	Reach 1
95	Common yellowthroat	Geothlypis trichas	Observation	1	5730167	561347	Proposed ASR
97	Common yellowthroat	Geothlypis trichas	Observation	1	5710417	556251	Proposed ASR
85	Common yellowthroat	Geothlypis trichas	Vocal	0	5723591	553834	Proposed ASR
102	Common yellowthroat	Geothlypis trichas	Vocal	0	5691758	559058	Proposed ASR
85	Common yellowthroat	Geothlypis trichas	Vocal	0	5711007	554412	Proposed ASR
92	Common yellowthroat	Geothlypis trichas	Observation	1	5736946	561827	Proposed ASR
Incidental	Cormorant	Phalacrocoracidae	Observation	30	5732021	548904	Lake SM Shoreline

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Cormorant	Phalacrocoracidae	Observation	1	5732108	544960	Lake SM Shoreline
Incidental	Cormorant	Phalacrocoracidae	Observation	200	5733757	550791	Lake SM Shoreline
Incidental	Eastern phoebe	Sayornis phoebe	Observation	1	5710402	556378	Proposed ASR
Incidental	Eastern phoebe	Sayornis phoebe	Observation	1	5687182	557455	Proposed ASR
88	Eastern phoebe	Sayornis phoebe	Vocal	0	5751080	572931	Reach 3 (Willow Point)
116	Eastern wood-pewee	Contopus virens	Vocal	0	5742214	560778	Option 4
Incidental	Franklin's gull	Leucophaeus pipixcan	Vocal	0	5708145	559233	Proposed ASR
Incidental	Franklin's gull	Leucophaeus pipixcan	Observation	1	5738294	556705	Lake SM Shoreline
Incidental	Greater yellow legs	Tringa melanoleuca	Observation	3	5710998	554416	Proposed ASR
Incidental	Green-winged teal	Anas carolinensis	Observation	2	5732124	550083	Lake SM Shoreline
Incidental	Green-winged teal	Anas carolinensis	Observation	2	5731806	549184	Lake SM Shoreline
Incidental	Green-winged teal	Anas carolinensis	Observation	2	5736287	557447	Lake SM Shoreline
120	Hawk	Unkown Species	Observation	1	5743765	556829	Reach 1
111	Hawk	Unkown Species	Observation	0	5749470	557059	Reach 2
85	Hawk	Unkown Species	Observation	0	5711007	554412	Proposed ASR
Incidental	Hawk sp.	Unkown Species	Observation	1	5731874	552217	Lake SM Shoreline
108	House sparrow	Passer domesticus	Observation	1	5747403	565418	Reach 3 (Johnson Beach)
88	Immature bald eagle	Haliaeetus leucocephalus	Observation	1	5751080	572931	Reach 3 (Willow Point)
86	Immature bald eagle	Haliaeetus leucocephalus	Observation	1	5739779	556772	Reach 1
Incidental	Killdeer	Charadrius vociferus	Observation	1	5735768	557269	Lake SM Shoreline
Incidental	Killdeer	Charadrius vociferus	Observation	1	5735143	557176	Lake SM Shoreline
Incidental	Killdeer	Charadrius vociferus	Observation	1	5735149	555296	Lake SM Shoreline
Incidental	Killdeer	Charadrius vociferus	Observation	1	5732999	549837	Lake SM Shoreline

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Killdeer	Charadrius vociferus	Vocal	0	5732888	549509	Lake SM Shoreline
Incidental	Killdeer	Charadrius vociferus	Vocal	0	5732124	550083	Lake SM Shoreline
Incidental	Killdeer	Charadrius vociferus	Vocal	0	5731234	546333	Lake SM Shoreline
Incidental	Killdeer	Charadrius vociferus	Vocal	0	5731995	545207	Lake SM Shoreline
112	Killdeer	Charadrius vociferus	Observation	1	5739846	558732	Option 4
112	Killdeer	Charadrius vociferus	Vocal	0	5739846	558732	Option 4
102	Killdeer	Charadrius vociferus	Observation	1	5740553	554367	Reach 1
106	Killdeer	Charadrius vociferus	Observation	1	5736017	555521	Lake SM Shoreline
119	Killdeer	Charadrius vociferus	Observation	1	5742115	555545	Reach 1
90	Killdeer	Charadrius vociferus	Observation	1	5745560	557625	Reach 1
92	Least flycatcher	Empidonax minimus	Observation	1	5736946	561827	Proposed ASR
Incidental	Lesser scaup	Aythya affinis	Observation	1	5736322	555524	Lake SM Shoreline
Incidental	Lesser scaup	Aythya affinis	Observation	2	5732088	548726	Lake SM Shoreline
100	Lesser scaup	Aythya affinis	Observation	1	5694669	559679	Proposed ASR
Incidental	Mallard	Anas platyrhynchos	Vocal	0	5687100	553225	Proposed ASR
Incidental	Mallard	Anas platyrhynchos	Observation	1	5738235	556249	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	1	5738332	555693	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5738294	556705	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	1	5737624	557372	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	5	5736287	557447	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	8	5735143	557176	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5734634	556861	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5736144	555941	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	3	5735955	555463	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5735149	555296	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	4	5735274	553812	Lake SM Shoreline

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Mallard	Anas platyrhynchos	Observation	1	5735237	553611	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5734710	553230	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5734671	552934	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5734090	552330	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5733012	549909	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	4	5733328	549768	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	4	5732888	549509	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5732124	550083	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	4	5731570	549601	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5731588	549382	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	2	5731806	549184	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	1	5732088	548726	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	1	5733795	545365	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	1	5731995	545207	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	4	5732235	544493	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	4	5730813	542673	Lake SM Shoreline
Incidental	Mallard	Anas platyrhynchos	Observation	1	5731812	547013	Lake SM Shoreline
100	Mallard	Anas platyrhynchos	Observation	1	5687199	558338	Proposed ASR
97	Mallard	Anas platyrhynchos	Observation	1	5710255	555771	Proposed ASR
Incidental	Marsh wren	Cistothorus palustris	Vocal	0	5710305	555930	Proposed ASR
Incidental	Marsh wren	Cistothorus palustris	Observation	2	5733209	550629	Lake SM Shoreline
Incidental	Marsh wren	Cistothorus palustris	Observation	1	5731591	548446	Lake SM Shoreline
116	Marsh wren	Cistothorus palustris	Vocal	0	5742214	560778	Option 4
127	Marsh wren	Cistothorus palustris	Observation	1	5751870	569013	Reach 3 (Johnson Beach)

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Mourning dove	Zenaida macroura	Vocal	0	5687060	549112	Proposed ASR
Incidental	Northern flicker	Colaptes auratus	Observation	1	5714267	553269	Proposed ASR
Incidental	Northern flicker	Colaptes auratus	Observation	1	5687058	549219	Proposed ASR
Incidental	Ovenbird	Seiurus	Vocal	0	5687100	553225	Proposed ASR
113	Ovenbird	Seiurus	Vocal	0	5738965	557833	Reach 1
90	Ovenbird	Seiurus	Vocal	0	5745560	557625	Reach 1
86	Ovenbird	Seiurus	Vocal	0	5739779	556772	Reach 1
91	Ovenbird	Seiurus	Vocal	0	5737271	558257	Reach 1
87	Ovenbird	Seiurus	Vocal	0	5753270	570518	Reach 3 (Johnson Beach)
127	Ovenbird	Seiurus	Vocal	0	5751870	569013	Reach 3 (Johnson Beach)
93	Ovenbird	Seiurus	Observation	1	5733379	560604	Proposed ASR
92	Ovenbird	Seiurus	Observation	1	5736946	561827	Proposed ASR
89	Ovenbird	Seiurus	Observation	1	5741405	564254	Proposed ASR
Incidental	Pileated woodpecker	Hylatomus pileatus	Observation	1	5687077	550817	Proposed ASR
112	Red-eyed vireo	Vireo olivaceus	Vocal	0	5739846	558732	Option 4
86	Red-eyed vireo	Vireo olivaceus	Vocal	0	5739779	556772	Reach 1
91	Red-eyed vireo	Vireo olivaceus	Vocal	0	5737271	558257	Reach 1
120	Red-eyed vireo	Vireo olivaceus	Vocal	0	5743765	556829	Reach 1
108	Red-eyed vireo	Vireo olivaceus	Vocal	0	5747403	565418	Reach 3 (Johnson Beach)
109	Red-eyed vireo	Vireo olivaceus	Vocal	0	5747605	564752	Reach 3
110	Red-eyed vireo	Vireo olivaceus	Vocal	0	5747151	560447	Reach 2
110	Red-eyed vireo	Vireo olivaceus	Vocal	0	5747151	560447	Reach 2
93	Red-eyed vireo	Vireo olivaceus	Observation	1	5733379	560604	Proposed ASR
92	Red-eyed vireo	Vireo olivaceus	Observation	1	5736946	561827	Proposed ASR
85	Red-eyed vireo	Vireo olivaceus	Vocal	0	5723591	553834	Proposed ASR
97	Red-eyed vireo	Vireo olivaceus	Vocal	0	5710417	556251	Proposed ASR

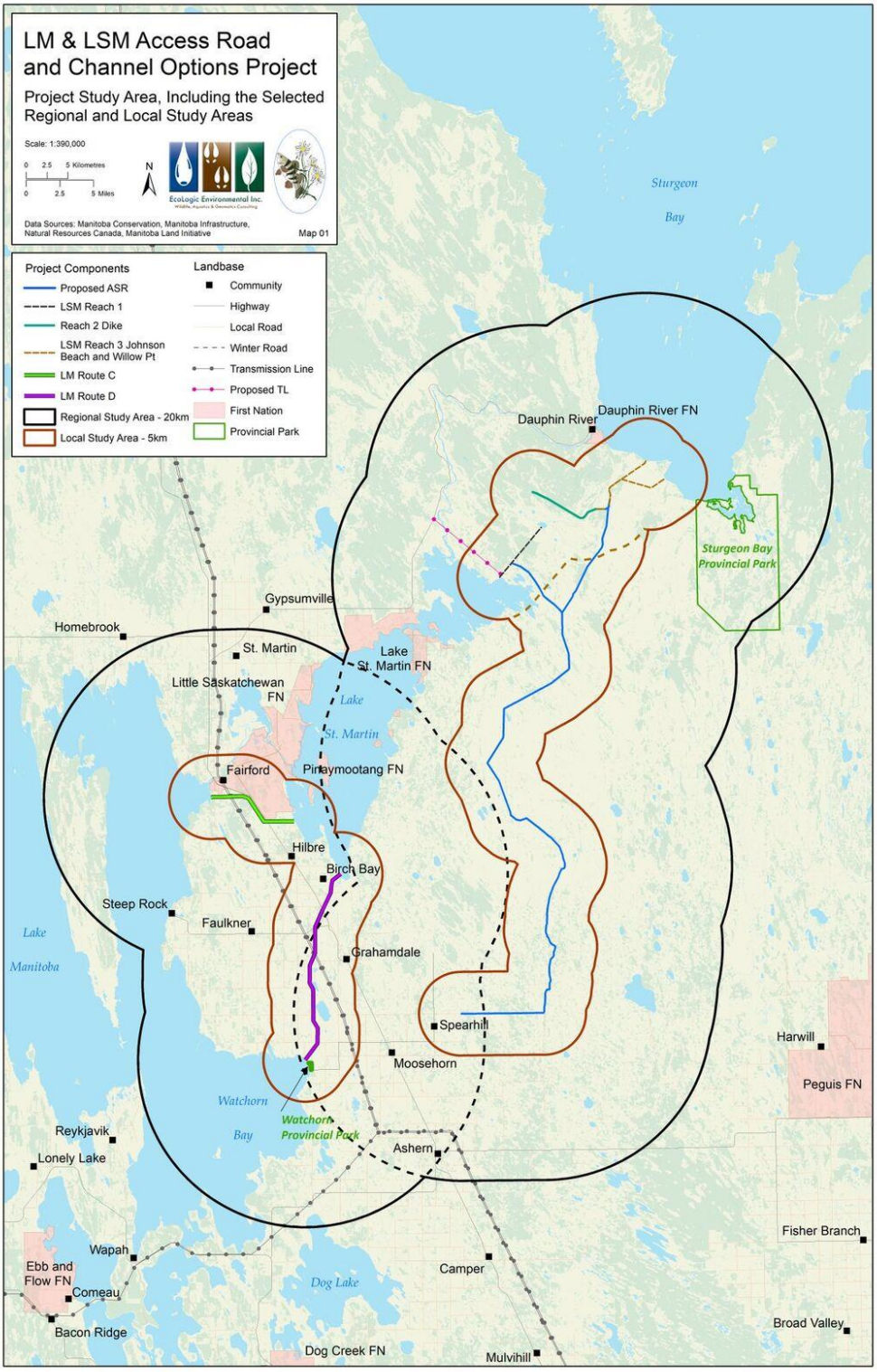
Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	2	5738617	553935	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Vocal	0	5710268	555098	Proposed ASR
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	2	5710325	555019	Proposed ASR
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	2	5710305	555930	Proposed ASR
Incidental	Red-winged blackbird	Agelaius phoeniceus	Vocal	0	5687060	549112	Proposed ASR
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5739875	558908	Option 4
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	2	5738235	556249	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5738294	556705	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5734284	557308	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5735023	556556	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	4	5735726	556073	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	4	5736379	555641	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	10	5735791	555613	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	3	5733328	549768	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5733611	549416	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	2	5733086	546008	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Vocal	0	5687100	553225	Proposed ASR
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	10	5738385	554674	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	10	5738337	555216	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5737334	556855	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	2	5735274	553812	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	6	5732720	549634	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	4	5731806	549184	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	4	5731911	545716	Lake SM Shoreline

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	4	5732108	544960	Lake SM Shoreline
Incidental	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5731583	546169	Lake SM Shoreline
105	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5737432	556753	Option 4
121	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5742390	559257	Option 4
112	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5739875	558908	Option 4
114	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5738235	556249	Option 4
87	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5753270	570518	Reach 3 (Johnson Beach)
87	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5753270	570518	Reach 3 (Johnson Beach)
87	Red-winged blackbird	Agelaius phoeniceus	Vocal	0	5753270	570518	Reach 3 (Johnson Beach)
108	Red-winged blackbird	Agelaius phoeniceus	Vocal	0	5747403	565418	Reach 3 (Johnson Beach)
127	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5751870	569013	Reach 3 (Johnson Beach)
103	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5739910	550477	Lake SM Shoreline
106	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5736017	555521	Lake SM Shoreline
107	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5736537	552973	Lake SM Shoreline
119	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5742115	555545	Reach 1
120	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5743765	556829	Reach 1
113	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5738965	557833	Reach 1
90	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5745560	557625	Reach 1
86	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5739779	556772	Reach 1
91	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5737271	558257	Reach 1
127	Red-winged blackbird	Agelaius phoeniceus	Vocal	0	5751870	569013	Reach 3 (Johnson Beach)

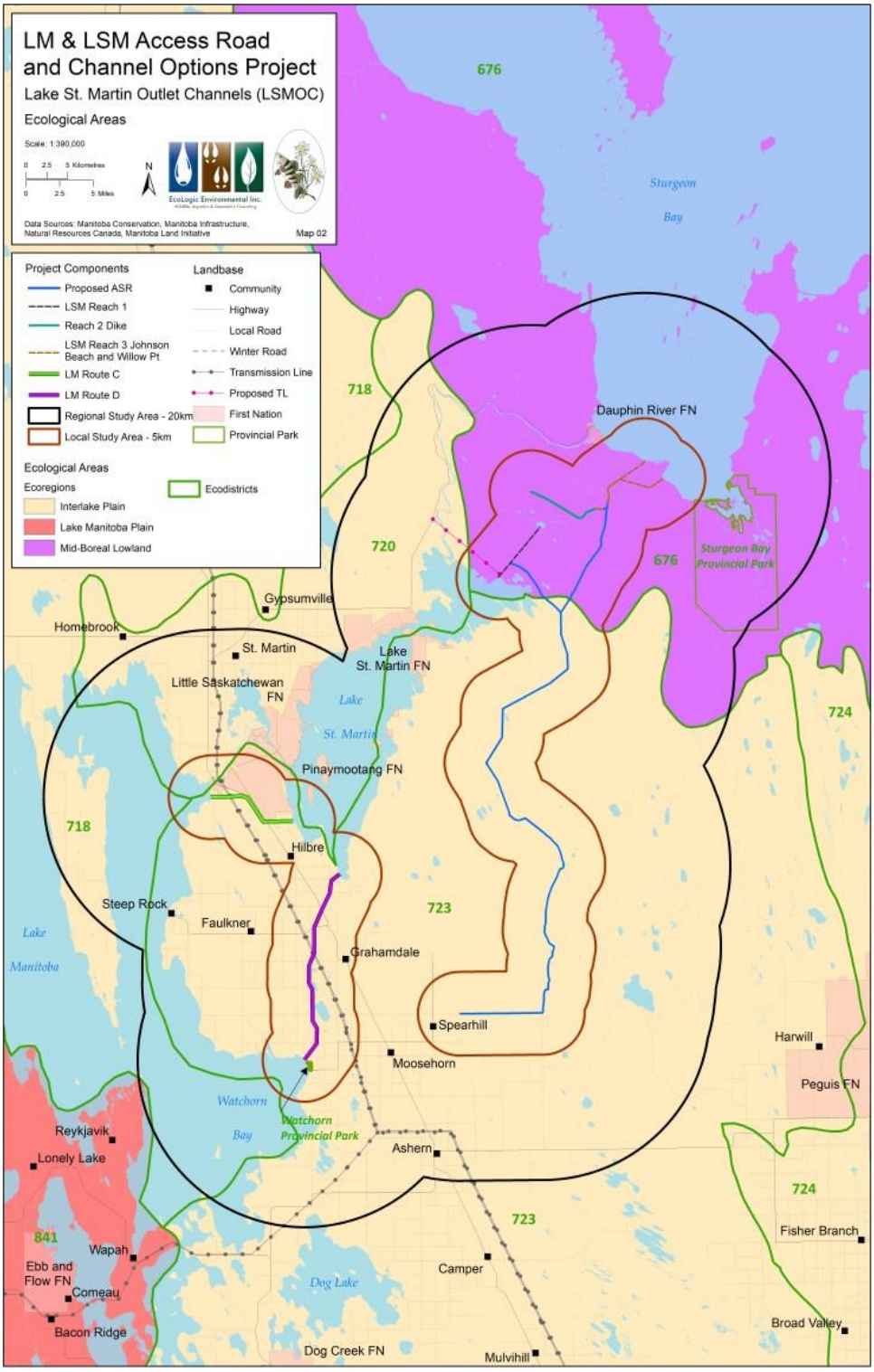
Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
95	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5730167	561347	Proposed ASR
89	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5741405	564254	Proposed ASR
100	Red-winged blackbird	Agelaius phoeniceus	Observation	1	5687199	558338	Proposed ASR
85	Red-winged blackbird	Agelaius phoeniceus	Vocal	0	5723591	553834	Proposed ASR
102	Red-winged blackbird	Agelaius phoeniceus	Vocal	0	5691758	559058	Proposed ASR
120	Rough legged hawk	Buteo lagopus	Observation	1	5743765	556829	Reach 1
120	Rough legged hawk	Buteo lagopus	Vocal	0	5743765	556829	Reach 1
Incidental	Sandhill crane	Grus canadensis	Observation	1	5707021	560256	Proposed ASR
Incidental	Sandhill crane	Grus canadensis	Observation	2	5701988	559426	Proposed ASR
Incidental	Sandhill crane	Grus canadensis	Observation	1	5708145	559233	Proposed ASR
85	Sedge wren	Cistothorus platensis	Vocal	0	5711007	554412	Proposed ASR
127	Sora	Porzana carolina	Vocal	0	5751870	569013	Reach 3 (Johnson Beach)
95	Sora	Porzana carolina	Vocal	0	5730167	561347	Proposed ASR
100	Sora	Porzana carolina	Vocal	0	5687199	558338	Proposed ASR
97	Sora	Porzana carolina	Vocal	0	5710417	556251	Proposed ASR
86	Swainson's hawk	Buteo swainsoni	Observation	1	5739779	556772	Reach 1
105	Swamp sparrow	Melospiza georgiana	Observation	1	5737432	556753	Option 4
121	Swamp sparrow	Melospiza georgiana	Observation	1	5742390	559257	Option 4
114	Swamp sparrow	Melospiza georgiana	Vocal	0	5738182	557002	Option 4
115	Swamp sparrow	Melospiza georgiana	Vocal	0	5741453	560114	Option 4
116	Swamp sparrow	Melospiza georgiana	Vocal	0	5742214	560778	Option 4
103	Swamp sparrow	Melospiza georgiana	Observation	1	5739910	550477	Lake SM Shoreline
107	Swamp sparrow	Melospiza georgiana	Observation	1	5736537	552973	Lake SM Shoreline
127	Swamp sparrow	Melospiza georgiana	Vocal	0	5751870	569013	Reach 3 (Johnson Beach)
108	Swamp sparrow	Melospiza georgiana	Vocal	0	5747403	565418	Reach 3 (Johnson Beach)

Point Count Number	Common Name	Scientific Name	Point Type	Total Count	Location		Area
					UTM_Y	UTM_X	
109	Swamp sparrow	Melospiza georgiana	Vocal	0	5747605	564752	Reach 3
85	Swamp sparrow	Melospiza georgiana	Vocal	0	5711007	554412	Proposed ASR
Incidental	Tree swallow	Tachycineta bicolor	Vocal	0	5710325	555019	Proposed ASR
120	Tree swallow	Tachycineta bicolor	Observation	1	5743765	556829	Reach 1
85	Trumpeter swan	Cygnus buccinator	Observation	1	5725200	556781	Proposed ASR
85	Trumpeter swan	Cygnus buccinator	Observation	2	5721413	553579	Proposed ASR
91	Veery	Catharus fuscescens	Observation	1	5737271	558257	Reach 1
87	Vesper sparrow	Pooecetes gramineus	Vocal	0	5753270	570518	Reach 3 (Johnson Beach)
93	Vesper sparrow	Pooecetes gramineus	Observation	1	5733379	560604	Proposed ASR
95	Vesper sparrow	Pooecetes gramineus	Observation	1	5730167	561347	Proposed ASR
Incidental	Warbling vireo	Vireo gilvus	Vocal	0	5687060	549112	Proposed ASR
127	White throated sparrow	Zonotrichia albicollis	Vocal	0	5751870	569013	Reach 3 (Johnson Beach)
109	White throated sparrow	Zonotrichia albicollis	Vocal	0	5747605	564752	Reach 3
110	White throated sparrow	Zonotrichia albicollis	Vocal	0	5747151	560447	Reach 2
93	White throated sparrow	Zonotrichia albicollis	Vocal	0	5733379	560604	Proposed ASR
95	White throated sparrow	Zonotrichia albicollis	Vocal	0	5730167	561347	Proposed ASR
Incidental	White-throated sparrow	Zonotrichia albicollis	Vocal	0	5710998	554416	Proposed ASR
Incidental	Wilson's snipe	Gallinago delicata	Vocal	0	5687060	549112	Proposed ASR
Incidental	Wilson's snipe	Gallinago delicata	Observation	1	5739875	558908	Option 4
105	Yellow headed blackbird	Xanthocephalus xanthocephalus	Observation	1	5737432	556753	Option 4

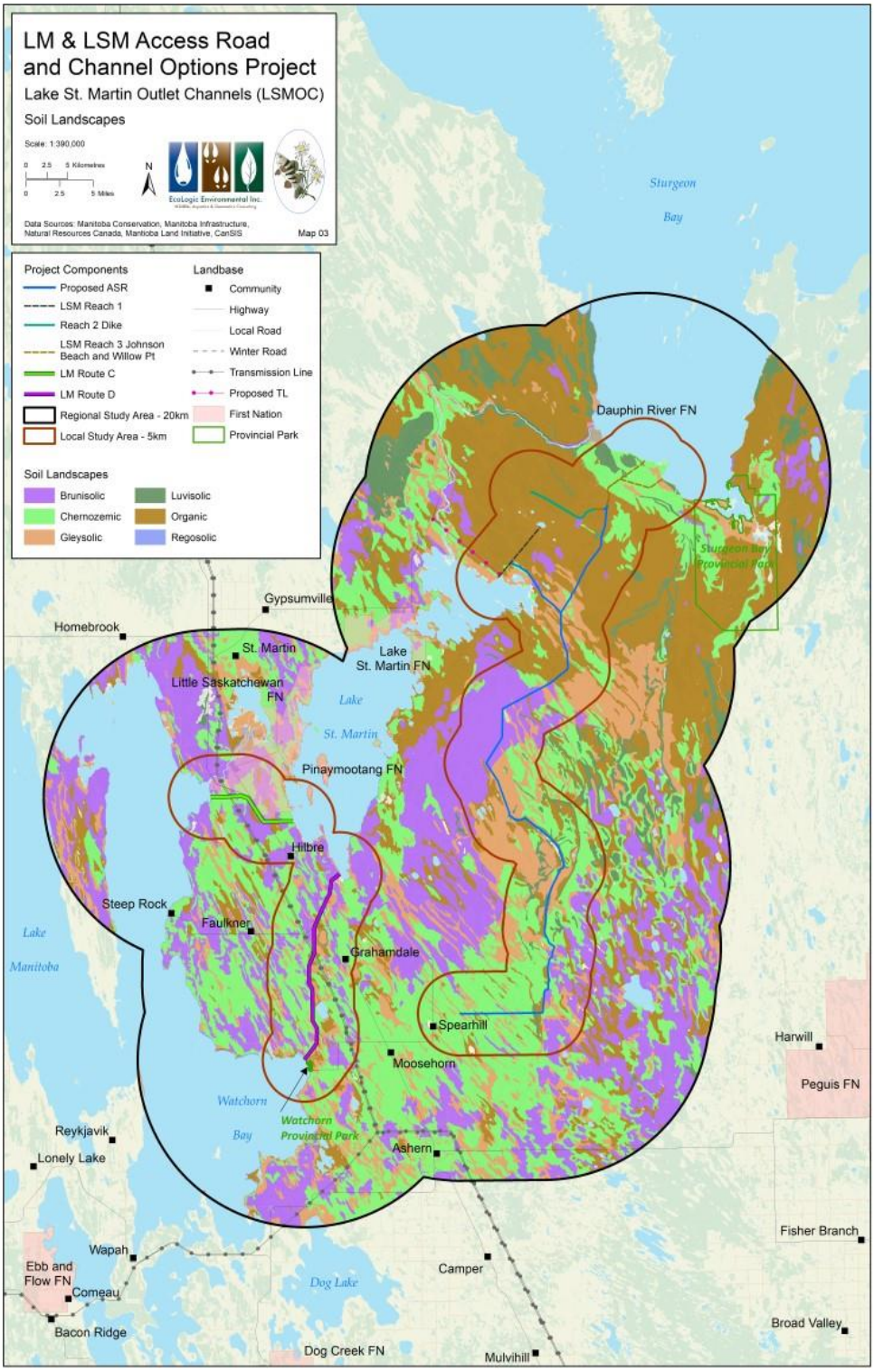
Appendix F: Report Mapping



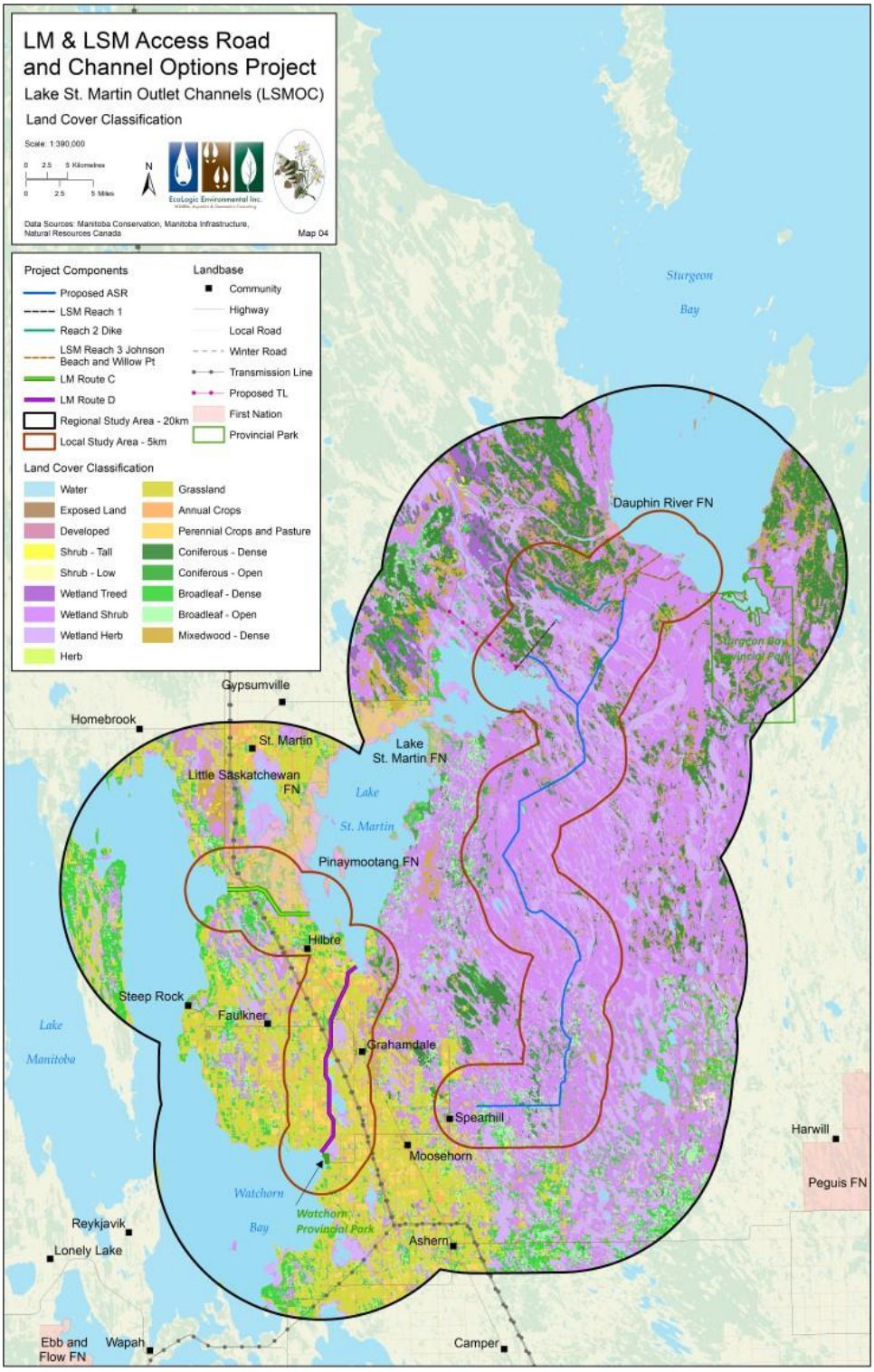
Map 1: Study Areas



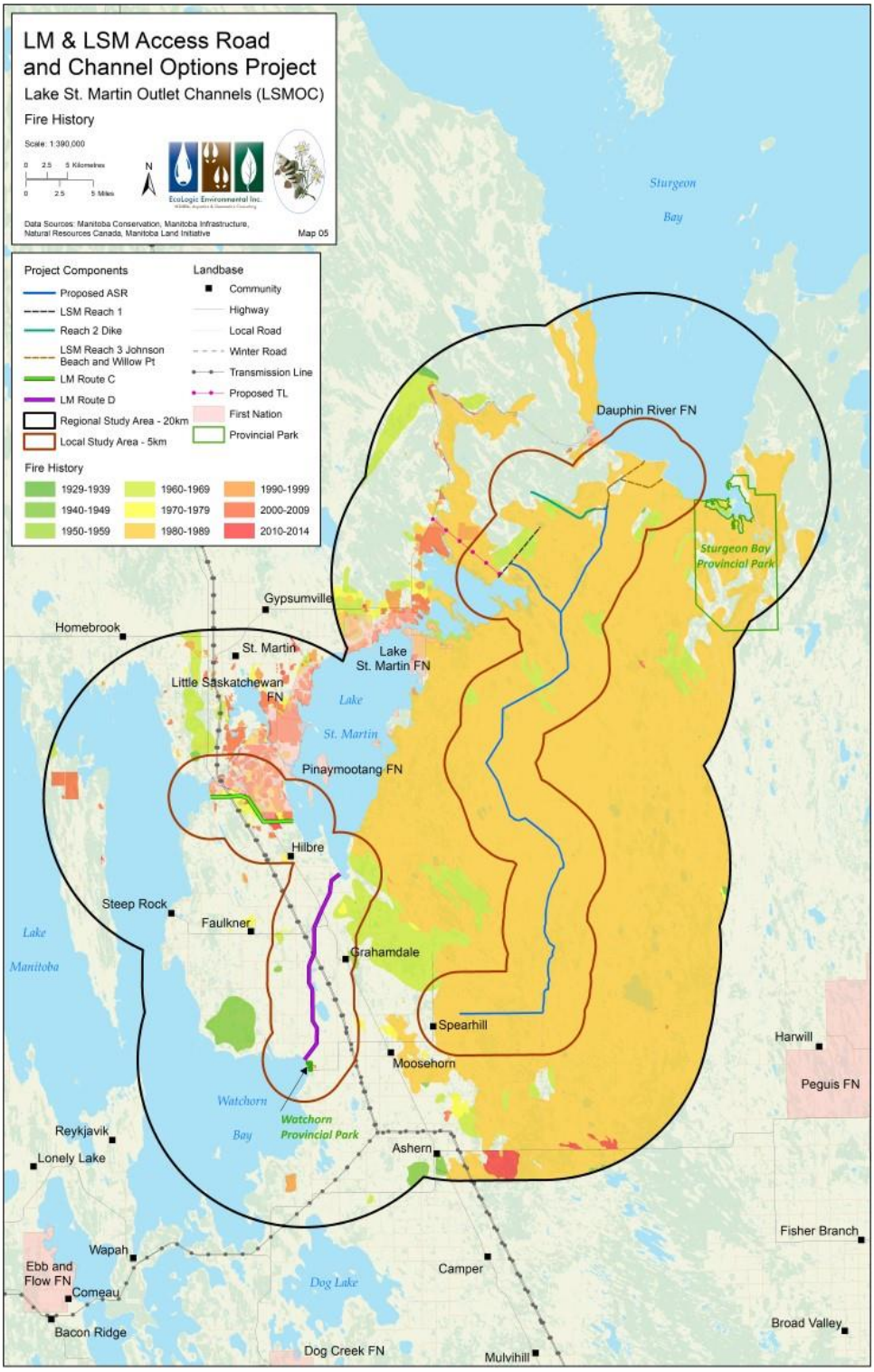
Map 2: Ecoregions within the LSA and RSA



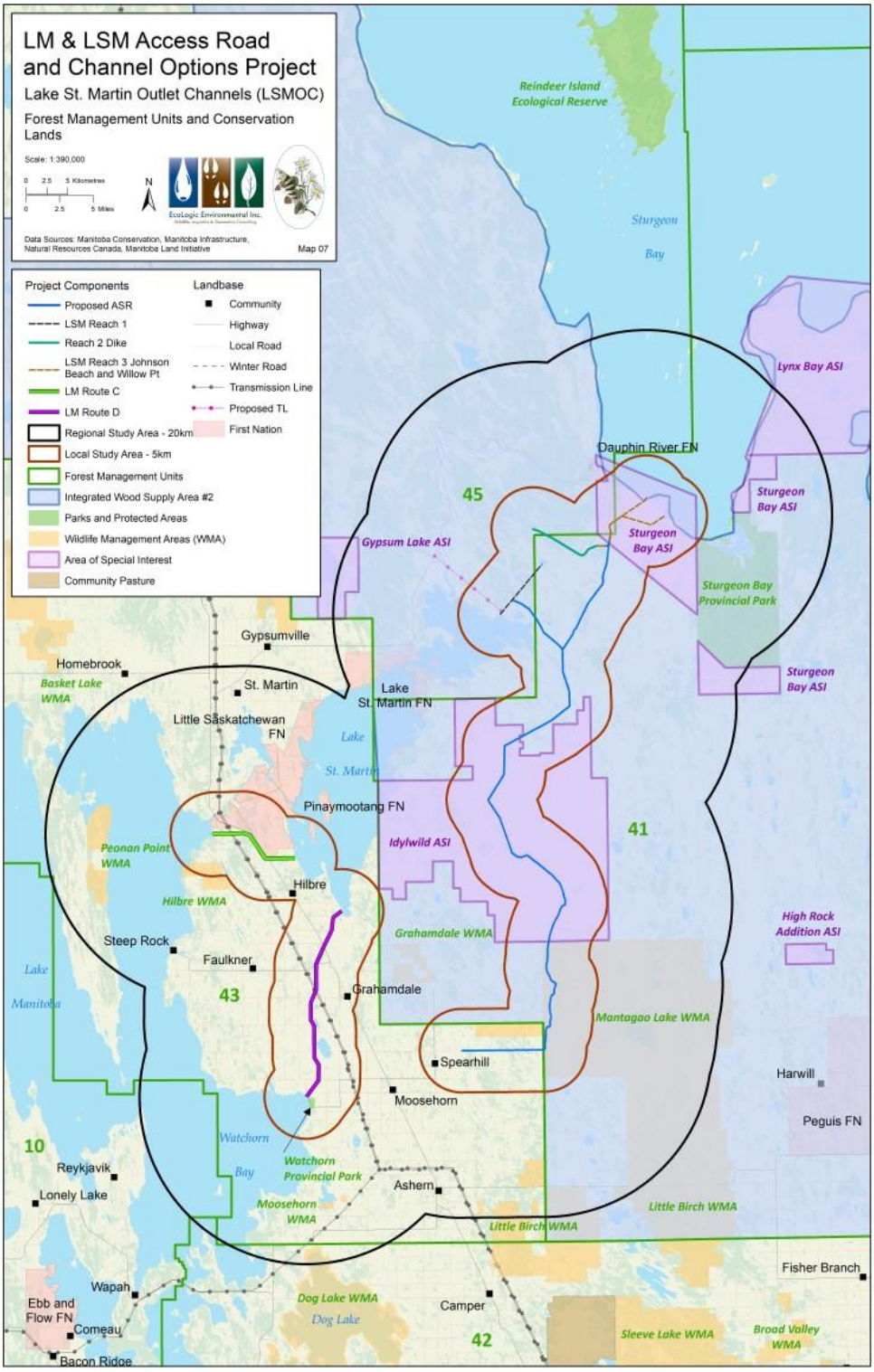
Map 3: Soil Classification within the LSA and RSA



Map 4: Land Cover Classification (LCC) within the LSA and RSA

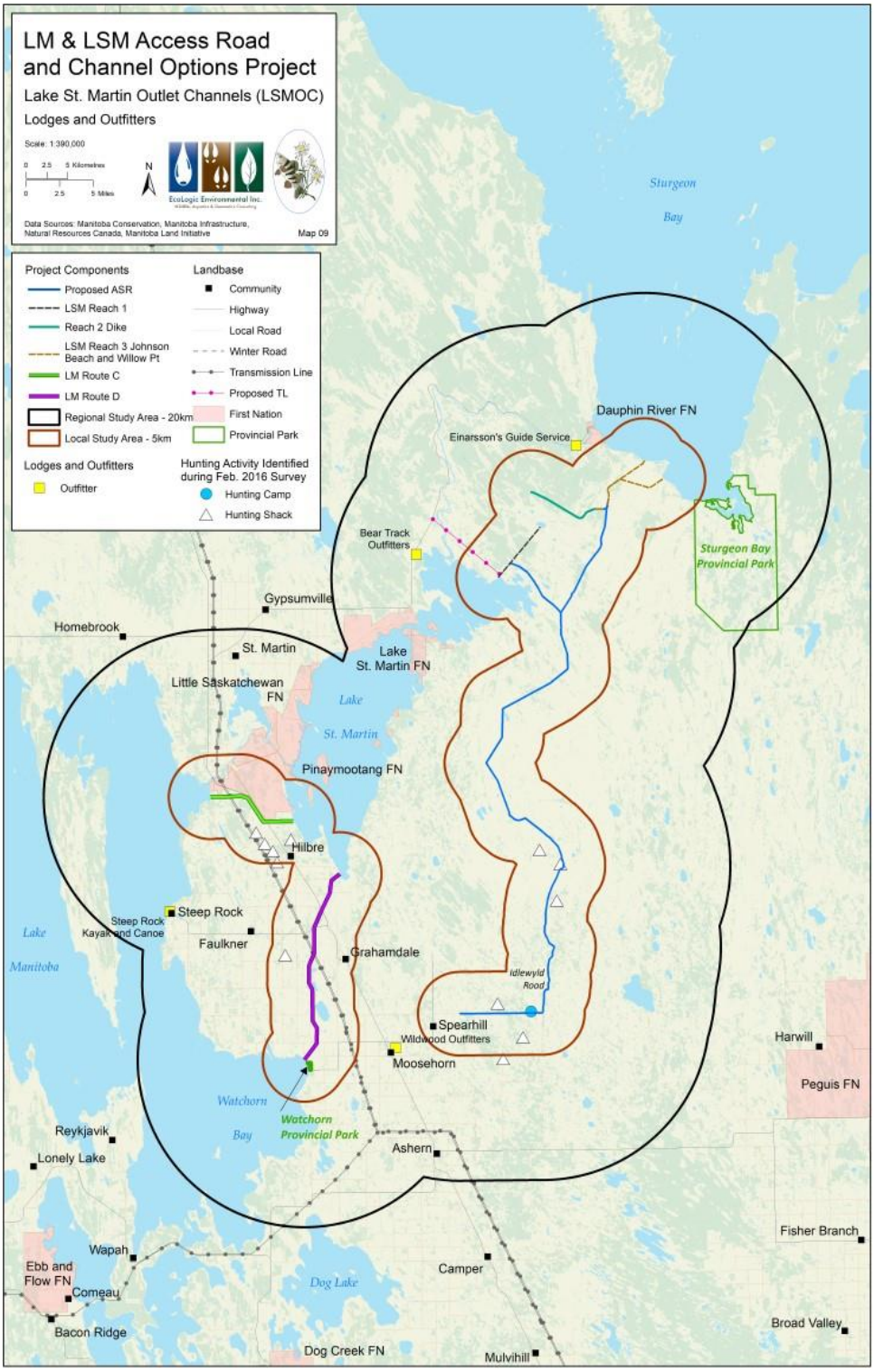


Map 5: Fire History within the LSA and RSA

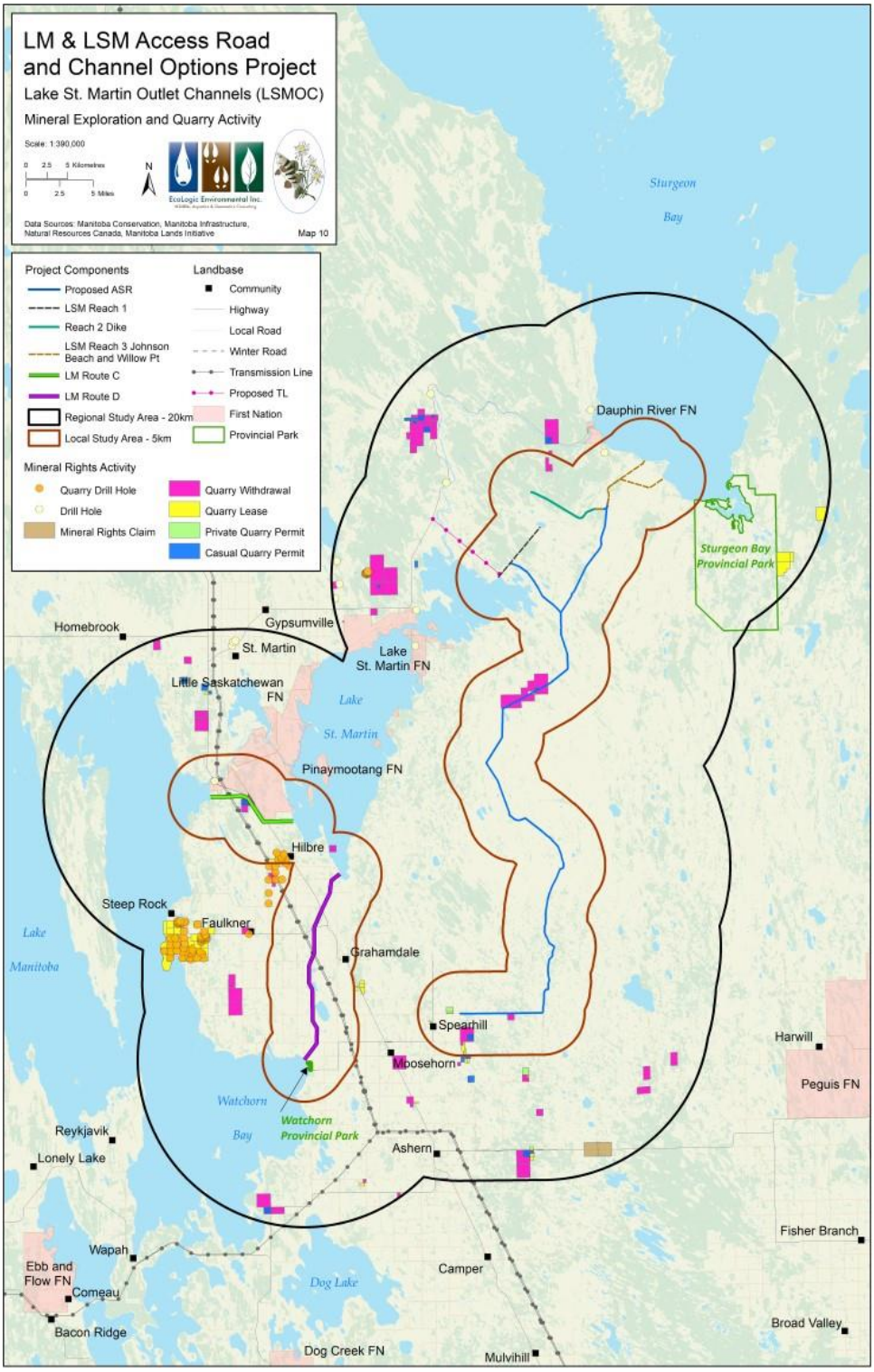


Map 7: Forest Management Units (FMUs) and Conservation Lands within the LSA and RSA

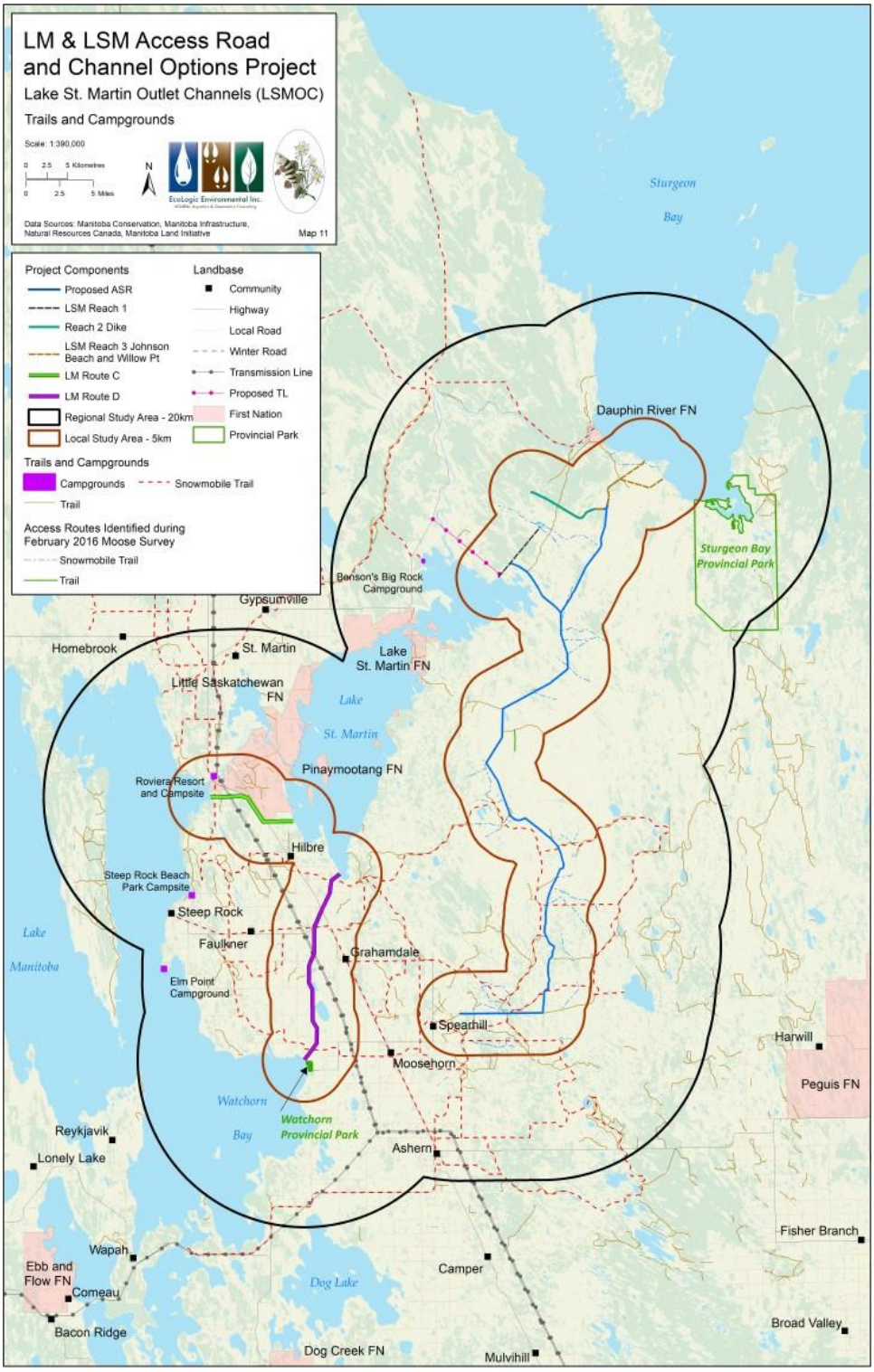
Map 8: Hydroelectric Development - Transmission Lines within the LSA and RSA



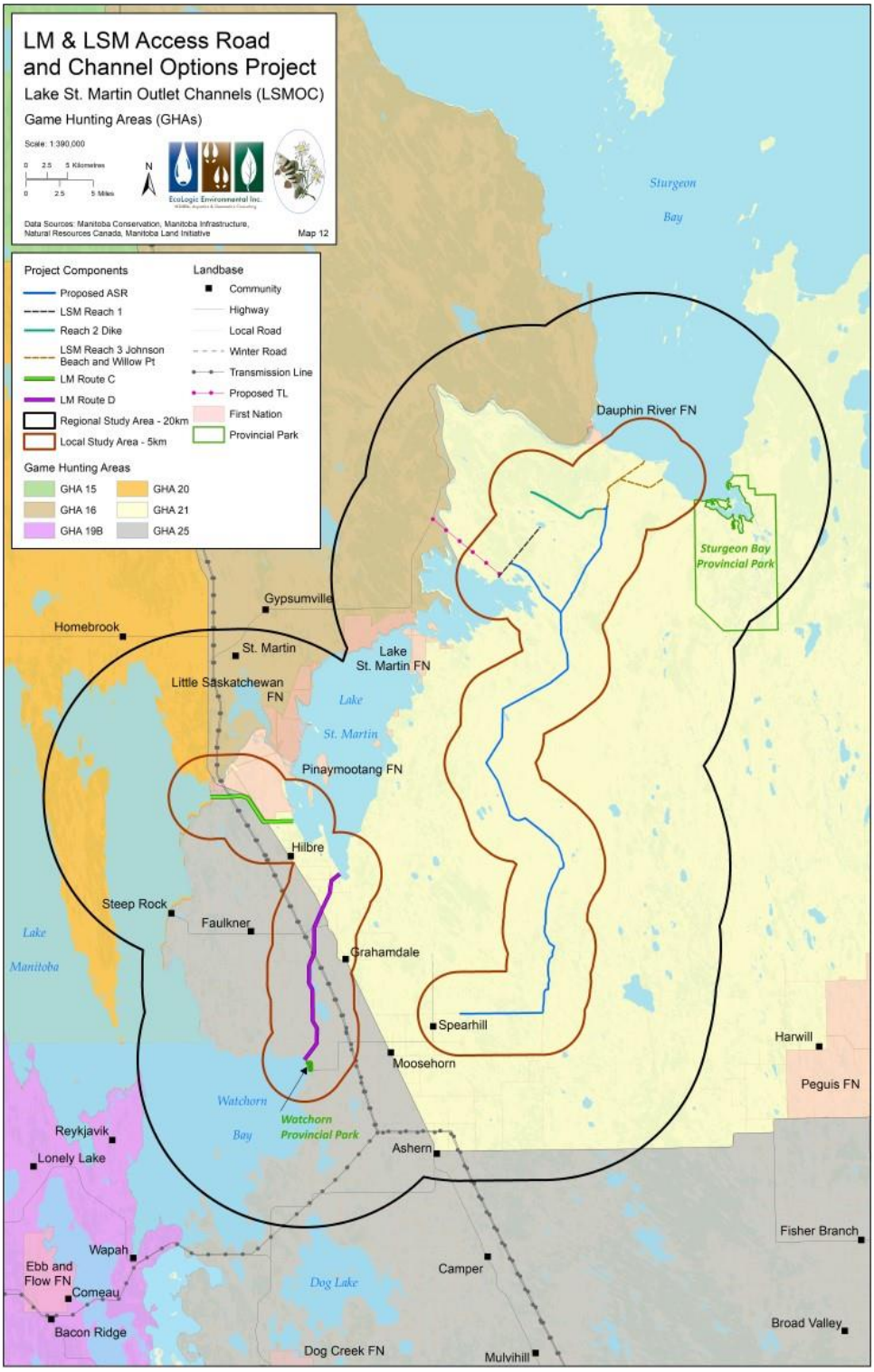
Map 9: Lodges and Outfitters within the LSA and RSA



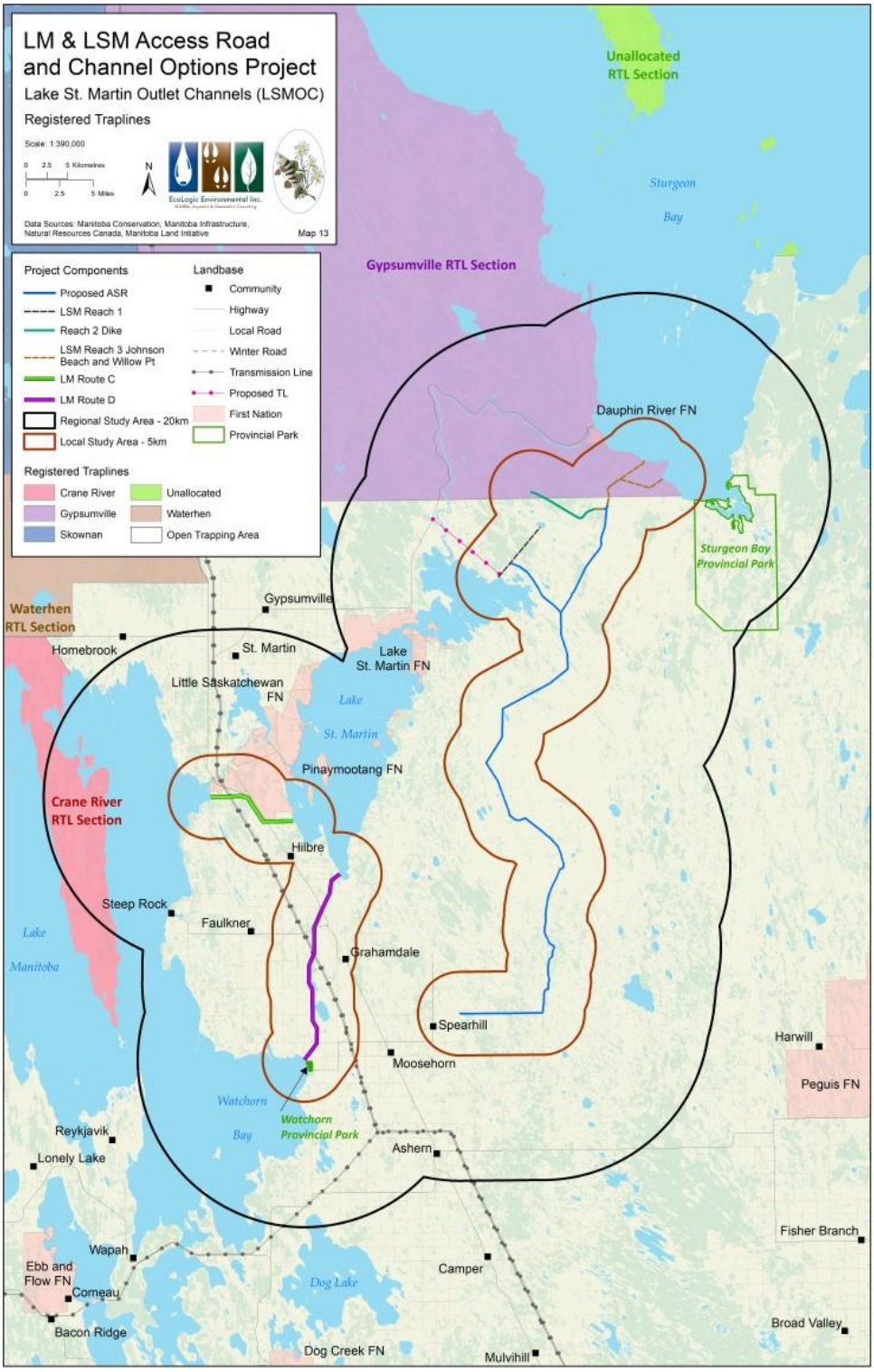
Map 10: Mineral Exploration and Quarry Activity within the LSA and RSA



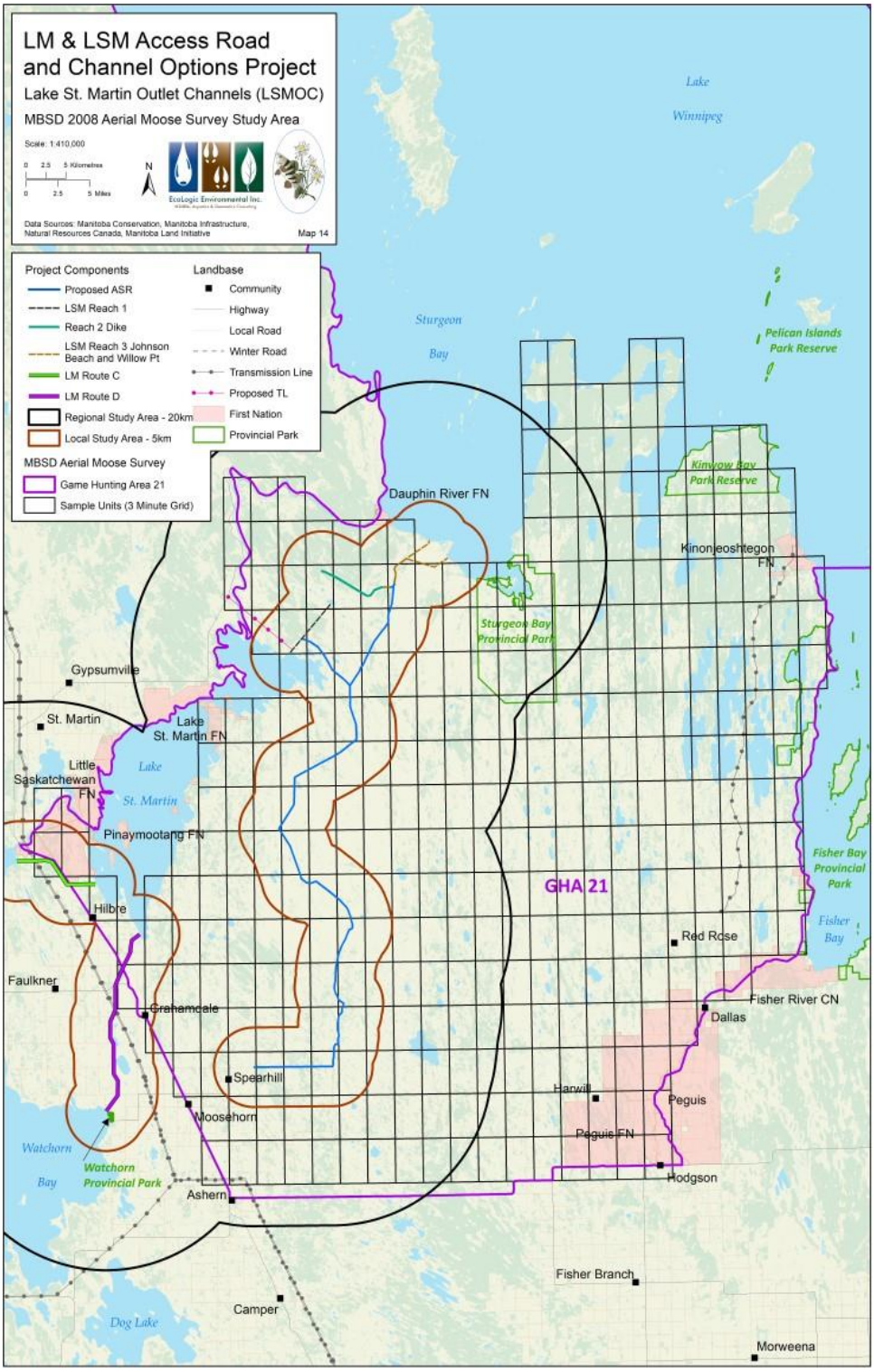
Map 11: Trails and Campgrounds within the LSA and RSA



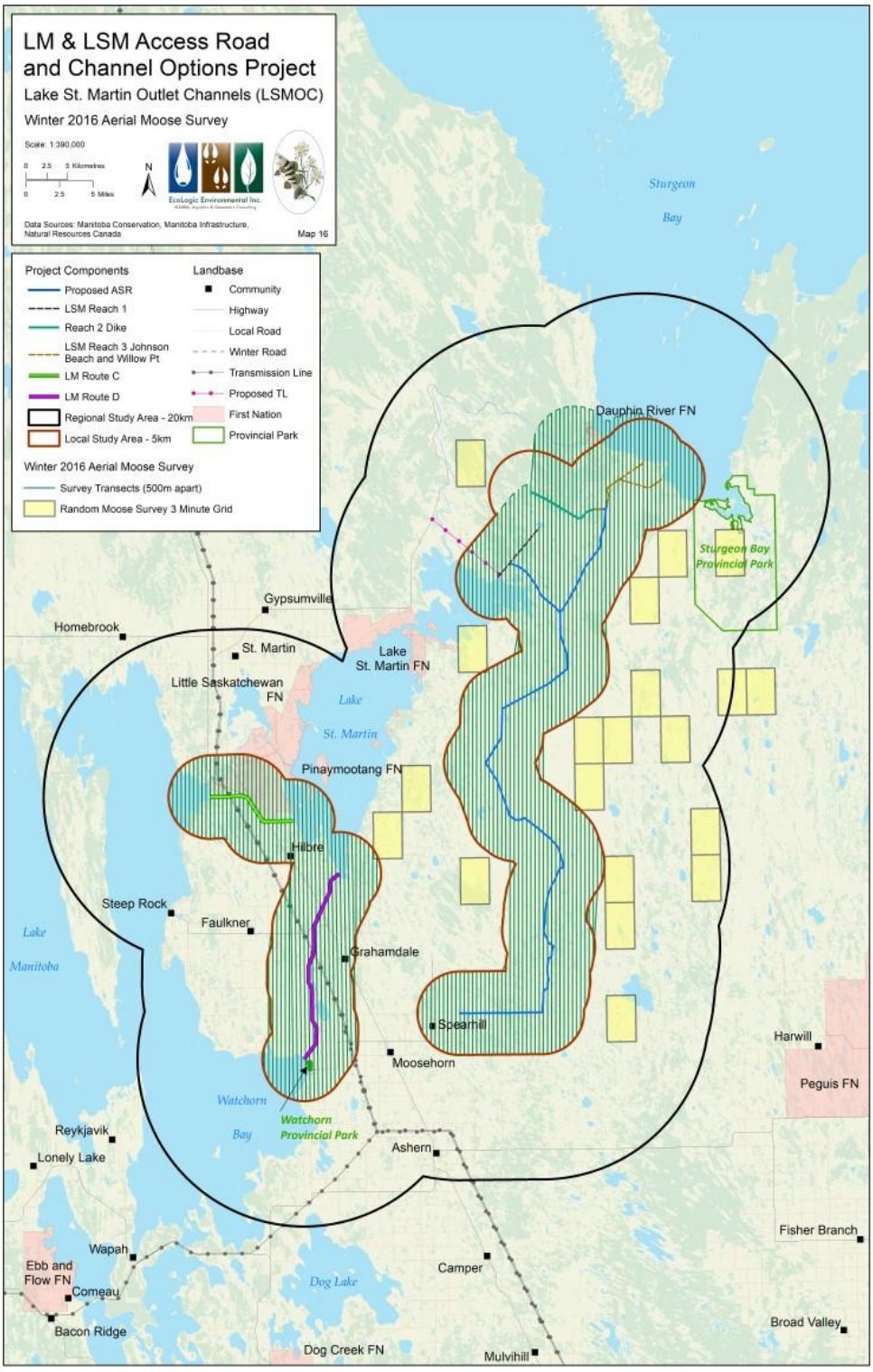
Map 12: Game Hunting Areas (GHAs) within the LSA and RSA



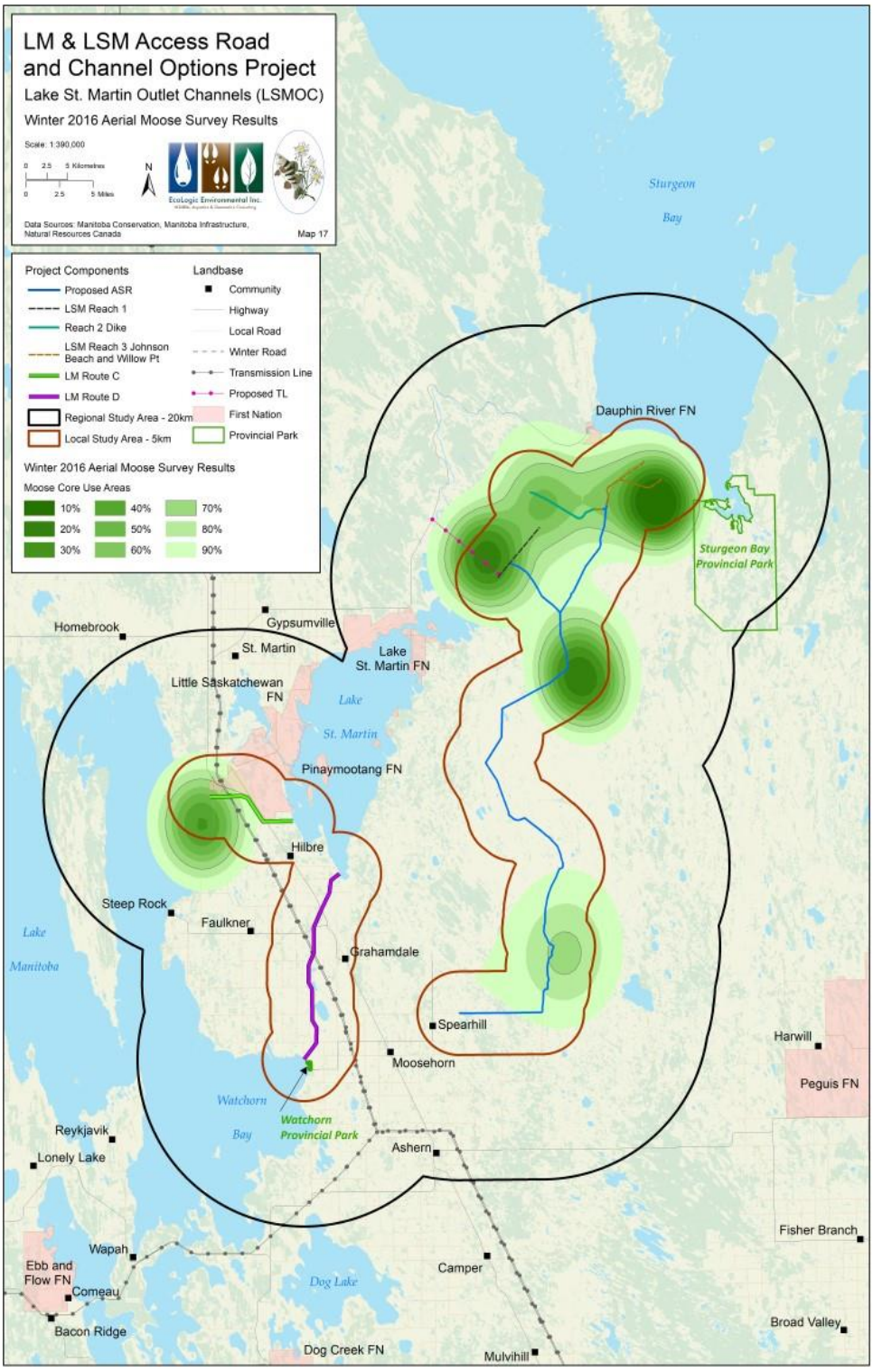
Map 13: Registered Traplines (RTLs) within the LSA and RSA



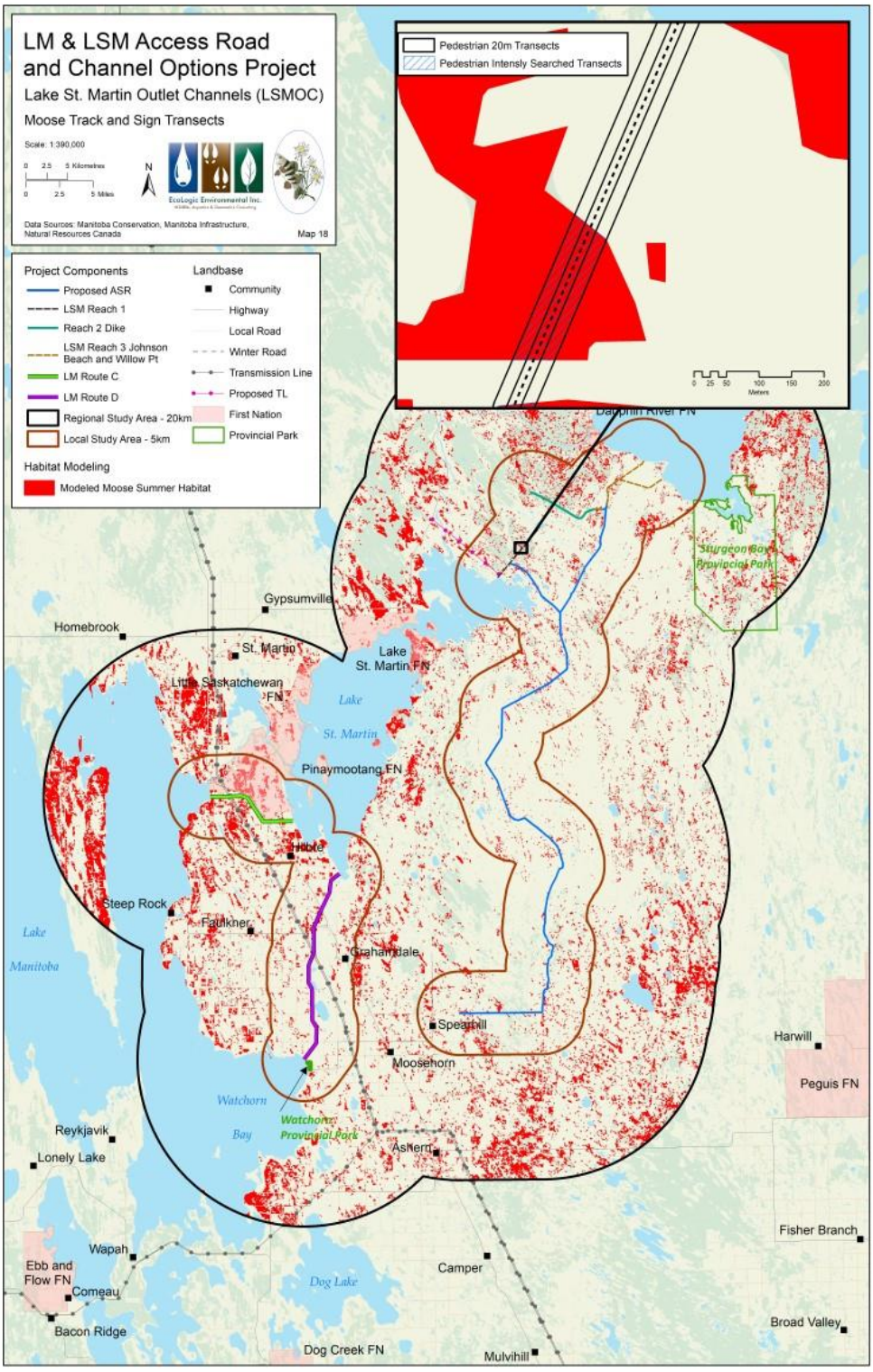
Map 14: Manitoba Sustainable Development (MBSD) 2008 Aerial Moose Survey Area


LM & LSM Access Road and Channel Options Project
Lake St. Martin Outlet Channels (LSMOC)
Winter 2016 Aerial Moose Survey
Scale: 1:390,000
0 2.5 5 Kilometres
0 2.5 5 Miles
N
EcoLogic Environmental Inc.
Data Sources: Manitoba Conservation, Manitoba Infrastructure, Natural Resources Canada
Map 16
Project Components
Proposed ASR
LSM Reach 1
Reach 2 Dike
LSM Reach 3 Johnson Beach and Willow Pt
LM Route C
LM Route D
Regional Study Area - 20km
Local Study Area - 5km
Landbase
Community
Highway
Local Road
Winter Road
Transmission Line
Proposed TL
First Nation
Provincial Park
Winter 2016 Aerial Moose Survey
Survey Transects (500m apart)
Random Moose Survey 3 Minute Grid
Sturgeon Bay
Dauphin River FN
Sturgeon Bay Provincial Park
Gypsumville
Homebrook
St. Martin
Lake St. Martin FN
Little Saskatchewan FN
Lake St. Martin
Pinaymootang FN
Hilbre
Steep Rock
Faulkner
Grahamdale
Lake Manitoba
Spearhill
Harwill
Moosehorn
Peguis FN
Watchorn Bay
Watchorn Provincial Park
Reykjavik
Lonely Lake
Ashern
Fisher Branch
Wapah
Ebb and Flow FN
Comeau
Bacon Ridge
Dog Lake
Camper
Broad Valley
Dog Creek FN
Mulvihill

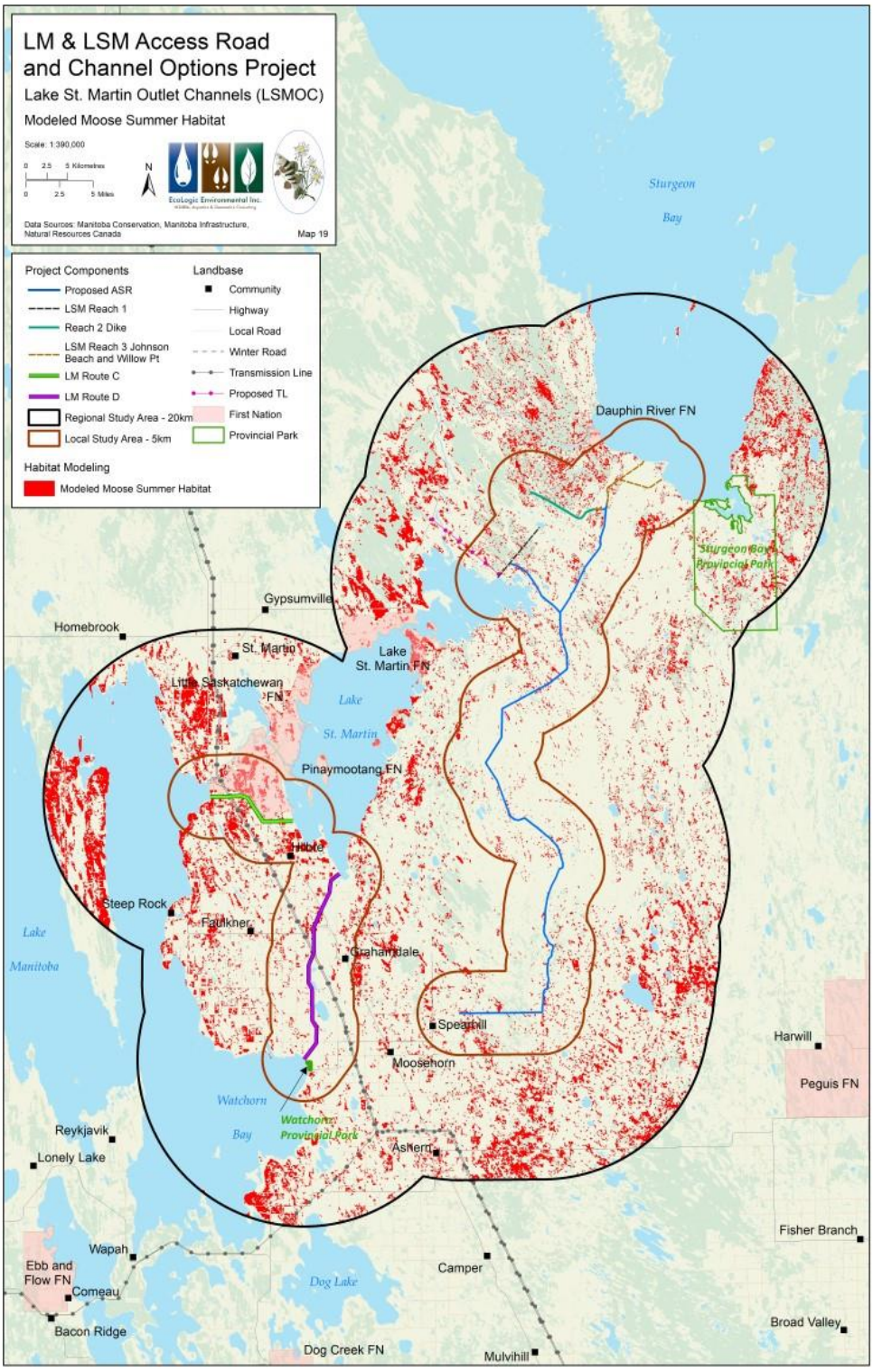
Map 16: Winter 2016 Aerial Moose Survey Area



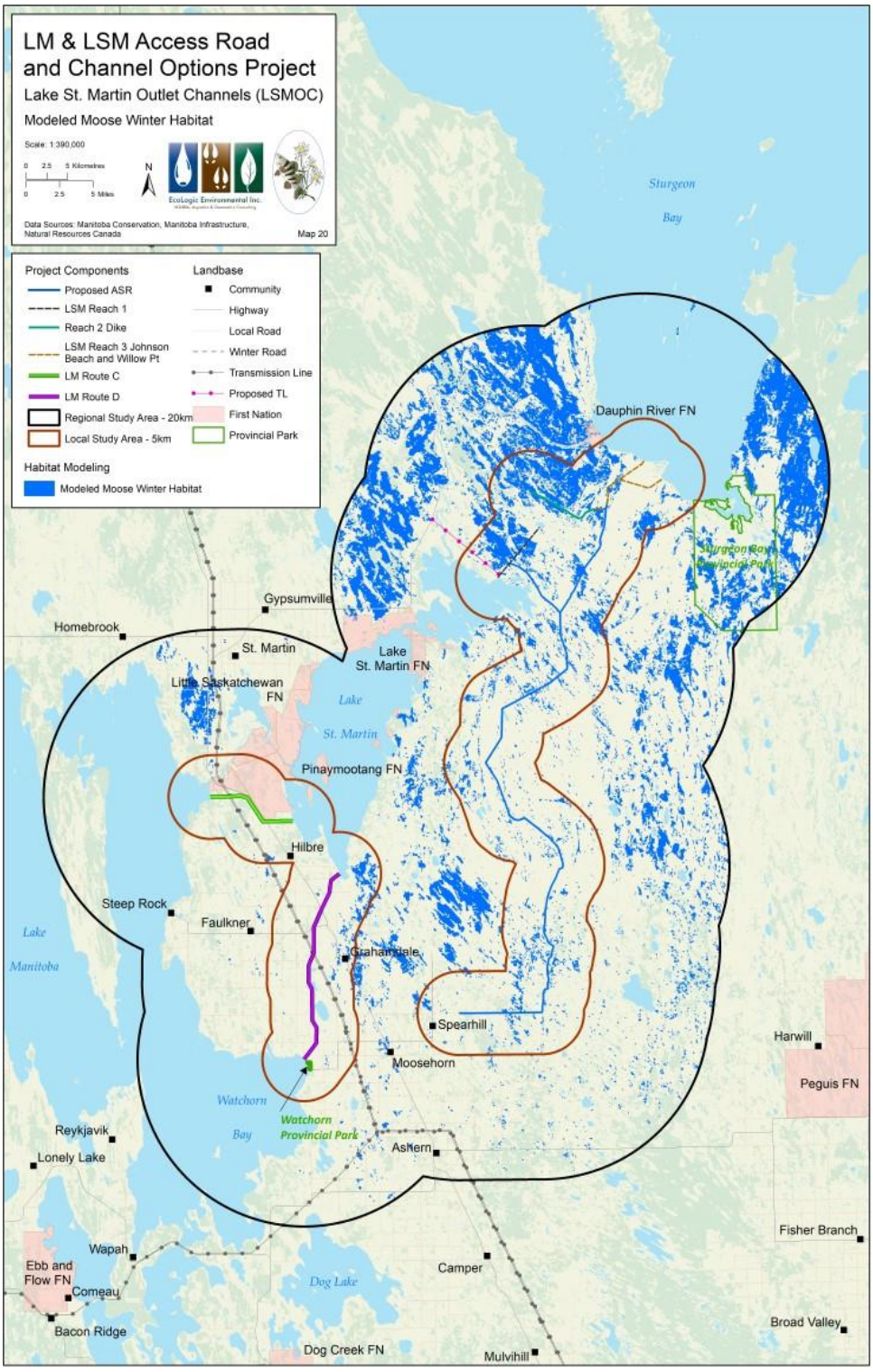
Map 17: Winter 2016 Aerial Moose Survey Results



Map18: Moose Track and Sign Survey Transects

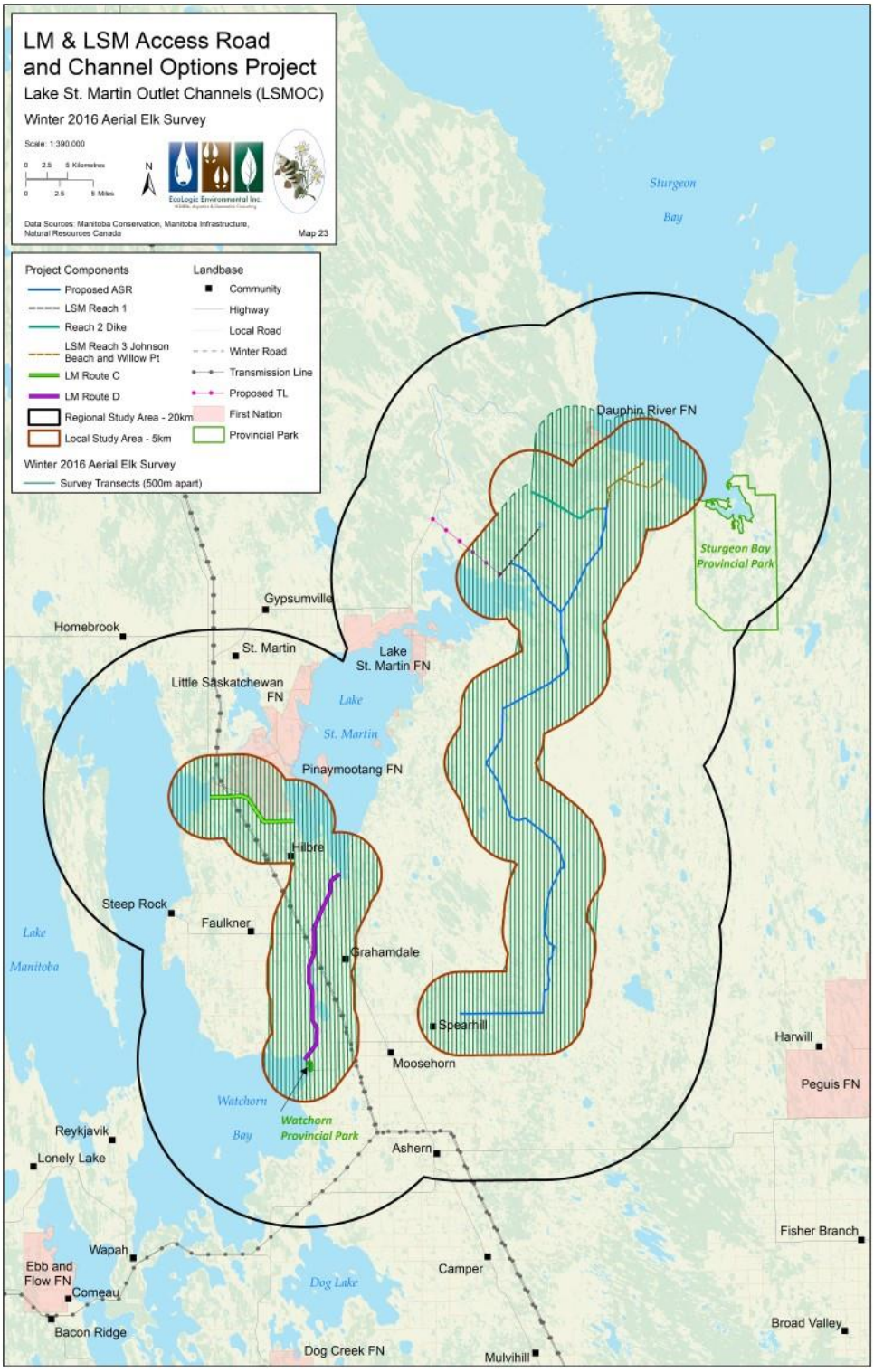


Map 19: Modeled Moose Summer Habitat

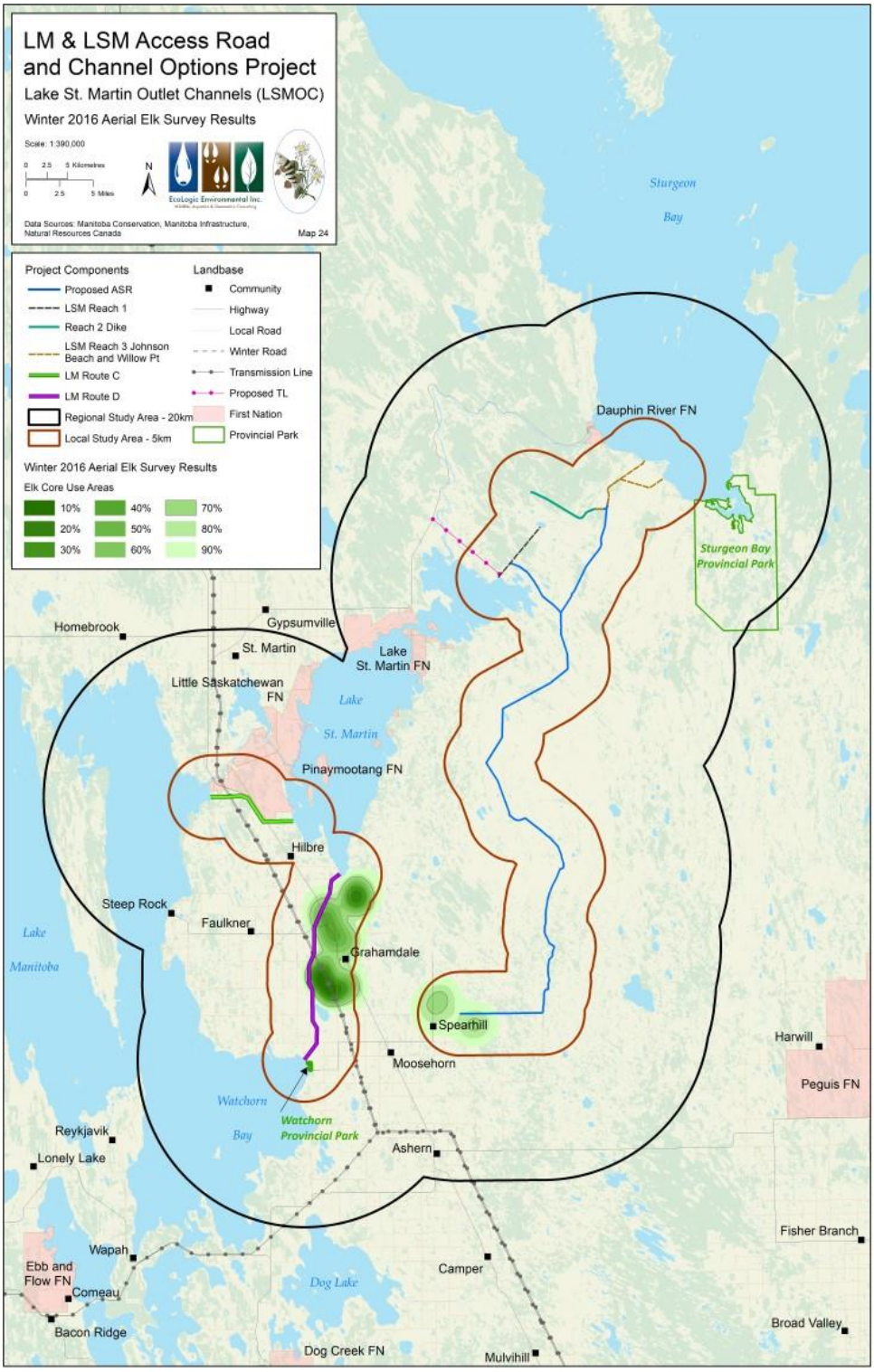


Map 20: Modeled Moose Winter Habitat

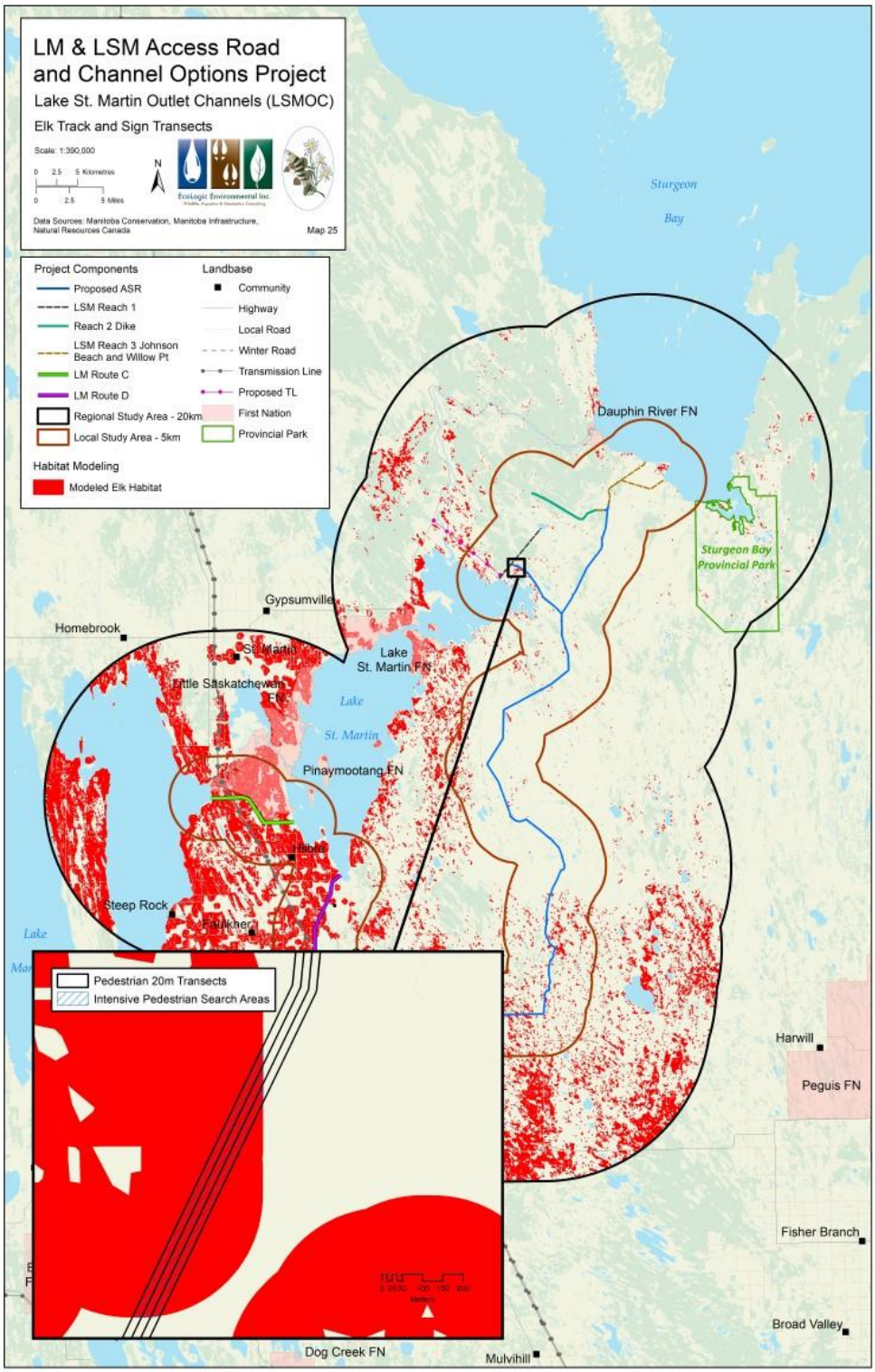
Map 21: Manitoba Sustainable Development (MBSD) Aerial Elk Survey Area



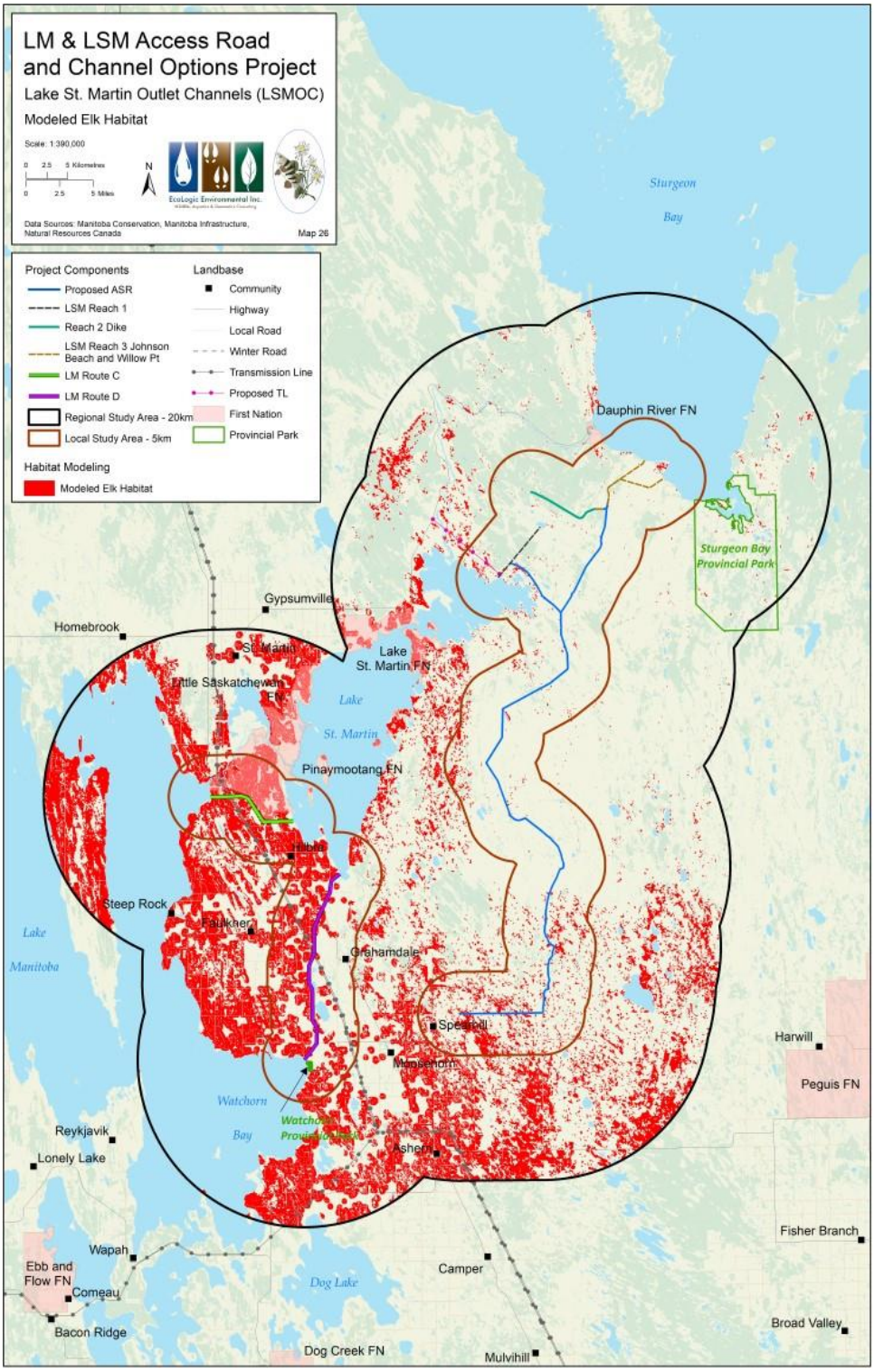
Map 23: Winter 2016Aerial Elk Survey Area



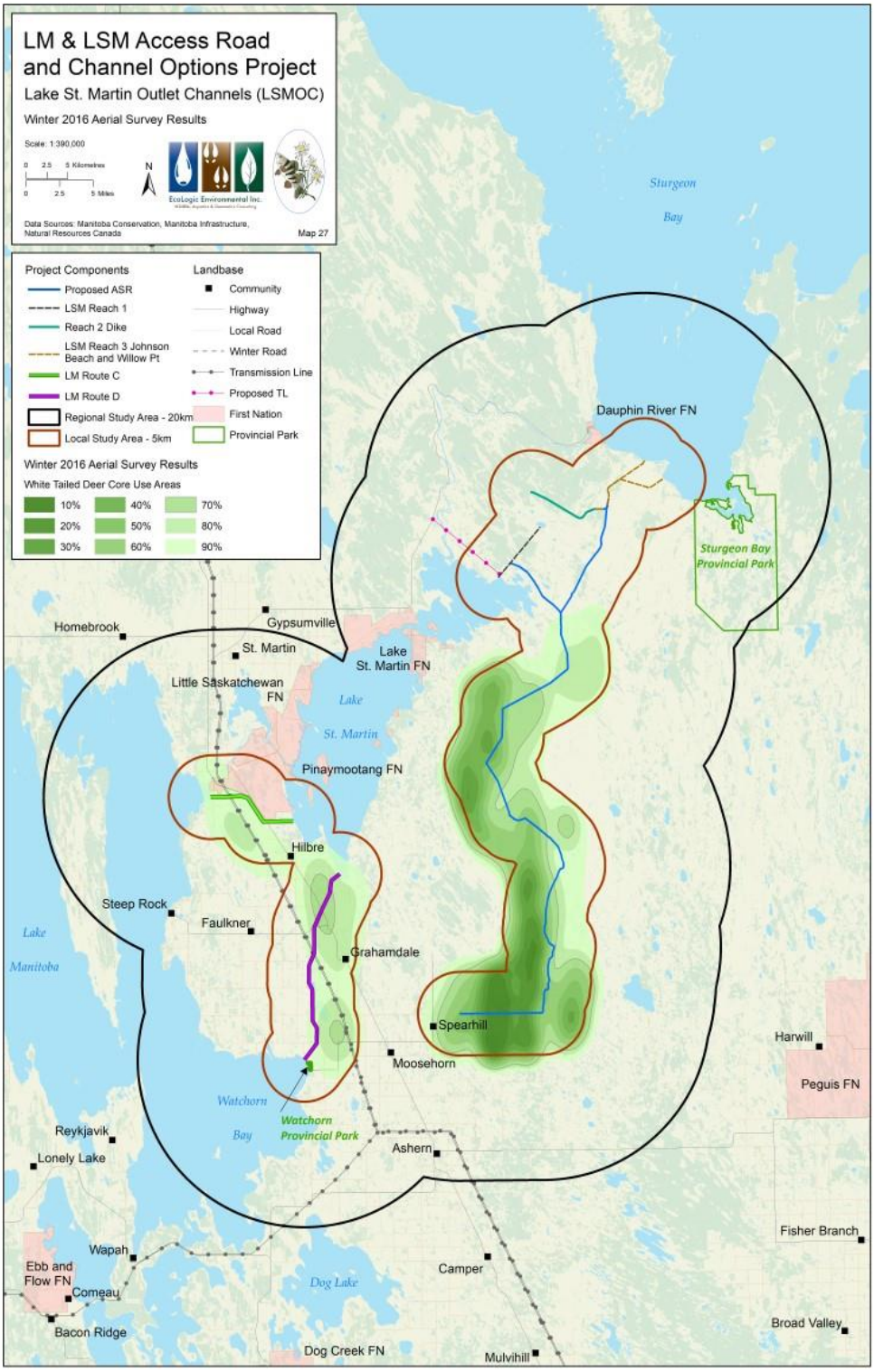
Map 24: Winter2016 Aerial Elk Survey Results



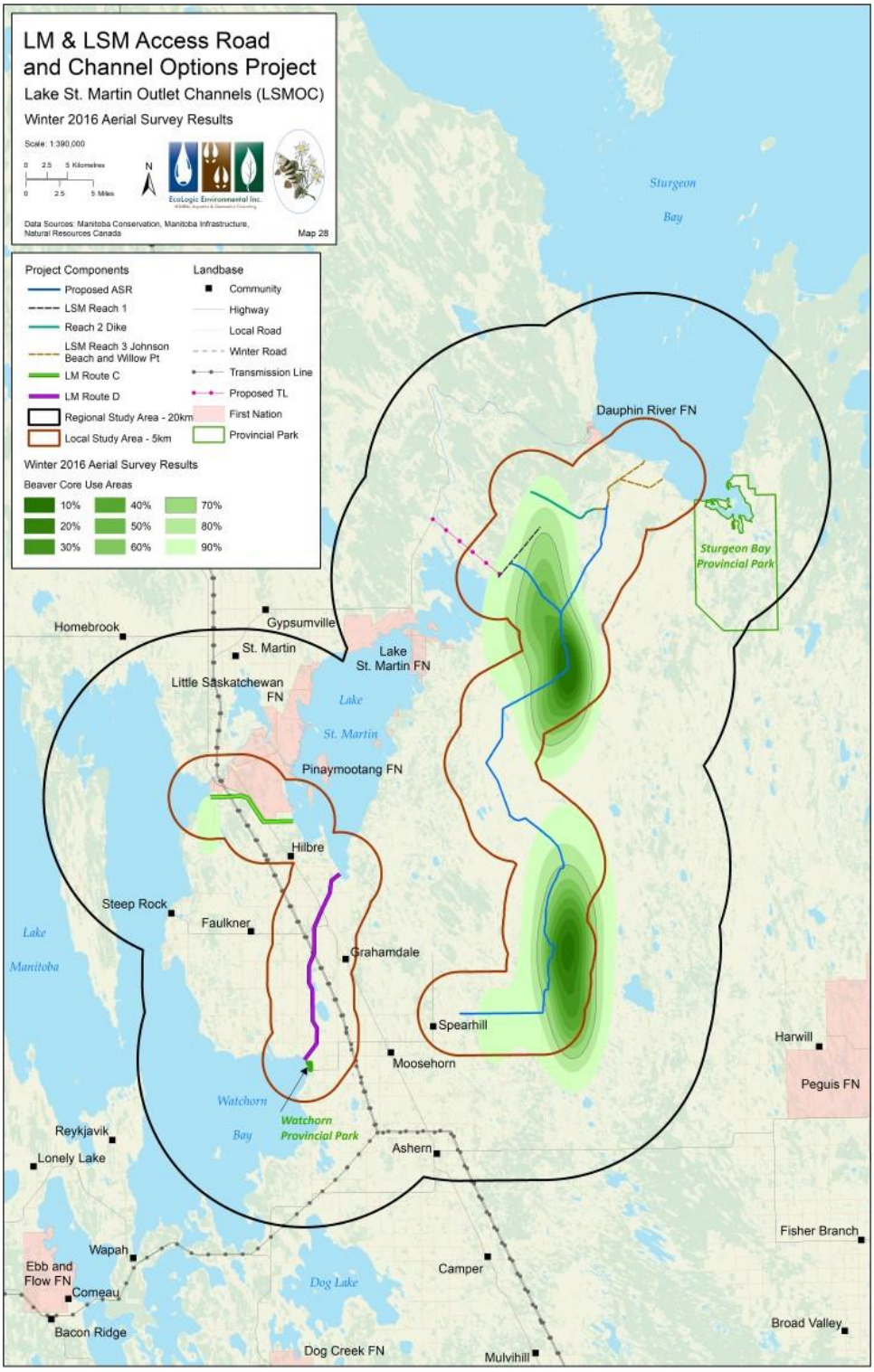
Map 25: Elk Track and Sign Survey Transects



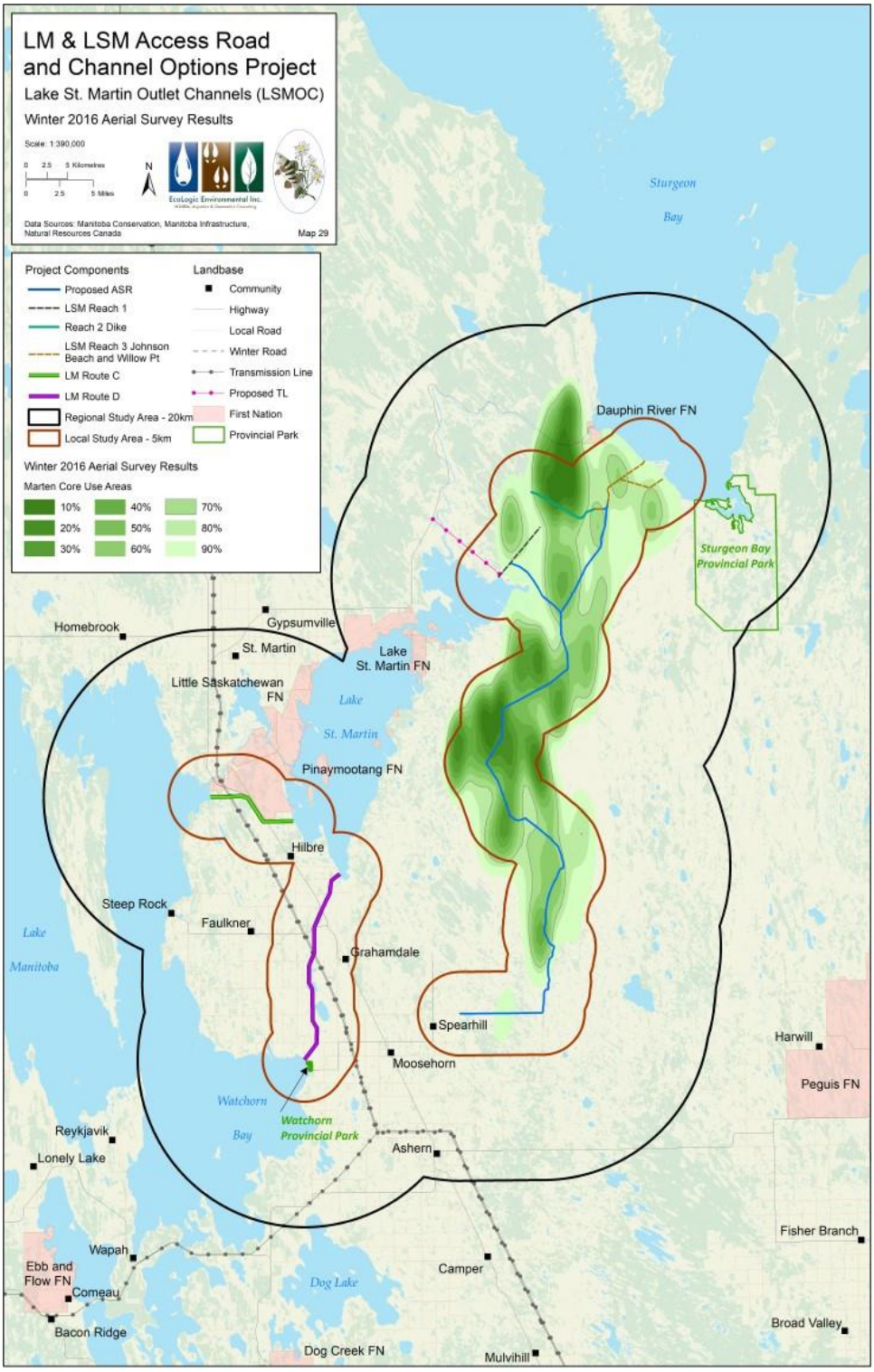
Map 26: Modeled Elk Habitat



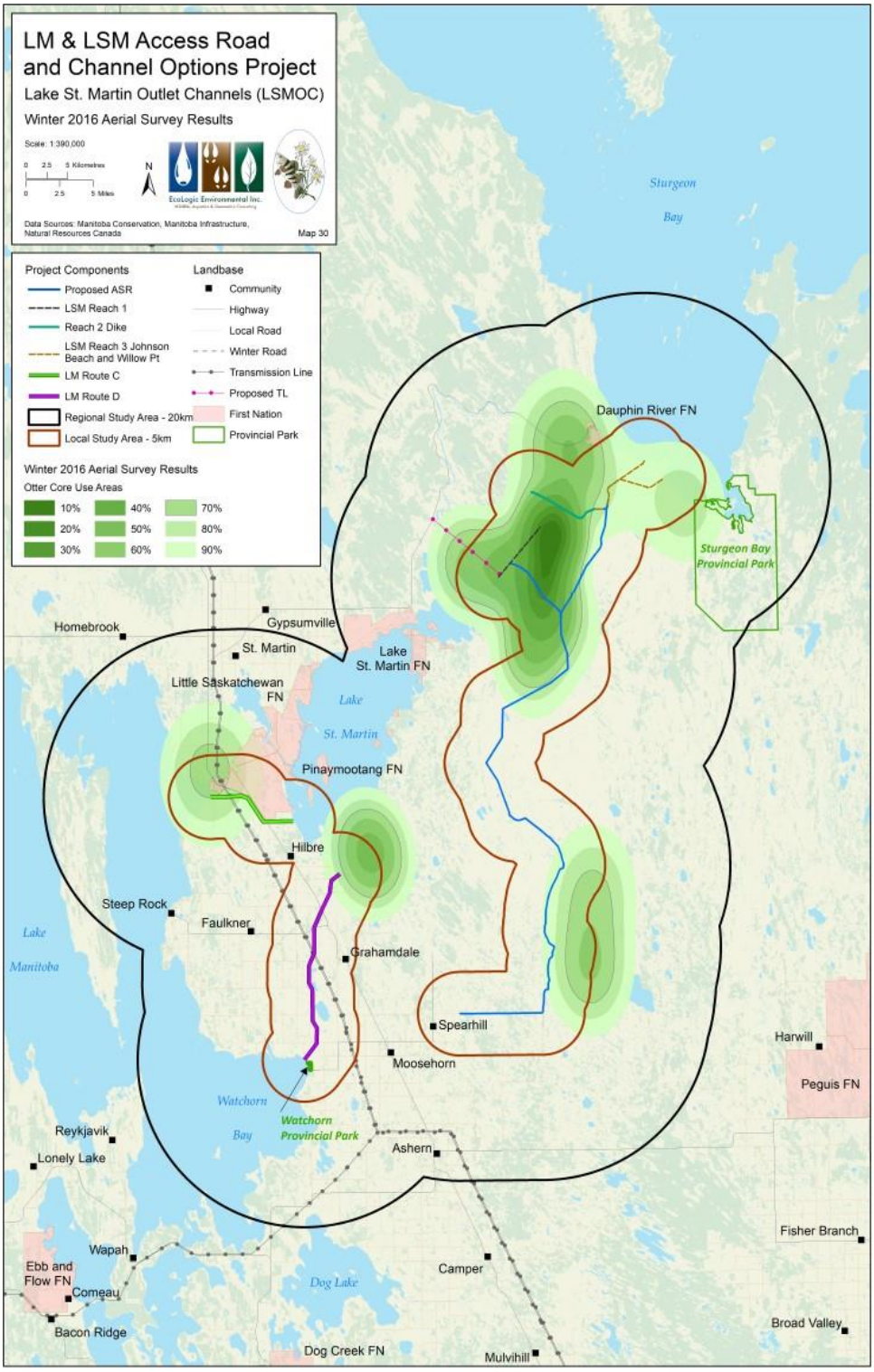
Map 27: White-tailed Deer Survey Results



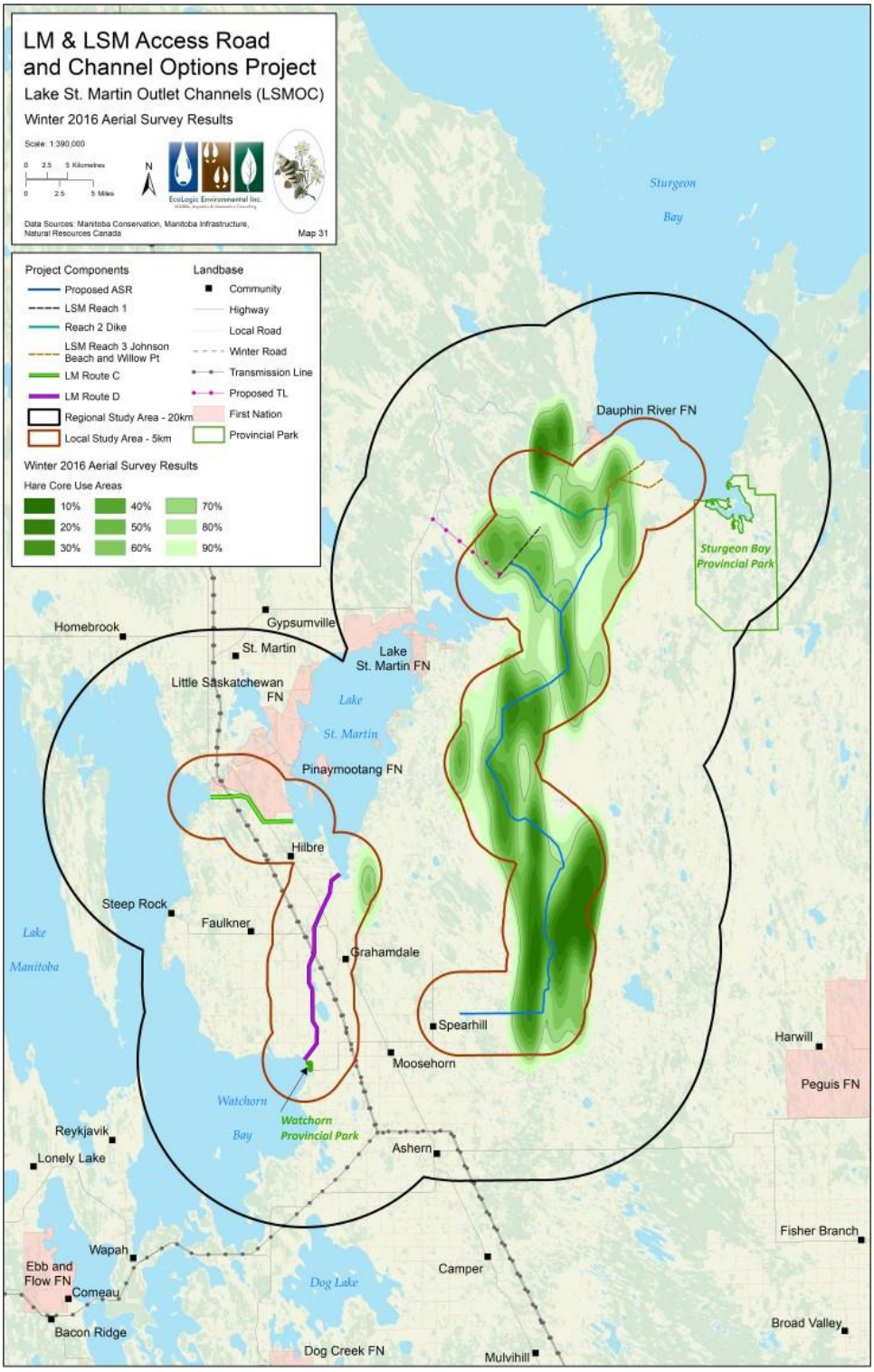
Map 28: Beaver Aerial Survey Results



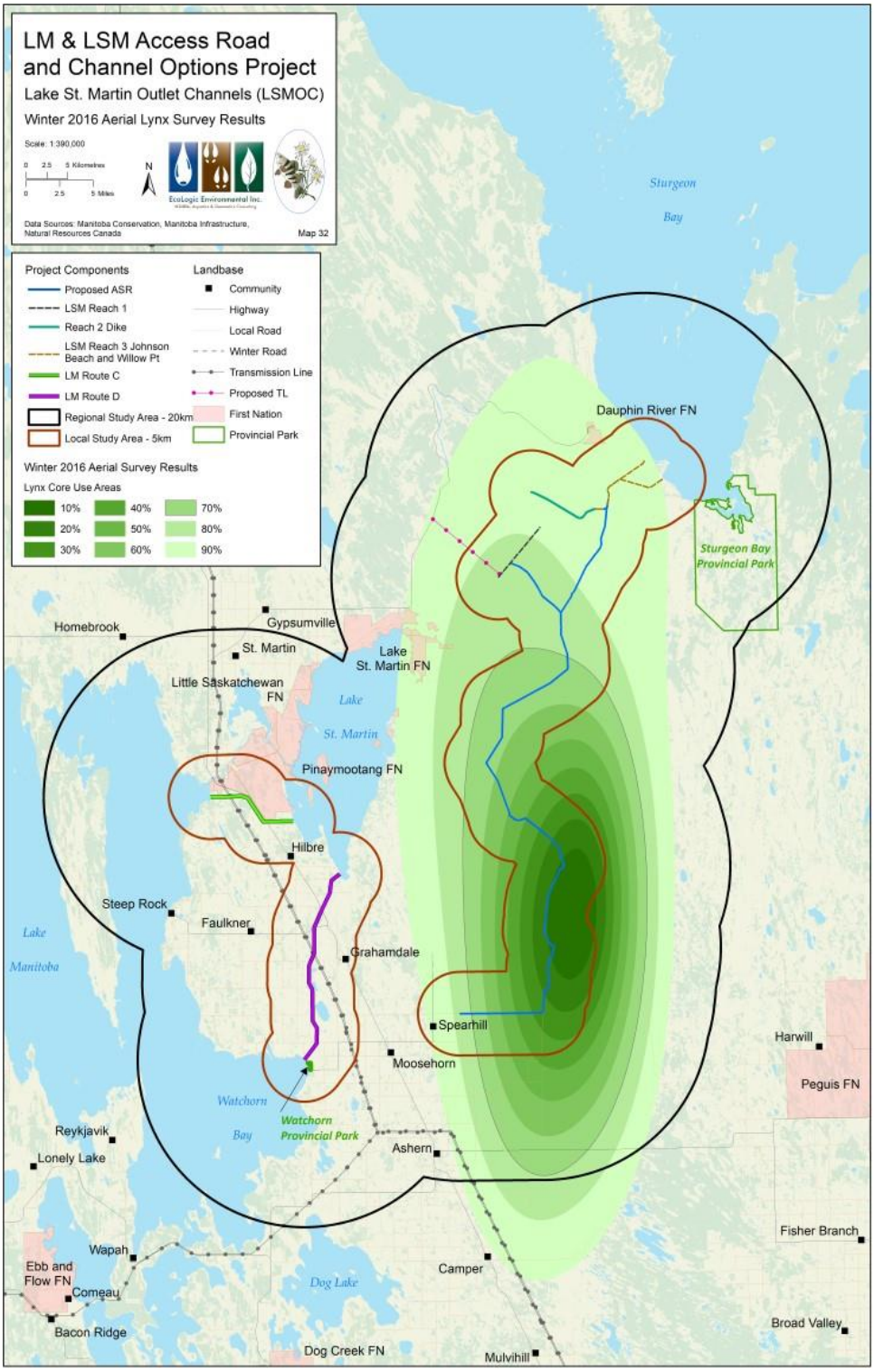
Map 29: Marten Aerial Survey Results



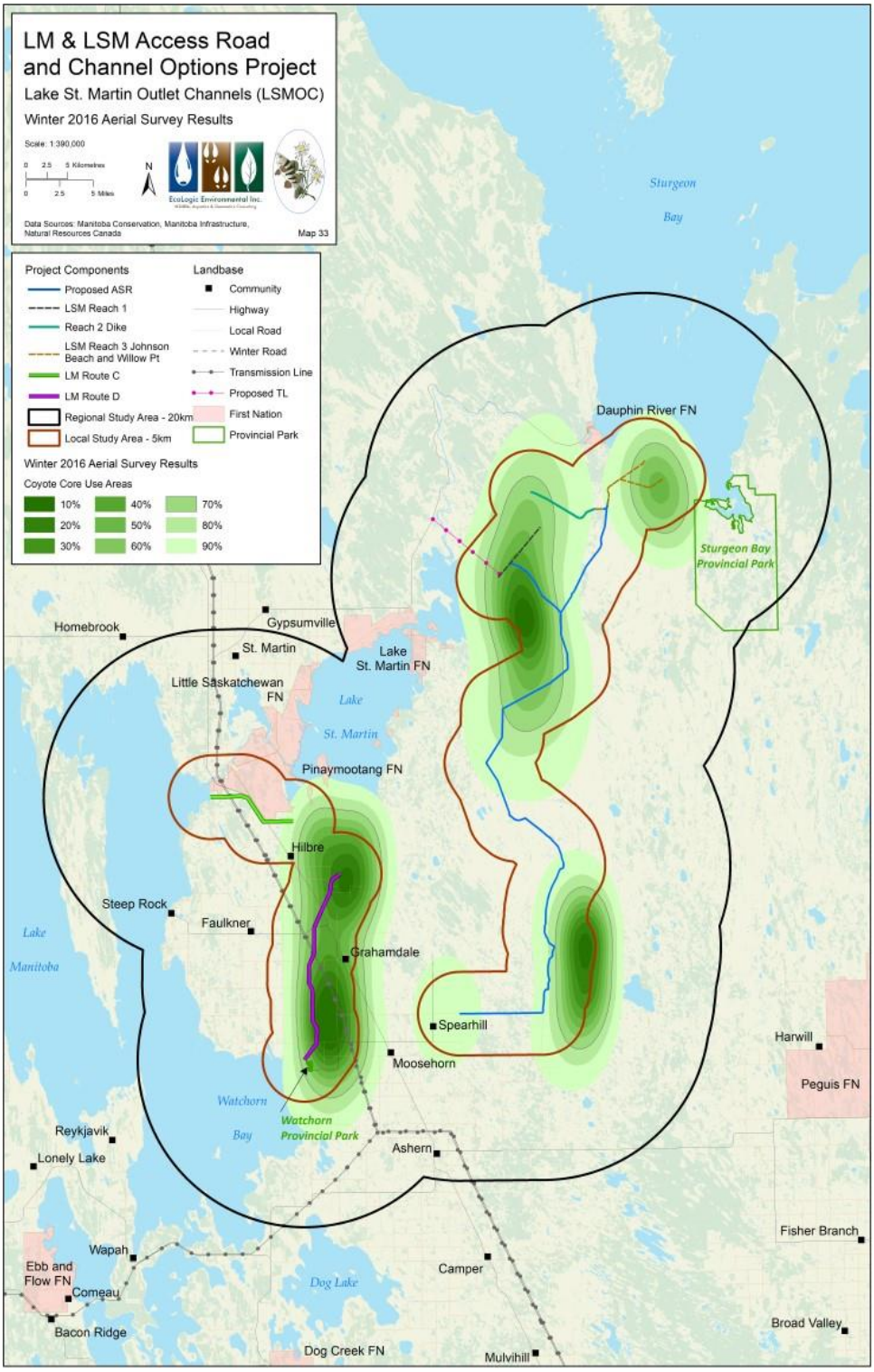
Map 30: Otter Aerial Survey Results



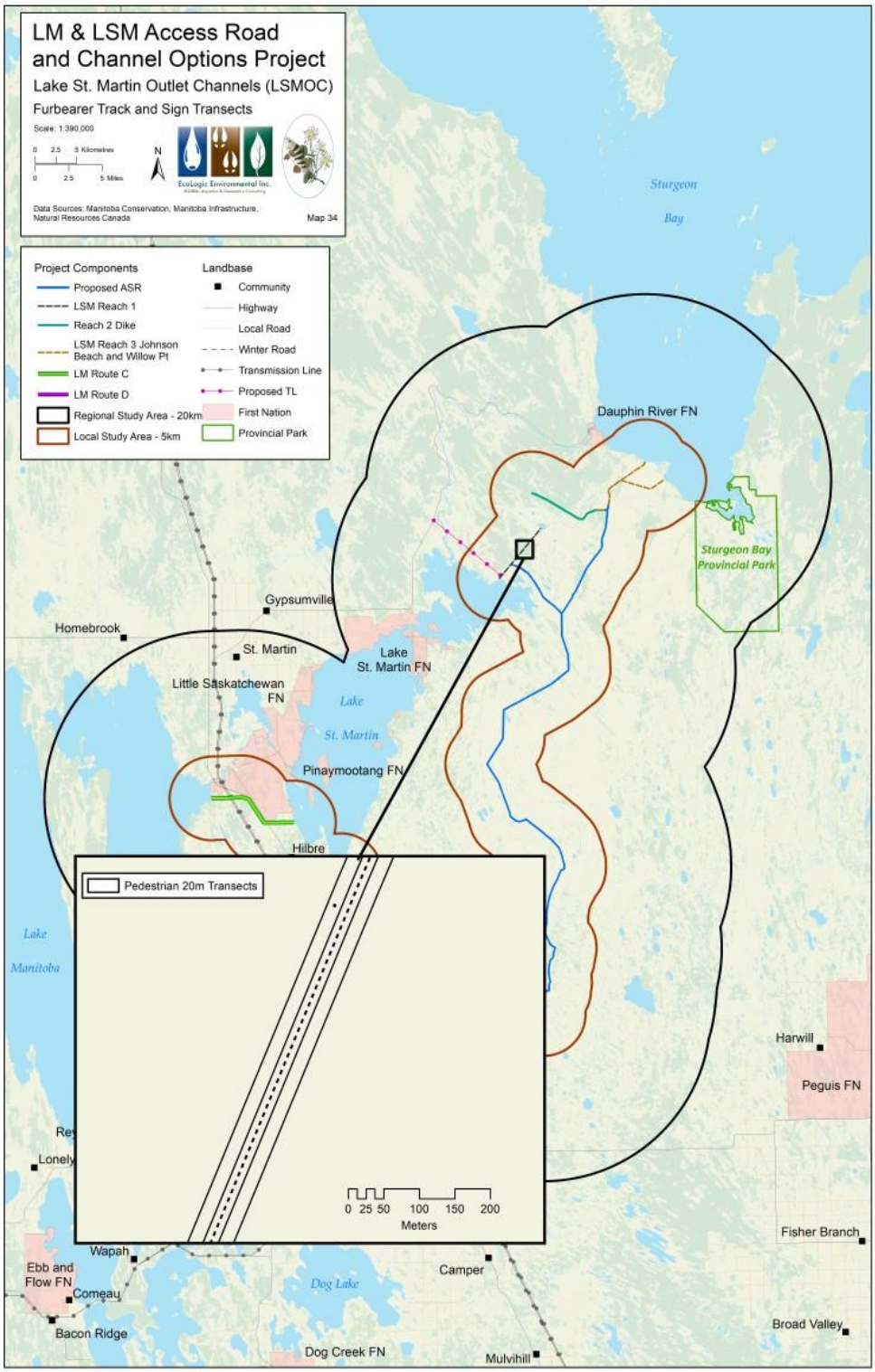
Map 31: Hare Aerial Survey Results



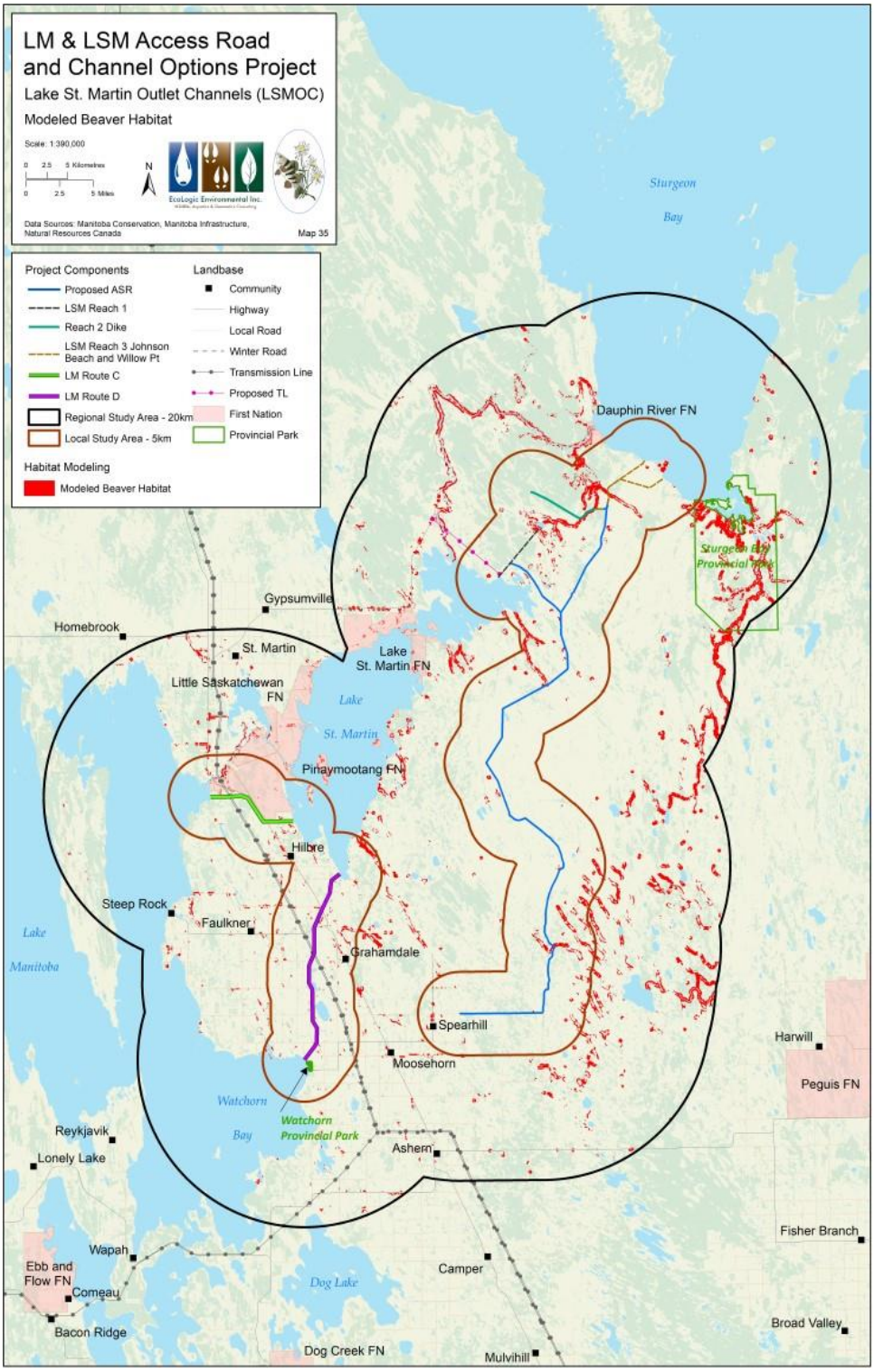
Map 32: Lynx Aerial Survey Results



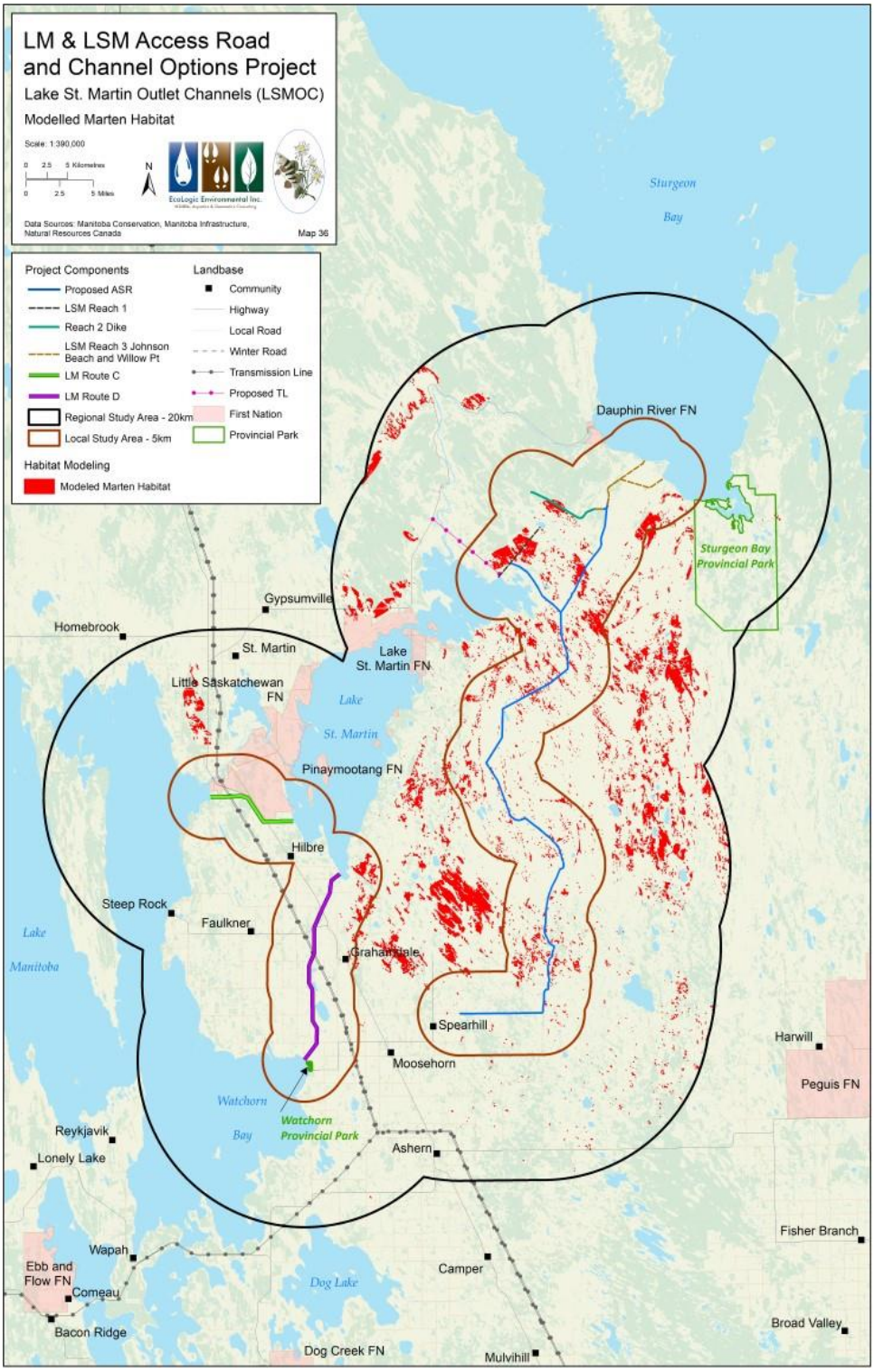
Map 33: Coyote Aerial Survey Results



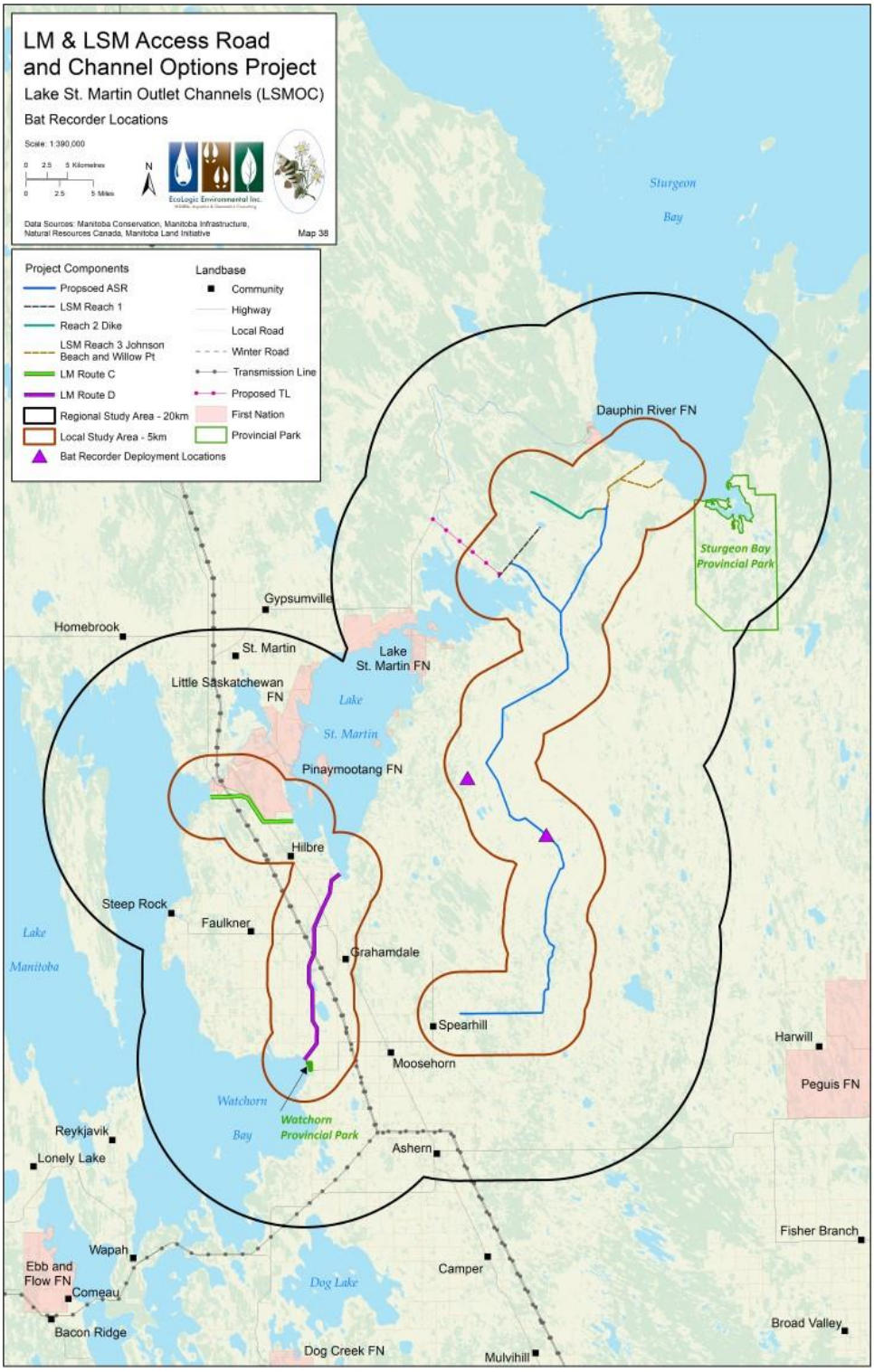
Map 34: Furbearer Track and Sign Survey Transects



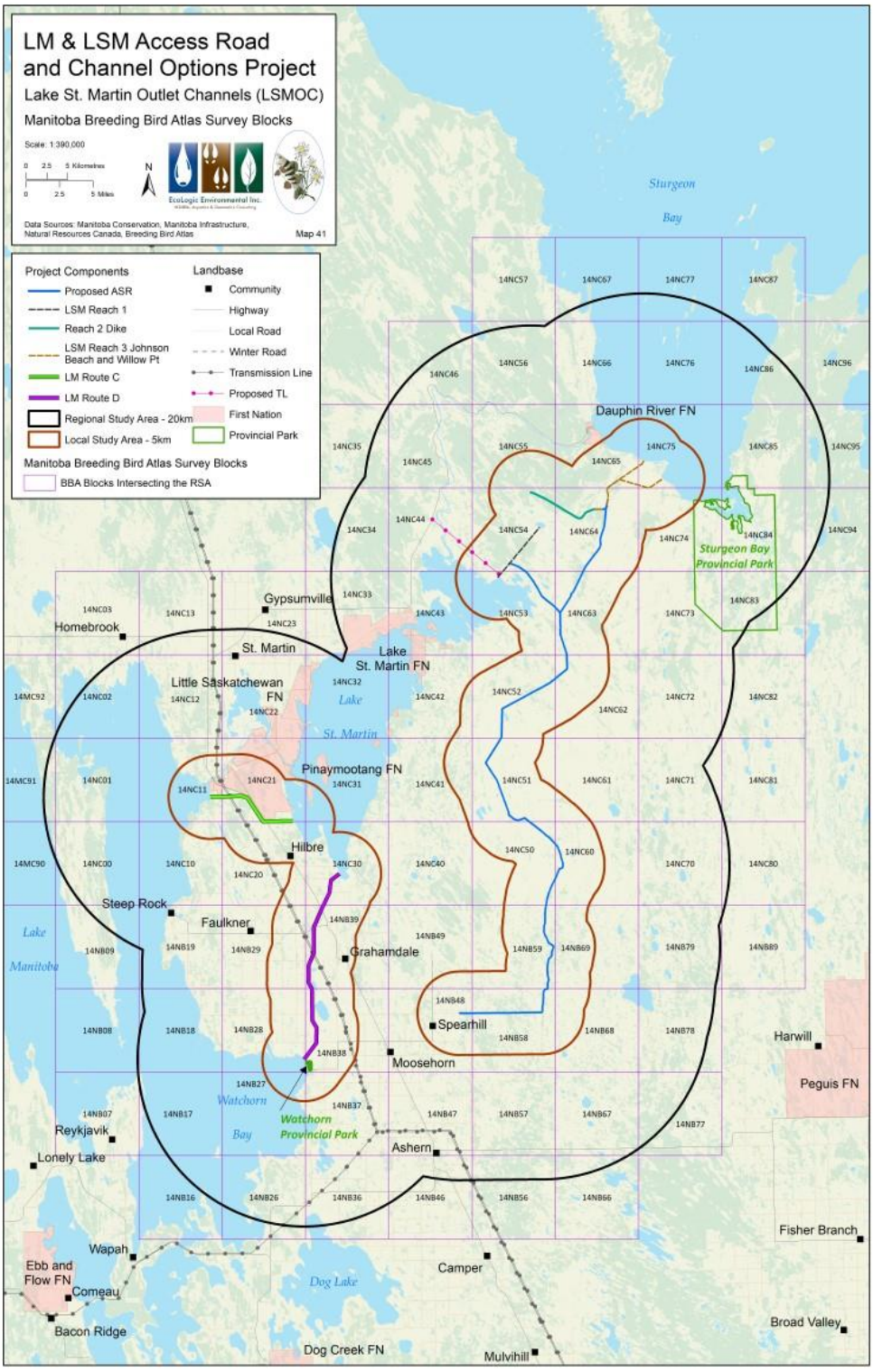
Map 35: Modeled Beaver Habitat



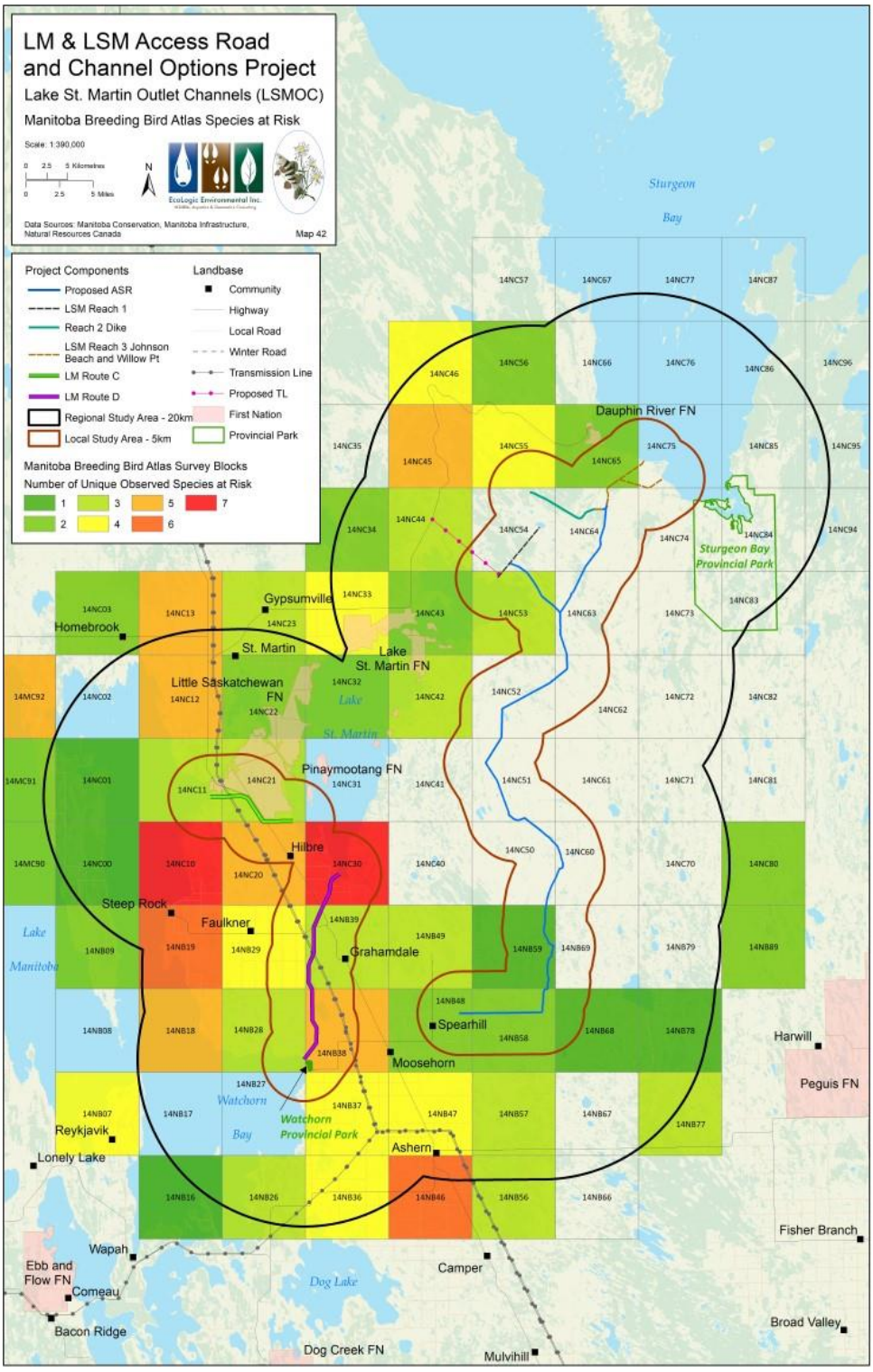
Map 36: Modeled Marten Habitat



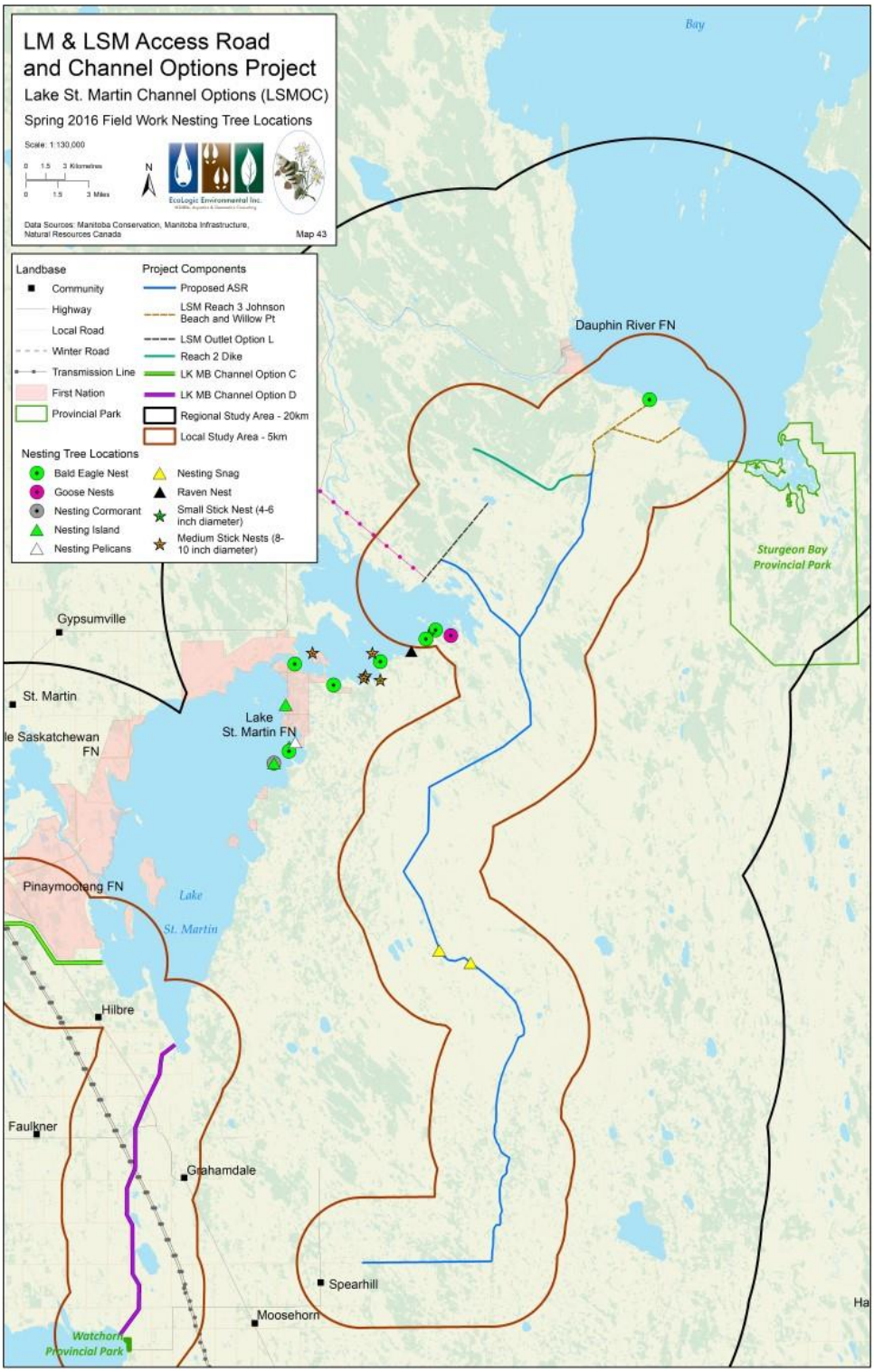
Map 38: Bat Recorder Deployment Locations along the Proposed ASR


LM & LSM Access Road and Channel Options Project
Lake St. Martin Outlet Channels (LSMOC)
Manitoba Breeding Bird Atlas Survey Blocks
Scale: 1:390,000
Data Sources: Manitoba Conservation, Manitoba Infrastructure, Natural Resources Canada, Breeding Bird Atlas
Map 41
Project Components
Proposed ASR
LSM Reach 1
Reach 2 Dike
LSM Reach 3 Johnson Beach and Willow Pt
LM Route C
LM Route D
Regional Study Area - 20km
Local Study Area - 5km
Landbase
Community
Highway
Local Road
Winter Road
Transmission Line
Proposed TL
First Nation
Provincial Park
Manitoba Breeding Bird Atlas Survey Blocks
BBA Blocks Intersecting the RSA
Sturgeon Bay
Dauphin River FN
Sturgeon Bay Provincial Park
Gypsumville
Homebrook
St. Martin
Lake St. Martin FN
Little Saskatchewan FN
Lake St. Martin
Pinaymootang FN
Hilbre
Steep Rock
Faulkner
Grahamdale
Lake Manitoba
Spearhill
Harwill
Moosehorn
Peguis FN
Watchorn Bay
Watchorn Provincial Park
Reykjavik
Lonely Lake
Ashern
Fisher Branch
Wapah
Ebb and Flow FN
Comeau
Bacon Ridge
Dog Lake
Camper
Broad Valley
Dog Creek FN
Mulvihill

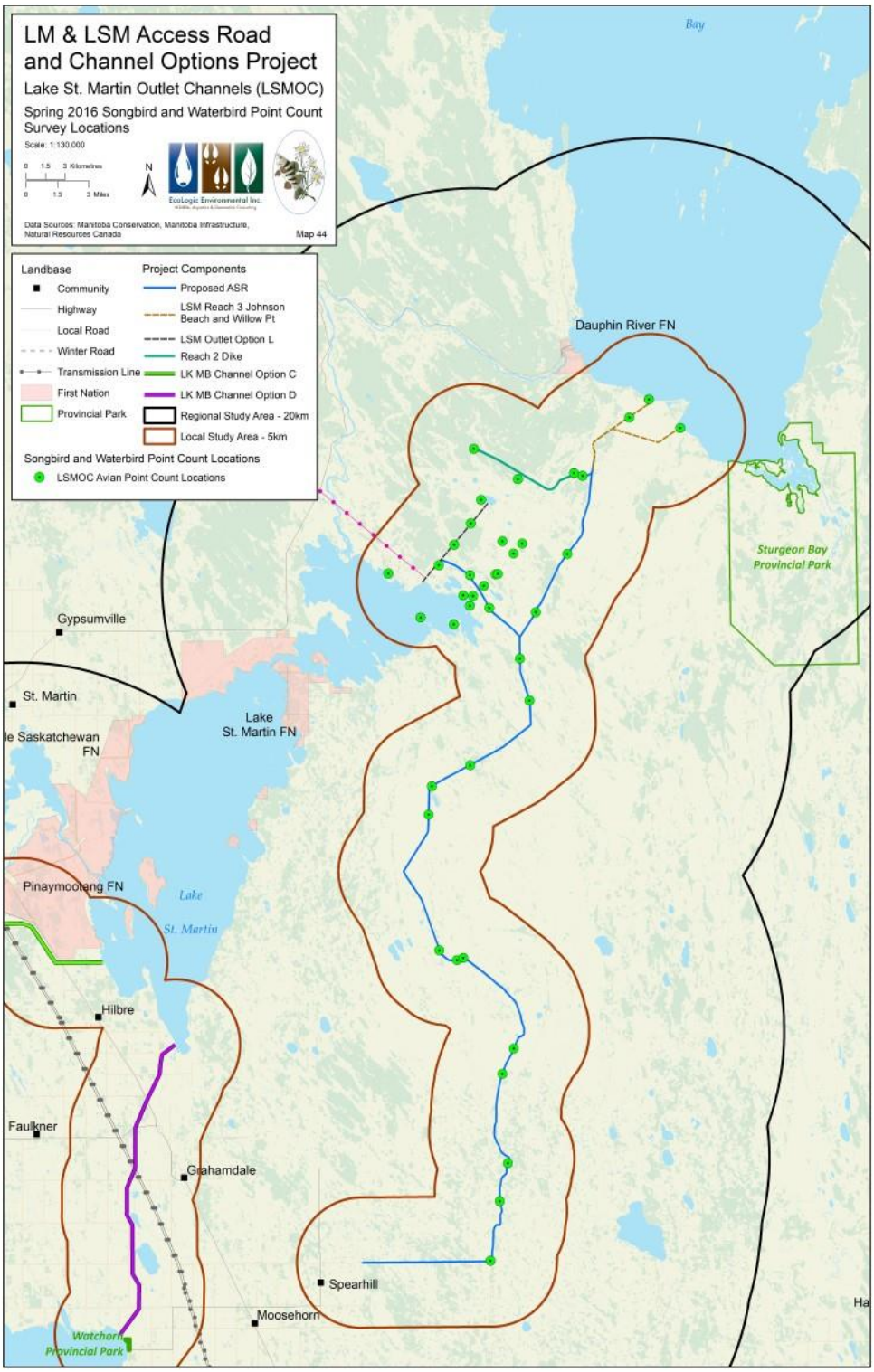
Map 41: Manitoba Breeding Bird Atlas (MBBA) Survey Grid



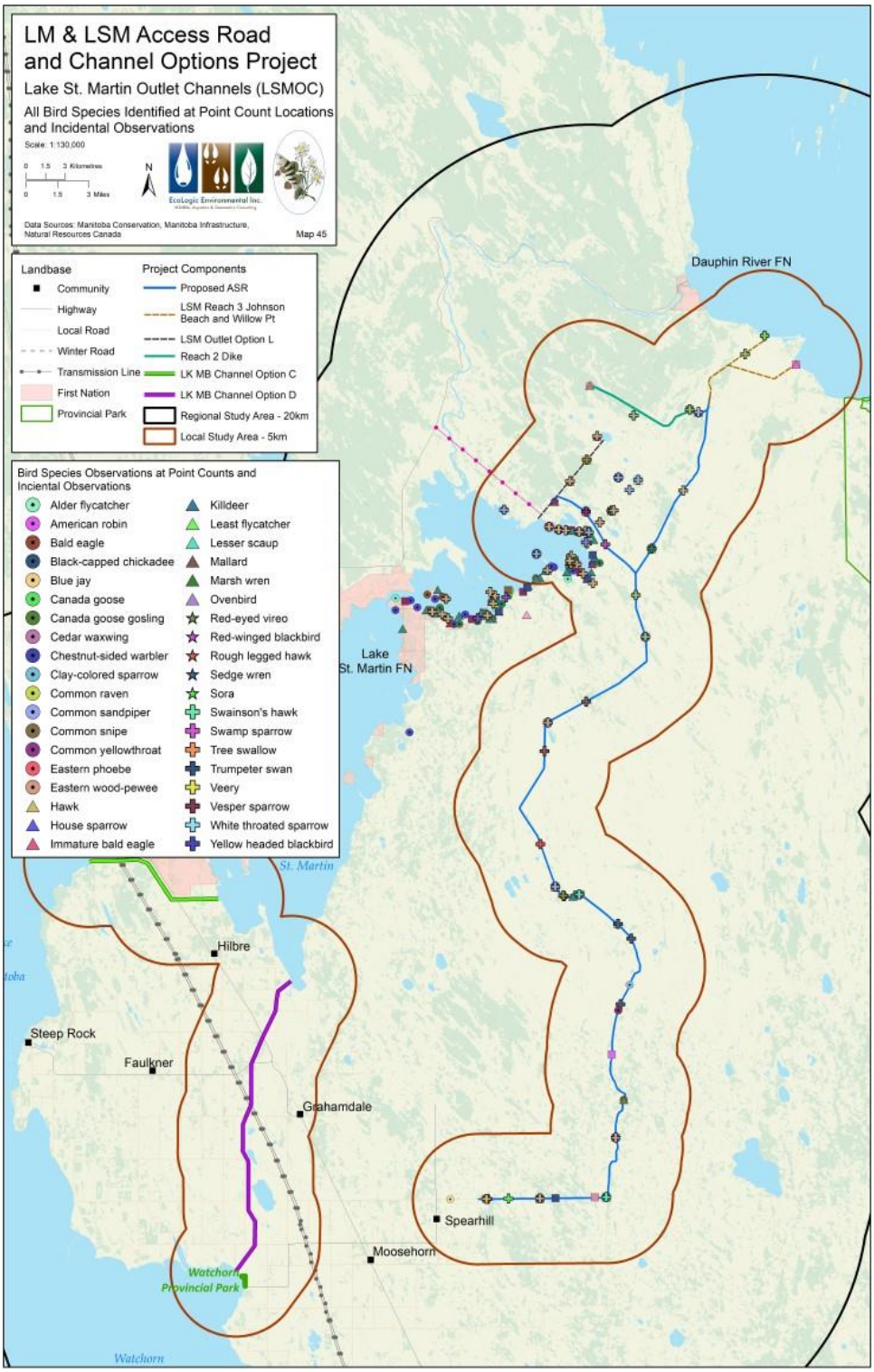
Map 42: Manitoba Breeding Bird Atlas (MBBA) Survey Results



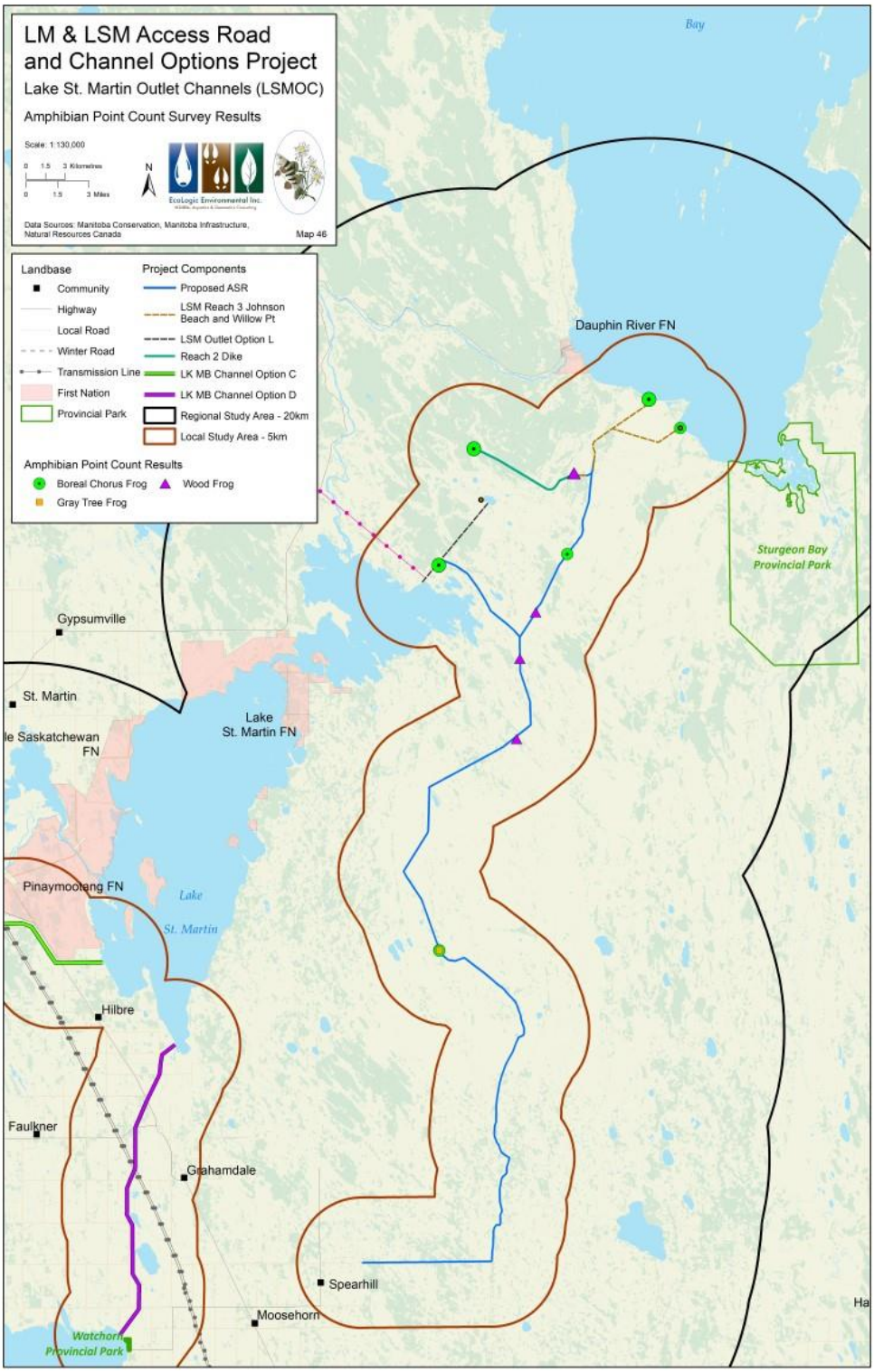
Map 43: Nesting Tree Locations Identified within the LSA



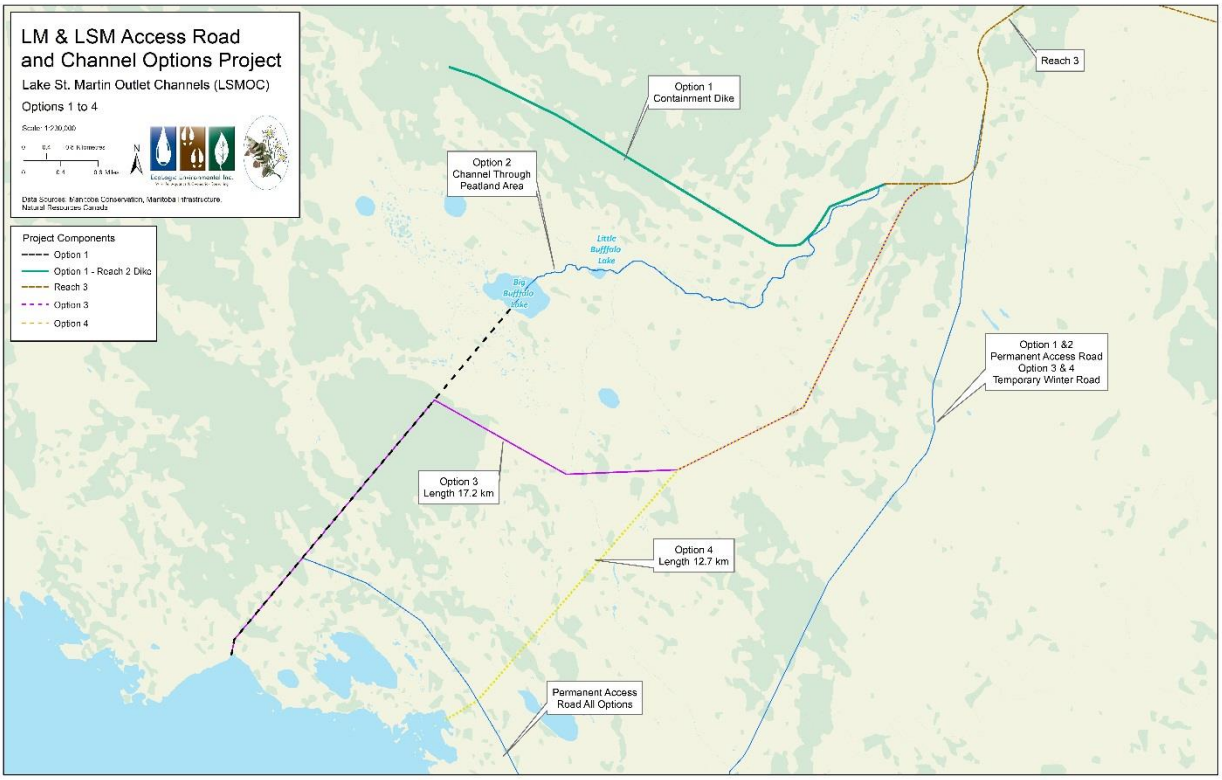
Map 44: Spring 2016 Songbird and Waterbird Point Count Survey Locations



Map 45: Point Count and Incidental Bird Observations within the LSA



Map 46: Point Count and Incidental Amphibian Observations within the LSA



Map 49: LSMOC Options 1 to 4