Lake Winnipeg East System Improvement (LWESI) Transmission Project

Wildlife Technical Report

Wildlife Resource Consulting Services MB Inc.

December 2012

EXECUTIVE SUMMARY

Manitoba Hydro has investigated transmission line routing options for the construction and operation of infrastructure associated with the Lake Winnipeg East System Improvement (LWESI) Transmission Project (the Project), including the Manigotagan Corner Station. The existing environment for wildlife and habitat in the Project Study Area was described through field studies, wildlife habitat modeling with a Geographic Information System, and by literature and local Aboriginal Traditional Knowledge. Six Valued Environmental Components (VECs) were selected to evaluate environmental effects on wildlife species with an identified ecological or societal importance. VECs included moose, American marten, bald eagle, spruce grouse, olive-sided flycatcher, and Canada warbler.

Three Alternative Routes for the transmission line were assessed for mammals, birds, amphibians, and reptiles, with emphasis on VECs and federally or provincially listed species at risk. The Final Preferred Route was selected from three alternatives using several criteria, including potential effects on wildlife. The Manigotagan Corner Station Site was selected on the basis of engineering and technical criteria.

An effects assessment was completed on the Final Preferred Route and Manigotagan Corner Station Site. Potential effects on wildlife during construction and operation included habitat loss, alteration, and fragmentation; sensory disturbance and disruption of movement; and mortality. It was determined that the Project footprint will affect less than 1% of VEC and listed species habitats in the Project Study Area. Sensory disturbance due to construction and due to maintenance activities during operation will temporarily reduce the amount of effective habitat for wildlife in the Project Study Area, but individuals are expected to find suitable habitat elsewhere. Wildlife mortality could increase during construction due to collisions with vehicles on Provincial Road (PR) #304, and bird nests could be damaged or destroyed if clearing or construction activities occur in spring or summer. During operation, effects on species such as moose, American marten, and spruce grouse will likely include increased mortality due to harvest, as access to the Project Study Area will be increased by the right-of-way. Potential bird-wire collisions were noted for a sensitive site at the Manigotagan River. The moose population is currently low in comparison to a decade ago in the Project Study Area and surrounding region, and Project-related effects could negatively affect the recovery rate of moose. Because the transmission line is located near, and parallels PR #304, indirect harvest effects are reduced.

Mitigation measures were identified, and the significance of residual effects on wildlife VECs was assessed. Key mitigation measures included clearing during late fall and winter to the extent possible to avoid the spring/summer nesting season for birds and parturition times for mammal species and breeding windows for frog species, construction activities will not be carried out during prescribed timing windows for wildlife species, using existing access roads, trails, or cut lines to the extent possible, and access management planning. Residual effects are expected to be decreased local species abundance due to habitat alteration for some species, and increased mortality. Effects were generally expected to be neutral or negative, small, and limited locally. Potential interactions with other projects in the area were considered, and monitoring and follow-up programs were suggested to verify effects predictions and to monitor wildlife and habitat in the Project Study Area near the transmission line right-of-way.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

Map Series 100 – 1500 See Enclosed CD

LIST OF APPENDICES

LIST OF ACRONYMS

%	percent
AC	alternating current
ATK	Aboriginal Traditional Knowledge
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
GHA	Game Hunting Area
GIS	Geographic Information System
GPS	Global Positioning System
km	kilometres
km^2	square kilometres
kV	kiloVolt
LCC	Land Cover Class
Line PQ95	Pine Falls–Manigotagan 115 kV Transmission Line
LWESI	Lake Winnipeg East System Improvement
m	metre
MBESA	*Manitoba Endangered Species Act*
MCWS	Manitoba Conservation and Water Stewardship
PR	Provincial Road
ROW	right-of-way
SARA	*Species at Risk Act*
SSEA	Site Selection and Environmental Assessment
the Project	Lake Winnipeg East System Improvement Transmission Project
VEC	Valued Environmental Component

1 INTRODUCTION

Manitoba Hydro is currently investigating transmission line routing options for the construction and operation of infrastructure associated with the Lake Winnipeg East System Improvement (LWESI) Transmission Project (the Project), which consists of a new 115 kiloVolt (kV) transmission line from Powerview-Pine Falls, Manitoba to Manigotagan Corner and a new 115-66 kV station at Manigotagan Corner. The environmental assessment (EA) process for the Project is consistent with provincial and federal EA legislation, guidelines and procedures, and best practices. The information contained in this document will also be incorporated into the EA Report. The Project Study Area (Map 1) is located in southeastern Manitoba, extending north from Pine Falls to Manigotagan Corner and east from the east shore of Lake Winnipeg 25 kilometers (km).

Manitoba Hydro uses a Site Selection and Environmental Assessment (SSEA) process to conduct assessments of its transmission facilities. The overarching objective in the conventional SSEA approach for transmission facilities is to provide impact avoidance and management opportunities at every stage in the process, from pre-licensing through post-construction. The objectives of the SSEA for the LWESI Project are to:

- provide a description of the proposed project;
- select routes for the transmission lines in a technically and environmentally sound manner;
- assess the potential effects of the proposed transmission line routes;
- develop practical ways to reduce potential negative project related effects; and
- develop an EA that includes the results of the SSEA process.

1.1 Project Overview

The Project is required to provide system upgrades in the region east of Lake Winnipeg. The Project will serve existing and new load growth, and provide firm transformation and adequate voltage support for the communities located in and around the region. It is expected that this new development will meet the electrical requirements for at least the next 20 years.

The Project includes the construction of a new 115 kV transmission line from Powerview-Pine Falls, Manitoba to Manigotagan [Pine Falls–Manigotagan 115 kV Transmission Line (Line PQ95)], approximately 75 km north of Powerview-Pine Falls. The Project will require the development of a new 115-66 kV transmission station (Manigotagan Corner Station) west of the intersection of Provincial Road (PR) #304 and the Rice River Road, near the Community of Manigotagan. This station will serve as the terminal for the new 115 kV transmission line as well as the existing 66 kV sub-transmission lines in the Manigotagan area.

This Technical Report supports the EA Report to meet the licensing requirements of *The Environment Act* (Manitoba) for a Class II Licence for this project.

1.2 Report Purpose and Outline

This report describes wildlife and wildlife habitat in the Project Study Area. Valued environmental components (VECs) were selected to evaluate environmental effects on species that have an identified ecological or societal importance. Aboriginal Traditional Knowledge (ATK) specific to wildlife in the Project Study Area was incorporated into the description of wildlife communities and into the effects assessment where possible. Three Alternative Routes were assessed for mammals, birds, amphibians, and reptiles and the effects of the Final Preferred Route were assessed with emphasis on VECs and federally or provincially listed species at risk. Mitigation measures and monitoring activities were identified.

The Wildlife Technical Report is organized into nine sections as follows:

- **Section 1** describes an overview of the Project and the outline of the report.
- **Section 2** describes the Project Study Area.
- **Section 3** outlines the methods used for field studies and the collection of other data.
- **Section 4** describes the wildlife communities and their habitat in the Project Study Area.
- **Section 5** outlines the evaluation of the effects of three Alternative Routes on wildlife, wildlife habitat, and potentially sensitive sites.
- **Section 6** describes the effects of the Preferred Route on wildlife and wildlife habitat.
- **Section 7** outlines the conclusions about Project effects on wildlife and wildlife habitat.
- **Section 8** contains references found in the report.
- **Section 9** is a glossary of selected terms used in the report.

2 STUDY AREA

2.1 General Regional Area Description

The area is made up of variably aged forest stands, plant communities, and floral species that reflect the climate, topography, soils, drainage, disturbance history, and forest development of the region. Forests provide a structure in which wildlife lives, and the degree and complexity of this structure within the landscape determines, to some extent, the wildlife inhabiting the forest.

2.2 Project Study Area

The Project Study Area includes an area of approximately 2,112 square kilometres (km^2) and extends from south of the community of Powerview-Pine Falls, north to the community of Manigotagan, and from the eastern boundary of Lake Winnipeg, to approximately 10 km east of PR #304 (see Map 1). The Project Study Area was chosen to be of sufficient size to assess any potential Project effects on biophysical and socioeconomic components.

The Project Study Area is mainly situated in the Boreal Shield Ecozone, which is dominated by broadly rolling uplands and lowlands. The southern extent of the Project Study Area is in the northern portion of the Lake of the Woods Ecoregion (Climate, Soils, Hydrogeology, and Geology Technical Report, Golder 2012a).

The Project Study Area is mainly forested. It is also covered by wetlands, mainly consisting of bog peatlands with black spruce, shrub, and moss communities and sedge-dominated fens with some tamarack and shrubs. White spruce, balsam fir, and balsam poplar thrive in moister areas while drier areas support aspen, jack pine, and white birch. American elm, bur oak and ash are found on stream banks. The deciduous forests generally have herbaceous and shrubby understories, and coniferous stands often have a feather moss ground cover. Frequent forest fires affect forest cover (see Vegetation Technical Report, Calyx Consulting 2012; Forestry Technical Report, Maskwa 2012, for more detail).

Agricultural lands are present near the Winnipeg River in the southern extent of the Project Study Area. Other land uses include mining, forestry, and transmission and distribution lines, all weather roads, seasonal trails, fishing, trapping, traditional resource use, recreation and tourism. Several communities are located in the Project Study Area that include, but are not limited to, Powerview-Pine Falls, Manigotagan, Black River and Hollow Water (see the Socio-economic Technical Report, Golder 2012b, for more detail).

3 METHODS

3.1 Data Collection and Analysis

The Project Study Area allows for an appropriate range of planning choices for consideration based on the collection of environmental information about its physical and biological characteristics (including wildlife and aquatic resources), as well as socio-economic and land use characteristics (including locations of communities, conservation areas, economic land uses [e.g., agriculture], and archaeological and heritage resources). Study area characterization, although broadly focused on all aspects of the environment, was guided by prior SSEA project experience through which Manitoba Hydro has established an understanding of the environmental issues and concerns associated with the development of transmission facilities.

In 2012, SSEA studies were conducted to gather information on a variety of wildlife groups using the habitats on the proposed transmission line routes. Information gained through these wildlife studies, together with other environmental study results were used to assist in the route selection process. Ultimately this information will be used in the development of the standalone LWESI environmental assessment that will be submitted to Manitoba Conservation and Water Stewardship (MCWS) for licensing approval.

This report provides information gathered in 2012 on wildlife communities using various habitats throughout areas proposed for transmission line development. Wildlife abundance and diversity were described and compared for the various habitat types that could be affected by the Project. A route analysis based on habitat data and wildlife community data was conducted to determine if the three options differed in terms of their potential to affect high-quality wildlife habitat.

3.1.1 Gap Analysis and Literature Review

Assessment of the wildlife community composition and of the abundance and distribution of individual species within the Project Study Area was conducted using a variety of methods. Wildlife studies began with desktop exercises, including a review of Manitoba Hydro studies, peer-reviewed literature, other reports, discussions with government and non-government organizations, and field surveys. Data were collected from studies completed by the Manitoba Model Forest and from the Manitoba Breeding Bird Atlas. Data from the Manitoba Breeding Atlas are currently being entered and analyzed, and the results reported are from three of five survey years (2010 to 2012) and are subject to revision or review.

Data collections for wildlife species and habitats focused on species of regulatory concern, conservation concern, and on potentially rare habitat types found in the Project Study Area. Field studies were not conducted for moose or boreal woodland caribou, because existing data sources were considered adequate to conduct an assessment. For example, moose population data were available from Manitoba Conservation and Water Stewardship. No surveys specific to boreal woodland caribou were conducted because adequate published and unpublished literature were available for review. Considerations were made for sampling to fill gaps in knowledge for the effects assessment. Wildlife use of existing habitats and specific habitat features were measured using techniques conforming to accepted professional standards and practices. A variety of methods, including breeding bird surveys, amphibian surveys and bat surveys were used to describe relative abundance and distribution, relative habitat use and seasonality (Schemnitz 1980; Elzinga et al. 2001).

3.1.2 Amphibian and Reptile Survey

Amphibians are common throughout the Project Study Area and generally require wet habitat. As the Project could affect amphibian habitat, surveys were completed in the Project Study Area along waterbodies such as creeks, canals, ponds and rivers in order to characterize the amphibian community. One hundred and fourteen sites in various wetland habitats (Map 2) were visited over a three-night period May 23/24, 24/25, and May 31/June 1. Sites were identified via satellite imagery and topographical data available through Geographic Information System (GIS) and Google Earth. Once identified, each site was visited by a biologist during the day to verify that a wetland was actually at each site. Survey methodologies generally followed Konze and McLaren 1997. Field technicians visited each site one-half hour after sunset to identify calling amphibians during a three-minute point count survey. Amphibian calls were recorded with a Tascam DR-100 Digital recorder so that all surveys could be verified and documented. Recordings of amphibians were analysed using Adobe Audition 2.0 and compared to known samples of amphibian species.

Reptiles use a variety of habitats including forests, rocky areas, and wetlands. Because snake mortalities commonly occur on roads near hibernacula in spring, the wetland habitat site reconnaissance visit and other site visits were used opportunistically to detect nearby garter snake hibernacula. Two sites were surveyed August 19, 2012 for potential red-sided garter snake hibernacula. The first site, at 14 U 703396 5609987, was identified from local knowledge (V. Keenan, pers. comm. 2012). The site consisted of a granite outcrop with underground cavities appropriate for sheltering snakes for the winter. A 30 minute search was performed for evidence of snakes in the area. The second site, at 14 U 705446 5615352, was a gravel borrow

area. The entire perimeter of the borrow area was searched, including overturning large, flat rocks to check for snakes underneath.

3.1.3 Breeding Bird Survey with Focus on Listed Bird Species

The construction and operation of transmission lines could affect migratory birds such as **Neotropical migrants** in a number of ways, both positively and negatively (Maurer et al. 1981). In order to assess the occurrence and distribution of birds near the preferred transmission line route, point counts were conducted in 2012 to identify birds by songs and calls recorded on Tascam DR-100 audio recorders. Survey methodologies generally followed Ralph et al. 1993, Hobson et al. 2002, and Rempel et al. 2005.

Point counts were conducted at 95 plots (Map 3) between June 26 and 29, which are in the optimal timing window suitable to conduct breeding bird surveys. Plot locations were determined based on Forest Resource Inventory habitat data. Vegetation cover data were converted to a broader classification and then grouped into habitat communities to determine the type of habitat most often frequented by birds and therefore the location best suited for each plot. The reclassified habitats were divided into categories including: softwood (black spruce pure, jack pine pure, white spruce pure, tamarack pure), hardwood (broadleaf pure, all other broadleaf), mixedwood (black spruce mixed, jack pine mixed, coniferous mixed, broadleaf mixed), grassland (dry prairie, wet prairie, grassland), wetland (wetland treed, wetland shrub, wetland herbaceous (herb), mud/salt flats), and shrubland (shrub). Emphasis was placed on range and habitat of federally or provincially listed species at risk, with a particular emphasis on olive-sided flycatcher and Canada warbler. Plot locations were selected to increase the detection of these species. A limited number of plots was selected in other habitats in the Project Study Area as other data were available and could be used to describe these communities. The proportion of each habitat type sampled is outlined in Table 3-1. Plots were placed a minimum of 250 metres (m) from adjacent plots to avoid double counting individuals.

Table 3-1: Forest Resource Inventory Covertypes Sampled During the Breeding Bird Survey

Covertype	Number of Sites
Broad leaf dense	7
Coniferous dense	13
Coniferous open	16
Mixedwood dense	22
Shrub tall	10
Wetland shrub	24
Wetland treed	3

Surveys began approximately a half hour before sunrise and continued until 10:00 a.m. Each observer used a Global Positioning System (GPS) to locate the pre-determined position of the plot and waited for the birds to settle into normal behaviours after being disturbed before beginning the survey. Audio recorders were set up and oriented upwards at each plot. Bird songs and calls were recorded for a period of 10 minutes and were later amplified and filtered of

ambient noise using Adobe Audition 2.0. A biologist identified each species and individual by listening to the recordings of bird songs and calls using high fidelity equipment.

Amphibian surveys were opportunistically used to record yellow rail, a species of special concern, that could be present in wetland areas. One hundred and fourteen sites in various wetland habitats were visited over a three-night period May 23/24, 24/25, and May 31/June 1. Yellow rail are detected most often at night (Holland and Taylor 2003a). Broadcast surveys were not used to improve detections.

3.1.4 Bat Survey

As bats are relatively common in the Project Study Area and habitat used for roosting and hunting can be affected by the clearing of the transmission line right-of-way (ROW), bat surveys were conducted from Pine Falls to Wanipigow Lake, just beyond the location of planned Project infrastructure. Point count surveys were completed throughout the Project Study Area along creeks, rivers, and other linear corridors and light sources where bats typically hunt. Point count survey methodologies generally followed Ralph et al. 1993, Hobson et al. 2002, and Rempel et al. 2005.

A total of 61 sites in various wetland habitats were visited (Map 4) over a three-night period August 16 to 18, 2012. Sites were identified via satellite imagery and topographical data available through GIS and Google Earth. Once identified, each site was visited by a field technician one-half hour after sunset. Each site was then surveyed using a Pettersson Ultrasound Detector D 240x during a 10-minute point count survey and recorded on an i-River iFP-700 Digital Audio Recorder so that all surveys could be verified and documented. For sites where ultrasound was detected, the recording was analysed using SonoBat 2.5.8, which allowed for the identification of each recording to species based on known species wavelength characteristics.

3.2 Valued Environmental Component Selection

The EA was focused on Valued Environmental Components (VECs), which are those aspects of the natural and socio-economic environment that are particularly notable or valued because of their ecological, scientific, resource, socio-economic, cultural, health, aesthetic, or spiritual importance, and which have a potential to be adversely affected by project development or have the potential to have an effect on the project. Hence, a VEC must both be important and have the potential to be affected by, or to affect, the Project. The potential to be affected means there has to be some interaction, either directly or indirectly, between the environmental component and some component or activity associated with the project during planning, construction, or operation. In this way, the assessment was focused on the identification and management of potential adverse effects.

A biophysical VEC can be a particular habitat, an environmental feature, a particular assemblage (community) of plants or animals, a particular species of plant or animal, or an indicator of environmental health. Biophysical VECs were defined on the basis of their meeting one or more of the following criteria:

- area of notable biological diversity;

- significant habitat for locally important species;
- significant habitat for uncommon or rare species;
- important corridor or linkage for fish and/or wildlife movement;
- sensitive receiving water environment;
- species at risk;
- notable species or species groups;
- indicator of environmental health;
- important component to the function of other ecosystem elements or functions;
- component is of economic or cultural significance;
- component is of educational, scientific, or aesthetic interest; and
- component is of provincial, national or international significance.

The VECs assessed in the effects analysis were defined by the multi-disciplinary project team undertaking the assessment based on:

- identified regulatory requirements;
- consultation with regulatory authorities;
- information derived from published and unpublished date sources;
- information and comment received during the engagement of local communities;
- feedback through the Public Engagement Process; and
- biophysical and heritage assessment field surveys.

A workshop was held with the discipline experts to identify VECs for the Project. Using the criteria above, and seeking to balance biophysical and socioeconomic criteria. A preliminary list of VECs was proposed based on selected baseline information collected in 2011. This list was reviewed and revised based on the selection criteria (above) and further knowledge of the area. Consideration was also given to the following factors:

- seeking a balance between biophysical and socioeconomic VECs;
- consideration of VECs representing both potential positive and negative effects of the Project; and
- limiting the total number to the essential aspects of the biophysical and socio-economic environments.

3.2.1 Scoping

Key elements of the Project that could adversely affect wildlife and wildlife communities included:

- Electrical wires and towers associated with alternating current (AC) transmission lines;

- Infrastructure associated with the LWESI transmission line;
- Construction equipment and people;
- Areas needed for the Project footprint including the ROW, Manigotagan Corner Station Site, and other infrastructure;
- Areas needed to support infrastructure development including borrow areas, excavated material placement areas, and access trails; and
- Operation and maintenance equipment and people.

Recurrent issues and concerns that were generated from scientific literature, other similar environmental assessments conducted outside of Manitoba, and consultations with the regulators and public included:

- Vulnerability of certain bird species (e.g., birds of prey) to bird-wire collision and electrocution;
- Global decline of listed species and Neotropical migrants from cumulative effects, including in part, from the development of linear corridors;
- Habitat loss; especially for listed species;
- Increased vulnerability of some local bird population concentrations (i.e., grouse, waterfowl, colonial waterbirds, listed species) to disturbances;
- Disruption of ecological processes and linkages where the effects to species or habitats could affect other species;
- Disruption of wildlife movements across fragmented landscapes; and
- Increased access to the area for resource users and predators created by the transmission line ROW and access trails.

3.3 Aboriginal Traditional Knowledge

An Aboriginal Traditional Knowledge (ATK) study was undertaken to provide relevant information on local knowledge and land use that were absent from the Project Study Area data record. Data on ATK was gathered during five workshops that were held in the communities of Hollow Water, Manigotagan, Black River, and Seymourville. Workshops were guided by a series of questions provided by discipline leads. Information was summarized in a series of map biographies on traditional and current land use practices, and interview summaries, and land use maps. Relevant information was integrated into the Technical Reports that support the EA Report.

Once collected, the tangible ATK and local knowledge survey data were reviewed for species location information, species composition, and other relevant features such as hunting grounds. The locations of important sites and mammal habitats were also noted, especially in relation to the Alternative Routes and the Preferred Route.

Community-based study in the form of workshop group interviews was conducted in August and September 2012. The ATK collected from the four communities during these interviews is

reported in the Cultural Resources Technical Report (NLHS 2012), and information specific to wildlife was added to the Existing Environment (Section 4).

3.4 Habitat Modeling for VECs and Listed Species

Land Cover Class (LCC) derived literature-based and expert opinion models that identifies the location of high quality habitat for each of the species (e.g., semi-open forest and natural edge adjacent to wetlands) was developed for five VECs and nine listed species. Low quality habitats are not identified in these models. Most models are non-spatial in the sense that they do not incorporate the adjacency of other habitat types. Exceptions include bald eagle, little brown myotis, and northern myotis (e.g., consideration for proximity to water). Other variables used in helping define the models include forest age, to accommodate for old growth, burns, and successional forest habitats. It should be noted that the age class for the LCC was not adjusted for the most recent forest fires that occurred in the Project Study Area (e.g., 2011). Appendix A describes modeling methods and results for each Alternative Route and the Preferred Route.

A number of other listed species occur in Manitoba; however, habitat models were not developed for these species because they are not expected to occur in the Project Study Area due to their breeding range limits, because they are rare transients, or because of particular habitat preferences, such as urban areas, where spatial overlap with the transmission line was highly unlikely to occur.

3.5 Habitat Fragmentation Analysis

Habitat fragmentation in the Project Study Area was assessed using the linear feature density (length of linear feature per unit area) metric. ArcGIS 10.1 was used to clip l roads and existing transmission line polylines within the study area. The length, in kilometers, of roads, existing transmission lines, and the Final Preferred Route was measured using the “addlength” tool of the Geospatial Modelling Environment 0.7.2.1 software package. The area of the study area, in square kilometers, was calculated using the ‘addarea’ tool of the Geospatial Modelling Environment 0.7.2.1 software package.

The road and trail classification system was derived from (Synthen Resource Services 1995). For the purpose of the assessment features with a “ROADCLASS” of 1, 2, 3, 3A, 3B, 4, 4M, Com, Hwy, Mun, Park, Prov, and T were considered roads. Features with a “ROADCLASS” of PL were excluded as these were powerlines and were already incorporated as part of the transmission line polylines.

Linear feature density was then determined for the existing environment (existing features) and for the future environment if the project is to go ahead (existing features plus the Final Preferred Route). All lengths were divided by the area of the Project Study Area. It should be noted that no future trails cleared to access the ROW were considered as these have not been identified.

4 EXISTING ENVIRONMENT

4.1 Overview

Wildlife species are part of an interconnected system where energy and matter are cycled through producers, consumers, and decomposers (Chapin et al. 2011). Up to 370 species of mammals, birds, amphibians, and reptiles could range into the Project Study Area. These include year-round residents, migrants, and occasional visitors. The northern portion of the Project Study Area lies in the Wrong Lake Ecodistrict of the Lac Seul Ecoregion and the southern portion lies in the Stead Ecodistrict of the Lake of the Woods Ecoregion (Smith et al. 1998). Habitat is dominated by coniferous species, with some mixedwood habitat (Map 5). Fire has resulted in jack pine communities and, to a lesser degree, aspen. Fens, bogs, and tamarack communities are scattered, and peatlands are common (Smith et al. 1998). The wildlife species found in the Project Study Area and a brief description of their role in ecosystem function are outlined below.

4.1.1 Mammals

Mammals play an important role in the biophysical and socio-economic environments. They are components of ecological cycles and provide food for people. Up to 53 mammal species could range into the Project Study Area (see Appendix B for a list of mammal species and their scientific names). Mammal species that were not selected as VECs were grouped according to general characteristics and assessed to a lesser extent than VECs. These groups include small mammals, aquatic furbearers, terrestrial furbearers, large carnivores, ungulates, and listed species. Groups were based on general characteristics such as body size and broad habitat requirements, and not on biological taxonomy. As such, mammal groupings are not meant to imply similarity in specific characteristics such as diet (e.g., herbivore or carnivore), or particular habitat preferences (e.g., mature forest or recent burns).

Small mammals include mice, voles, shrews, bats, squirrels, and chipmunks, and are the foundation of the carnivore and omnivore food webs. They are generally short-lived and are prolific breeders; most have more than one litter a year (Banfield 1987). Twenty-five species could occur in the Project Study Area. Most of the small mammal species in the Project Study Area are year-round residents. Eastern red bat, hoary bat, northern myotis, and silver-haired bats are migratory. All of the small mammal species breed in the region, with the possible exception of woodland jumping mouse, whose presence is uncertain. Bat and flying squirrel populations are coming back (Black River First Nation ATK Workshop Interview August 15, 2012). Signs of red squirrel were observed incidentally during field studies, and two species of bat (hoary bat and little brown myotis) were detected during bat surveys (Appendix C).

Aquatic furbearers are medium-sized mammals that rely on water for a large portion of their food or habitat. Muskrat, beaver, mink, and river otter can be found in the Project Study Area. All are year-round residents and breed in the region. There are more beaver in the area than other animals, and there are fewer muskrat than in the past (Hollow Water First Nation ATK Workshop Interview August 22, 2012). Signs of beaver were observed incidentally during field studies.

Terrestrial furbearers spend the majority of their time and derive most or all of their food from upland (terrestrial) habitats. They are medium-sized mammals and include raccoon, weasels, porcupine, coyote, and lynx. Up to 18 species could occur in the Project Study Area. Rabbit, fox, fisher, raccoon, coyote, lynx, and bobcat are among the species identified in the Project Study Area (Hollow Water First Nation ATK Workshop Interview August 22, 2012 and September 17, 2012; Manigotagan ATK Workshop Interview September 17, 2012; Seymourville/Manigotagan ATK Workshop Interview August 22, 2012), Skunk and porcupine can also be found in the area, but there are fewer than in the past (Hollow Water First Nation ATK Workshop Interview August 22, 2012). Most terrestrial furbearer species are year-round residents and breed in the region. The status of American badger, bobcat, long-tailed weasel, and white-tailed jackrabbit is uncertain. Of the four species, only bobcat is thought to breed in the area, but all could be residents of the region.

Large carnivores are larger-sized mammals that prey on other animals. Large carnivores that could be found in the Project Study Area are black bear, gray wolf, and cougar. All are residents, and black bear and gray wolf breed in the region. Cougars are sparse in eastern Manitoba, and the Project Study Area is unlikely to have a breeding population. However, cougars are returning to the area and one was observed in the Project Study Area (Hollow Water First Nation ATK Workshop Interview August 22, 2012). Game Hunting Area (GHA) 26, in which the Project Study Area occurs, can likely support approximately 1,200 black bears, but the black bear population is unknown (Manitoba Model Forest Committee for Cooperative Moose Management meeting minutes June 27, 2011). Large numbers of bears with three cubs are being observed, which is unusual, as bears typically have one or two (Hollow Water First Nation ATK Workshop Interview August 22, 2012). Instances of bears with three cubs are special because bears are a sacred animal and are culturally significant (Hollow Water First Nation ATK Workshop Interview August 22, 2012). There are an estimated 25 packs of gray wolves in GHA 26 (Manitoba Model Forest Committee for Cooperative Moose Management meeting minutes March 15, 2012). A wolf reduction project is currently in effect in GHA 26, which was announced in February 2011 (Manitoba Model Forest Committee for Cooperative Moose Management meeting minutes October 13, 2011). Registered trappers are paid $250 per wolf harvested, and funding is provided by Manitoba Conservation and Water Stewardship. Fifty-five wolves were harvested in GHA 26 in the winter of 2011-2012 (Manitoba Model Forest Committee for Cooperative Moose Management meeting minutes March 15, 2012).

Ungulates are hoofed mammals that contribute to ecosystem function by consuming plants and as prey for large carnivores. Ungulates that could occur in the Project Study Area include white-tailed deer and moose, which can be found throughout the area (Black River First Nation ATK Workshop Interview August 15, 2012), and boreal woodland caribou, which are found further away (Hollow Water First Nation ATK Workshop Interview August 22, 2012). All are residents of the region and breed there.

4.1.2 Birds

Of the approximately 400 species of birds found in Manitoba, 306 could be found in the Project Study Area, although some are occasional or rare migrants (see Appendix D for a list of bird species and their scientific names). Of these, 66 were found during field surveys and 96 have been observed in the region during independent breeding bird surveys for the Manitoba Bird Atlas (see Appendix D and Appendix E).

As with mammals, birds were organized into groups based on general characteristics. These groups include waterfowl and other waterbirds, colonial waterbirds, birds of prey, upland game birds, woodpeckers, and songbirds and other birds.

Waterfowl and other waterbirds are primarily migratory, nesting in Manitoba in spring and wintering in the southern United States and Central and South America. For the purpose of analysis, waterfowl and other waterbirds are ducks, geese, swans, loons, coots, rails, and cranes. Up to 39 species can be found in the Project Study Area, one of which, common loon, was observed during field studies. There are few ducks in some areas (Manigotagan ATK Workshop Interview September 17, 2012). Waterfowl and other waterbirds are associated with temporary and permanent waterbodies, and occasionally can be found along rivers and creeks in the Project Study Area. Local resource users indicate that upland game birds are scarce (Black River First Nation ATK Workshop Interview August 15, 2012). Beaver floods provide suitable habitat.

Birds that form groups to breed and nest are termed colonial waterbirds (Parnell et al. 1988). These birds are generally migratory. For this study, colonial waterbirds are gulls, terns, grebes, pelicans, cormorants, herons, bitterns, and shorebirds. Turkey vultures, whose taxonomy is uncertain but are thought to be related to storks (Koonz and Taylor 2003a) are included in this group. Recently, more vultures have been observed in the area (Hollow Water First Nation ATK Workshop Interview September 17, 2012). Of the 67 species that could be found in the Project Study Area, two (Wilson's snipe and ring-billed gull) were observed during field studies. Habitat such as large lakes is limiting to species occurrences in the Project Study Area.

Up to 29 species of birds of prey can be found in the Project Study Area including falcons, hawks, owls, and osprey. They occupy a variety of habitats and can be migratory or year-round residents. Rivers, wetlands, and forest are important habitat for these species. Only broad-winged hawk was observed during field studies. Owls are more numerous in the Project Study Area some years than others, and their prevalence is linked to small mammal populations (Manigotagan ATK Workshop Interview September 17, 2012). Common owl species observed during nocturnal owl surveys in the region include northern saw-whet owl and boreal owl (Manitoba Nocturnal Owl Survey unpublished data). Eagles are frequently observed in the area (Hollow Water First Nation ATK Workshop Interview August 22, 2012 and September 17, 2012; Manigotagan ATK Workshop Interview September 17, 2012; Black River First Nation ATK Workshop Interview August 15, 2012; Seymourville/Manigotagan ATK Workshop Interview August 22, 2012). Bald eagle was identified as a VEC.

Upland game birds can be found in forested habitats and openings and mainly include grouse and partridge. Seven species could be found in the Project Study Area, although ruffed grouse, spruce grouse, and sharp-tailed grouse are the most likely residents. Turkeys were once common in the area but have not been observed in recent years (Hollow Water First Nation ATK Workshop Interview September 17, 2012). Some upland game birds are not as numerous in the Project Study Area as they once were (Hollow Water First Nation ATK Workshop Interview August 22, 2012; Black River First Nation ATK Workshop Interview August 15, 2012). No upland game birds were observed during field studies. Spruce grouse was selected as a VEC.

Of the ten woodpecker species that occur in Manitoba, five are permanent residents, three are summer visitors, and two are infrequent visitors (Taylor 2003a). Forested habitat is important for most of these species. Nine species could occur in the Project Study Area, four of which were observed during field studies (see Appendix D).

Songbirds and other birds, including passerines, are the most abundant of all bird groups in Manitoba. Some of the bird families in this group such as chickadees, nuthatches, and some finches and jays are year-round residents, while other groups including flycatchers, swallows, thrushes, kinglets, pipits, vireos, tanagers, blackbirds, sparrows, and warblers are mainly short-distance or long-distance migrants. Fifty-eight of the 154 species that can be found in the Project Study Area were observed during field studies.

Many of the bird species in the boreal forest can be found in a range of habitats, often with a preference for particular types. Bird communities were assessed in the Manitoba Model Forest, which overlaps the Project Study Area, from 1993 to 1996 (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). While species diversity was similar in forest types in the Manitoba Model Forest, differences in species diversity were apparent when the age and composition of the forest were considered. Bird communities were similar in habitat disturbed by fire or timber harvest, and communities of the most common birds were similar in riparian and non-riparian forest types. Bird communities in the Manitoba Model Forest, which includes the Project Study Area, are based on environmental gradients associated with black spruce to trembling aspen (in mature forests, and those associated with riparian habitat types (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997).

4.1.3 Amphibians and Reptiles

Up to 11 species of amphibians and reptiles can be found in the Project Study Area (see Appendix F for a list of species and their scientific names). These species are preyed upon by birds and mammals. Amphibians generally live and breed in or near water. This group includes salamanders, frogs, and toads. Wood frog, gray tree frog, boreal chorus frog, and spring peeper are common species. Of the eight species that could occur in the Project Study Area, six were recorded during the field survey (Appendix G). Mudpuppy and blue-spotted salamander, which do not vocalize, were not detected. Mudpuppies are reported to be attracted to beaver lodges in the area (Manigotagan ATK Workshop Interview September 17, 2012). Blue-spotted salamander are unlikely to occur in the Project Study Area due to range limitations. Reptiles, which occur in aquatic and terrestrial habitats, include turtles and snakes. None were recorded during field studies in the Project Study Area, where two species of turtle and one species of snake can be found. Western painted turtle and red-sided garter snake are most likely to be found in the Project Study Area; western painted turtle was observed in the area in 2011 (Joro Consultants Inc. 2011). Turtles often cross the road at the bridges over the Manigotagan and Black rivers (Hollow Water First Nation ATK Workshop Interview August 22, 2012).

In late May, no red-sided garter snakes were observed on PR #304 between Pine Falls and the proposed Manigotagan Corner Station. Two sites were surveyed for red-sided garter snake **hibernacula** (dens). The first site consisted of a granite outcrop with underground cavities. Both habitats looked suitable as hibernacula. Red-sided garter snakes have been reported from the areas searched. No snakes or shed skins were observed during a search of the immediate area. The perimeter of the second site, a large gravel borrow pit, was searched. No snakes or shed skins were observed. As the search was performed in mid-August, there was a lesser probability that these hibernacula could be confirmed.

4.1.4 Listed Species

Several wildlife species that could occur in the Project Study Area have been federally or provincially listed as species at risk. Of the mammal species that could be found in the Project Study Area, only the boreal woodland caribou is currently listed. It has been designated threatened by the federal *Species at Risk Act* (SARA) and *The Endangered Species Act* of Manitoba (MBESA). The Owl-Flintstone boreal woodland caribou range is partially contained in the Project Study Area. A recovery strategy (Manitoba Conservation 2005) and a draft action plan for high risk ranges including Owl-Flintstone and Atikaki-Berens contain plans for implementing recommended recovery actions to help guide recovery efforts (Manitoba Conservation 2011).

An emergency assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) concluded that the little brown myotis, which has been documented in the Project Study Area, and the northern myotis are endangered and recommended that they be placed on Schedule 1 of SARA (COSEWIC 2012). The wolverine has been designated a species of special concern by COSEWIC, but is not listed by SARA or MBESA.

Of the 306 bird species that could be found in the Project Study Area, 23 are listed by SARA, MBESA, or both (Table 4-1). Of these, yellow rail, least bittern, short-eared owl, common nighthawk, whip-poor-will, olive-sided flycatcher, Canada warbler, and rusty blackbird are the most likely to be found in the Project Study Area, and were the focus of the assessment for listed bird species. Horned grebe is not listed by SARA or MBESA, but is listed as special concern by COSEWIC. While the ranges of the other listed bird species may overlap the Project Study Area, there is generally little to no habitat available and they are not likely to occur in the area. Canada warbler and olive-sided flycatcher are VECs and are discussed in Section 4.2. Map 6 illustrates the location of listed species detected during field surveys. Olive-sided flycatcher and Canada warbler observations are not displayed as they are also VECs and are mapped in Sections 4.2.5 and 4.2.6 respectively.

One of the species of amphibians and reptiles that could be found in the Project Study Area is listed by SARA. The northern leopard frog is a species of special concern and was observed during the amphibian survey completed in 2012.

Table 4-1: Listed Bird Species that Could Occur in the Project Study Area

Group	Species	*Species at Risk Act*	*The Endangered Species Act* (Manitoba)
Waterfowl and other waterbirds	Trumpeter swan		Endangered
	Yellow rail	Special concern	
	Whooping crane	Endangered	Endangered
Colonial waterbirds	Least bittern	Threatened	Endangered
	Piping plover	Endangered	Endangered
	Red knot	Endangered	Endangered

Table 4-1: Listed Bird Species that Could Occur in the Project Study Area

Group	Species	*Species at Risk Act*	*The Endangered Species Act* (Manitoba)
Birds of prey	Peregrine falcon	Threatened	Endangered
	Ferruginous hawk		Endangered
	Burrowing owl	Endangered	Endangered
	Short-eared owl	Special concern	Threatened
Woodpeckers	Red-headed woodpecker	Threatened	Threatened
Songbirds and other birds	Common nighthawk	Threatened	Threatened
	Whip-poor-will	Threatened	Threatened
	Chimney swift	Threatened	Threatened
	Olive-sided flycatcher	Threatened	
Songbirds and other birds	Loggerhead shrike	Endangered	Endangered
	Sprague's pipit	Threatened	Threatened
	Golden-winged warbler	Threatened	Threatened
	Canada warbler	Threatened	Endangered
	Baird's sparrow		Threatened
	Chestnut-collared longspur	Threatened	Endangered
	Rusty blackbird	Special concern	

4.1.4.1 Little Brown Myotis

The little brown myotis is a habitat generalist, occupying a range of habitats (Wund 2006). While they inhabit parts of Alaska and northern Canada, their wings and ears are poorly suited to the cold, and they hibernate in caves or other shelters for the winter (Banfield 1987). They occur through much of Manitoba, including the Project Study Area (Humphrey 1982). While breeding occurrences in Manitoba are rare, the non-breeding status of the little brown myotis is listed as widespread, abundant, and secure in the province or throughout its range (NatureServe 2012). Data obtained from the Manitoba Conservation Data Centre did not list any known bat hibernacula in the Project Study Area. This species is not yet listed by SARA, but an emergency order to place this and other bat species on Schedule 1 of SARA has been requested (COSEWIC 2012). The primary threat to little brown myotis is the spread of white-nose syndrome, caused by a fungus, which is predicted to result in the extirpation of little brown myotis within 16 years (Frick et al. 2010; Forbes 2012). While white-nose syndrome has not yet been identified west of Ontario, it is expected to spread to hibernacula across North America within 11 to 22 years (Frick et al. 2010; Forbes 2012). A little brown myotis was identified during the bat survey (see Map 6).

4.1.4.2 Northern Myotis

The northern myotis generally feeds in aspen or aspen-white spruce mixedwood forests (Kalcounis et al. 1999). Mixedwood forests provide foraging opportunities and roost sites

(Kalcounis et al. 1999). Its range includes the southern half of Manitoba (Schmidt 2003). Like the little brown myotis, is not yet listed by SARA, but an emergency order to place this species on Schedule 1 of SARA has been requested due to the imminent threat of white-nose syndrome (COSEWIC 2012). No northern myotis were detected during the bat surveys.

4.1.4.3 Wolverine

The wolverine is listed as special concern by COSEWIC but is not listed by SARA or MBESA. Wolverines were once distributed throughout Manitoba, but now occur mainly in the north (COSEWIC 2003). The Manitoba wolverine population has been estimated to be between 1,200 and 1,600 animals, and it is thought that the provincial population is either increasing or stable (COSEWIC 2003). Factors limiting wolverine populations include their low reproductive rate and low natural densities; harvest by trapping; predator control programs; the loss of physical and effective habitat; and habitat fragmentation (COSEWIC 2003).

Wolverine home ranges can be 40 to 500 square kilometres (km^2), which may overlap with other individuals' ranges (COSEWIC 2003). Wolverines occupy a range of habitats in treed in treeless areas, and are most abundant in areas with little human activity (COSEWIC 2003). A single wolverine is known to inhabit the Project Study Area (Manigotagan ATK Workshop Interview September 17, 2012). Portions of six registered traplines overlap the Project Study Area. A single wolverine was trapped on traplines 16, 26, 27, and 28 from 1996 to 2011. Trapping records do not give a comprehensive measure of species abundance. Factors such as demand, market prices, and trapper effort can affect the data. Instead, trapping data provide a qualitative measure of presence/absence information for the region.

4.1.4.4 Boreal Woodland Caribou

Boreal woodland caribou, a forest-dwelling type of woodland caribou, are listed as threatened under SARA and MBESA. They do not tend to form large herds when calving and calve on islands when possible (Thomas and Gray 2002). Threats to boreal woodland caribou include habitat loss, alteration, and fragmentation due to human activities and natural processes such as forest fires; disturbance by humans; predation; increases in densities of other ungulate species; climate change; parasites and disease; and hunting (Environment Canada 2012; Manitoba Conservation 2011). The Owl-Flintstone population has been monitored since the 1970s and no large changes in the population have been observed. However, habitat alteration has led to concern about the long-term viability of the population, which has recently been estimated at 62 to 70 individuals (Manitoba Conservation 2011).

As illustrated in Map 7 a small portion (7 percent [%]) of the Owl-Flintstone population's range is found within the eastern edge of the Project Study Area (Manitoba Conservation 2011). The Project is not expected to affect the Owl-Flintstone population as its range is more than 4.5 km away from any of the Alternative Routes and human-caused disturbance is typically assessed within 500 m of the disturbance (Environment Canada 2012) and ATK from Hollow Water First Nation members also indicates that caribou are found further away from the Project Study Area (Hollow Water First Nation ATK Workshop Interview August 22, 2012). In addition, Owl-Flintstone core use areas do not occur in the Project Study Area (Schindler 2005; Joro Consultants Inc. 2011; Figure 4-1). A small portion of the Atikaki-Berens range (<0.1%) overlaps the northernmost edge of the Project Study Area (Map 7). Although caribou are not usually expected this far west, individuals may occur occasionally. Potential fresh caribou scat was

observed incidentally by an aquatic field technician on the south shore of the O`Hanly River, west of PR #304 (B. Kotak, pers. comm. 2012). See Appendix H for a record of this occurrence.

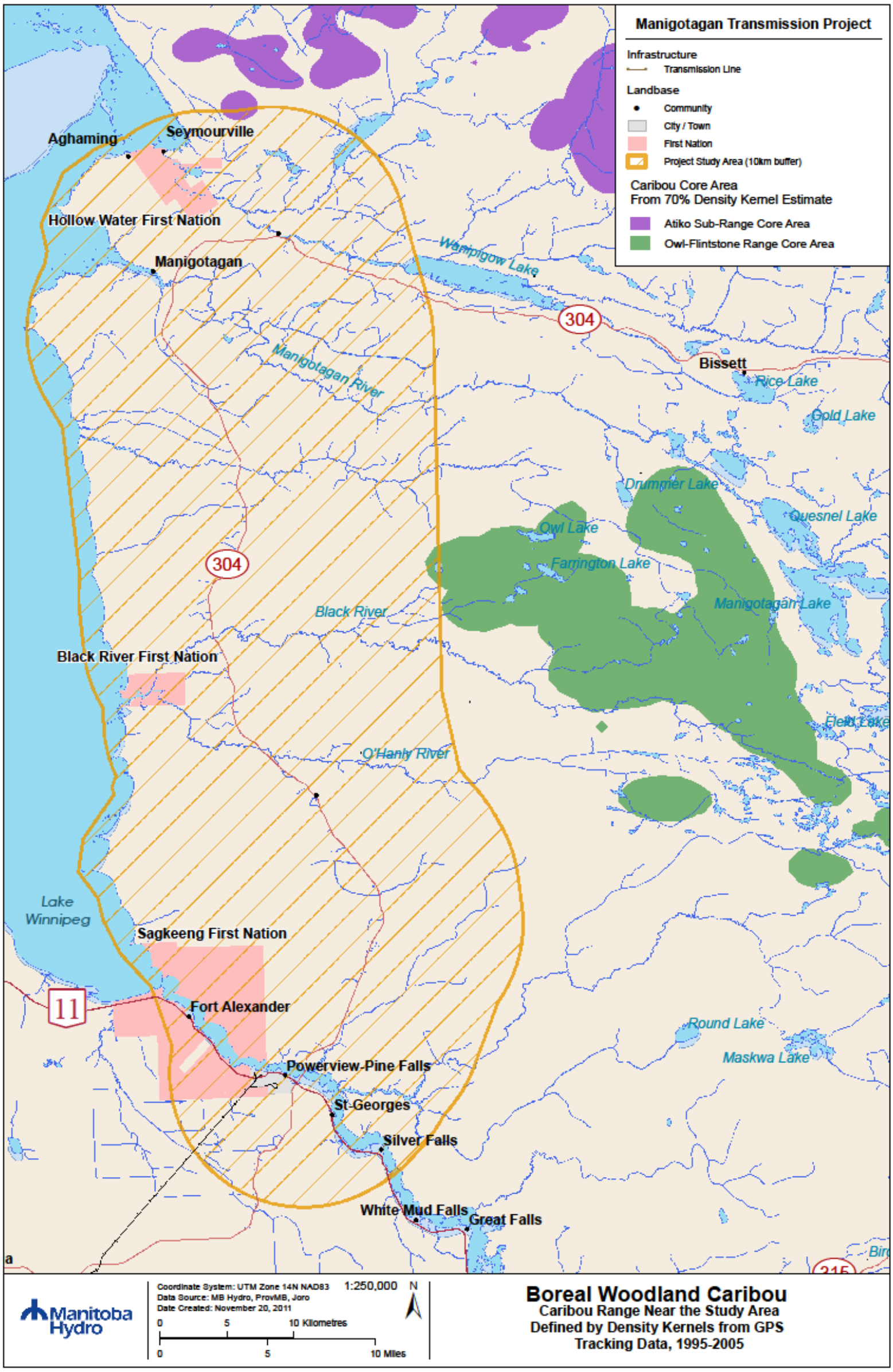
4.1.4.5 Yellow Rail

Yellow rails are widely distributed in the United States and Canada, particularly in south central and southeastern Canada, during the breeding season (Bookhout 1995). This species is listed as special concern by SARA and is not listed by MBESA. No definitive population estimates are available because surveys must specifically target yellow rails, which are found in areas and are active at times not generally surveyed during breeding bird surveys (COSEWIC 2009a). The population in Canada was estimated at 5,000 to 6,000 pairs based on the availability of habitat and the number of pairs an average site could reasonably accommodate (COSEWIC 2009a). Occurrence in Manitoba is from the end of April to mid-September (Holland and Taylor 2003a). Breeding habitat is described as wet sedge meadows where sedge species in deep water are selected (Bookhout and Stenzel 1987; Bookhout 1995). Yellow rail was not detected during Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). No yellow rails were recorded during field surveys. Additionally, the Manitoba Breeding Bird Atlas has no records of yellow rail within the Project Study Area.

4.1.4.6 Least Bittern

Least bitterns are listed as threatened by SARA and endangered by MBESA. They are rare breeders in Manitoba, uncommonly found in the southeast and west to Delta Marsh in small wetlands (Koes 2003a). Least bitterns arrive in Manitoba from their wintering grounds in early May and depart by the end of October. Least bitterns favour breeding habitat of small wetland containing dense, tall, emergent vegetation, with some small areas of open water and woody vegetation (Gibbs et al. 1992) and particularly tall shrubs (Hay 2006). Threats to least bittern populations are primarily habitat loss and degradation, but also include collisions with human-made structures and vehicles (COSEWIC 2009b). Targeted surveys are required to estimate least bittern populations and their abundance in Canada is poorly understood, but there are an estimated 1,500 pairs (COSEWIC 2009b). Targeted surveys in Manitoba since 2004 indicate that the population has increased from 100 pairs to a maximum of 200 pairs (COSEWIC 2009b). The least bittern was not detected during Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). No least bitterns were recorded during field surveys. Additionally, the Manitoba Breeding Bird Atlas has no records of least bittern within the Project Study Area.

Figure 4-1: Boreal Woodland Caribou Range Core Areas Near the Project Study Area



Source: Joro Consultants Inc. 2012.

4.1.4.7 Short-eared Owl

Despite a largely continuous distribution ranging from northern Canada to northern Mexico (Holt and Leasure 1993), the short-eared owl is listed as special concern by SARA and threatened by MBESA. Short-eared owl populations have declined by approximately 23% over the past decade due to habitat loss and the degradation of habitat areas, particularly wintering areas (COSEWIC 2008a). Additional threats include egg and nestling mortality due to mowing and harvesting agricultural crops and, to a lesser extent, collisions with transmission lines, barbed-wire fences, and vehicles (COSEWIC 2008a). While assessment of populations is difficult, an estimate of 350,000 individuals in Canada has been generated (COSEWIC 2008a). Short-eared owls can be found throughout Manitoba, except in contiguous forested areas (Holland and Taylor 2003b). Breeding habitat consists of open landscapes with abundant small mammal prey (Holt and Leasure 1993), including grasslands, wetland, and occasionally hay land habitats. Short-eared owls typically arrive in Manitoba in late March and early April and migrate after the breeding season, from August to October (Holland and Taylor 2003b). The short-eared owl was not detected during Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). Although no short-eared owls were observed during field studies, other records in the area include observations by the Manitoba Breeding Bird Atlas.

4.1.4.8 Common Nighthawk

Common nighthawks are listed as threatened by SARA and MBESA. They breed throughout Manitoba, with the exception of the extreme north (Taylor 2003b). The population in Canada was estimated at 200,000 breeding pairs in 2007, and appears to have declined from the preceding decade (COSEWIC 2007a). In Manitoba, surveys indicated a population decline from the mid-1970s to the mid-1990s; however counts increased from 2000 to 2005 (COSEWIC 2007a). Threats to common nighthawk populations in Canada are not well documented, but are thought to include habitat loss and alteration; the decreasing abundance of the insects they consume due to urban mosquito control programs; terrestrial and avian predators; and collisions with vehicles (COSEWIC 2007a). Their habitat requirements are not highly specific; they can be found nesting on sand dunes, beaches, logged or burned areas of forests, forest clearings, prairies, farmlands, and gravel rooftops (Poulin et al. 1996). Common nighthawks arrive in Manitoba from their wintering grounds in mid to late May (Taylor 2003b) and begin their southward migration from Manitoba in mid-August with some late departures in September (Taylor 2003b). The common nighthawk was considered very rare in Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). One common nighthawk was recorded during the breeding bird survey (see Map 6) and they have been observed in the Project Study Area by local First Nations members (Black River First Nation ATK Workshop Interview August 15, 2012). The Manitoba Breeding Bird Atlas has no records of common nighthawk within the Project Study Area.

4.1.4.9 Whip-poor-will

Whip-poor-wills, which are listed as threatened by SARA and MBESA, are distributed through much of southern Manitoba (Taylor and Holland 2003a; COSEWIC 2009c). They occupy upland mixedwood or deciduous forest with open areas (Taylor and Holland 2003a). They begin to arrive in Manitoba in early May and nest from late May to mid-July (Taylor and Holland 2003a). The whip-poor-will population has declined since the mid-1960s (COSEWIC 2009c). In 2004 the whip-poor-will population in Canada was estimated at 66,000 individuals and was approximately

8,000 individuals in Manitoba (COSEWIC 2009c). Threats include habitat loss and degradation, changes in food supply, collisions with vehicles, and predation (COSEWIC 2009c). The whip-poor-will was considered occasional in Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997), but this species is not detected regularly by using conventional breeding bird surveys because it sings at night. Nine whip-poor-will calls were recorded incidentally in the Project Study Area during the amphibian surveys (see Map 6). Whip-poor-wills have been observed by local First Nations members (Black River First Nation ATK Workshop Interview 2012) and appear to be increasing in the area (Seymourville/Manigotagan ATK Workshop Interview August 22, 2012). Other whip-poor-will records in the area include observations from the Manitoba Breeding Bird Atlas.

4.1.4.10 Rusty Blackbird

Rusty blackbirds are listed as special concern by SARA and are not listed by MBESA. While rusty blackbirds' breeding range extends over much of Canada (Avery 1995), in Manitoba they are typically found north of the 55th parallel (Nero and Taylor 2003). The Canadian population of rusty blackbirds is estimated at between 1.1 and 1.4 million individuals and has been in decline since the mid-1960s (COSEWIC 2006). Threats include habitat loss, bird control programs, and influx of dominant species such as red-winged blackbird (COSEWIC 2006). Rusty blackbirds are uncommon breeders in south central Manitoba (Nero and Taylor 2003). Favoured breeding habitat is in wet boreal forest regions (Nero and Taylor 2003), including the mixedwood regions north to the edge of the tundra, usually near wet areas such as bogs, fens, and riparian zones (Avery 1995). Rusty blackbirds are seasonal migrants, arriving in Manitoba by early April and departing in late July in the north and September in the south (Nero and Taylor 2003). The rusty blackbird was considered very rare in Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). One rusty blackbird was recorded during the breeding bird survey (see Map 6). The Manitoba Breeding Bird Atlas has also recorded rusty blackbirds within the Project Study Area but has no confirmed nesting records to date.

4.1.4.11 Northern Leopard Frog

One amphibian species that could be found in the Project Study Area is listed by SARA. The northern leopard frog is a species of special concern and was recorded or heard at a total of 11 sites during the amphibian survey completed in 2012 (see Map 6). It is not listed by MBESA. COSEWIC (2009d) reports that northern leopard frogs inhabit wet upland meadows and prairie in summer. This species requires water for breeding and its larval life stage, and for dispersal and movement between habitats. Northern leopard frogs overwinter in waterbodies that do not freeze solid. Threats include diseases; the introduction of invasive plants and non-native predators such as fishes and bullfrogs; human-caused habitat loss, alteration, and fragmentation; pollution; and drought. Northern leopard frogs are predators and prey, are indicators of ecosystem health, and are distributed throughout southern Manitoba (COSEWIC 2009d). They have been observed east of the Project Study Area in permanent waterbodies in Nopiming Provincial Park (Lees et al. 2008).

4.1.4.12 Common Snapping Turtle

The common snapping turtle is the only listed reptile species that could be found in the Project Study Area. It is listed as special concern by SARA, and is not listed by MBESA. COSEWIC

(2008b) reports that snapping turtles prefer slow-moving water with a muddy bottom and aquatic vegetation. The main factor limiting snapping turtle populations is the slow recruitment, late maturity, long lifespan, and high adult survival that characterize their life history strategy. Habitat loss, pollution, nest predation by mammals, mortality due to boat propeller strikes, and bycatch from fishing are also threats. Snapping turtles are distributed throughout southern Manitoba, and it is estimated that there are fewer than 100 individuals in the province (COSEWIC 2008b).

4.1.4.13 Other Listed Species

The remaining listed bird species are not expected to occur in the Project Study Area for various reasons. Trumpeter swans were considered extirpated in Manitoba until recently; their habitat consists of marshes and other wetlands or waterbodies (Koes 2003b). This species has been observed in the region but have not been observed in the Project Study Area. Horned grebes prefer permanent ponds with open water and emergent vegetation (Holland and Taylor 2003c). Peregrine falcons require cliffs or tall buildings to breed (White et al. 2002) and ferruginous hawks (De Smet 2003a) and burrowing owls (De Smet 2003b) mainly breed in southwestern Manitoba. Red-headed woodpeckers select open deciduous forest with standing dead trees, particularly near pastures and where the understory has been removed by cattle (Taylor 2003c). Chimney swifts breed in urban areas (Taylor and Holland 2003b). Sprague's pipits inhabit pastures and grasslands (Holland et al. 2003a), as do loggerhead shrikes, which also require willows and other shrubs (De Smet 2003c). Baird's sparrows (De Smet 2003d) and chestnut-collard longspurs (Holland et al. 2003b) inhabit grasslands. As there is no suitable habitat for these species in the Project Study Area, they will not be considered further in the selection of alternate routes or in the effects assessment. The northern limit of golden-winged warbler range is south of the Project Study Area (Edie et al. 2003), and this species will not be considered further in the selection of alternate routes or in the effects assessment. None of these species were recorded during Manitoba Model Forest surveys (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997), field studies or with recent Manitoba Breeding Bird Atlas data; however, it is noted that the occasional occurrences of these species, although highly unlikely, cannot be entirely ruled out.

4.2 Valued Environmental Components

Based on the information provided in Section 3.2, the following wildlife species were selected as VECs:

- Moose – Protected species (*The Wildlife Act* of Manitoba); Important to people (harvest, economy); scientific importance – **umbrella species**; linkages to potential Project effects including habitat loss or alteration, fragmentation and mortality from collisions and access
- American marten – Protected species (*The Wildlife Act*); important to people (harvest, economy); scientific importance – indicator of coniferous and mixedwood forest associations and community health; linkages to potential Project effects including habitat loss or alteration, fragmentation, and mortality from access
- Bald eagle – Protected species (*The Wildlife Act*); other regulatory requirements for nests; Important to people (cultural, viewing); indicator of important corridor or linkage for bird movement; scientific importance - indicator of mature riparian forest community health;

linkages to potential Project effects including nest loss, wire strikes and habitat loss or alteration

- Spruce grouse – Protected species (*The Wildlife Act*); important to people (harvest, viewing, economy); Scientific importance – indicator of mature black spruce forest bird associations and community health; linkages to potential Project effects including nest loss, wire strikes and habitat loss or alteration
- Olive-sided flycatcher – Protected species (*Migratory Birds Convention Act, Species at Risk Act, The Endangered Species Act*); important to people (viewing); scientific importance - Indicator of wetland and burn bird associations and community health; linkages to potential Project effects including nest loss and habitat alteration
- Canada warbler – Protected species (*Migratory Birds Convention Act, Species at Risk Act, The Endangered Species Act*); important to people (viewing); scientific importance - Indicator of mature deciduous dominated bird associations and community health; linkages to potential Project effects including habitat loss or alteration

The following sections describe the current condition of these VECs, including habitat preferences, habitats, limiting factors, and occurrences in the Project Study Area.

4.2.1 Moose

Moose range is extensive in Manitoba; moose are commonly found in forest, shrub, and wetland habitats and occupy much of northern Manitoba (Banfield 1987). In the south, they occupy areas east of Lake Winnipeg to the Ontario border and south of the Winnipeg River (Pattie and Hoffmann 1990). Populations are highly variable and have been reported at levels of 0.4 moose/km^2 in high-quality habitats (Palidwor et al. 1995). Moose densities increase away from areas easily accessible to humans.

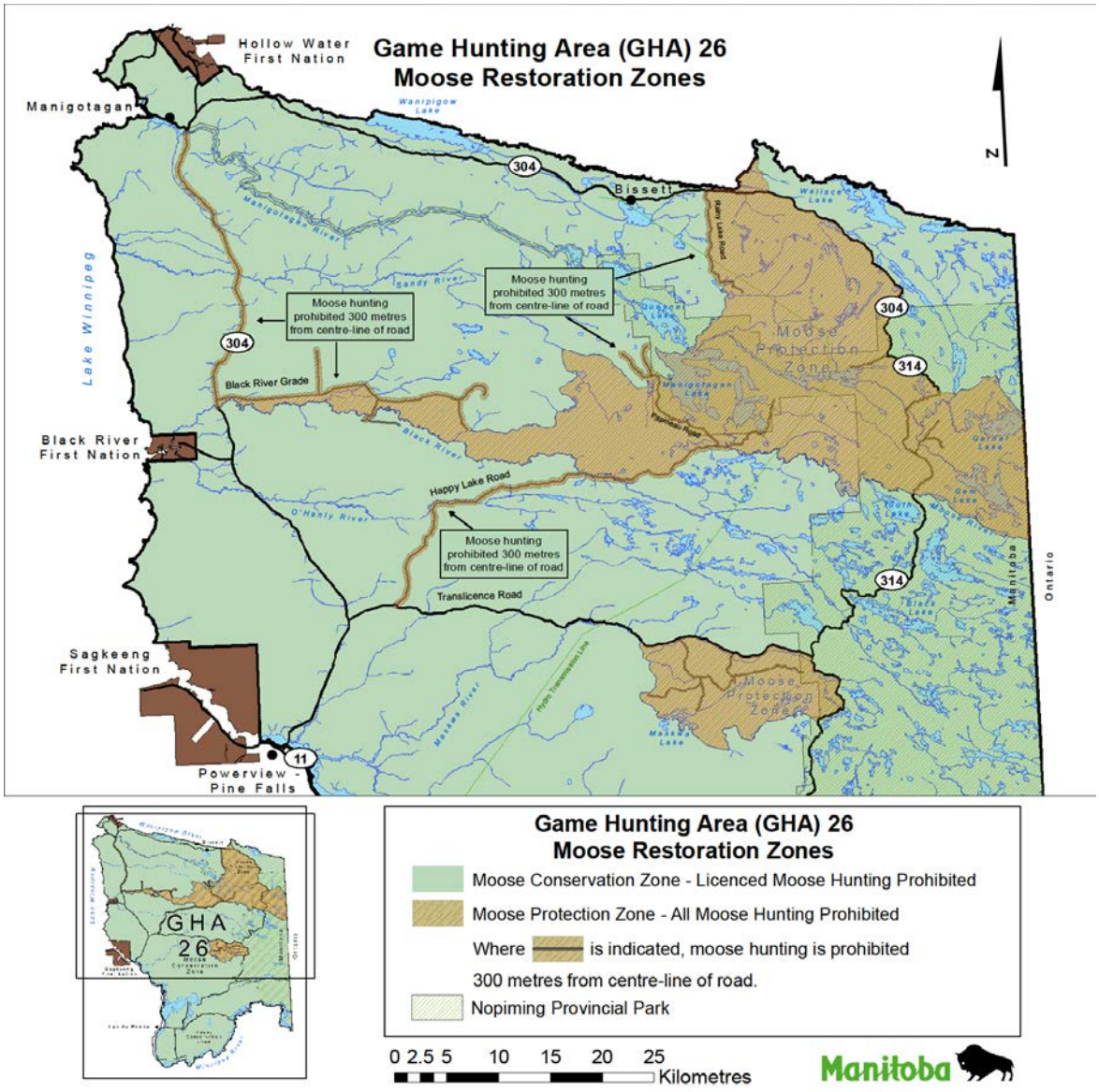
Moose are associated with riparian habitat, especially areas featuring willow, a key forage species. In the absence of such habitat, moose select stands that originate after fire or logging, which feature early successional vegetation (Doerr 1983). Forest fires in 1989 and 1999, that occurred in the Project Study Area, have produced high quality foraging areas for moose (Pubic Engagement Program Technical Report, Maskwa Ecological Consulting et al. 2012). Forest fire suppression in the region will eventually lead to a decline in high quality moose habitat (Manitoba Model Forest Committee for Cooperative Moose Management meeting minutes March 15, 2012). Regenerating patches of forest provide nutritious forage, which results in a greater number of cows giving birth to twins (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011). Other important habitat includes areas for aquatic feeding, areas of coniferous cover, and mineral licks (Palidwor et al. 1995), which are muddy pools or seepage from which moose derive nutrients (Rea et al. 2004; Manitoba Conservation 2010). Mineral licks can often be identified by the trails leading to and from the water's edge (Tankersley and Gasaway 1983; Rea et al. 2004; Manitoba Conservation 2010). No mineral licks were identified in the Project Study Area during workshop interviews, or incidentally during field studies. Young, open-canopied forest stands with deciduous trees are more suitable for food than conifer-dominated, closed canopied stands, which provide shelter from deep snow, predators, or extreme temperatures (KBM Forestry Consultants Inc. 2006), and moose calve along the Wanipigow, Manigotagan, Sandy, and Black rivers, and Duncan Creek (Hollow Water

First Nation ATK Workshop Interview August 22, 2012). Moose crossings have been identified at the mouth of the Manigotagan River and between English Brook and Second Falls (Manigotagan ATK Workshop Interview September 17, 2012). Winter habitat is a critical component of moose range. Cover is beneficial because 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). Preferred calving habitat is on islands and peninsulas, likely for predator avoidance (KBM Forestry Consultants Inc. 2006).

Moose populations in the Project Study Area have declined and a number of GHAs have been closed to hunting in order to rehabilitate moose numbers. Parts of GHA 17A, immediately north of the Project Study Area, and GHA 26, in which the Project Study Area is located, are closed to licensed hunters to allow for moose populations to recover (MCWS 2012a). Only a small fraction of GHA 17A is in the Project Study Area, north of PR #304. GHA 26 was closed to licensed hunting in 2010, and "moose restoration zones" were also closed to treaty and Aboriginal rights-based hunters in January 2012 (Government of Manitoba 2012; Figure 4-2). The moose population in GHA 17A was estimated at 1,560 individuals in the late 1980s, at 835 in the 1990s, reached a low of 505 in the mid-2000s, and is currently estimated at 518 individuals (Table 4-2). The moose population in GHA 26 increased from the mid-1980s to the early 2000s, then declined from 2005 to 2010. Fewer moose are being observed in the area (Hollow Water First Nation ATK Workshop Interview August 22, 2012). Harvest and predation are the main causes of moose mortality in GHA 26; from 2006 to 2010 gray wolves killed approximately 400 moose per year, and hunters took approximately 275 moose per year (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011).

Moose are prey for gray wolves, but wolf predation alone does not limit moose populations (Palidwor et al. 1995). Wolves have been found to kill moose in locations that are further from forest edges than moose are generally found and in locations characterized by lower road densities (Kunkel and Pletscher 2000). Black bears prey on moose calves (Bastille-Rousseau et al. 2011) and could be a significant contributor to moose calf mortality in GHA 26 (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011). Disease transmission is a contributing factor to the decline in the moose population in GHA 26 (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011). Moose populations are susceptible to infection by the parasite *Parelaphostrongylus tenuis*, which causes brainworm, a disabling neurological disease that can result in death (Palidwor et al. 1995). The natural host for the disease for a portion of its life cycle is white-tailed deer, whose range has expanded northward into GHA 26. Moose become susceptible when the habitats of the two species overlap. Moose are also susceptible to brucellosis and anthrax transmitted by livestock (Palidwor et al. 1995).

Figure 4-2: Game Hunting Area 26 Moose Restoration Zones



Source: MCWS date unknown.

Table 4-2: Estimated Moose Population in Game Hunting Areas 17A and 26, 1980s to 2010

Game Hunting Area	Survey Year	Survey Area (km²)	Overall Density (individuals/km²)	Population Estimate	Confidence Interval ± 95%	Population Range
17A	1987/1988	3,930	0.40	1,560	30.9	1,079-2,041
	1999/2000	3,224	0.18	571	52.8	270-872
	2006/2007	3,356	0.15	505	24.9	379-631
	2010/2011	3,473	0.15	518	22.4	402-634
26	1985/1986	5,469	0.16	850	29.9	647-1,011
	1992/1993	5,960	0.30	1,788	30.5	1,242-2,334
	1999/2000	6,862	0.34	2,350	17.8	1,933-2,767
	2005/2006	6,395	0.22	1,553	16.3	1,300-1,806
	2009/2010	7,702	0.11	823	18.0	675-972

Source: MCWS unpublished data.

4.2.2 American Marten

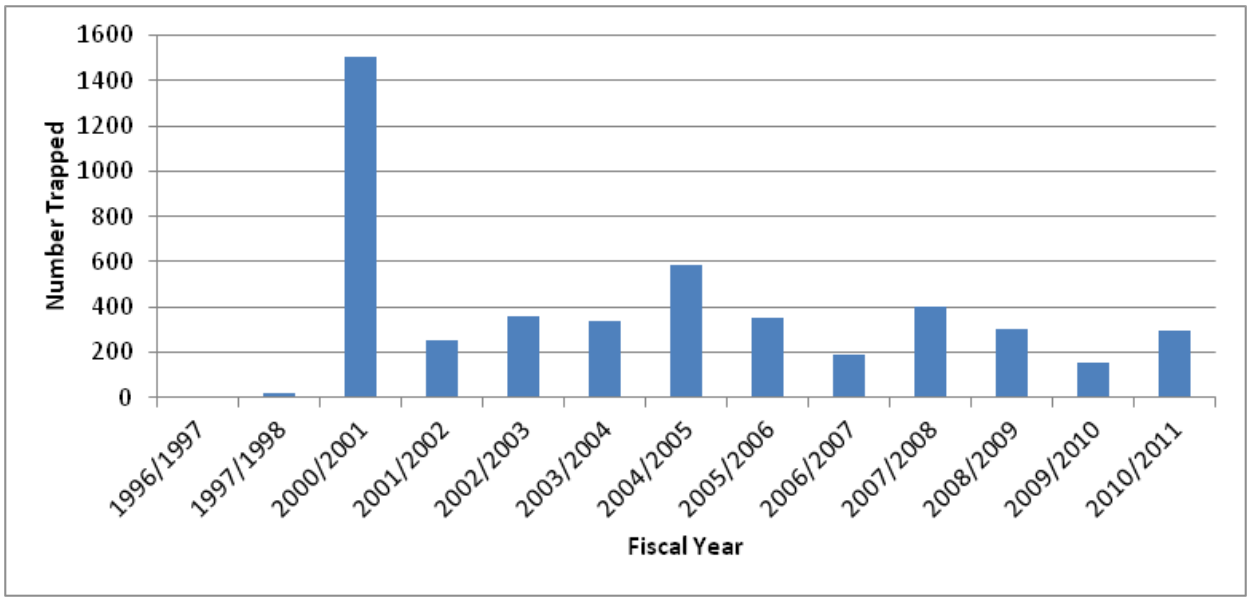
American martens are predators whose diet varies somewhat with the season (Takats et al. 1999). While voles are the preferred prey (Strickland et al. 1998; Banfield 1987), the American marten diet extends to berries, mice, shrews, snowshoe hare, squirrels, birds, amphibians, insects, and fish, when available (Banfield 1987; Ben-David et al. 1997; Takats et al. 1999). American martens have also been known to scavenge winterkilled ungulates and other carrion (Strickland et al. 1998; Ben-David et al. 1997; Takats et al. 1999).

While American martens spend much of their time in trees, they also move and hunt on the ground (Banfield 1987). Contiguous, mature, or old forest is preferred by this species (Chapin et al. 1998) and optimum habitat includes old growth spruce/fir with a minimum of 30% canopy cover (Clark et al. 1987). A well-established understory of fallen logs and stumps is important for denning and dense shrub and **forb** vegetation supports small mammal prey populations (Clark et al. 1987). American martens tend to avoid large openings such as clear cuts (Chapin et al. 1998), however it has been suggested that low levels of timber harvest may be a benefit in the short term, due to an increase in diversity and abundance of prey species (Buskirk and MacDonald 1984).

American martens are widespread, abundant, and secure throughout their range in Manitoba (NatureServe 2012). Due to their lack of adaptation to extremely cold weather, they require den sites throughout their home ranges. In winter, denning usually occurs in squirrel middens, rock piles, hollow logs, and stumps (Buskirk 1984), with a preference for subnivean dens (Wilbert et al. 2000). In warmer weather, American martens may rest in the tree canopy (Buskirk 1984), or select dens in hollow trees (Strickland et al. 1998). While there is a tendency to think of American martens as **arboreal**, they spend much of their time on the ground (Francis and Stephenson 1972; Buskirk and Ruggiero 1994).

Portions of six registered traplines overlap the Project Study Area. A total of 4,758 American martens were trapped on traplines 16, 26, 27, and 28 from 1996 to 2011 (Manitoba Conservation unpublished data). The American marten harvest was lowest in 1996/1997, and peaked in 2000/2001 (Figure 4-3) when 1,502 were trapped. These records do not give a comprehensive measure of species abundance. Factors such as demand, market prices, and trapper effort can affect the data. Instead, trapping data provides qualitative information for American marten the region.

Figure 4-3: American Marten Harvest on Four Registered Traplines Overlapping the Project Study Area, 1996 to 2011



4.2.3 Bald Eagle

Bald eagles are common in Manitoba and nest in all forested areas of the province, with some reports of pairs nesting in agricultural areas (Koonz 2003). There are an estimated 300,000 bald eagles in North America (Rocky Mountain Bird Observatory 2007). Bald eagle nests are commonly found in mature forests, usually within 2 km of a waterbody, likely associated with prey availability in the area (Buehler 2000). The bald eagle was considered rare in Manitoba Model Forest studies, and all observations were recorded in riparian forests (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). In the Project Study Area, bald eagles nest along the O'Hanly River (Black River First Nation ATK Workshop Interview August 15, 2012). When nesting in the vicinity of human activity bald eagles select nest sites at a distance from the disturbance, often including a visual buffer in the form of existing tree stands (Andrew and Mosher 1982). Nests are usually constructed in large trees that are capable of supporting stick nests and that provide the pair with a view of the surrounding area (Buehler 2000). Nests built in deciduous trees tend to collapse within a few years, but nests in conifers may last two decades (Koonz 2003).

Bald eagle roosting is similar to nesting in that individuals perch in trees close to waterbodies suitable for foraging; however, these roosts are generally located much further from waterbodies than nests (Buehler 2000). Migration patterns are complex and associated with the age of the

individual; immature eagles are generally nomadic because they have not established a nesting territory, while adult birds will migrate seasonally, usually due to food shortages as a result of seasonal weather changes (Buehler 2000). Bald eagles are seen almost all winter in the Project Study Area, likely because scraps from commercial fishing activities provide a source of food (Seymourville/Manigotagan ATK Workshop Interview August 22, 2012). Although no bald eagles were observed during field studies, they are frequently observed in the Project Study Area (Hollow Water First Nation ATK Workshop Interview August 22, 2012 and September 17, 2012). Other records in the area include observations by the Manitoba Breeding Bird Atlas.

4.2.4 Spruce Grouse

Spruce grouse distribution generally follows that of the boreal forest (Ross 2007). The species can be found throughout Manitoba, with the exception of the southwestern corner of the province, and are year-round residents. Spruce grouse inhabit mature mixedwood forests dominated by conifers and spruce bogs (Holland and Taylor 2003d) and tend to be found in upland areas (Johnsgard 2008).

The spruce grouse diet comprises insects, berries, and fungi in summer and conifer needles in winter (Ross 2007). Jack pine and tamarack needles are most frequently consumed, even when black spruce is widely available (Johnsgard 2008). Adult males are generally territorial and relatively sedentary (Johnsgard 2008). Home ranges can be 1.9 to 3.6 hectares (ha), and average 2.8 ha (Johnsgard 2008). Females nest on the ground in concealed locations such as under branches or in brush (Johnsgard 2008).

Spruce grouse are widespread and secure throughout their range (NatureServe 2012) and are hunted in Manitoba (MCWS 2012a). The spruce grouse was considered very rare in Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997), although this species is hard to detect during conventional breeding bird surveys. Although no spruce grouse were observed during field studies, other records in the area include observations from the Manitoba Breeding Bird Atlas.

4.2.5 Olive-sided Flycatcher

Olive-sided flycatchers are listed as threatened by SARA and are not listed by MBESA. The estimated population in North America is 1.2 million (Rocky Mountain Bird Observatory 2007). Threats include habitat loss and alteration, particularly due to forest harvest practices, and a general decline in insect prey (COSEWIC 2007b).

Olive-sided flycatchers are sparsely distributed south of the boreal forest tree line in Manitoba and are usually found nesting and foraging near boreal forest bogs, wet areas, or recently burned stands (Altman and Sallabanks 2000; Koonz and Taylor 2003b). In northern conifer forests they are most commonly found in edge habitats such as meadows, bogs, and clear-cuts, which appears to correspond to the availability of standing dead trees and remnant live trees that are important for singing and foraging perches (Altman and Sallabanks 2000). This species can be found in semi-open forest and natural edge adjacent to wetlands. As such, it was selected as the VEC associated with this habitat type.

The attraction to human-caused edge habitats, such as commercial logging, for nesting and foraging is a significant factor in the nesting success of olive-sided flycatchers (Robertson and

Hutto 2007). Individuals nesting in recently logged forests have lower rates of nest success when compared to those nesting in naturally burned stands (Robertson and Hutto 2007). Nesting pairs of olive-sided flycatchers have relatively large territories stretching to approximately 1.6 km per pair (Bent 1942). In habitat with dense visual buffers pairs were found nesting approximately 200 m apart (Altman 1998).

Olive-sided flycatchers migrate to Central America and northern South America in the fall, where they favour wintering habitat similar to their breeding habitat in North America (Altman and Sallabanks 2000). Their dependence on flying insects for foraging results in a late spring arrival and early fall departure (Altman and Sallabanks 2000). The olive-sided flycatcher was considered rare in Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). A single olive-sided flycatcher was recorded in the Project Study Area during field surveys (Map 8). Other olive-sided flycatcher records in the area include observations from the Manitoba Breeding Bird Atlas.

4.2.6 Canada Warbler

Canada warblers are listed as threatened by SARA and endangered by MBESA. They are found in the southern half of the boreal forest in Manitoba, and more commonly in west central Manitoba (Holland et al. 2003c). They inhabit moist mixedwood forests with dense and diverse understory growth, often near open water such as lakes or rivers (Conway 1999). As such, they were also selected as a VEC for this habitat type. Nesting habitat is usually associated with wet, mossy, forested areas; the nest itself is located in tree stumps, fallen logs, and dense ferns (Conway 1999). Nests are very well hidden and are usually inferred from adult behaviour such as territorial singing, alarm calls, and carrying food (Holland et al. 2003c). Territory sizes of Canada warblers vary according to regional habitat conditions (Conway 1999); Martin (1960) observed territories of Canada warblers in black spruce-dominated stands averaging 0.2 ha.

There are an estimated 1.4 million Canada warblers in North America and 150,000 in Manitoba (Rocky Mountain Bird Observatory 2007). Factors limiting Canada warbler populations include habitat loss and degradation in wintering and breeding ranges, paved road development, habitat fragmentation, and decline in insect outbreak cycles (COSEWIC 2008c). There has been some indication that Canada warbler populations respond positively to spruce budworm outbreaks then experience population declines in following years (Sleep et al. 2009).

Canada warblers are Neotropical migrants, traveling from their breeding range in the boreal regions of North America to wintering ranges in northern South America (Conway 1999). Fall migration is in August and September (Holland et al. 2003c). In spring, migrants arrive from mid-May to early June (Holland et al. 2003c). The Canada warbler was considered common in Manitoba Model Forest studies. Observations were about three times higher in riparian forest compared to other young or mature terrestrial forest types (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). Canada warblers were recorded at 13 sites in the Project Study Area during breeding bird surveys (Map 9). Other records in the area include observations from the Manitoba Breeding Bird Atlas.

5 EVALUATION OF ALTERNATIVE ROUTES AND INFRASTRUCTURE

The overall route selection process for the Pine Falls – Manigotagan 115 kV Transmission Line (Line PQ95) component is described in Chapter 6 of the main Environmental Assessment Report. Evaluation of the Alternative Routes focused on a predetermined set of evaluation criteria that reflect the importance of known factors identified from various perspectives including socio-economic, biophysical, cost, and technical. These criteria, as well as valuable feedback obtained from the Public Engagement Program, became the basis from which to compare and evaluate the Alternative Routes.

The Manigotagan Corner Station Site was selected on the basis of engineering and technical criteria. The preferred station site has been integrated into the Public Engagement Program and has received favourable feedback from local community representatives.

The Sections below describe the inputs for the Line PQ95 Alternative Routes and the Manigotagan Corner Station Site from the wildlife perspective.

5.1 Evaluation of Alternative Routes

Careful routing of transmission lines can avoid or minimize potentially adverse effects associated with their development. As such, the process of identification and comparison/ evaluation of Alternative Routes is based on criteria related to environmental issues and concerns, project-specific criteria identified when the Project Study Area was delineated and characterized, including initial consultation, and on the technical and economic feasibility requirements of the transmission facilities. As part of this process, potential constraints and opportunities were assessed for wildlife and wildlife habitat near the Alternative Routes and related Project infrastructure. Potential constraints and opportunities for the three proposed Alternative Routes and related Project infrastructure were identified for wildlife by using scientific literature, existing data, and professional judgement. The criteria used to assess the constraints and opportunities that consider routing alternatives for mammals are described below.

Constraints

- Movement corridors and flight paths
- Riparian habitat (i.e., watercourse crossings)
- Uncommon habitat

Opportunities

- Common habitat
- Proximity to other linear features

Mammal species and some bird groups generally have higher densities in wetland, creek, and riparian habitats, often due to edges and higher quality food and foraging opportunities (Shulz and Leininger 1991; Naiman et al. 1993). Biodiversity tends to be higher near waterbodies and watercourses (Naiman et al. 1993). Movements by waterfowl and birds of prey often occur near waterbodies and watercourses. As such, these areas are best avoided where possible. The spatial relationship of rivers, streams and creeks in the Project Study Area was assessed in relation to the proposed Alternative Routes and Project infrastructure using GIS.

The wildlife assessment of Alternative Routes A, B and C used a desktop study to identify measureable differences among the routes. Wildlife species require particular habitat types to maintain certain life functions. Habitats required by VECs and listed species were modeled and their representation on each Alternative Route was calculated using GIS. The amount of habitat that could be potentially altered on the Alternative Routes was used to select a Preferred Route for each species. To assess the general effects of the Alternative Routes on wildlife, the length of the routes was used as an estimate of the amount of habitat each would alter, where a longer route was assumed to alter more habitat than a shorter one. Riparian areas typically support a greater diversity of wildlife species than upland areas, and the number of natural and human-made watercourses crossed by each route was considered, where the fewest crossings would have the smallest effect on most wildlife species. The average distance of each route to PR #304 was measured as an indicator of habitat fragmentation. The more closely a route follows the existing ROW, the smaller the expected effect of habitat fragmentation for many wildlife species.

5.2 Description and Evaluation of Alternative and Proposed Route

5.2.1 Alternative Routes

The LWESI transmission line will run approximately 75 km from Powerview-Pine Falls to Manigotagan. Three route options were identified near PR #304. Alternative Route A is the longest with the most watercourse crossings, but follows PR #304 and an existing transmission line for much of its length. Alternative Route C is shortest with the fewest watercourse crossings (Table 5-1). As Alternative Route C would create a new linear corridor for much of its length, the effects of habitat fragmentation would be greatest for this route.

Potentially sensitive wildlife habitats were also evaluated. Habitat models that indicate the amount of suitable habitat affected on each route were developed for VECs and the listed species most likely to be found in the Project Study Area (Appendix A). Wildlife Management Areas and Important Bird Areas in the Project Study Area were considered. Wildlife Management Areas are important multi-use habitats for various wildlife species. Each of the proposed route options avoids the Observation Point Wildlife Management Area southwest of Manigotagan. Important Bird Areas are internationally significant areas for the conservation of birds and biodiversity; none were identified in the Project Study Area.

Table 5-1: Comparison of Three Alternative Routes for the LWESI Transmission Line

Alternative Route	Length (km)	Number of Watercourse Crossings	Average Distance to PR #304 (km)[a]
A	72.7	20	0.6
B	72.0	23	0.9
C	69.9	11	1.1

(a) The average distance of Alternative Routes to PR #304 was calculated using ArcGIS 10.1. Points were developed along each Alternative Route polyline at 10 m intervals using the “construct points” tool. A spatial join was then used to determine the distance of each point to the PR #304. The mean distance to the road was then calculated for each Alternative Route using Microsoft Excel 2007.

5.2.1.1 Alternative Route A

Alternative Route A is 72.7 km in length; the longest of the three routes. This route would cross the greatest amount of wildlife habitat. As indicated in the aquatics assessment, Alternative Route A crosses 20 watercourses, 15 natural and five man-made. Five of the natural watercourse crossings are at Duncan Creek, where there is generally no riparian forest habitat, only aquatic vegetation. This route would intersect marginally more riparian wildlife habitat than Alternative Route C, but less than Alternative Route B. The average distance of the route to PR #304 is 0.6 km and it would fragment marginally less habitat than Alternative Routes B and C.

5.2.1.2 Alternative Route B

At 72.0 km in length, Alternative Route B is marginally shorter than Alternative Route A, and the amount of habitat alteration would be similar on both routes. As indicated in the aquatics assessment, Alternative Route B crosses the most watercourses of the three routes (23 crossings). Five of the watercourse crossings are at Duncan Creek, where there is generally no riparian forest habitat, only aquatic vegetation. This route would intersect the most riparian wildlife habitat. The average distance of the route to PR #304 is 0.9 km; which would result in slightly more habitat fragmentation than Alternative Route B and slightly less fragmentation than Alternative Route C.

5.2.1.3 Alternative Route C

Alternative Route C is 69.9 km in length, the shortest of the three routes. Although it is expected to alter the smallest amount of wildlife habitat, Alternative Route C is only marginally shorter than Alternative Routes A and B. It crosses 11 watercourses, 9 natural and 2 man-made, the fewest of the three routes, and would intersect the least amount of riparian wildlife habitat. The average distance of the route to PR #304 is 1.1 km and it would fragment marginally more habitat than Alternative Routes A and B.

5.2.1.4 Mammals

Small Mammals

Riparian areas are typically productive for small mammals. Alternative Routes A and B, which have more watercourse crossings, are expected to have greater small mammal populations and a greater diversity of species than Alternative Route C. As the shortest route, slightly less small mammal habitat would be disturbed on Alternative Route C than on Alternative Routes A and B. Alternative Route C is slightly preferred for small mammals.

Aquatic Furbearers

Riparian areas are important habitat for aquatic furbearers. Alternative Routes A and B, with the most watercourse crossings, are expected to have a greater diversity and abundance of aquatic furbearers than Alternative Route C. However, Alternative Routes B and C would fragment the landscape to a slightly greater degree than Alternative Route A. As Alternative Routes B and C would provide slightly more access to the area by trappers, Alternative Route A, which generally follows existing linear features, is slightly preferred for aquatic furbearers.

Terrestrial Furbearers

As the shortest route, Alternative Route C would disturb less terrestrial furbearer habitat than Alternative Routes A and B. However, Alternative Routes B and C would fragment the landscape to a slightly greater degree than Alternative Route A. As Alternative Routes B and C would provide slightly more access to the area by trappers, Alternative Route A, which generally follows existing linear features, is slightly preferred for terrestrial furbearers.

Large Carnivores

Given the large home ranges of both gray wolves and black bears, it is likely that the same individuals would be affected by all Alternative Routes. None of the Alternative Routes is expected to have a greater effect on large carnivores than the others and no option is preferred.

Ungulates

As the shortest route, Alternative Route C would disturb marginally less ungulate habitat than Alternative Routes A and B. However, Alternative Routes B and C will fragment the landscape to a slightly greater degree than Alternative Route A. As Alternative Routes B and C would provide slightly more access to the area by hunters, Alternative Route A, which generally follows existing linear features, is slightly preferred for ungulates.

5.2.1.5 Birds

Waterfowl and Other Waterbirds

Waterfowl tend to follow watercourses in flight. The risk of birds colliding with transmission lines would be marginally greater on Alternative Routes A and B, with the most watercourse crossings, than on Alternative Route C, with the least watercourse crossings. A number of waterfowl and other waterbirds may inhabit the watercourses to be crossed by the transmission line. As Alternative Route C is shortest and has the fewest watercourse crossings, it is preferred for waterfowl and other waterbirds.

Colonial Waterbirds

Colonial waterbirds tend to follow watercourses in flight. The risk of birds colliding with transmission lines would be marginally greater on Alternative Routes A and B, with the most watercourse crossings, than on Alternative Route C. A number of colonial waterbirds may inhabit the watercourses to be crossed by the transmission line. As Alternative Route C is the shortest and has the fewest watercourse crossings, it is slightly preferred for colonial waterbirds.

Birds of Prey

Alternative Routes A and B, which cross more linear watercourses than Alternative Route C, are expected to have a marginally greater likelihood of bird collisions with transmission wires. As the shortest route, Alternative Route C will likely disturb less bird of prey habitat than Alternative Routes A and B. Consequently, Alternative Route C is slightly preferred for birds of prey.

Upland Game Birds

As the shortest route, Alternative Route C would disturb less habitat than Alternative Routes A and B. However, species such as grouse are often observed on ROWs. Improved access for hunters could result in increased upland game bird mortality. As Alternative Routes B and C would provide slightly more access to the area by hunters, Alternative Route A, which generally follows existing linear features, is slightly preferred for upland game birds.

Woodpeckers

Construction of the transmission line along existing linear features would result in less woodpecker habitat alteration, and Alternative Route A is slightly preferred.

5.2.1.6 Amphibians and Reptiles

Amphibians

Because amphibian breeding habitats have already been affected by existing linear features, Alternative Route A, which generally follows these features, is preferred.

Reptiles

As reptile habitats along the existing route option have already been affected by existing linear features, Alternative Route A, which generally follows these features, is preferred.

5.2.1.7 Listed Species

Little Brown Myotis

Alternative Route C crosses the least amount (61%; Appendix A, Table A-1) of little brown myotis habitat (Map Series 100). However, Alternative Routes A and B cross only marginally greater amounts (68% and 64%, respectively). Given that there is a small difference in affected habitat among routes and there are no known hibernacula on any of the routes, Alternative Route C is slightly preferred for little brown myotis.

Northern Myotis

Alternative Route C crosses the least amount (61%; Appendix A, Table A-1) of northern myotis habitat (Map Series 200). However, Alternative Routes A and B cross only marginally greater amounts (68% and 64%, respectively). Given that there is a small difference in affected habitat among routes and no known hibernacula on any of the routes, Alternative Route C is slightly preferred for northern myotis.

Wolverine

Given the large home range of wolverines, it is likely that the same individual or individuals would be found along each of the Alternative Routes. Alternative Route A, which generally follows existing linear features, will fragment marginally less habitat than Alternative Routes B and C. Alternative Routes B and C would provide slightly more access to the area by trappers.

As Alternative Route A will create a smaller amount of new access for trapping, it is slightly preferred for wolverine.

Boreal Woodland Caribou

Limited boreal woodland caribou range occurs in the Project Study Area, and core areas are not currently found there. Alternative Route A, which generally follows existing linear features, is expected to fragment slightly less habitat than Alternative Routes B and C. Routes that occur farthest west or are nearest existing linear features would reduce access effects associated with predation, disease, and possibly hunting.

Yellow Rail

Model results indicate that there is no suitable yellow rail habitat on the Alternative Routes (Map Series 300), thus none is preferred from a habitat perspective.

Least Bittern

Alternative Route B crosses the least amount (30%; Appendix A, Table A-1) of available least bittern habitat (Map Series 400). However, Alternative Routes A and C cross only a marginally greater amount (33% and 32%, respectively). Given that there is a difference of 3% or less among routes none is preferred from a habitat perspective.

Short-eared Owl

Each Alternative Route crosses the same amount (4%; Appendix A, Table A-1) of available short-eared owl habitat (Map Series 500). Given that there is no difference among routes none is preferred from a habitat perspective.

Common Nighthawk

Alternative Route A crosses the least amount (45%; Appendix A, Table A-1) of available common nighthawk habitat (Map Series 600). However, Alternative Routes B and C cross only a marginally greater amount (49% and 48%, respectively). Given that there is a difference of 4% or less among routes none is preferred from a habitat perspective

Whip-poor-will

Alternative Routes B and C cross the least amount (11%; Appendix A, Table A-1) of available whip-poor-will habitat (Map Series 700). However, Alternative Route A crosses only a marginally greater amount (12%). Given that there is a difference of 1% among routes none is preferred from a habitat perspective.

Rusty Blackbird

Alternative Route B crosses the least amount (49%; Appendix A, Table A-1) of available rusty blackbird habitat (Map Series 800). However, Alternative Routes A and C cross only a marginally greater amount (53% and 54%, respectively). Given that there is a difference of 4% or less among routes none is preferred from a habitat perspective.

Northern Leopard Frog

As a surrogate for northern leopard frog summer habitat, the number of watercourse crossings was considered. Alternative Routes A and B are expected to have a greater abundance of northern leopard frogs than Alternative Route C, which has the fewest watercourse crossings. Consequently Alternative Route C is preferred.

5.2.1.8 Valued Environmental Components

Moose

Alternative Route A crosses the least amount (33%; Appendix A, Table A-1) of available primary moose habitat (Map Series 900). However, Alternative Routes B and C cross only a marginally greater amount (38% and 34%, respectively). Each Alternative Route crosses similar amounts (29% 29%, and 32%) of secondary moose habitat. Given that there is a difference of 5% or less in the amount of primary and secondary habitat among routes none is preferred from a habitat perspective.

As Alternative Route A follows PR #304 for the majority of its length, browse on the ROW could attract moose to the road on this route, increasing the risk of moose-vehicle collisions and the harvest of moose near the road. Alternative Routes B and C are slightly more likely to enhance the accessibility of moose in the area to hunters and predators further from the road. Consequently, Alternative Route A, which generally follows existing linear features, is preferred.

American Marten

Alternative Route A crosses the least amount (45%; Appendix A, Table A-1) of American marten habitat (Map Series 1000). However, Alternative Routes B and C cross only a marginally greater amount (49% and 47%, respectively). Given that there is a difference of 4% or less among routes none is preferred from a habitat perspective. As Alternative Route A follows PR #304 for the majority of its length, it would provide less access for trapping. Alternative Route A is slightly preferred for American marten.

Bald Eagle

Alternative Route C crosses the least amount of bald eagle habitat (11%; Appendix A, Table A-1; Map Series 1100). However, Alternative Routes A and B cross only a marginally greater amount (14%). ATK indicated bald eagle habitat on Alternative Routes A and C, and an eagle nesting region was identified on Alternative Route B (see Section 6.7.1.3 of the Environmental Assessment Report). Given that there is a difference of 3% among routes none is preferred from a habitat perspective. Bald eagles tend to fly along waterways and Alternative Routes A and B, which cross more watercourses, would increase the risk of bird-wire collisions. Based on the number of watercourse crossings, Alternative Route C is slightly preferred for bald eagle.

Spruce Grouse

Alternative Route A crosses the least amount (42%; Appendix A, Table A-1) of spruce grouse habitat (Map Series 1200). However, Alternative Routes B and C cross only a marginally greater amount (46%). Given that there is a difference of 4% among routes none is preferred from a

habitat perspective. As Alternative Route A follows PR #304 for the majority of its length, it would provide less access for hunting, and it is slightly preferred for spruce grouse.

Olive-sided Flycatcher

Alternative Route crosses a relatively large amount of olive-sided flycatcher habitat (Appendix A, Table A-1; Map Series 1300). Alternative Routes A and B cross the least amount (83%) of olive-sided flycatcher habitat, However, there is virtually no difference in the amount of habitat crossed by Alternative Route C (84%). Given that there is a difference of 1% among routes none is preferred from a habitat perspective.

Canada Warbler

Alternative Routes B and C cross the least amount of available Canada warbler habitat (11%; Appendix A, Table A-1; Map Series 1400). However, there is virtually no difference in the amount of habitat crossed by Alternative Route A (12%). Given that there is a difference of 1% among routes none is preferred from a habitat perspective.

6 EFFECTS AND MITIGATION

6.1 Overview

The effects assessment followed the methods outlined in Chapter 7 of the Environmental Assessment Report. Table 6-4 in Section 6.8.2.4 provides a summary of the residual Project effects.

Based on the site selection process outlined in Chapter 3 of the Environmental Assessment Report, a Preferred Route was selected based on route comparison using several criteria, including wildlife. The Final Preferred Route is 71.6 km in length and primarily follows Alternative Route A, however some portions of Alternative Routes B and C were selected over Alternative Route A (Map 10). The Manigotagan Corner Station Site was selected on the basis of engineering and technical criteria. The following effects assessment was completed on the Final Preferred Route and station site.

A range of effects on terrestrial wildlife can be associated with the development of a transmission line. Changes in species diversity and abundance occur through the **anthropogenic** development of habitat areas such that these areas are no longer able to sustain some species. Changes in habitat composition can also lead to increases in the abundance of other species, such as increases in brown-headed cowbird populations in southern Manitoba, which can lead to increased competition for resources between wildlife species where none existed before. Construction of Project components can lead to sensory disturbance and discourage species' use of habitats. Transmission line ROWs can create increased opportunities for harvesting species by hunting, trapping, and poaching. While these activities can occur in a sustainable manner with regulation or enforcement, if done in excess they can lead to local and potentially regional declines in some mammal populations. Additional increases in mortality during operation may be observed from predation and collisions with transmission wires and towers associated with the transmission line.

In this assessment, particular attention was given to the potential effects of the Project on VECs. However, effects are also anticipated for non-VEC species. Given the diversity of species found in riparian habitat, potential effects were mitigated by selecting a transmission line route to minimize the number of watercourse crossings and to avoid areas that have not yet been altered through large-scale anthropogenic development. Reducing access to previously undisturbed areas and minimizing effects on sensitive habitat areas will also likely reduce potential Project effects on mammal species, including VECs considered in more detail below.

Clearing, construction, operation, and maintenance of the transmission line could affect terrestrial wildlife directly and indirectly in three primary ways:

- habitat loss, alteration, and fragmentation;
- sensory disturbance and disruption of movement; and
- mortality.

Terrestrial wildlife are expected to experience a loss of habitat and change in habitat structure and composition through clearing of the ROW and construction of the transmission line. Habitat alteration could have different types of effects, and potentially, more pronounced effects on some species, such as American marten and Canada warbler, than species which are associated with edges and open areas, such as olive-sided flycatcher.

Sensory disturbance and habitat fragmentation will likely affect terrestrial wildlife in the Project Study Area, and could result in disruption of their movements. Sensory disturbance will likely be due to construction activities and traffic. Such disturbances could decrease the amount of effective habitat available for various species, as individuals disturbed by construction activities will avoid active construction zones. Although there is some uncertainty as to the extent of these effects, they are not anticipated to extend beyond 1 km. Sensory disturbance could also be due to transmission line maintenance during operation. Transmission line ROWs and access trails contribute to habitat fragmentation, which reduces core area size for mammals and birds requiring large, undisturbed blocks of habitat. Sensory disturbance and habitat fragmentation could result in avoidance of the Project Study Area by mammals and birds, disrupting their movements. Such disruptions could occur temporarily during construction or over a longer term due to the presence of transmission line ROWs and Project infrastructure.

Mammal and bird mortality could occur as a result of improved access to the Project Study Area by hunters, trappers, and predators, and via accidents such as collisions with vehicles or transmission wires. Linear features including roads and transmission lines act as movement corridors for predators such as black bear and gray wolf, and improve access to formerly remote areas by resource users. Increased mortality of prey species and harvested animals could result from increased access to the Project Study Area. Improved hunting efficiency could benefit some predator species.

Because the SSEA process was used to determine the optimal locations for Project infrastructure, it is expected that many potential effects will have been mitigated entirely or minimized for terrestrial wildlife including mammals, birds, amphibians, and reptiles. Generally, construction-related effects should be minimal, as Manitoba Hydro's current fire protection practices, oil containment, and materials handling/spill response practices will be applied throughout the construction and operation phases. Mitigation for accidents and malfunctions

includes planned measures such as training in fire response protocols, and the presence of fire suppression equipment on site will reduce the extent of fire damage. Spill response programs and equipment will be in place for spillage or leaks of any oils or contaminants. All material will be stored and handled in accordance with established policies and regulations. Legislation and regulations will be followed for the transportation of dangerous goods, and on-site emergency response teams will receive training with respect to fuel spill containment, cleanup, and other emergency measures.

6.2 Valued Environmental Components

6.2.1 Moose

6.2.1.1 Construction

Potential Project effects on moose during construction include habitat loss and alteration. Habitat modeling indicates that 35% of the habitat in the transmission line footprint is primary moose habitat and 31% is secondary moose habitat (Map Series 900). Two percent of the habitat at the Manigotagan Corner Station Site is primary moose habitat and 23% is secondary habitat Less than 1% of primary habitat and secondary habitat in the Project Study Area will be affected when the transmission line ROW and Manigotagan Corner Station Site are cleared (Appendix A, Table A-2). A small loss of coniferous thermal and escape cover is anticipated. Other habitat effects include a small alteration of moose calving habitat near the Wanipigow, Manigotagan, Sandy, and Black rivers, and Duncan Creek (Hollow Water First Nation ATK Workshop Interview August 22, 2012).

Natural mineral licks are an important source of sodium (Tankersley and Gasaway 1983) and other nutrients (Ayotte et al. 2006) for moose. These features are very sensitive to land development activities (Domaar and Walker 1996; Rea et al. 2004). Although no mineral licks were found incidentally during field studies and none were identified during the ATK workshops, if present, mitigation involving set-back distances will be required to minimize Project effects (see Section 6.8.1).

Sensory disturbances during construction (e.g., traffic, machinery) could result in a loss of **effective habitat** and disruption of movements. In addition to the physical habitat affected by clearing, the avoidance of construction zones could temporarily reduce the amount of habitat near the transmission line and disrupt their movements through it. However, moose do not easily abandon suitable areas (RRCS 1994) and often return when disturbances end (Colescott and Gillingham 1998). Because moose do not easily abandon habitat and are likely to return when the disturbance ends, the effects of sensory disturbance and disruption of movements on moose in the Project Study Area are expected to be negligible to small and temporary.

Other Project effects on moose could include increased mortality due to collisions with vehicles and to hunting. Traffic on PR #304 will likely increase during construction, increasing the risk of moose-vehicle collisions, which have been reported in the area (Black River First Nation ATK Workshop Meeting August 15, 2012). While vehicles may occasionally collide with moose due to increased local construction traffic, such events are uncommon (Terrestrial & Aquatic Environmental Managers 1993) and will likely have a negligible effect on the moose population. The temporary presence of workers in the area could increase the number of hunters and the

number of moose harvested. Because the licensed moose hunting season in GHA 26 was closed in 2010 and some areas were closed to all hunting in early 2012 (Government of Manitoba 2012), no effect on the moose population is anticipated. However, as the moose population is currently low in GHA 26, substantial Project-related moose mortality, although not anticipated, could negatively affect the recovery rate of moose in the Project Study Area.

6.2.1.2 Operation

Potential Project effects on moose during operation include habitat alteration and fragmentation. No additional loss of moose habitat is anticipated during operation; however, vegetation on the ROW is expected to regenerate over time, which will likely provide forage for moose (KBM Forestry Consultants Inc. 2006; Peek 2007). Periodic maintenance will be required to prevent vegetation from reaching heights that could interfere with the function of the transmission line, impede access for maintenance workers, or create a fire hazard (Manitoba Hydro 2007). Vegetation management will likely disturb moose habitat periodically; however, as moose prefer younger vegetation to mature vegetation and regenerating shrub communities for forage (KBM Forestry Consultants Inc. 2006; Peek 2007), the effect of periodic maintenance on moose habitat will be negligible.

The ROW could contribute to habitat fragmentation in the Project Study Area. As the Preferred Route mainly follows existing ROWs, the direct effects of habitat fragmentation on moose are expected to be negligible to small. Habitat fragmentation could also indirectly affect moose by attracting white-tailed deer to the ROW. As deer prefer edge habitat, increased fragmentation could provide access to the Project Study Area and suitable habitat for deer (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011). Deer can transmit the brainworm and liver fluke parasites to moose. The brainworm parasite, which is known to occur in the area, is harmless to deer but fatal to moose (Terrestrial & Aquatic Environmental Managers 1993; Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011). Liver flukes can also contribute to moose mortality (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011), if moose are in a weakened state. The creation of favourable deer habitat (Manitoba Model Forest 1994) and increased white-tailed deer movements in the Project Study Area could result in a greater rate of infection for moose; however, as the Preferred Route mainly follows existing ROWs, the redistribution of deer range, and the potential spread of brainworm or liver flukes, is not anticipated beyond those habitats already affected by deer range in GHA 26.

Potential Project effects on moose could include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb moose; however, such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on moose are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. As the ROW will generally follow PR #304, moose in the area are expected to be accustomed to disturbance from vehicles, and no additional effect is anticipated. Moose in the region follow the same trails and use the same areas as in the past (Manigotagan ATK Workshop Interview September 17, 2012). Moose movements in the area could be disrupted due to habitat fragmentation and the presence of Project infrastructure. Moose are resilient to development features on the landscape (Laurian et al. 2008) and often use edge habitat (Dussault et al. 2005). Local First Nations members indicated that the ROW might not change moose habits (Manigotagan ATK Workshop Interview

September 17, 2012). As such, disruption of moose movements by the transmission line ROW will likely be negligible.

Moose mortality could increase during operation due to hunting and predation. The moose population is in decline in GHA 26, and although not anticipated, substantial Project-related moose mortality could negatively affect the recovery rate of moose in the Project Study Area. As moose numbers in GHA 26 are expected to increase with on-going management, harvest effects are still of concern for future moose population management. Local First Nations members are particularly concerned that easier access will be provided for hunters from outside the area to harvest moose (Manigotagan ATK Workshop Interview September 17, 2012). Increased site lines for hunters and predators where the ROW follows existing linear features and more efficient movement for predators such as gray wolves could contribute to moose mortality (James and Stuart-Smith 2000). While the moose season is currently closed in the Project Study Area and surrounding region, the illegal harvest of moose is also a concern. Because the transmission line ROW generally follows existing linear features, and no new access to unaffected interior core area populations of moose in the Project Study Area is anticipated, and with mitigation, the effects on moose mortality are expected to be small in the Project Study Area.

6.2.2 American Marten

6.2.2.1 Construction

Potential Project effects on American marten during construction include habitat alteration. Habitat modeling indicates that 45% of the habitat in the transmission line footprint is suitable for American marten (Map Series 1000). Less than 1% of American marten habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). There is no American marten habitat in the Manigotagan Corner Station footprint.

Sensory disturbance due to clearing and construction activities could cause American martens to avoid the construction zone, reducing the amount of effective habitat in the Project Study Area and altering their movements throughout their home ranges. American martens appear to tolerate intermittent sensory disturbance due to motorized vehicles (Zielinski et al. 2008). Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise; however, construction noise and the presence of workers will likely be constant for a short period of time as clearing and construction progress along the ROW. American martens that avoid the area will likely find suitable habitat elsewhere in their home ranges, and are expected to return to the area after the sensory disturbance ends.

Other potential Project effects on American marten include increased mortality due to trapping. As portions of the ROW could create new access in the Project Study Area, trapping activity could increase in the area. Because trapping is unlikely to occur in an active construction area, and because trapping success will likely be limited if American marten avoid the area during construction, no effect on mortality is anticipated during construction.

6.2.2.2 Operation

Potential Project effects on American marten during operation include habitat alteration and fragmentation. No additional loss of American marten habitat is anticipated during operation;

however, vegetation on the ROW is expected to regenerate over time and will likely be used by martens, as they may occupy openings narrower than 100 m in summer and winter (Clark et al. 1987). Because there will be a buffer of forested habitat between PR #304 and the transmission line instead of a single wide ROW, fragmentation effects that would be associated with the east-west movements of American marten are not expected. Periodic vegetation management could alter useable American marten habitat on the ROW. Although marten do not make extensive use of openings (Clark et al. 1987), because of some vegetation regrowth, the effect of habitat alteration is expected to be small. Overall, the ROW could contribute to habitat fragmentation in the Project Study Area, but as the Preferred Route mainly follows existing ROWs, the effects of habitat fragmentation on American marten are expected to be negligible to small.

Project effects on American marten could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb American marten; however, such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on American marten are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. American martens appear to tolerate intermittent sensory disturbance due to motorized vehicles (Zielinski et al. 2008). Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise, and no additional effect is anticipated. The ROW could create a barrier to movements until some vegetation regenerates. The ROW will be 60 m in width, which will not likely impede American marten movements (Clark et al. 1987). As such, disruption of American marten movements by the transmission line ROW will likely be negligible.

American marten mortality could increase during operation due to trapping. As portions of the ROW could create new access in the Project Study Area, trapping activity could increase in the area. If trapping effort surpasses a sustainable level, a corresponding decrease in the American marten population could be expected. As a limited number of traplines overlap the ROW, and because trappers are stewards of their traplines (Fur Institute of Canada 2003), and as MCWS manage and monitor the provincial trapping of fur on a sustainable basis, the American marten harvest will not likely exceed sustainable levels.

6.2.3 Bald Eagle

6.2.3.1 Construction

Potential Project effects on bald eagle during construction include habitat alteration. Habitat modeling indicates that 12% of the habitat in the transmission line footprint is suitable for bald eagle (Map Series 1100). Less than 1% of bald eagle habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). There is no bald eagle habitat in the Manigotagan Corner Station footprint. Bald eagle nests could be damaged or removed during clearing. While some loss of bald eagle habitat is anticipated, transmission towers can provide nesting habitat for bald eagles (Guinn 2004; Gross and Brauning 2011). With mitigation, the overall effect will be negligible.

Sensory disturbance and disruption of movements can affect bald eagles during construction. Bald eagles arrive early in Manitoba (as early as mid-March to late April). Bald eagles are relatively sensitive to sensory disturbance (Buehler 2000) and effective habitat could be reduced in the Project Study Area if clearing and construction occur into early spring. If construction occurs in summer, sensory disturbance could affect breeding and nesting activities and disrupt

daily movements in the Project Study Area. As bald eagles are migratory, none are expected to be in the Project Study Area in winter. If construction continues into early spring, the effects of sensory disturbance and disruption of movements will likely be negligible because few bald eagles are anticipated along the transmission line. No effects on seasonal movements are anticipated, as bald eagles migrate long distances with relatively few stopovers (Laing et al. 2005), and they generally fly an estimated minimum of 1 km above the ground (Harmata 1984). As such, construction activities are not expected to affect migration movements over the Project Study Area.

Bald eagles are somewhat susceptible to collisions with vehicles, particularly when scavenging road-killed carcasses (Stinson et al. 2007). Local increases in traffic associated with clearing and construction could temporarily increase the risk of collisions with vehicles, potentially increasing the occurrences of mortality or injury. Collisions with vehicles are infrequent relative to other sources of mortality (Harmata et al. 1999), and with mitigation, the effects on the bald eagle population will likely be negligible.

6.2.3.2 Operation

No additional loss of bald eagle habitat is anticipated during operation. The transmission towers could provide nesting habitat (Guinn 2004; Gross and Brauning 2011), but nests could interrupt power transmission (Steenhoff et al. 1993), necessitating their removal (Manitoba Hydro 2010). Because alternate habitat is available, these effects are considered neutral.

Project effects on bald eagle could include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb bald eagles, particularly during the spring nesting season; however, such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on bald eagle are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise, and no additional effect is anticipated. As bald eagles are known to perch and nest on transmission towers, the transmission line is not expected to affect their daily movements, but could possibly enhance them to a small degree. No effects on seasonal movements are anticipated.

Potential Project effects on bald eagle also include increased mortality. Bald eagles are susceptible to electrocution (Harness and Wilson 2001; Millsap et al. 2004) and the risk of death or injury could increase if they perch or nest on transmission towers. A minimum of 1.5 m, 1.2 m vertical, and 1.5 m diagonal spacing between electrically conductive points on the transmission line is required to prevent most bird of prey electrocutions (APLIC 2006). The wide spacing of the lines between the conductors, and the configuration of the transmission line makes this effect highly unlikely (see Project Description). Collisions with wires are another source of mortality associated with transmission lines (Mojica et al. 2009). As collisions with wires are more likely over or near open water, the risk of collision would likely be greatest near rivers such as the Manigotagan and the Winnipeg River. No overhead transmission lines will be used at the Winnipeg River crossing (see Project Description). Although other rivers such as the Black and O'Hanly rivers have suitable forage fish species (e.g., walleye, northern pike, white sucker - see Aquatic Technical Report, Miette 2012) for bald eagle, because these rivers are narrow in width and are less suitable for foraging by eagles, bird-wire collisions are not expected at these sites. With mitigation, effects of increased mortality on the bald eagle population are expected to be

negligible. With mitigation (see Section 6.8), effects of increased mortality on the bald eagle population are expected to be small.

6.2.4 Spruce Grouse

6.2.4.1 Construction

Potential Project effects on spruce grouse during construction include habitat loss. Habitat modeling indicates that 40% of the habitat in the transmission line footprint is suitable for spruce grouse (Map Series 1200). Less than 1% of spruce grouse habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). There is no spruce grouse habitat in the Manigotagan Corner Station footprint. Spruce grouse are expected to find undisturbed habitat in the Project Study Area (Potvin et al. 1999) and the effects of habitat loss are expected to be small and short-term.

Sensory disturbance and disruption of movements can affect spruce grouse during construction. If clearing and construction occur in spring and early summer, sensory disturbance could affect breeding and nesting activities and disrupt daily movements in the Project Study Area. While spruce grouse are tolerant of human presence, males will cease their spring displays when disturbed (Holland and Taylor 2003d). Spruce grouse inhabit the Project Study Area year-round; habitat avoidance and disruption of daily movements are also anticipated for winter. There will be no effects on seasonal movements as this species does not migrate. Effects will be temporary and limited to the local population, and are expected to be small.

Project effects on spruce grouse could include increased mortality. As the ROW is cleared, opportunities for harvest of spruce grouse could increase. As the season for these species ends in mid-December (MCWS 2012a), legal harvest will not occur if clearing occurs out of season. Because domestic or illegal harvest is unlikely to occur in an active construction area, and because if it occurs, harvest success would be limited because spruce grouse are expected to avoid the area during construction, no effects are anticipated. Collisions with vehicles, a potential source of spruce grouse mortality due to increased traffic on PR #304 during construction, have been recorded, but do not appear to be common (Clevenger et al. 2003). If clearing and construction occur in spring, spruce grouse nests could be damaged or destroyed. With mitigation, these effects will not occur. Individuals foraging on the cleared ROW could be susceptible to collisions with construction machinery, but vehicle speeds are expected to be slow and controlled, reducing the risk of collisions. As the harvest is not expected to increase during construction and collisions with vehicles are unlikely, increased mortality is expected to have a negligible effect on the local spruce grouse population.

6.2.4.2 Operation

Potential Project effects on spruce grouse during operation include habitat alteration and fragmentation. No additional loss of spruce grouse habitat is anticipated during operation; however, vegetation on the ROW is expected to regenerate over time, and is expected to be used by spruce grouse to a small degree. Periodic vegetation management could alter spruce grouse habitat on the ROW. Vegetation management is expected to be infrequent, and vegetation will regenerate. The ROW would also contribute to habitat fragmentation in the Project Study Area. As the Preferred Route mainly follows existing ROWs, the effects of habitat fragmentation on spruce grouse are expected to be negligible to small.

Project effects on spruce grouse could include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb spruce grouse, particularly during the spring nesting season; however, such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on spruce grouse are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle and snowmobile use on the ROW is also possible. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise, and no additional effect is anticipated. Daily movements could be affected, as spruce grouse use open areas less than forested areas (Huggard 2003) and individuals could avoid the ROW. No effects on seasonal movements are anticipated, as spruce grouse do not migrate. As sensory disturbance and disruption of movements will affect a limited number of individuals in the immediate area of the transmission line, effects on the spruce grouse population are expected to be negligible.

Spruce grouse mortality could increase during operation. Portions of the ROW could provide improved access to hunters in the Project Study Area and increase the spruce grouse harvest. As the ROW will generally follow existing linear features, access to the area beyond what is currently available will be limited. Provincial harvest management strategies and regulations are an important consideration in ensuring sustainable spruce grouse populations. Any increased mortality related to domestic or regulated hunting will likely be negligible relative to the spruce grouse population in the Project Study Area. Upland game birds such as spruce grouse are vulnerable to collisions with transmission lines, partially attributed to their somewhat clumsy flying ability (Janss 2000; Bevanger and Brøseth 2001). Transmission lines with ground wires to protect against lightning tend to increase the susceptibility of some bird species to collisions (Bevanger and Brøseth 2001). As the number of levels of wires increases, and where guyed wires are used to support transmission line towers, so does the chance of collision (Bevanger and Brøseth 2001). Because the risk of collisions is very small and they are unlikely to occur, only a small increase in spruce grouse mortality is anticipated during operation. Occasional wire strikes are not expected to have a measureable effect on a healthy local population.

6.2.5 Olive-sided Flycatcher

6.2.5.1 Construction

Potential Project effects on olive-sided flycatcher during construction include habitat loss and alteration, which are threats to olive-sided flycatcher populations (COSEWIC 2007b). Habitat modeling indicates that 85% of the habitat in the transmission line footprint is suitable for olive-sided flycatcher (Map Series 1300). Less than 1% of olive-sided flycatcher habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). Seventy-four percent of the habitat in the Manigotagan Corner Station footprint is olive-sided flycatcher habitat; less than 1% of olive-sided flycatcher habitat in the Project Study Area will be lost at the Manigotagan Corner Station Site. Olive-sided flycatchers occupy the edges of forest openings but require residual live trees and standing dead trees for nesting and foraging (COSEWIC 2007b). As such, habitat alteration due to clearing will likely have a small effect on the local olive-sided flycatcher population.

Project effects could include sensory disturbance and disruption of movements. If clearing and construction occur in spring and early summer, sensory disturbance could affect breeding and nesting activities and temporarily reduce the amount of effective habitat in the Project Study Area, possibly resulting in reduced reproductive success. No effects are anticipated for winter,

as this species is migratory and will be absent. With mitigation, these effects are expected to be neutral for the transmission line, and negligible at the Manigotagan Corner Station Site where year-round construction activities are anticipated.

Few direct sources of olive-sided flycatcher morality are anticipated during the construction phase. If clearing and construction occur in spring, nests could be damaged or destroyed. Collisions with vehicles are not reported as a source of mortality in the literature. With mitigation, these effects will be neutral.

6.2.5.2 Operation

No additional loss of olive-sided flycatcher habitat is anticipated during operation, and effects associated with habitat fragmentation are expected to be negligible due to the species' preference for open areas at the edges of forests. Olive-sided flycatchers could benefit from edge habitat created along the ROW. However, human disturbances such as forest clearing can mimic more suitable natural habitat, attracting nesting birds and reducing nest success (Robertson and Hutto 2007). Such habitat selection will be local, and will affect a few individuals rather than populations (Robertson and Hutto 2006). The removal of standing dead **danger trees** (individual tall trees that are close to interfering with transmission line operation and safety) during operation could marginally reduce the site suitability of habitat adjacent to the ROW for olive-sided flycatcher. These habitat effects are considered negligible to small.

Project effects on olive-sided flycatcher could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb olive-sided flycatchers in the vicinity of the ROW, particularly during the spring nesting season. Such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on olive-sided flycatcher are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Although excessive noise can affect breeding bird communications (e.g., Brumm 2004; Habib et al. 2007; Goodwin and Shriver 2011), no additional effect is anticipated because of the intermittent nature of the noise. No effects are anticipated for winter, as this species is migratory and will be absent. No disruption of movements are anticipated because olive-sided flycatchers favour openings as habitat.

Few sources of Project-related olive-sided flycatcher mortality are anticipated during operation. As olive-sided flycatchers are relatively small and mobile, no collisions with the transmission line are expected. Vegetation management conducted in spring could result in damage or destruction of nests, reducing the population's nesting success. Human activities that create edge areas have been identified as potential 'ecological traps' where predation by squirrels and **corvids** causes increased mortality (Altman and Sallabanks 2000). Although the loss of individual birds or eggs could have a negative effect on the local population, these effects are expected to be negligible to small.

6.2.6 Canada Warbler

6.2.6.1 Construction

Potential Project effects on Canada warbler during construction include habitat alteration, which is a threat to Canada warbler populations (COSEWIC 2008c). Habitat modeling indicates that

10% of the habitat in the transmission line footprint is suitable for Canada warbler (Map Series 1400). In all, less than 1% of Canada warbler habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). There is no Canada warbler habitat in the Manigotagan Corner Station footprint. Small habitat alterations and losses may affect a few individuals but are not expected to have a measureable effect on the local Canada warbler population or on breeding and nesting habitat availability. As a small loss of habitat is expected, effects on the local Canada warbler population will likely be small.

Project effects could also include sensory disturbance and disruption of movements. If clearing and construction occur in spring and early summer, sensory disturbance could affect breeding and nesting activities and temporarily reduce the amount of effective habitat in the Project Study Area, possibly resulting in reduced reproductive success. No effects are anticipated for winter, as this species is migratory and will be absent. With mitigation, including the avoidance of clearing and construction during the breeding and nesting season, no Project effects are anticipated during construction.

Few direct sources of Canada warbler mortality are anticipated during construction. If clearing and construction occur in spring, nests could be damaged or destroyed. Collisions with vehicles are not reported as a source of mortality in the literature, but there is a very small chance for such accidents to occur. With mitigation, these effects will be neutral.

6.2.6.2 Operation

Potential Project effects on Canada warbler during operation could include habitat alteration and fragmentation. No additional loss of Canada warbler habitat is anticipated during operation. The Canada warbler is relatively resilient to some levels of human-caused disturbance (Cooper et al. 1997) but could be vulnerable to brown-headed cowbird **brood parasitism**, which is much greater in habitat edges associated with fragmentation than in interior forests (Chace et al. 2005; Tewksbury et al. 2006). Brown-headed cowbirds were rare in the Manitoba Model Forest studies (Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting 1997). Few brown-headed cowbirds are expected in forested habitats in the Project Study Area because they are associated with forest openings near agricultural land (Coker and Capen 1995), which generally occur in the south. Overall, the effects of habitat alteration and fragmentation are expected to be negligible to small.

Project effects on Canada warbler could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb Canada warblers in the vicinity of the ROW, particularly during the spring nesting season. Such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on Canada warbler are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Although excessive noise can affect breeding bird communications (e.g., Brumm 2004; Habib et al. 2007; Goodwin and Shriver 2011), no additional effect is anticipated because of the intermittent nature of the noise. No effects are anticipated for winter, as this species is migratory and will be absent. The presence of the ROW could affect the daily or seasonal migratory movements of Canada warblers in the Project Study Area. As this species migrates long distances and would encounter many natural and **anthropogenic** obstacles, and because it is somewhat tolerant of human disturbances, effects on daily or seasonal movements will likely be negligible.

Few sources of Project-related Canada warbler mortality are anticipated during operation. As Canada warblers are relatively small and mobile, no collisions with the transmission line are expected. Vegetation management conducted in spring could result in damage or destruction of nests, reducing the population's nesting success. Although the loss of individual birds or eggs could have a negative effect on the local population, these effects are expected to be negligible to small.

6.3 Listed Species

6.3.1 Little Brown Myotis and Northern Myotis

6.3.1.1 Construction

Potential Project effects on little brown myotis and northern myotis during construction include habitat loss and alteration. The results of a habitat modeling exercise indicate that 74% of the habitat in the transmission line footprint is suitable for these species (Map Series 100 and 200). In all, less than 1% of little brown myotis and northern myotis habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). Seventy-four percent of the habitat in the Manigotagan Corner Station footprint is little brown myotis and northern myotis habitat; less than 1% of this habitat in the Project Study Area will be lost at the Manigotagan Corner Station Site. The loss of mature forest will reduce roosting and foraging sites for these bat species, which could decrease their abundance (Crampton and Barclay 1998). There are no known hibernacula in the Project Study Area.

Project effects on little brown myotis and northern myotis could include sensory disturbance. The effects of sensory disturbance on these species are not well documented. Bats roosting near the construction zone could be disturbed by construction noise in spring and summer, but are expected to find other areas in which to roost (Fenton and Barclay 1980). No effects are anticipated for winter, as bats will be in hibernation, and there are no known hibernacula in the area.

No Project-related mortality of little brown myotis or northern myotis is anticipated. Disturbance of hibernating bats can reduce their chance of survival (Fenton and Barclay 1980); however, there are no known hibernacula in the Project Study Area. The greatest threat to these species is white-nose syndrome (COSEWIC 2012), which is unrelated to Project effects.

6.3.1.2 Operation

No additional loss of little brown myotis and northern myotis habitat is anticipated during operation. No effects of habitat alteration or fragmentation are expected.

Project effects on little brown myotis and northern myotis could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb roosting bats in the vicinity of the ROW. Such events will be brief and infrequent. No disruption of bat movements is anticipated, as bats can be found in a range of habitats, including openings in forests, and are not expected to avoid the transmission line ROW.

No Project-related mortality of little brown myotis or northern myotis is anticipated. As bats are small, agile, and use echolocation for navigation (Fenton and Barclay 1980), they are not expected to collide with transmission wires. The greatest threat to these species is white-nose syndrome (COSEWIC 2012), which is unrelated to Project effects.

6.3.2 Wolverine

6.3.2.1 Construction

Potential Project effects on wolverine during construction include habitat loss and alteration. Dens sites could be lost during clearing. Given the large home range of a single wolverine, it is unlikely that habitat loss will have a measurable effect on the wolverine population.

Sensory disturbance due to clearing and construction activities could cause wolverine to avoid the construction zone, reducing the amount of effective habitat in the Project Study Area and altering their movements through their home ranges. As the Project Study Area represents a fraction of a wolverine's home range, minimal effects on the population are anticipated. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise; however, construction noise and the presence of workers will likely be constant for a short period of time as clearing and construction progress along the ROW. Wolverines that avoid the area will likely find suitable habitat elsewhere in their home ranges, and are expected to return to the area after the sensory disturbance ends.

Other potential Project effects on wolverine include increased mortality due to trapping. As portions of the ROW could create new access in the Project Study Area, trapping activity could increase in the area. If trapping effort surpasses a sustainable level, a corresponding decrease in the wolverine population could be expected. As a limited number of traplines overlap the ROW and trappers are stewards of their traplines (Fur Institute of Canada 2003), the wolverine harvest will not likely exceed sustainable levels. Trapping effort and success in the area during construction will likely be limited because wolverines are sparse in the area and are expected to avoid the construction zone.

6.3.2.2 Operation

Potential Project effects on wolverine during operation include habitat alteration and fragmentation. No additional loss of wolverine habitat is anticipated. The ROW could contribute to habitat fragmentation in the Project Study Area. As the Preferred Route mainly follows existing ROWs, the effects of habitat fragmentation on wolverine are expected to be negligible to small.

Project effects on wolverine could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb wolverine; however, such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on wolverine are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise, and no additional effect is anticipated. The ROW could create a barrier to movements; however, wolverines can be found on transmission line ROWs (Harriman and Baker 2003). As such, the effects of disrupted movements by the transmission line ROW will likely be negligible.

Wolverine mortality could increase during operation due to trapping. As portions of the ROW could create new access in the Project Study Area, trapping activity could increase in the area. If trapping effort surpasses a sustainable level, a corresponding decrease in the wolverine population could be expected. A limited number of traplines overlap the ROW. Additionally, because trappers are stewards of their traplines (Fur Institute of Canada 2003) and MCWS manage and monitor the provincial trapping of furbearers on a sustainable basis, the wolverine harvest will not likely exceed sustainable levels.

6.3.3 Boreal Woodland Caribou

6.3.3.1 Construction

Potential Project effects on boreal woodland caribou during construction include habitat loss and alteration, sensory disturbance, and disruption of movements. Food and cover could be lost during clearing of the transmission line ROW. Additionally, sensory disturbances during construction (e.g., traffic, machinery) could result in a loss of effective habitat and disruption of movements; the avoidance of construction zones could temporarily reduce the amount of habitat caribou use in the Project Study Area and disrupt their movements through it. Given that the Owl-Flintstone boreal woodland caribou core range is located outside the Project Study Area, caribou are highly unlikely to be in the area and will not be affected.

Other Project effects on boreal woodland caribou could include increased mortality due to collisions with vehicles and to hunting. Traffic on PR #304 will likely increase during construction, increasing the risk of caribou-vehicle collisions. Given that the Owl-Flintstone boreal woodland caribou core range is located outside the Project Study Area, caribou-vehicle collisions are considered to be highly unlikely. There is no legal harvest, traditional or licensed, for caribou in GHA 26 thus no effect on the caribou population is anticipated from increased access for hunting (Manitoba Conservation 2011). Illegal hunting has been cited as a concern for boreal woodland caribou herds (Manitoba Conservation 2011); however, the Owl-Flintstone population's range does not overlap the Project footprint and no new access will be created. As the Owl-Flintstone population is currently considered to be self-sustaining (Environment Canada 2012) and caribou are highly unlikely to be in the area, no effects on caribou are anticipated.

6.3.3.2 Operation

Potential Project effects on boreal woodland caribou during operation include habitat alteration and fragmentation; however, habitat and fragmentation effects are not expected because the core range of Owl-Flintstone boreal woodland caribou is not located in the Project Study Area. As the Preferred Route mainly follows existing ROWs, and because caribou are highly unlikely to be in the area, no effects on caribou are anticipated.

Project effects on occasionally occurring individual animals could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb caribou; however, such events will be brief and infrequent, and maintenance activities follow well-established guidelines. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible.

Roads and ROW development facilitate the movement of predators and increase the potential for human disturbance, which can impact caribou on affected ranges. Recreational development

in southeastern Manitoba has applied similar pressures through increased access, service line development, and higher levels of human activity (MCWS 2011).

There is no legal harvest, traditional or licensed, for caribou in GHA 26 thus no effect on the caribou population is anticipated from increased access (Manitoba Conservation 2011). Illegal hunting has been cited as a concern for boreal woodland caribou herds (Manitoba Conservation 2011); however, the Owl-Flintstone population's range does not overlap the Project footprint and no new access will be created.

Habitat fragmentation could indirectly affect caribou by attracting white-tailed deer to the ROW. As deer prefer edge habitat, increased fragmentation could provide access to the Project Study Area and suitable habitat for deer (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011). Deer can transmit the brainworm and liver fluke parasites to caribou. The brainworm parasite, which is known to occur in the area, is harmless to deer but fatal to caribou (Terrestrial & Aquatic Environmental Managers 1993; Thomas and Gray 2002). The creation of favourable deer habitat (Manitoba Model Forest 1994) and increased white-tailed deer movements in the Project Study Area could result in a greater rate of infection for caribou. As caribou select habitats to avoid other ungulates and associated predators, infection is considered uncommon. Additionally, the Owl-Flintstone population's range does not overlap the Project footprint and no deer-caribou contact as a direct result of the Project is anticipated.

6.3.4 Yellow Rail

6.3.4.1 Construction

Potential Project effects on yellow rail during construction include habitat loss and alteration, which are threats to yellow rail populations (COSEWIC 2009a). There does not appear to be suitable yellow rail habitat in the transmission line and Manigotagan Corner Station footprints (Appendix A, Table A-2; Map Series 300). No effects on the species are anticipated during construction.

6.3.4.2 Operation

As there does not appear to be suitable yellow rail habitat in the Project footprint and little in the Project Study Area, limited Project-related effects on the species are anticipated during operation. Collisions with tall structures contribute to yellow rail mortality (Goldade et al. 2002), and individual birds could occasionally collide with the transmission wires while traveling through the area. The loss of individual birds could have a negative effect on the local population.

6.3.5 Least Bittern

6.3.5.1 Construction

Potential Project effects on least bittern during construction include habitat loss and alteration, which are threats to least bittern populations (COSEWIC 2009b). Habitat modeling indicates that 38% of the habitat in the transmission line footprint is suitable for least bittern (Map Series 400). Less than 1% of least bittern habitat in the Project Study Area will be affected when the

transmission line ROW is cleared (Appendix A, Table A-2). Seventy-four percent of the habitat in the Manigotagan Corner Station footprint is least bittern habitat; less than 1% of least bittern habitat in the Project Study Area will be affected by clearing for the Manigotagan Corner Station. Small habitat alterations and losses may affect a few individuals but are expected to have a small effect on the local least bittern population or on breeding and nesting habitat availability.

Project effects could also include sensory disturbance and disruption of movements. If clearing and construction occur in spring and early summer, sensory disturbance could affect breeding and nesting activities and temporarily reduce the amount of effective habitat in the Project Study Area, possibly resulting in reduced reproductive success. No effects are anticipated for winter, as this species is migratory and will be absent. Effects of sensory disturbance will be temporary and limited to the local population. Seasonal and daily movements could be affected as individuals will likely avoid the construction zone. Effects of altered movements will be local and limited to the construction period, and are expected to be small.

Few direct sources of least bittern mortality are anticipated during construction. If clearing and construction occur in spring, nests could be damaged or destroyed. Collisions with vehicles are a source of least bittern mortality (COSEWIC 2009b), and increased construction traffic on PR #304 could increase the risk of collisions. The loss of individual birds or eggs could have a negative effect on the local population.

6.3.5.2 Operation

Potential Project effects on least bittern during operation could include habitat alteration and fragmentation. No additional loss of least bittern habitat is anticipated during operation. As least bitterns generally prefer small wetlands (Gibbs et al. 1992) it is unlikely that vegetation management on the ROW will affect suitable habitat. Because least bitterns have highly variable home range sizes (COSEWIC 2009b) and the Preferred Route generally follows existing linear features, habitat fragmentation is expected to have a negligible effect on the least bittern population.

Project effects on least bittern could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb least bitterns in the vicinity of the ROW, particularly during the spring nesting season. Such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on least bittern are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise, and no additional effect is anticipated. No effects are anticipated for winter, as this species is migratory and will be absent. No disruption of movements due to the presence of the ROW is anticipated as least bitterns are susceptible to collisions with transmission wires (COSEWIC 2009b) thus are not expected to avoid the ROW.

Least bittern mortality could increase during operation. Collisions with overhead wires can be a locally serious threat to least bitterns (COSEWIC 2009b). Individual birds may occasionally collide with wires, particularly near wetlands or waterbodies. Vegetation management conducted in spring could result in damage or destruction of nests, reducing the population's nesting success. The loss of individual birds or eggs could have a negative effect on the local population.

6.3.6 Short-eared Owl

6.3.6.1 Construction

Potential Project effects on short-eared owl during construction include habitat alteration, which is a threat to short-eared owl populations (COSEWIC 2008a). Habitat modeling indicates that 3% of the habitat in the transmission line footprint is suitable for short-eared owl (Map Series 500). Less than 1% of short-eared owl habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). There is no short-eared owl habitat in the Manigotagan Corner Station footprint. Short-eared owl populations are eruptive and frequently change breeding locations (Holland and Taylor 2003b), making prediction of effects very difficult and highly uncertain. Small habitat alterations and losses may affect a few individuals but are expected to have a small effect on the local short-eared owl population or on breeding and nesting habitat availability.

Project effects could also include sensory disturbance and disruption of movements. If clearing and construction occur in spring and early summer, sensory disturbance could affect breeding and nesting activities and temporarily reduce the amount of effective habitat in the Project Study Area, possibly resulting in reduced reproductive success. Limited effects are anticipated for winter, as this species is migratory and is mostly absent in winter (Holland and Taylor 2003b). Effects of sensory disturbance will be temporary and limited to the local population. Seasonal and daily movements could be affected as individuals will likely avoid the construction zone. Effects of altered movements will be local and limited to the construction period, and are expected to be small.

Short-eared owl mortality could increase during construction. Nests are susceptible to destruction by machinery, and collisions with vehicles are a source of mortality (COSEWIC 2008a). If clearing and construction occur in spring, nests could be damaged or destroyed, particularly in sedge or grassy habitat (Holland and Taylor 2003b). Increased construction traffic on PR #304 could increase the risk of collisions with vehicles. Collisions are uncommon and the risk will be greatly reduced in winter, when most or all short-eared owls will be absent. The loss of individual birds or eggs could have a negative effect on the local population.

6.3.6.2 Operation

Potential Project effects on short-eared owl could include habitat alteration and fragmentation. No additional alteration of short-eared owl habitat is anticipated during operation. This species could benefit from increased prey in cleared areas along the ROW. As the overall amount of suitable habitat appears more important than the size of habitat patches (Herkert et al. 1999; Johnson 2001), and because the Preferred Route generally follows existing linear features, habitat fragmentation is expected to have a negligible effect on short-eared owl.

Project effects on short-eared owl could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb short-eared owls in the vicinity of the ROW, particularly during the spring nesting season. Such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on short-eared owl are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise, and no additional effect is anticipated.

Few effects are anticipated for winter, as this species will mainly be absent. No disruption of movements due to the presence of the ROW are anticipated as short-eared owls are susceptible to collisions with transmission wires (COSEWIC 2008a).

Short-eared owl mortality could increase during operation. Collisions with overhead wires can be a threat to short-eared owls (COSEWIC 2008a). Individual birds may occasionally collide with wires, particularly near wetlands or grasslands. Vegetation management conducted in spring could result in damage or destruction of nests, reducing the population's nesting success. The loss of individual birds or eggs could have a negative effect on the local population.

6.3.7 Common Nighthawk

6.3.7.1 Construction

Potential Project effects on common nighthawk during construction include habitat alteration, which is a threat to common nighthawk populations (COSEWIC 2007a). Habitat modeling indicates that 40% of the habitat in the transmission line footprint is suitable for common nighthawk (Map Series 600). Less than 1% of common nighthawk habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). There is no common nighthawk habitat in the Manigotagan Corner Station footprint.

Project effects could also include sensory disturbance and disruption of movements. If clearing and construction occur in spring and early summer, sensory disturbance could affect breeding and nesting activities and temporarily reduce the amount of effective habitat in the Project Study Area, possibly resulting in reduced reproductive success. No effects are anticipated for winter, as this species is migratory and will be absent. Effects of sensory disturbance will be temporary and limited to the local population. Seasonal and daily movements could be affected as individuals will likely avoid the construction zone. Effects of altered movements will be local and limited to the construction period, and are expected to be small.

Potential sources of common nighthawk mortality include damaged eggs and collisions with vehicles. If clearing and construction occur in spring, eggs could be damaged or destroyed. As no nests are built and eggs are laid directly on bare rock or gravel (Taylor 2003b), they can be particularly difficult to detect. Increased construction traffic on PR #304 could increase the risk of collisions with vehicles, which are a source of common nighthawk mortality (COSEWIC 2007a). The risk will be greatly reduced in winter, when common nighthawks will be absent. The loss of individual birds or eggs could have a negative effect on the local population.

6.3.7.2 Operation

No additional common nighthawk habitat loss is anticipated during operation. Potential Project effects on common nighthawk could include habitat alteration and fragmentation. Common nighthawk habitat is generally associated with forested areas with clearings (Taylor 2003b), and periodic vegetation management could create habitat on the ROW, which will become less suitable over time as vegetation regenerates. As common nighthawks were once associated with urban areas with suitable nesting habitat (i.e., gravel roofs; Taylor 2003b), and because the Preferred Route generally follows existing linear features, habitat fragmentation is expected to have a negligible effect on this species.

Project effects on common nighthawk could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb common nighthawks in the vicinity of the ROW, particularly during the spring nesting season. Such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on common nighthawks are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise, and no additional effect is anticipated. No effects are anticipated for winter, as this species is migratory and will be absent. No disruption of movements due to the presence of the ROW are anticipated as common nighthawks are associated with openings in forest habitat (COSEWIC 2007a).

Few sources of Project-related common nighthawk mortality are anticipated during operation. Collisions with transmission wires are not reported as threats to common nighthawk populations (COSEWIC 2007a), and collisions with communication towers and wires are infrequent (Gehring et al. 2011). Vegetation management conducted in spring could result in damage or destruction of nests, reducing the population's nesting success. The loss of individual birds or eggs could have a negative effect on the local population.

6.3.8 Whip-poor-will

6.3.8.1 Construction

Potential Project effects on whip-poor-will during construction include habitat alteration, which is a threat to common nighthawk populations (COSEWIC 2009c). Habitat modeling indicates that 10% of the habitat in the transmission line footprint is suitable for whip-poor-will (Map Series 700). Less than 1% of whip-poor-will habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). There is no whip-poor-will habitat in the Manigotagan Corner Station footprint.

Project effects could also include sensory disturbance and disruption of movements. If clearing and construction occur in spring and early summer, sensory disturbance could affect breeding and nesting activities and temporarily reduce the amount of effective habitat in the Project Study Area, possibly resulting in reduced reproductive success. No effects are anticipated for winter, as this species is migratory and will be absent. Effects of sensory disturbance will be temporary and limited to the local population. Seasonal and daily movements could be affected as individuals will likely avoid the construction zone. Effects of altered movements will be local and limited to the construction period, and are expected to be small.

Potential sources of common nighthawk mortality include damaged eggs and collisions with vehicles. If clearing and construction occur in spring, eggs could be damaged or destroyed. As no nests are built and eggs are laid on the ground in clumps of leaves (Cink 2002), they can be particularly difficult to detect. Increased construction traffic on PR #304 could increase the risk of collisions with vehicles, which are noted sources of whip-poor-will mortality (COSEWIC 2009c). The risk will be eliminated in winter, when whip-poor-wills will be absent. The loss of individual birds or eggs could have a negative effect on the local population.

6.3.8.2 Operation

No additional whip-poor-will habitat loss is anticipated during operation. Potential Project effects on whip-poor-will could include habitat alteration and fragmentation. Whip-poor-will habitat is generally associated with forested areas with clearings (Taylor and Holland 2003a) and periodic vegetation management could create habitat on the ROW, which will become less suitable over time as vegetation regenerates. As whip-poor-wills are associated with partly open forests (Taylor and Holland 2003a) and edges, including roadsides (Cink 2002), and because the Preferred Route generally follows existing linear features, habitat fragmentation is expected to have a negligible effect on this species.

Project effects on whip-poor-will could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb whip-poor-wills in the vicinity of the ROW, particularly during the spring nesting season. Such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on whip-poor-wills are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise, and no additional effect is anticipated. No effects are anticipated for winter, as this species is migratory and will be absent. No disruption of movements due to the presence of the ROW are anticipated as whip-poor-wills are associated with openings in forest habitat (COSEWIC 2009c).

Few sources of Project-related whip-poor-will mortality are anticipated during operation. Collisions with transmission wires are not reported as threats to whip-poor-will populations (COSEWIC 2009c). Vegetation management conducted in spring could result in damage or destruction of nests, reducing the population's nesting success. The loss of individual birds or eggs could have a negative effect on the local population.

6.3.9 Rusty Blackbird

6.3.9.1 Construction

Potential Project effects on rusty blackbird during construction include habitat loss and alteration, which are threats to rusty blackbird populations (COSEWIC 2006). Habitat modeling indicates that 57% of the habitat in the transmission line footprint is suitable for rusty blackbird (Map Series 800). Less than 1% of rusty blackbird habitat in the Project Study Area will be affected when the transmission line ROW is cleared (Appendix A, Table A-2). Seventy-four percent of the habitat in the Manigotagan Corner Station footprint is rusty blackbird habitat; less than 1% of rusty blackbird habitat in the Project Study Area will be affected by clearing for the Manigotagan Corner Station.

Project effects could also include sensory disturbance and disruption of movements. Sensory disturbance due to clearing and construction could temporarily reduce the amount of effective habitat in the Project Study Area. As rusty blackbirds do not breed in the Project Study Area (Nero and Taylor 2003), no effects on reproductive success are expected. No effects are anticipated for winter, as this species is migratory and will be absent. Effects of sensory disturbance will be temporary and limited to the local population. Seasonal and daily movements could be affected as individuals will likely avoid the construction zone. Effects of

altered movements will be local and limited to the construction period, and are expected to be small.

Few direct sources of rusty blackbird mortality are anticipated during construction. As this species does not breed in the Project Study Area, no mortality due to nest destruction is anticipated. Collisions with vehicles are not reported as a source of mortality in the literature, but there is a very small chance for such accidents to occur. The loss of individual birds could have a negative effect on the local rusty blackbird population.

6.3.9.2 Operation

No additional loss of rusty blackbird habitat is anticipated during operation. As rusty blackbirds can be found in habitats in early stages of succession created by disturbances such as fire and windthrow (COSEWIC 2006), habitat could be created along the ROW. Potential Project effects could include habitat alteration and fragmentation. As this species does not breed in the Project Study Area and is associated with habitats in early stages of succession, the effects of habitat alteration and fragmentation will likely be negligible.

Project effects on rusty blackbird could also include sensory disturbance and disruption of movements. Annual inspections of the transmission line could disturb rusty blackbirds in the vicinity of the ROW. Such events will be brief and infrequent. Maintenance activities follow well-established guidelines and the effects of sensory disturbance on rusty blackbirds are expected to be negligible. Intermittent sensory disturbance due to off-road vehicle use on the ROW is also possible. Individuals whose home ranges overlap PR #304 may be accustomed to traffic noise. As such, no additional effect is anticipated. No effects are anticipated for winter, as this species is migratory and will be absent. No disruption of movements due to the presence of the ROW are anticipated as rusty blackbirds are associated with open habitats.

Few direct sources of rusty blackbird mortality are anticipated during construction. As this species does not breed in the Project Study Area, no mortality due to nest destruction is anticipated. Collisions with vehicles are not reported as a source of mortality in the literature, but there is a very small chance for such accidents to occur. The loss of individual birds could have a negative effect on the local rusty blackbird population.

6.3.10 Northern Leopard Frog

6.3.10.1 Construction

Potential Project effects on northern leopard frog during construction include habitat loss and alteration, which are threats to northern leopard populations (COSEWIC 2009d). Habitat loss will mainly be in riparian areas, and is expected to have a small effect on the northern leopard frog population.

Project-related effects on northern leopard frog include increased mortality. With increased construction traffic on PR #304, the risk of northern leopard frogs being run over by vehicles will increase. This species is particularly susceptible to road mortality during migration and dispersal (Linck 2000). The loss of individual frogs could have a negligible effect on the northern leopard frog population.

6.3.10.2 Operation

No additional loss of northern leopard frog habitat is anticipated during operation. Potential Project effects mainly include increased mortality, as transmission towers near waterbodies could provide perching opportunities for birds, which could result in a small increase in northern leopard frog mortality.

6.3.11 Common Snapping Turtle

6.3.11.1 Construction

Potential Project effects on common snapping turtle during construction include habitat loss and alteration, which are threats to snapping turtle populations (COSEWIC 2008b). As snapping turtles are mainly found in riparian areas, a small effect on the snapping turtle population is anticipated.

Snapping turtle mortality could increase in the Project Study Area during construction due to increased traffic on PR #304. Due to the slow recruitment and late maturity that characterize their life history (COSEWIC 2008b), the loss of individuals could have a effect on the snapping turtle population.

6.3.11.2 Operation

No additional effects on common snapping turtle are anticipated during operation.

6.4 Other Wildlife

6.4.1 Mammals

6.4.1.1 Small Mammals

Small mammals are expected to experience limited habitat loss from clearing and sensory disturbance during construction. Small mammals are expected to find suitable habitat throughout the Project Study Area. Some small mammal mortality could occur during clearing of the ROW.

During operation, no additional small mammal habitat will be lost. As vegetation regenerates along the ROW, new habitats will be created and used by small mammals and new small mammal communities will develop on the ROW and along its edges. Habitats with low-growth vegetation will be dominated by species that do not require forest canopy cover (e.g., meadow vole.

6.4.1.2 Aquatic Furbearers

Aquatic furbearers are expected to experience minor habitat loss from clearing and sensory disturbance during construction, as relatively few watercourses will be crossed by the transmission line ROW.

During operation, no additional habitat loss is expected. As vegetation regenerates along the ROW, new browse could be created for beaver. While limited new access may be created for trappers, trapping pressure is not expected to increase substantially, as a limited number of registered traplines overlap the Project Study Area. The effects of trapping on aquatic furbearers are expected to be small in magnitude.

6.4.1.3 Terrestrial Furbearers

Terrestrial furbearers are expected to experience some habitat loss and sensory disturbance during construction. Terrestrial furbearers are expected to find suitable habitat throughout the Project Study Area. In addition, some terrestrial furbearers such as red fox and coyote could become habituated to people if food and garbage are not properly managed. These potential effects are manageable with mitigation.

During operation, no additional habitat loss is expected. As vegetation regenerates along the ROW, hunting opportunities for some terrestrial furbearers may be created as small mammal populations begin to use habitat along the ROW. While some new access may be created for trappers, it is unlikely that trapping pressure will increase because a limited number of registered traplines overlap the Project Study Area and trappers are stewards of their traplines (Fur Institute of Canada 2003). The effects of trapping on terrestrial furbearers are expected to be small in magnitude.

6.4.1.4 Large Carnivores

Large carnivores are expected to experience some habitat loss and sensory disturbance during construction, possibly at black bear and gray wolf dens. Gray wolves can move away from the disturbance with relatively few effects (Linnell et al. 2000). However, denning black bears are particularly vulnerable to disturbance, as they are in a state of hibernation and the energetic cost of relocating can be high (Linnell et al. 2000). Den abandonment by females with cubs can result in cub mortality (Linnell et al. 2000). While individual responses vary, black bears appear to tolerate human activity more than 1 km from the den (Linnell et al. 2000). With the exception of denning black bears, large carnivores are expected to find suitable habitat throughout the Project Study Area. Other effects during construction include the potential for black bear to become habituated to people if food and garbage are not properly managed.

During operation, no additional habitat loss is expected. The creation of new linear corridors could facilitate movement and increase hunting efficiency for gray wolves. The density of gray wolves in the Project Study Area is not expected to change given the scale of the disturbance. The harvest of black bears in GHA 26 could increase with increased access to the area on the ROW, but the effect on the population will likely be negligible. Because large carnivores occupy large home ranges, it is unlikely that operation of the Project will have a measureable effect on their populations.

6.4.1.5 Ungulates

White-tailed deer is the only other ungulate besides moose expected to be affected by the Project. White-tailed deer are expected to experience some habitat loss and sensory disturbance during construction, however they are expected to find suitable habitat throughout the Project Study Area. Other Project effects on white-tailed deer could include increased

mortality due to collisions with vehicles and to hunting. Traffic on PR #304 will likely increase during construction, increasing the risk of deer-vehicle collisions.

During operation, no additional white-tailed deer habitat loss is expected. As vegetation regenerates along the ROW, white-tailed deer are expected to take advantage of new browse opportunities. White-tailed deer may experience increased predation as predators move along the ROW. While some new access may be created for hunters, the ROW mainly follows existing linear features. The effects of hunting on white-tailed deer are expected to be small in magnitude.

6.4.2 Birds

6.4.2.1 Waterfowl and Other Waterbirds

Waterfowl and other waterbirds are expected to experience minor habitat loss from clearing and sensory disturbance during construction, as relatively few watercourses and wetlands will be crossed by the transmission line. There is a small potential for waterfowl and other waterbird nests to be damaged or destroyed by machinery during the construction phase in spring and early summer. These effects are expected to be small in magnitude with mitigation (see Section 6.8).

During operation, no additional habitat loss is expected. As vegetation regenerates along the ROW, new nesting habitat will likely be created. While limited new access may be created for hunters, hunting pressure is not expected to increase substantially. The effects of hunting on waterfowl and other waterbirds are expected to be small in magnitude. Some waterfowl and other waterbirds are particularly susceptible to collisions with power lines. While individual birds may collide with wires, otherwise healthy populations should not be affected by such incidents.

6.4.2.2 Colonial Waterbirds

Colonial waterbirds are expected to experience minor habitat loss from clearing and sensory disturbance during construction, as relatively few watercourses and wetlands will be crossed by the transmission line. There is a small potential for colonial waterbird nests to be damaged or destroyed during the construction phase in spring and early summer. These effects are expected to be small in magnitude with mitigation.

During operation, no additional habitat loss is expected. As vegetation regenerates along the ROW, new nesting habitat will likely be created. Some colonial waterbirds are particularly susceptible to collisions with power lines. While individual birds may collide with wires, otherwise healthy populations should not be affected by such incidents.

6.4.2.3 Birds of Prey

Birds of prey are expected to experience minor habitat loss from clearing and sensory disturbance during construction. There is a small potential for large stick nests to be damaged or destroyed by machinery during the construction phase in spring and early summer. These effects are expected to be small in magnitude with mitigation (see Section 6.8).

During operation, no additional habitat loss is expected. As vegetation regenerates along the ROW, hunting opportunities may be created as small mammal populations begin to use the habitat along the ROW. The transmission towers could provide nesting and perching opportunities (Guinn 2004; Gross and Brauning 2011), but nests could interrupt power transmission (Steenhoff et al. 1993), necessitating their removal (Manitoba Hydro 2010). Birds of prey are susceptible to electrocution and collisions with wires and the risk of death or injury could increase if they perch or nest on transmission towers. With mitigation (see Section 6.8), effects of increased mortality on the birds of prey populations are expected to be small.

6.4.2.4 Upland Game Birds

Upland game birds are expected to experience some habitat loss and sensory disturbance during construction, however they are expected to find suitable habitat throughout the Project Study Area. There is a small potential for upland game bird nests to be damaged or destroyed by machinery during the construction phase in spring and early summer. These effects are expected to be small in magnitude with mitigation (see Section 6.8).

During operation, no additional habitat loss is expected. The transmission towers could provide perching opportunities for birds of prey, which could result in increased upland game bird mortality though predation. Upland game birds are particularly susceptible to collisions with power lines. While individual birds may collide with wires, otherwise healthy populations should not be affected by such incidents.

6.4.2.5 Woodpeckers

Woodpeckers are expected to experience some habitat loss and sensory disturbance during construction; however, they are expected to find suitable habitat throughout the Project Study Area. There is a small potential for nesting cavities to be damaged or destroyed by machinery during the construction phase in spring and early summer. These effects are expected to be small in magnitude with mitigation (see Section 6.8).

During operation, no additional habitat loss is expected. Some additional nest cavities could be lost if danger trees are removed during vegetation management.

6.4.2.6 Songbirds and Other Birds

Songbirds and other birds are expected to experience minor habitat loss from clearing and sensory disturbance during construction, however they are expected to find suitable habitat throughout the Project Study Area. There is a small potential for nests to be damaged or destroyed by machinery during construction in spring and early summer. These effects are expected to be small in magnitude with mitigation (see Section 6.8).

During operation, no additional habitat loss is expected. As vegetation regenerates along the ROW, new shrub and edge habitat will likely be created, however predation by terrestrial predators such as striped skunks and raccoons could increase along the ROW. Some songbirds and other birds are susceptible to collisions with power lines. While individual birds may collide with wires, otherwise healthy populations should not be affected by such incidents. Some songbirds and other birds are vulnerable to brown-headed cowbird brood parasitism, which is much greater in habitat edges associated with fragmentation than in interior forests.

6.4.3 Amphibians and Reptiles

6.4.3.1 Amphibians

Amphibians are expected to experience minor habitat loss from clearing and sensory disturbance during construction, as relatively few watercourses and wetlands will be crossed by the transmission line. Mortality may result from increased traffic along PR #304 in areas where frogs cross the road.

During operation, no additional habitat loss is expected. The transmission towers could provide perching opportunities near watercourse crossings for birds, which could result in increases in amphibian mortality through predation.

6.4.3.2 Reptiles

Reptiles are expected to experience minor habitat loss from clearing during construction, as relatively few watercourses will be crossed by the transmission line. Mortality could result from increased traffic along PR #304 in areas where snakes cross the road or where turtles bask in the sun.

During operation, no additional habitat loss is expected. The transmission towers could provide perching opportunities for birds, which could result in increased reptile mortality, particularly of snakes, though predation.

6.5 Habitat Fragmentation Analysis

The linear feature density indicates that the existing environment in the Project Study Area has a high degree of fragmentation (1.19 km/km^2) due to existing roads, a transmission line (located immediately adjacent to the road), and from past forestry activity (Table 6-1). It is possible that portions of forestry roads and trails, and the existing transmission line ROWs beside PR #304 are not being used as human travel corridors because of the proximity of parallel and adjacent travels routes, they are partially overgrown, distant from any current human uses or are accessible only in winter due to natural and other barriers. If forestry roads and the existing transmission line beside PR #304 were removed in the Project Study Area for example, linear feature density would decline from 1.19 km/km^2 to 0.47 km/km^2.

The addition of the Final Preferred Route results in an increase in linear feature density to 1.23 km/km^2, which is a change of 3%. The addition of the Final Preferred Route is expected to have a small incremental effect on habitat resulting from increased fragmentation. As the transmission line ROW regenerates to shrubland, and if access effects are managed, the effect on wildlife and habitat is predicted to be negligible.

Table 6-1: Linear Feature Density for the Existing and Future Environment

	Roads and Trails	Transmission Lines	Existing Environment	Final Preferred Route	Future Environment
Length (km)	2166.40	351.73	2518.12	71.60	2589.72
Density (km/km^2)	1.03	0.17	1.19	0.03	1.23

Note: differences due to rounding

6.6 Accidental Effects on Wildlife and Habitat

Petroleum products such as gasoline and other potentially harmful products used during the construction and operation of a transmission line could be released into the environment accidentally. Depending on the volume released, these substances could have deleterious effects on wildlife and habitat. Accidental fires that could occur during construction or operation could also have a negative effect on wildlife and habitat, depending on the size and severity of the fire.

Manitoba Hydro has extensive policies and practices regarding requirements to meet or exceed legislation and regulations associated with the prevention and/or handling of potentially harmful substances, fire prevention measures and other emergency procedures. As such, measureable effects on wildlife and habitat are not anticipated. Refer to the Environmental Protection Program (Chapter 8 of the EA Report) for a detailed description Manitoba Hydro's policies and practices concerning prevention measures, accidental release of harmful substances, and fire.

6.7 Wildlife Sensitive Sites

Wildlife sensitive sites along the Final Preferred Route were identified (Table 6-2; Map Series 1500). These included areas where the transmission line ROW intersects existing roads or trails, and where the ROW crosses a wetland likely used by waterfowl and other waterbirds, a movement corridor for waterfowl and other waterbirds and raptors. Areas where the ROW intersect roads or trails are expected to create access points for resource harvesters, and there is a risk of bird-wire collisions in areas used by waterfowl and other waterbirds and raptors.

Table 6-2: Wildlife Environmental Sensitive Sites on the Final Preferred Route

WSS_ID	Environmentally Sensitive Site	Site Description	Effect on Wildlife	Degree of Risk
MAMM_001	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_002	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_003	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_004	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low

Table 6-2: Wildlife Environmental Sensitive Sites on the Final Preferred Route

WSS_ID	Environmentally Sensitive Site	Site Description	Effect on Wildlife	Degree of Risk
MAMM_005	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_006	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_007	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_008	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_009	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_010	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_011	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_012	Road crossing	ROW crossing PR #304	May provide increased sightlines from the road and additional access for hunters	Moderate
MAMM_013	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_014	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_015	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_016	Road crossing	ROW crossing Translicense Road	May provide additional access for hunters	Moderate
MAMM_017	Road crossing	ROW crossing PR #304	May provide increased sightlines from the road and additional access for hunters	Moderate
MAMM_018	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_019	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_020	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_021	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_022	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_023	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_024	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_016	Road crossing	ROW crossing an existing road	May provide additional access for hunters	Moderate
MAMM_026	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low

Table 6-2: Wildlife Environmental Sensitive Sites on the Final Preferred Route

WSS_ID	Environmentally Sensitive Site	Site Description	Effect on Wildlife	Degree of Risk
MAMM_027	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_028	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_029	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_030	Road crossing	ROW crossing PR #304	May provide increased sightlines from the road and additional access for hunters	Moderate
MAMM_031	Road crossing	ROW crossing an existing road	May provide increased sightlines from the road and additional access for hunters	Moderate
MAMM_032	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_033	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_034	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
MAMM_035	Trail crossing	ROW crossing an existing trail	May provide additional access for hunters	Low
BIRD_001	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_002	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_003	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_004	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_005	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_006	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_007	Black River Crossing	ROW is crossing the Black River, which may be used as a movement corridor for waterfowl, waterbirds, and raptors	Moderately higher risk of wire collision, localized to the ROW	Moderate
BIRD_008	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low

Table 6-2: Wildlife Environmental Sensitive Sites on the Final Preferred Route

WSS_ID	Environmentally Sensitive Site	Site Description	Effect on Wildlife	Degree of Risk
BIRD_009	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_010	Sandy River Crossing	ROW is crossing the Sandy River, which may be used as a movement corridor for waterfowl, waterbirds, and raptors	Moderately higher risk of wire collision, localized to the ROW	Moderate
BIRD_011	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_012	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_013	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_014	Waterfowl and other waterbird sensitivity area	ROW crossing a wetland likely used by waterfowl or other waterbirds	Marginally higher risk of wire collision, localized to the ROW	Low
BIRD_015	Manigotagan River Crossing	ROW is crossing the Manigotagan River, which may be used as a movement corridor for waterfowl, waterbirds, and raptors	Higher risk of wire collision, localized to the ROW	High
AMPH_001	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_002	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_003	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_004	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_005	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_006	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_007	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low

Table 6-2: Wildlife Environmental Sensitive Sites on the Final Preferred Route

WSS_ID	Environmentally Sensitive Site	Site Description	Effect on Wildlife	Degree of Risk
AMPH_008	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_009	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_010	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_011	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low
AMPH_012	Potential amphibian breeding habitat	ROW crossing an area likely used by amphibians during breeding season	Marginally higher risk of disturbance to breeding habitat, localized to the right	Low

6.8 Proposed Mitigation Measures and Residual Effects

6.8.1 Mitigation Measures

The following mitigation measures are proposed for wildlife:

- Construction activities in or near to wildlife and wildlife habitat will be conducted in accordance with contact specifications.
- Wildlife and wildlife habitat will be protected in accordance with provincial and federal legislation (Manitoba Hydro 2009) and guidelines.
- The Environmental Inspector will inspect important wildlife habitats and environmentally sensitive sites regularly to ensure that environmental protection measures are implemented and effective, and unforeseen effects are addressed.
- Orientation for Contractor and Manitoba Hydro employees will include awareness of environmental protection measures for wildlife and wildlife habitat.
- Boundaries of important wildlife habitats will be flagged by prior to commencement of construction.
- Construction activities will not be carried out during prescribed timing windows for wildlife species.
- Construction activities will not be carried out within established buffer zones and setback distances for wildlife species (Appendix I).
- Clearing will occur during late fall and winter to the extent possible to avoid the spring/summer nesting season for birds and parturition times for mammal species and breeding windows for frog species.

- Clearing will not be permitted within established setbacks for bird nesting and brood rearing during established timing windows (Appendix I).
- Construction camps, facilities, and buildings will not be located within established buffer zones and setback distances from important wildlife habitats, including waterbodies, wetlands, riparian areas, and water bird habitats.
- Quarry blasting operations and conductor splicing will be scheduled to minimize disturbance to wildlife.
- Blasting will not be permitted during timing windows established for sensitive bird breeding, nesting, and brood-rearing months.
- Transmission tower construction will not be permitted within established buffer zones for bird nesting and brood rearing during established timing windows.
- Long-term storage of cleared vegetation will be avoided to allow for unrestricted wildlife movements.
- Trees containing active nests and areas where active animal dens or burrows are encountered will be left undisturbed until unoccupied.
- Trees containing large nests of sticks and areas where active animal dens or burrows are encountered will be left undisturbed until unoccupied. Artificial structures for nesting may be provided if unoccupied nests must be removed.
- Existing access roads, trails, or cut lines will be used to the extent possible.
- Access roads and trails will be kept as short and narrow as possible.
- Trails through or near important habitat types will be managed in accordance with the Access Management Plan.
- All season access roads will not be permitted within established buffer zones and setback distances from waterbodies, wetlands, riparian areas, and water bird habitats.
- Rehabilitated access roads and trails will be inspected in accordance with the Site Rehabilitation Plan to assess the success of re-vegetation and to determine if additional rehabilitation is required.
- Manitoba Conservation and Water Stewardship and Fisheries and Oceans Canada will be contacted if beaver dams must be cleared along ROWs or access roads and trails. Clearing of dams will be carried out in accordance of the Fisheries and Oceans Operational Statement on Beaver Dam Removal (Fisheries and Oceans Canada 2009).
- Manitoba Conservation and Water Stewardship will be notified if animal traps are encountered and must be removed for project activities.
- Wildlife will not be fed, befriended, or harassed at construction areas.
- Construction camps will be kept clean, food will be kept in sealed storage areas, and kitchen wastes will be stored in bear-proof containers in northern and rural areas.
- Problem wildlife will be reported immediately to Manitoba Conservation and Water Stewardship.

- Public use of access roads and trails during construction will be controlled through the Access Management Plans.
- Hunting and harvesting of wildlife by project staff will not be permitted while working on the project sites.
- No firearms will be permitted at construction sites.
- Vehicles will not exceed posted speed limits and wildlife warning signs will be installed in high density areas and at known crossings locations.
- Any wildlife killed or injured by vehicles will be reported to Manitoba Conservation and Water Stewardship.
- Where buffer zones or setbacks are not feasible for colonial waterbirds, bird deflectors will be placed on sky wires to improve visibility of the wires to birds and to minimize potential bird-wire collisions.
- Bird diverters or aerial markers may be installed in high bird traffic areas.

Additional mitigation measures are recommended and include:

- Hand clearing or selective clearing within 100 m of where the ROW intersects PR #304 or other roads to reduce the line of sight.
- Establishing vegetation screens at points where the transmission line ROW crosses PR #304 and other existing roads to obscure the line of sight along the transmission line ROW.
- Ground inspection should occur where feasible in one pass in late fall/early winter when the ground is frozen and there is minimal snow, or in late March.

6.8.2 Residual Effects

6.8.2.1 Mammals

After mitigation, the Project is not expected to have significant negative residual effects on mammal populations or their habitats. Predicted long-term residual effects include the following:

- Small alteration of habitat for mammals along the transmission line ROW;
- Small avoidance of Project infrastructure by edge-sensitive mammals resulting in a loss of habitat;
- Periodic sensory disturbance effects on mammals during operation resulting in small behavioural changes;
- A small increase in localized access for hunters and trappers resulting in a small increase in aquatic furbearer, terrestrial furbearer, and ungulate mortality; and
- A small increase in local access for predators resulting in a small increase in small mammal, aquatic furbearer, terrestrial furbearer, and ungulate mortality.

These effects will be observed during the construction and operation phases of the Project. It is expected that Project activities will be reversible, as over time, biophysical disturbances due to the Project will be reversed by the natural succession of vegetation. Residual effects are expected to be of small magnitude after applying mitigation measures.

6.8.2.2 Birds

After mitigation, the Project is not expected to have significant negative residual effects on bird populations or their habitats. Predicted long-term residual effects include the following:

- Occasional collision with transmission line resulting in a negligible increase in mortality;
- Small decrease in productivity to some local bird populations due to brood parasitism by brown-headed cowbird and possibly by opportunistic invasive species such as blue jay and American crow, which are known to occasionally consume eggs or young;
- Small alteration of habitat for birds along the transmission line ROW;
- Small avoidance of Project infrastructure by edge sensitive birds resulting in a loss of effective habitat;
- Periodic sensory disturbance effects to birds during operation resulting in small behavioural changes;
- Small increases to nesting and foraging opportunities for some bird species, and small decreases of nesting and foraging opportunities for other bird species;
- A small increase in local access for hunters and trappers resulting in a small increase in waterfowl and upland game bird mortality; and
- A small increase in local access for predators resulting in a small increase in waterfowl and other waterbird, colonial waterbird, upland game bird, and songbirds and other bird mortality.

These effects will be observed during the construction and operations phases of the Project. It is expected that Project activities will be reversible, as over time, biophysical disturbances due to the Project will be reversed by the natural succession of vegetation. Residual effects are expected to be of small magnitude after applying mitigation measures.

6.8.2.3 Amphibians and Reptiles

After mitigation, the Project is not expected to have significant negative residual effects on amphibian and reptile populations or their habitats. Predicted long-term residual effects include the following:

- Small alteration of habitat for amphibians and reptiles along the transmission line ROW primarily at breeding ponds and watercourse crossings;
- A small increase in local access for predators resulting in a small increase in amphibian and reptile mortality.

These effects will be observed during the construction and operations phases of the Project. It is expected that Project activities will be reversible, as over time, biophysical disturbances due to the Project will be reversed by the natural succession of vegetation. Residual effects are expected to be of small magnitude after applying mitigation measures.

6.8.2.4 Significance of Residual Effects

Residual effects are environmental effects that remain following application of mitigation measures. The determination of the significance of the residual Project effects on wildlife VECs was based on the criteria outlined in (Table 6-3). Residual effects on mammal VECs are outlined in Table 6-4.

Table 6-3: Assessment Factors and Criteria Used to Evaluate Significance of Residual Effects

Assessment Factor	Definition	Criteria	Significance Evaluation
Direction	Indicates whether the effect on the environment is positive, negative, or neutral.	Positive	Beneficial or desirable change
		Negative	Adverse or undesirable change
		Neutral	No detectable or measurable change
Magnitude	A measure of the intensity of an effect, or the degree of change caused by the Project relative to baseline conditions or guideline values. The scales of magnitude are defined for each VEC and relate to relative (%) or absolute changes above or below baseline, or threshold values.	Negligible	No detectable or measurable effect
		Small	Effect does not exceed baseline values, or guidelines
		Moderate	Measurable effect that results in a short-term change, or meets and may occasionally exceed guidelines
		Large	Effect sufficient to cause a change that exceeds baseline values or guidelines
Geographic Extent	Refers to the area affected, and is categorized into three scales of local, regional, and beyond regional. Local-scale effects mostly represent changes that are directly related to the Project footprint and activities, but may also include small-scale indirect effects.	Project Footprint	Effects confined to the project footprint, including ROW
		Local	Direct and indirect effects that may extend beyond the project footprint, but not more than 5 km beyond the ROW or project components
		Regional	Direct and indirect effects that extend beyond local effects; may include cumulative changes from other projects;
Duration	The amount of time (usually in years) from the beginning of an effect to when the effect on a VEC is reversed, and is expressed relative to Project phases	Short-term	Effect that occurs during site preparation and/or construction phases of the project (i.e. one to five years)
		Medium-term	Effect that extends throughout the construction and operation phases of the project (i.e. up to 50 years)
		Long-term	Effect extends more than 50 years

Table 6-3: Assessment Factors and Criteria Used to Evaluate Significance of Residual Effects

Assessment Factor	Definition	Criteria	Significance Evaluation
Reversibility	After removal of the stressor, reversibility is the likelihood and time required for the Project to no longer influence the VEC or system. For socio-economic VECs, the manageability of effects is considered rather than reversibility.	Reversible	Effect is reversible during the life of the project
		Permanent	Long term permanent effect
Frequency	How often an effect will occur	Infrequent	Effect may occur once during the life of the project
		Sporadic/ Periodic	Effect may occur without predictable pattern during the life of the project
		Regular/ Continuous	Effect may occur periodically or continuously during the life of the project

Table 6-4: Summary of Residual Effects of the Lake Winnipeg East System Improvement Transmission Project on Wildlife Valued Environmental Components

Species	Potential Effect	Project Phase	Key Mitigation Measures	Residual Effect	Significance Criteria
Moose	• habitat loss and alteration • sensory disturbance and disruption of movement • increased mortality due to predation, wildlife-vehicle collisions	Construction	• existing access roads, trails, or cut lines will be used to the extent possible • hunting and harvesting of wildlife by Project staff will not be permitted while working on Project sites • no firearms will be permitted at construction sites • vehicles will not exceed posted speed limits and wildlife warning signs will be installed in high density areas and at known crossing locations	Decreased local moose abundance due to reduced habitat, sensory disturbance, and increased mortality	**Direction:** Negative **Magnitude:** Small **Geographic extent:** Local **Duration:** Short-term **Reversibility:** Reversible **Frequency:** Regular/continuous
	• habitat alteration and fragmentation • sensory disturbance and disruption of movement • increased mortality due to hunting and predation	Operation	• access roads and trails will be rehabilitated where possible • ground inspection should occur where feasible in one pass in late fall/early winter when the ground is frozen and there is minimal snow, or in late March • vegetation screenings will be established at pointes where the transmission line ROW crosses roads	Decreased local moose abundance due to increased mortality	**Direction:** Negative **Magnitude:** Small **Geographic extent:** Local **Duration:** Medium-term **Reversibility:** Reversible **Frequency:** Sporadic/periodic
American marten	• habitat alteration • sensory disturbance	Construction	• existing access roads, trails, or cut lines will be used to the extent possible	Decreased local American marten abundance due to habitat alteration and avoidance of construction zones	**Direction:** Negative **Magnitude:** Negligible to small **Geographic extent:** Local **Duration:** Short-term **Reversibility:** Reversible **Frequency:** Regular/continuous
	• habitat alteration and fragmentation • sensory disturbance and disruption of movement • increased mortality due to trapping	Operation	• access roads and trails will be rehabilitated where possible	Decreased local American marten abundance due to habitat fragmentation and increased mortality	**Direction:** Negative **Magnitude:** Negligible to small **Geographic extent:** Local **Duration:** Medium-term **Reversibility:** Reversible **Frequency:** Sporadic/periodic

Table 6-4: Summary of Residual Effects of the Lake Winnipeg East System Improvement Transmission Project on Wildlife Valued Environmental Components

Species	Potential Effect	Project Phase	Key Mitigation Measures	Residual Effect	Significance Criteria
Bald eagle	• habitat alteration • sensory disturbance and disruption of movement • increased mortality due to collisions with vehicles	Construction	• clearing will occur in late fall and winter to the extent possible, when bald eagles are generally not in the area • blasting, drilling, and transmission tower construction will not be permitted during timing windows established for sensitive bird breeding, nesting, and brood-rearing months • trees containing large stick nests will be left undisturbed until unoccupied; artificial structures for nesting may be provided if unoccupied nests must be removed	Decreased local bald eagle abundance due to sensory disturbance and habitat alteration	**Direction:** Neutral **Magnitude:** Negligible **Geographic extent:** Local **Duration:** Short-term **Reversibility:** Reversible **Frequency:** Regular/continuous
	• sensory disturbance and disruption of movement • increased mortality due to bird-wire collisions	Operation	• bird diverters or aerial markers may be installed in high bird traffic areas	Decreased local bald eagle abundance due to increased mortality	**Direction:** Neutral **Magnitude:** Negligible **Geographic extent:** Project footprint **Duration:** Medium-term **Reversibility:** Reversible **Frequency:** Sporadic/periodic
Spruce grouse	• habitat alteration • -sensory disturbance and disruption of movement • -increased mortality due to collisions with vehicles, and nest destruction	Construction	• clearing will occur in late fall and winter to the extent possible • blasting, drilling, and transmission tower construction will not be permitted during timing windows established for sensitive bird breeding, nesting, and brood-rearing months • existing access roads, trails, or cut lines will be used to the extent possible • hunting and harvesting of wildlife by Project staff will not be permitted while working on Project sites • no firearms will be permitted at construction sites • vehicles will not exceed posted speed limits	Decreased local spruce grouse abundance due to sensory disturbance and increased mortality	**Direction:** Negative **Magnitude:** Small **Geographic extent** - Local **Duration:** Short-term **Reversibility:** Reversible **Frequency:** Regular/continuous

Table 6-4: Summary of Residual Effects of the Lake Winnipeg East System Improvement Transmission Project on Wildlife Valued Environmental Components

Species	Potential Effect	Project Phase	Key Mitigation Measures	Residual Effect	Significance Criteria
Spruce grouse (cont'd)	• habitat alteration and fragmentation • sensory disturbance and disruption of movement • increased mortality due to harvest and bird-wire collisions	Operation	• access roads and trails will be rehabilitated where possible • bird diverters or aerial markers may be installed in high bird traffic areas	Decreased local spruce grouse abundance due to increased mortality	**Direction:** Negative **Magnitude:** Negligible **Geographic extent:** Project footprint **Duration:** Medium-term **Reversibility:** Reversible **Frequency:** Sporadic/periodic
Olive-sided flycatcher	• habitat loss and alteration • sensory disturbance and disruption of movement • increased mortality due to nest damage or destruction	Construction	• clearing will occur in late fall and winter to the extent possible • blasting, drilling, and transmission tower construction will not be permitted during timing windows established for sensitive bird breeding, nesting, and brood-rearing months • clearing and construction activities will not be carried out within established buffer zones and setback distance	Decreased local olive-sided flycatcher abundance due to habitat loss and alteration, sensory disturbance, and increased mortality	**Direction:** Negative **Magnitude:** Small **Geographic extent:** Project footprint **Duration:** Short-term **Reversibility:** Reversible **Frequency:** Sporadic/periodic
	• habitat alteration due to the removal of standing dead danger trees • sensory disturbance • increased mortality due to nest damage or destruction during vegetation management in spring and nest predation	Operation	• -none specific to operation	Decreased local olive-sided flycatcher abundance due to habitat alteration and increased mortality	**Direction:** Negative **Magnitude:** Small **Geographic extent:** Project footprint **Duration:** Medium-term **Reversibility:** Reversible **Frequency:** Sporadic/periodic
Canada warbler	• habitat alteration • sensory disturbance and disruption of movement • increased mortality due to nest damage or destruction	Construction	• clearing will occur in late fall and winter to the extent possible, when olive-sided flycatchers are not in the area • blasting, drilling, and transmission tower construction will not be permitted during timing windows established for sensitive bird breeding, nesting, and brood-rearing months • clearing and construction activities will not be carried out within established buffer zones and setback distance	Decreased local Canada warbler abundance due to habitat alteration, sensory disturbance, and increased mortality	**Direction:** Negative **Magnitude:** Small **Geographic extent:** Local **Duration:** Short-term **Reversibility:** Reversible **Frequency:** Sporadic/periodic

Table 6-4: Summary of Residual Effects of the Lake Winnipeg East System Improvement Transmission Project on Wildlife Valued Environmental Components

Species	Potential Effect	Project Phase	Key Mitigation Measures	Residual Effect	Significance Criteria
Canada warbler (cont'd)	• habitat alteration and fragmentation • sensory disturbance • increased mortality due to nest damage or destruction during vegetation management in spring and brood parasitism	Operation	• none specific to operation	Decreased local Canada warbler abundance due to habitat alteration and increased mortality	**Direction:** Negative **Magnitude:** Small **Geographic extent**: Project footprint **Duration:** Medium-term **Reversibility:** Reversible **Frequency:** Sporadic/periodic

6.9 Interactions with Other Projects

The spatial boundary for interactions with other projects is the Project Study Area. Potential interactions were determined for adverse residual effects on VECs (Section 6.8.2.4) that have the potential to interact with the effects of other past, current, or future projects and human activities (Table 6-5). VECs with no residual effect or a positive residual effect were not included in the assessment. Finally, the assessment only includes adverse residual effects on VECs that overlap both spatially and temporally with the effects of other projects and human activities. As no residual effects are anticipated for bald eagle, it was not included in the assessment of interactions with other projects.

Project and human activities were selected for inclusion in the assessment based on the following criteria:

- Past Projects: Projects within the Project Study Area whose ongoing effects can be reasonably expected to change in the future and, as a result of those changes, interact with this Project's adverse residual effects.
- Current Projects: Projects in construction, development or operation within the Project Study Area.
- Future Projects: Projects approved for construction/development or in the permitting pipeline within the Project Study Area.
- Prospective Projects: Projects announced in the Project Study Area (e.g., wind farms, transmission expansion, government vision statements) but not yet moving along a development or permitting pathway, and any projected changes in land use patterns (e.g., changes in agricultural activity).

Table 6-5: Projects and Activities with the Potential to Interact with the Lake Winnipeg East System Improvement Transmission Project

Sector	Project	Description	Location	Status	Timelines
Mining	San Gold Mine Expansion	• Planned expansion of San Gold's Gold Mine and tailings pond in Bissett, northeast of Project Study Area • Production is expected to double	Northeast of Project Study Area	Ongoing	
	Mineral Exploration	• The north end of the Project Study area overlaps with many mining claims and exploration activities (e.g. drill holes) • Mining claims are held by Golden Pocket Resources, DLW Gold Ventures Inc., Canada Bay Resources Ltd., and San Gold Corp.	North of Project Study Area	Ongoing/ Planned	
	Quarry Development	• There are 83 quarry leases within the Project Study Area, several in close proximity to the Project • Lease holders include private companies, as well as Manitoba Infrastructure and Transportation (MIT), and the East Side Road Authority • Development and expansion of existing and new quarries is likely, particularly for projects such as the East Side Road	Within the Project Study Area	Ongoing/ Planned	
Forestry	Timber Resource Harvesting	• Request for Proposal (RFP) to for timber resource harvesting in FML01 by Manitoba Conservation and Water Stewardship (Manitoba Conservation and Water Stewardship [MCWS]) • A potential respondent to the RFP would be a community and forest industry joint venture being spearheaded by the Manitoba Model Forest (Winnipeg River Integrated Wood and Biomass Project) • This would result in an estimated 400 to 450 direct jobs, up to 400,000 m^3 softwood/year and 200,000 m^3 hardwood/year	Within the Project Study Area	Planned	Within 1 – 3 years

Table 6-5: Projects and Activities with the Potential to Interact with the Lake Winnipeg East System Improvement Transmission Project

Sector	Project	Description	Location	Status	Timelines
Wildlife	Closure of Licensed and Rights Based Moose Hunting	• As of January 26, 2012, all licensed hunting in Game Hunting Area (GHA) 26 is closed • In addition, moose protection zones in areas of heavy moose concentration areas along roads and rivers are closed to hunting for rights-based peoples • Proposed decommissioning of roads by MCWS	GHA 26 within the Project Study Area	Ongoing/ Planned	2012
Transportation & Communication Infrastructure	East Side Road Authority	• Construction of a 156 km all season gravel road along the east side of Lake Winnipeg from Provincial Road #304 east of Hollow Water to Berens River First Nation	North of Project Study Area	Ongoing	2010 - 2014
	Fibre Optic Cable	• The San Gold Mine in Bissett, and several community members have expressed an interest in fibre optic cable service in the area	Within and northeast of Project Study Area	Potential	Unknown
Cottage Development	Black River First Nation Cottage Development Initiative	• Expansion of cottage development within the Black River First Nations territory in conjunction with MCWS • Phase I of the project is underway with road development underway for servicing of 50 cottage lots • Future phases are planned for an additional 550 additional cottage lots	Black River First Nation Reserve at the west of the Project Study Area	Ongoing/ Planned	Phase I: underway (year 1 of 5) Phase II:– 5 – 10 years
	Hollow Water First Nation Cottage Development Plans	• Considering cottage development projects with MCWS	Hollow Water First Nation Reserve at the north end of the Project Study Area	Potential	Unknown
	Sagkeeng First Nation Cottage Development Plans	• Considering cottage development projects with MCWS	Sagkeeng First Nation Reserve at the southwest end of the Project Study Area	Potential	Unknown

6.9.1 Moose

Potential Project effects on moose could interact with ongoing projects in and near the Project Study Area. Sensory disturbance from ongoing mineral exploration, quarry development, and cottage development expansion during the Project construction period could result in a further reduction of effective habitat for moose. Habitat in the region is fragmented due to access roads created for timber resource harvesting (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011; see Section 6.5). This network of roads currently provides access to moose by hunters and predators, and provides pathways for deer to expand their range into the area, facilitating the spread of disease (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011). Access is a major cause of the decline of the moose population in GHA 26 (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News 2011), and the addition of a transmission line ROW could exacerbate these effects. However, due to the degree of existing fragmentation in the region (1.19 km/km^2), and the very small increase in linear feature density in the Project Study Area (3%) that is located parallel to and near PR #304, the addition of a transmission line ROW is expected to have a negligible effect on moose mortality. The co-operative management of moose, the decommissioning of existing forestry roads, and the management of wolf and deer populations in GHA 26 will ensure that the moose population will recover and remain sustainable.

Effects of future mineral exploration and quarry development and the expansion of an existing mine northeast of the Project Study Area could increase the loss of moose habitat in the Project Study Area. These projects could contribute to moose mortality on PR #304 due to increased traffic on the road. Effects of future timber resource harvesting in FML01, which overlaps the Project Study Area, could include increased habitat fragmentation if new roads are cleared or decommissioned roads are re-opened. If existing forestry roads are used, the potential effects of habitat fragmentation would be minimized. Further, future forestry operations would alter future moose habitat. The location of habitat alteration is uncertain, but these habitat effects would be considered both positive and negative. Construction of an all season road along the east side of Lake Winnipeg, installation of a fibre optic cable, and the expansion of cottage developments in the Project Study Area will further fragment habitat in the region and increase access for resource users, in addition to increasing the number of people traveling through the Project Study Area, which could increase future hunting pressure and the risk of moose-vehicle collisions in the area. Because cottage developments are likely to occur on lakes outside the Project Study Area, and the fibre optic cable system might be built along existing ROWs, these anthropogenic activities are unlikely to measurably contribute to moose habitat alteration. The closure of licensed moose hunting in GHA 26 and of rights-based moose hunting in moose restoration zones in GHA 26 will reduce the harvest of moose in the Project Study Area. Cottagers who are not First Nations members or Metis will be unable to hunt in the area until the licensed harvest is resumed, but may instead harvest in GHA 17A directly north of GHA 26, whose moose population is also reduced, or elsewhere in Manitoba where moose populations are healthy. The licensed and rights-based harvest of white-tailed deer in the area could increase due to increased access created by multiple projects, and due to the presence of more recreational resource users at cottage developments. A reduction in the white-tailed deer population could reduce the likelihood of transmission of disease to moose.

6.9.2 American Marten

Potential Project effects on American marten could interact with ongoing projects in and near the Project Study Area. Sensory disturbance from ongoing mineral exploration, quarry development, and cottage development expansion during the Project construction period could result in a further reduction of habitat and effective habitat for this species. Habitat in the region is fragmented due to access roads created for timber resource harvesting (Manitoba Model Forest Committee for Cooperative Moose Management, Moose News; see Section 6.5). A small increase in linear feature density in the Project Study Area is anticipated as a result of the Project, which could reduce the suitability of the habitat in the area for American marten.

Effects of future mineral exploration and quarry development and the expansion of an existing mine northeast of the Project Study Area could increase the loss of American marten habitat in the Project Study Area and increased fragmentation could reduce the suitability of the habitat in the area for this species. Because cottage developments are likely to occur on lakes outside the Project Study Area, and the fibre optic cable system might be built along existing ROWs, these anthropogenic activities are unlikely to measurably contribute to American marten habitat alteration.

6.9.3 Spruce Grouse

Potential Project effects on spruce grouse could interact with ongoing projects in and near the Project Study Area. Sensory disturbance from ongoing mineral exploration, quarry development, and cottage development expansion during the Project construction period could result in a further reduction of habitat and effective habitat for this species. Existing roads and trails provide access and contribute to harvest effects for the spruce grouse population in the Project Study Area. The growth of young forest into mature forest types is expected to increase local spruce grouse populations as forests regenerate.

Effects of future mineral exploration and quarry development and the expansion of an existing mine northeast of the Project Study Area could increase the loss of spruce grouse habitat in the Project Study Area. Effects of future timber resource harvesting in FML01, which overlaps the Project Study Area, could include increased habitat fragmentation if new roads are cleared or decommissioned roads are re-opened. The future harvest of mature spruce trees would reduce preferred spruce grouse habitat and depress the population of spruce grouse in the Project Study Area. Construction of an all season road along the east side of Lake Winnipeg, installation of a fibre optic cable, and the expansion of cottage developments in the Project Study Area will further fragment habitat in the region and increase access for resource users, in addition to increasing the number of people traveling through the Project Study Area, which could increase hunting pressure in the area. Because cottage developments are likely to occur on lakes outside the Project Study Area, and the fibre optic cable system might be built along existing ROWs, these anthropogenic activities are unlikely to measurably contribute to spruce grouse habitat alteration.

6.9.4 Olive-sided Flycatcher

Potential Project effects on olive-sided flycatcher could interact with ongoing projects in and near the Project Study Area. Sensory disturbance from ongoing mineral exploration, quarry

development, and cottage development expansion during the Project construction period could result in a further reduction of habitat and effective habitat for this species. Conversely, recent fires in the area have likely improved olive-sided flycatcher habitat. Because olive-sided flycatchers prefer open habitat, the transmission line ROW is not expected to measurably affect the population in addition to other anthropogenic effects in the Project Study Area.

Effects of future mineral exploration and quarry development and the expansion of an existing mine northeast of the Project Study Area could increase the loss of olive-sided flycatcher habitat in the Project Study Area. As olive-sided flycatcher populations are in serious decline, threats such as habitat loss and alteration, particularly due to forest harvest practices (COSEWIC 2007b) and cumulative habitat losses with other projects could continue to depress the local population. Environment Canada is working on recovery strategies to reverse the decline of olive-sided flycatcher (Species at Risk Public Registry 2012).

6.9.5 Canada Warbler

Canada warblers rely on mature riparian or wet forest types with a rich shrub understory as high quality habitat. Fire, and past harvest activities most likely limited the Canada warbler populations in the Project Study Area. Potential Project effects on Canada warbler could interact with ongoing projects in and near the Project Study Area. Sensory disturbance from ongoing mineral exploration, quarry development, and cottage development expansion during the Project construction period could result in a further reduction of habitat and effective habitat for this species. The growth of young forest into mature forest types is expected to increase local Canada warbler populations as forests regenerate.

Effects of future mineral exploration and quarry development and the expansion of an existing mine northeast of the Project Study Area could increase the loss of Canada warbler habitat in the Project Study Area. The future harvest of mature deciduous or mixedwood forest would reduce preferred habitat and depress the Canada warbler population in the Project Study Area. As Canada warbler populations are in serious decline, threats such as habitat loss and degradation in wintering and breeding ranges, paved road development, and habitat fragmentation (COSEWIC 2008c) due to the Project in combination with past, present, and future projects could continue to depress the local population. Environment Canada is working on recovery actions to reverse the decline of Canada warbler (Species at Risk Public Registry 2012).

6.10 Monitoring and Follow-Up

Standard inspection and effects monitoring are recommended for amphibians and reptiles to ensure that wetland mitigation measures are followed, such as the retention of riparian buffers.

A pre-construction aerial survey is recommended to identify large stick nests for birds of prey and colonial waterbirds. Standard inspection and effects monitoring is recommended if nests are found on or within 200 m of the ROW. Follow-up monitoring would then be required to ensure that mitigation measures are adhered to, such as the retention of buffers, the use of bird diverters, and the application of timing restrictions.

Yellow rail and least bittern follow-up is recommended to verify the presence or absence of populations in suitable habitats along the ROW. Because these listed waterbird species are more susceptible to mortality associated with wire collisions, follow-up should include the installation of bird diverters and protective sleeves on guy wires if birds are found. Monitoring the effectiveness of bird diverters would then be recommended at these sensitive sites.

Manitoba Hydro should monitor the transmission line for bird electrocutions. If bird electrocution mortalities are found, adaptive management should be applied such as the installation of porcupine wire, to prevent birds from landing near conductors and being electrocuted.

A pre-construction aerial survey is recommended to identify mineral licks and heavy use game trails that may lead to mineral licks. Standard inspection and effects monitoring is recommended if mineral licks are found. Follow-up monitoring would then be required to ensure that mitigation measures are adhered to, such as the retention of buffers and vegetation management.

A pre-construction ground survey is recommended to identify the presence/absence of black bear dens. Standard inspection and effects monitoring is recommended if active black bear dens are found. Follow-up monitoring would then be required to ensure that mitigation measures are adhered to, such as the application of buffers to prevent disturbance during clearing and construction.

Monitoring is recommended for validating the effectiveness of line-of-sight vegetation screens where the transmission line crosses roads.

Monitoring is recommended for access management, and to validate that moose harvest and predation mortality along the transmission line ROW remains small.

7 CONCLUSIONS

During the routing and site-selection process for Line PQ95, Alternative Routes were assessed based on their potential effects on mammal, bird, amphibian, and reptile species in the Project Study Area. Associated infrastructure, including the Manigotagan Corner Station Site, was also evaluated.

There were no substantial concerns with any of the Alternative Routes or with the associated infrastructure. The Preferred Route for the transmission line from a wildlife perspective was Alternative Route A primarily because it most closely followed PR #304 and was likely to create marginally less access to the area.

Alternative Route A, with some portions of Alternative Routes B and C, was the route selected by Manitoba Hydro based on the overall site selection process, which gave consideration to biological effects, socio-economic effects, community concerns, cost, and engineering limitations.

Based on the selected location for the transmission line and the Manigotagan Corner Station, the Project was not expected to substantially affect mammals, birds, amphibians, or reptiles. With mitigation that includes the use of buffers, timing restrictions such as clearing and construction in late fall/winter, the use of bird deflectors at sensitive sites, development of an access management plan, the restriction of hunting by project workers, the development of

buffers to reduce the line of sight between hunters, predators and prey, and the placement of warning signs, predicted residual effects on VECs were expected to be neutral to adverse, negligible to small, local, and short-term to medium-term. Monitoring was recommended for some VECs to ensure compliance, and to verify effects predictions on local wildlife populations.

8 REFERENCES

8.1 Literature Cited

Altman, B. 1998. Productivity of the olive-sided flycatcher in the Cascade Mountains of northern Oregon: a pilot project to assess nesting success as a potential factor in population declines. In Olive-sided flycatcher (*Contopus cooperi*). In The Birds of North America, No. 502. Edited by A. Poole and F. Gill. The Birds of North America, Inc., Philadelphia, PA.

Altman, B. and R. Sallabanks. 2000. Olive-sided flycatcher (*Contopus cooperi*). In The Birds of North America. No. 502. Edited by A. Poole and F. Gill. The Birds of North America, Inc., Philadelphia, PA.

Andrew, J.M. and J.A. Mosher. 1982. Bald eagle site selection and nesting habitat in Maryland. Journal of Wildlife Management 46(2): 382-390.

APLIC (Avian Power Line Interaction Committee). 2006. Suggested practices for avian protection on power lines: the state of the art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, DC and Sacramento, CA. 204 pp.

Avery, M.L. 1995. Rusty blackbird (*Euphagus carolinus*). In The Birds of North America, No. 200. Edited by A. Poole and F. Gill. The Birds of North America Inc., Philadelphia, PA.

Ayotte, J.B., K.L. Parker, J.M. Arocena, and M.P. Gillingham. 2006. Chemical composition of lick soils: functions of soil ingestion by four ungulate species. Journal of Mammalogy 87(5): 878-888.

Banfield, A.F.W. 1987. The Mammals of Canada. University of Toronto Press. Toronto, ON. 438 pp.

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.

Bastille-Rousseau, G., D. Fortin, C. Dussault, R. Courtois, and J.-P. Ouellet. 2011. Foraging strategies by omnivores: are black bears actively searching for ungulate neonates or are they simply opportunistic predators? Ecography 34: 588-596.

Ben-David, M.R., W. Flynn, and D.M. Schell. 1997. Annual and seasonal changes in diets of martens: evidence from table isotope analysis. Oecologia 111: 280-291.

Bent, A.C. 1942. Life histories of North American flycatchers, larks, swallows, and their allies. In Olive-sided flycatcher (*Contopus cooperi*), in The Birds of North America No. 502. Edited by A. Poole and F. Gills. The Birds of North America Inc., Philadelphia, PA.

Bevanger, K. and H. Brøseth. 2001. Bird collisions with power lines – an experiment with ptarmigan (*Lagopus* spp.). Biological Conservation 99: 341-346.

Black River First Nation ATK Workshop Interview. August 15, 2012. Interview conducted by Hani Khalidi at the Black River First Nation Administration Office Boardroom.

Bookhout, T.A. 1995. Yellow rail (*Coturnicops noveboracensis*). In The Birds of North America, No 139. Edited by A. Poole and F. Gill. The Birds of North America Inc., Philadelphia, PA.

Bookhout, T.A. and J.R. Stenzel. 1987. Habitat and movement of breeding yellow rails. Wilson Bulletin 99(3): 441-447.

Brumm, H. 2004. The impact of environmental noise on song amplitude in a territorial bird. Journal of Animal Ecology 73: 434-440.

Buehler, D.A. 2000. Bald eagle (*Haliaeetus leucocephalus*). In The Birds of North America. No. 506. Edited by A. Poole and E. Gill. The Birds of North America, Inc., Philadelphia, PA.

Buskirk, S.W. 1984. Seasonal use of resting sites by marten in south-central Alaska. Journal of Wildlife Management 48: 950-953.

Buskirk, S.W. and L.F. Ruggiero. 1994. American marten. In The scientific basis for conserving carnivores: American marten, fisher, lynx, and wolverine in the western United States. Edited by L.F. Ruggiero, K.B. Aubry, and S.W. Buskirk. USDA Forest Service General Technical Report, Fort Collins, Colorado. pp. 7-37.

Buskirk, S.W., and S.O. MacDonald. 1984. Seasonal food habits of marten in south-central Alaska. Canadian Journal of Zoology 62: 944-950.

Calyx Consulting. 2012. *Lake Winnipeg East System Improvement (LWESI) Transmission Project. Vegetation Technical Report*. Prepared for Golder Associates Ltd. and Manitoba Hydro. Winnipeg, MB.

Chace, J.F., C. Farmer, R. Winfree, D.R. Curson, W.E. Jensen, C.B. Goguen, and S.K. Robinson. 2005. Cowbird (*Molothrus* spp.) ecology: a review of factors influencing distribution and abundance of cowbirds across spatial scales. Ornithological Monographs No. 57, Management of Cowbirds and Their Hosts: Balancing Science, Ethics, and Mandates, pp. 45-70.

Chapin, F.S III, P.A. Matson, and P.M. Vitousek. 2011. Principles of Terrestrial Ecosystem Ecology. Second Edition. Springer Science+Business Media, LLC, New York, NY. 529 pp. Available from http://books.google.ca/books?hl=en&lr=&id=68nFNpceRmIC&oi=fnd&pg=PR5&dq=ecosystem+approach+terrestrial+matter+cycle&ots=V0EY4Afppn&sig=hE0FyUawRxDZZzf2Kb8fL_uDWmo#v=onepage&q=ecosystem%20approach%20terrestrial%20matter%20cycle&f=false [accessed September 18, 2012].

Chapin, T.D., D.J. Harrison and D.D. Katnik. 1998. Influence of landscape pattern on marten. Conservation Biology 12: 1327-1337.

Cink, C.L. 2002. Whip-poor-will (*Caprimulgus vociferous*). In The Birds of North America, No. 620. Edited by A. Poole and F. Gills. The Birds of North America, Inc., Philadelphia, PA.

Clark, T.W., E. Anderson, C. Douglas, and M. Strickland. 1987. *Martes americana*. Mammalian Species 289: 1-8.

Clevenger, A.P., B. Chruszcz, and K.E. Gunson. 2003. Spatial patterns and factors influencing small vertebrate fauna road-kill aggregations. Biological Conservation 109: 15-26.

Coker, D.R. and D.E. Capin. 1995. Landscape-level habitat use by brown-headed cowbirds in Vermont. Journal of Wildlife Management 56(4): 631-673.

Colescott, J.H., and Gillingham, M.P. 1998. Reaction of moose (*Alces alces*) to snowmobile traffic in the Greys River Valley, Wyoming. Alces 34: 329-338.

Conway, C.J. 1999. Canada warbler (*Wilsonia canadensis*). In The Birds of North America, No. 421. Edited by A. Poole and F. Gill. The Birds of North America, Inc., Philadelphia, PA.

Cooper, J.M., K.A. Enns, and M.G. Shepard. 1997. Status of the Canada warbler in British Columbia. Wildlife Working Report WR-81. Ministry of Environment, Lands and Parks Wildlife Branch, Victoria, BC. 24 pp.

COSEWIC (Committed on the Status of Endangered Wildlife in Canada). 2003. COSEWIC assessment and update status report on the wolverine *Gulo gulo* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. Vi + 41 pp. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_wolverine_e.pdf [accessed September 18, 2012].

COSEWIC 2007b. COSEWIC assessment and status report on the olive-sided flycatcher *Contopus cooperi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vii + 25 pp. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_olivesided_flycatcher_0808_e.pdf [accessed September 7, 2012].

COSEWIC. 2006. COSEWIC assessment and status report on the rusty blackbird *Euphagus carolinus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vi + 28 pp. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_rusty_blackbird_0806_e.pdf [Accessed September 17, 2012].

COSEWIC. 2007a. COSEWIC assessment and status report on the common nighthawk *Chordeiles minor* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vi + 25 pp. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_chordeiles_minor_e.pdf [Accessed September 17, 2012].

COSEWIC. 2008a. COSEWIC assessment and update status report on the short-eared owl *Asio flammeus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_shorteared_owl_0808_e.pdf [accessed August 30, 2012].

COSEWIC. 2008b. COSEWIC assessment and status report on the snapping turtle *Chelydra serpentina* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. vii + 47 pp. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_snapping_turtle_0809_e.pdf [accessed September 6, 2012].

COSEWIC. 2008c. COSEWIC assessment and status report on the Canada warbler *Wilsonia canadensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vi + 35 pp. [Available from

http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_canada_warbler_0808_e.pdf [accessed August 30, 2012].

COSEWIC. 2009a. COSEWIC assessment and status report on the yellow rail *Coturnicops noveboracensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vii + 32 pp. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_yellow_rail_1101_e.pdf [Accessed September 7, 2012].

COSEWIC. 2009b. COSEWIC assessment and update status report of the least bittern *Ixobyrychus exilis* in Canada. Committee on the Status of Endangered Wildlife in Canada Ottawa, ON. vi + 36 pp.. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_least_bittern_0809_e.pdf [accessed September 7, 2012].

COSEWIC. 2009c. COSEWIC assessment and status report on the whip-poor-will *Caprimulgus vociferous* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vi + 28 pp. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_whip-poor-will_0809_e.pdf [accessed September 7, 2012].

COSEWIC. 2009d. COSEWIC assessment and update status report on the northern leopard frog *Lithobates pipiens*, Rocky Mountain population, Western Boreal/Prairie populations and Eastern populations, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vii + 69 pp. Available from http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_northern_leopard_frog_0809i_e.pdf [accessed September 6, 2012].

COSEWIC. 2012. Emergency assessment concludes that three bat species are endangered in Canada. Press release, Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. Available from http://www.cosewic.gc.ca/eng/sct7/Bat_Emergency_Assessment_Press_Release_e.cfm [accessed September 18, 2012].

Crampton, L.H. and R.M.R. Barclay. 1998. Selection of roosting and foraging habitat by bats in different-aged aspen mixedwood stands. Conservation Biology 12(6): 1347-1358.

De Smet, K.D. 2003a. Ferruginous hawk. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 140-141.

De Smet, K.D. 2003b. Burrowing owl. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 230-231.

De Smet, K.D. 2003c. Loggerhead shrike. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 263.

De Smet, K.D. 2003d. Baird's sparrow. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 354-355.

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): 79-88.

Dormarr, J.F. and B.C. Walker. 1996. Elemental content of animal licks along the eastern slopes of the Rocky Mountains in southern Alberta, Canada. Canadian Journal of Soil Science 76: 509-512.

Dussault, C., J.-P. Ouelett, R. Courtois, J. Huot, L. Breton, and H. Jolicoeur, 2005. Linking moose habitat selection to limiting factors. Ecography 28: 619–628.

Edie, S., J. Maynard, and P. Taylor. 2003. Golden-winged warbler. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 316-317.

Elzinga, C.L., D.W. Salzer, J.W. Willoughby, and J.P. Gibbs. 2001. Monitoring Plant and Animal Populations. John Wiley & Sons, Mississauga, ON. 360 pp.

Environment Canada. 2012. Recovery strategy for the woodland caribou, boreal population (*Rangifer tarandus caribou*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa, ON. 120 pp.

Fenton, M.B. and R.M.R. Barclay. 1980. *Myotis lucifugus*. Mammalian Species 142: 1-8.

Fisheries and Oceans Canada. 2009. Beaver Dam Removal. Manitoba Operational Statement v3.

Forbes, G. 2012. Technical summary and supporting information for an emergency assessment of the little brown myotis *Myotis lucifugus* [online]. Prepared by Graham Forbes, Co-Chair, Terrestrial Mammal Subcommittee, Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.

Francis, G.R., and A.B. Stephenson. 1972. Marten ranges and food habits in Algonquin Provincial Park, Ontario. Research Report (Wildlife) No. 91, Ontario Ministry of Natural Resources, APM Reprint #1981.

Frick, W., J. Pollock, A. Hicks, K. Langwig, S. Reynolds. G. Turner, C. Butchkoski, and T. Kunz. 2010. An emerging disease causes regional population collapses of a common North American bat species. Science 329: 679-682.

Fur Institute of Canada. 2003. Trappers: stewards of the land. Fur Institute of Canada, Ottawa, ON. 20 pp.

Gehring, J., P. Kerlinger, and A.M. Manville III. 2011. The role of tower height and guy wires on avian collisions with communication towers. Journal of Wildlife Management 75(4): 848-855.

Gibbs, J.P., F.A. Reid, and S.M. Melvin. 1992. Least bittern (*Ixobrychus exilis*). In The Birds of North America, No. 17. Edited by A. Poole, P. Stettenheim, and F. Gill. The Birds of North America Inc., Philadelphia, PA.

Goldade, C.M., J.A. Dechant, D.H. Johnson, A.L. Zimmerman, B.E. Jamison, J.O. Church, and B.R. Euliss. 2002. Effects of management practices on wetland birds: yellow rail. Northern Prairie Wildlife Research Center, Jamestown, ND. 21 pp. Available from

http://www.npwrc.usgs.gov/resource/literatr/wetbird/download/yera.pdf [accessed September 18, 2012].

Golder (Golder Associates Ltd.). 2012a. *Lake Winnipeg East System Improvement (LWESI) Transmission Project. Climate, Soils, Hydrogeology, and Geology Technical Report*. Prepared for Manitoba Hydro. Winnipeg, MB.

Golder. 2012b. *Lake Winnipeg East System Improvement (LWESI) Transmission Project. Socio-economic and Land Use Technical Report*. Prepared for Manitoba Hydro. Winnipeg, MB.

Goodwin, S.E. and W.G. Shriver. 2011. Effects of traffic noise on occupancy patterns of forest birds. Conservation Biology 25(2): 406-411.

Government of Manitoba. 2012. Media Bulletin January 20 – Manitoba. Additional temporary closure on moose hunting put in place in eastern Manitoba. Available from http://news.gov.mb.ca/news/index.html?archive=today&item=13048 [accessed October 9, 2012].

Gross, D.A. and D.W. Brauning. 2011. Bald eagle management plan for Pennsylvania (2010-2019). Bureau of Wildlife Management Pennsylvania Game Commission, Harrisburg, PA. 64 pp.

Guinn, J.E. 2004. Bald eagle nest site selection and productivity related to habitat and human presence in Minnesota. PhD thesis, Biological Sciences, North Dakota State University of Agriculture and Applied Science. 159 pp.

Habib, L., E.M. Bayne, and S. Boutin. 2007. Chronic industrial noise affects pairing success and age structure of ovenbirds (*Seiurus aurocapilla*). Journal of Applied Ecology 44: 176-184.

Harmata, A.R. 1984. Bald eagles of the San Luis Valley, Colorado: their winter ecology and spring migration. PhD thesis, Montana State University, Bozeman. In Buehler, D.A. 2000. Bald eagle (*Haliaeetus leucocephalus*). In The Birds of North America. No. 506. Edited by A. Poole and E. Gill. The Birds of North America, Inc., Philadelphia, PA.

Harmata, A.R., G.J. Montopoli, B. Oakleaf, P.J. Harmata, and M. Restani. 1999. Movements and survival of bald eagles banded in the Greater Yellowstone Ecosystem. Journal of Wildlife Management 63(3): 781-193.

Harness, R.E. and K.R. Wilson. 2001. Electric-utility structures associated with raptor electrocutions in rural areas. Wildlife Society Bulletin 29: 612-623.

Harriman, J. and D. Baker. 2003. Applying integrated resource and environmental management to transmission right-of-way management. Journal of Environmental Planning and Management 46(2): 199-217.

Hay, S. 2006. Distribution and habitat of the least bittern and other marsh bird species in southern Manitoba. M.N.R.M. thesis, University of Manitoba, Winnipeg, Manitoba. 91 pp.

Herkert, J.R., S.A. Simpson, R.L. Westemeier, T.L. Esker, and J.W. Walk. 1999. Response of northern harriers and short-eared owls to grassland management in Illinois. Journal of Wildlife Management 63(2): 517-523.

Hobson, K.A., R.S. Rempel, H. Greenwood, B. Turnbull, and S.L. Van Wilgenberg. 2002. Acoustic surveys of birds using electronic recordings: new potential from an omnidirectional microphone system. Wildlife Society Bulletin 30:707-720.

Holland, G.E, C.E. Curtis, and P. Taylor. 2003b. Chestnut-collared longspur. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 367.

Holland, G.E, C.E. Curtis, and P. Taylor. 2003c. Canada warbler. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 339.

Holland, G.E. and P. Taylor. 2003a. Yellow rail. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 156.

Holland, G.E. and P. Taylor. 2003b. Short-eared owl. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 235.

Holland, G.E. and P. Taylor. 2003c. Horned grebe. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 76-77.

Holland, G.E. and P. Taylor. 2003d. Spruce grouse. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 151.

Holland, G.E., C.E. Curtis, K.D. De Smet, and P. Taylor. 2003a. Sprague's pipit. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 311-312.

Hollow Water First Nation ATK Workshop Interview. August 22, 2012. Interview conducted by Hani Khalidi at the Hollow Water Band Office Boardroom.

Hollow Water First Nation ATK Workshop Interview. September 17, 2012. Interview conducted by Hani Khalidi at the Hollow Water Band Office Boardroom.

Holt, D.W and S.M. Leasure. 1993. Short-eared owl (*Asio flammeus*). In The Birds of North America, No. 62. Edited by A. Poole and F. Gill. The Birds of North America Inc. Philadelphia, PA.

Huggard, D.J. 2003. Use of habitat features, edges and harvest treatments by spruce grouse in subalpine forest. Forest Ecology and Management 175: 531-544.

Humphrey, S.R. 1982. Bats (*Vespertilionidae* and *Molossidae*). In Wild Mammals of North America: Biology, Management, and Economics. Edited by J.A. Chapman and G.A. Feldhamer. Johns Hopkins University Press, Baltimore, MD. pp. 52-70.

James, A.R.C. and A.K. Stuart-Smith. 2000. Distribution of caribou and wolves in relation to linear corridors. Journal of Wildlife Management 64(1): 154-159.

Janss, G.F.E. 2000. Avian mortality from power lines: a morphologic approach of a species-specific mortality. Biological Conservation 95: 353-359.

Johnsgard, P.A. 2008. Spruce grouse. Grouse and Quails of North America Paper 14. Available from http://digitalcommons.unl.edu/bioscigrouse/14 [accessed August 29, 2012].

Johnson, D. 2001. Habitat fragmentation effects on birds in grasslands and wetlands: a critique of our knowledge. Great Plains Research 11: 211-231.

adjacent forest in east Tennessee. American Midland Naturalist 101: 231-235.

Joro Consultants Inc. 2011. Pine Falls to Manigotagan Transmission Line Site Selection and Environmental Assessment (SSEA) Biophysical Component Summary Report. Prepared for Manitoba Hydro by Joro Consultants Inc. Winnipeg, MB. 62 pp.

Kalcounis, M.C., K.A. Hobson, R.M. Brigham, and K.R. Hecker. 1999. Bat activity in the boreal forest: importance of stand type and vertical strata. Journal of Mammalogy 80(2): 673-682.

KBM Forestry Consultants Inc. 2006. A pilot moose habitat model for the Mid Boreal Uplands Ecoregion of the Manitoba Model Forest. Prepared for Manitoba Model Forest Network. Available from http://www.manitobamodelforest.net/publications/Habitat%20Suitability%20index%20Model%20-%20Moose%202006.pdf [accessed October 10, 2012].

Koes, R.F. 2003a. Least bittern. In The Birds of Manitoba, Manitoba Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 85.

Koes, R.F. 2003b. Trumpeter swan. In The Birds of Manitoba, Manitoba Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 101-102.

Konze, K. and M. McLaren. 1997. Wildlife monitoring programs and inventory techniques for Ontario. Ontario Ministry of Natural Resources, Northeast Science and Technology. Technical Manual TM-009. 141 pp.

Koonz, W.H. 2003. Bald eagle. In The Birds of Manitoba, Manitoba Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 131-132.

Koonz, W.H. and P. Taylor. 2003a. Turkey vulture. In The Birds of Manitoba, Manitoba Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 93.

Koonz, W.H. and P. Taylor. 2003b. Olive-sided flycatcher. In The Birds of Manitoba, Manitoba Avian Research Committee. Edited by P. Taylor. Manitoba Naturalist Society, Winnipeg, MB. pp. 252-253.

Kunkel, K.E., and D.H. Pletscher. 2000. Habitat factors affecting vulnerability of moose to predation by wolves in southeastern British Columbia. Canadian Journal of Zoology 157: 150-157.

Laing, D.K., D.M. Bird, and T. Chubbs. 2005. First complete migration cycles for juvenile bald eagles (*Haliaeetus leucocephalus*) from Labrador. Journal of Raptor Research 39: 11-18.

Laurian, C., Dussault, C., Ouellet, J.-P., Courtois, R., Poulin, M., and Breton, L. 2008. Behaviour of moose relative to a road network. Journal of Wildlife Management 72: 1550-1557.

Lees, L., D. Martinson, and B. Kotak. 2008. Assessment of frog and toad populations in the Manitoba Model Forest year I: May to July 2008. Model Forest Report 08 -02- 06 – D. Prepared for the Manitoba Model Forest, Pine Falls, Manitoba. Available from http://www.manitobamodelforest.net/publications/Assessment%20of%20Frog%20and%20Toad%20Populations.pdf [accessed September 17, 2012].

Linck, M.H. 2000. Reduction in road mortality in a northern leopard frog population. Journal of the Iowa Academy of Science 107(3): 209-211.

Linnell, J.D.C., J.E. Swenson, R. Andersen, and B. Barnes. 2000. How vulnerable are denning black bears to disturbance? Wildlife Society Bulletin 28(2): 400-413.

Manigotagan ATK Workshop Interview. September 17, 2012. Interview conducted by Hani Khalidi at the Wood 'n' Bell Hotel and Restaurant, Manigotagan.

Manitoba Breeding Bird Atlas. 2012. Online database available from http://www.birdatlas.mb.ca/mbdata/datasummaries.jsp?lang=en [accessed August 29, 2012].

MCWS (Manitoba Conservation and Water Stewardship). 2012a. 2012 Manitoba Hunting Guide. Available from http://www.gov.mb.ca/conservation/wildlife/hunting/pdfs/hunting%20guide_2012_web.pdf [accessed August 29, 2012].

MCWS. 2012b. Forestry Road Management. Forest Practices Guidebook. Government of Manitoba, Winnipeg, MB. 28 pp.

MCWS. No date. Moose fact sheet [online]. Available from http://www.gov.mb.ca/conservation/wildlife/mbsp/fs/moose.html [accessed September 18, 2012].

Manitoba Conservation. 2005. Manitoba's Conservation and Recovery Strategy for Boreal Woodland Caribou. Government of Manitoba, Winnipeg, MB. 20 pp.

Manitoba Conservation. 2010. Forest Management Guidelines for Terrestrial Buffers. Forest Practices Guidebook. Government of Manitoba, Winnipeg, MB. 14 pp.

Manitoba Conservation. 2011. Action Plans for Boreal Woodland Caribou Ranges in Manitoba (*Rangifer tarandus caribou*). Draft. Government of Manitoba, Winnipeg, MB. 53 pp.

Manitoba Hydro. 2007. Transmission line and transmission station vegetation management practices. Manitoba Hydro, Winnipeg, MB. 14 pp. Available from http://www.hydro.mb.ca/environment/publications.shtml [accessed October 9, 2012].

Manitoba Hydro. 2009. Guide to environmental legislation: applicable to Manitoba Hydro's Projects and Operations.

Manitoba Hydro. 2010. Fur, feathers, fins, and transmission lines: how rights of way affect wildlife. Editing and design by Marr Consulting Services. Original edition written by R.P. Berger, Wildlife Resource Consulting Services MB Inc. Manitoba Hydro System Planning and Environment Division, Winnipeg, MB. 90 pp.

Manitoba Model Forest. 1994. Manitoba Model Forest Inc. cooperative moose management strategy. Project # 93-2-16 Final Report. Prepared for the Manitoba Model Forest, Pine Falls, MB by Terrestrial & Aquatic Environmental Managers Inc. in cooperation with Harvey Payne, Georg Lithman, and Manitoba Natural Resources. Available from http://www.manitobamodelforest.net/publications/Cooperative%20Moose%20Management%201994%20Report.pdf [accessed October 10, 2012].

Manitoba Model Forest Committee for Cooperative Moose Management meeting minutes June 27, 2011. Manitoba Model Forest, Pine Falls, MB. Available from http://www.manitobamodelforest.net/publications/CCMM_Minutes_June_27_2011.pdf [accessed October 9, 2012].

Manitoba Model Forest Committee for Cooperative Moose Management meeting minutes October 13, 2011. Manitoba Model Forest, Pine Falls, MB. Available from http://www.manitobamodelforest.net/publications/CCMM_Minutes_Oct_13_2011.pdf [accessed October 9, 2012].

Manitoba Model Forest Committee for Cooperative Moose Management meeting minutes March 15, 2012. Manitoba Model Forest, Pine Falls, MB. Available from http://www.manitobamodelforest.net/publications/CCMM_Minutes_Mar_15_2012.pdf [accessed October 9, 2012].

Manitoba Model Forest Committee for Cooperative Moose Management. 2011. Moose News February, 2011. Manitoba Model Forest, Pine Falls, MB. Available from http://www.manitobamodelforest.net/publications/MooseNewsFeb2011.pdf [accessed October 9, 2012].

Martin, N.D. 1960. An analysis of bird populations in relation to forest succession in Algonquin Provincial Park, Ontario. Ecology 41: 126-140.

Maskwa (Maskwa Ecological Consulting Inc.). 2012. *Lake Winnipeg East System Improvement (LWESI) Transmission Project. Forestry Technical Report*. Prepared for Golder Associates Ltd. and Manitoba Hydro. Winnipeg, MB.

Maskwa, Miette Environmental Consulting Inc., and Eagle Vision Resources. 2012. Lake Winnipeg East System Improvement (LWESI) Transmission Project Public Engagement Program Technical Report. Prepared for Golder Associates Ltd. And Manitoba Hydro. Winnipeg, MB.

Mauer, B.A., L.B. McArthur, and R.C. Whitmore. 1981. Effects of logging on guild structure of a forest bird community in West Virginia. American Birds 35: 11-13.

Miette (Miette Environmental Consulting Inc.). 2012. *Lake Winnipeg East System Improvement (LWESI) Transmission Project. Aquatic Environment Technical Report*. Prepared for Golder Associates Ltd. and Manitoba Hydro. Winnipeg, MB.

Millsap, B., T. Breen, E. McConnell, T. Steffer, L. Phillips, N. Douglass, S. Taylor. 2004. Comparative fecundity and survival of bald eagles fledged from suburban and rural natal areas in Florida. Journal of Wildlife Management 68(4): 1018-1031.

Mojica, E.K., B.D. Watts, J.T. Paul, S.T. Voss, and J. Pottie. 2009. Factors contributing to bald eagle electrocutions and line collisions on Aberdeen Proving Ground, Maryland. Journal of Raptor Research 43(1): 57-61.

Naiman, R.J., H. Decamps, and M. Pollock. 1993. The role of riparian corridors in maintaining regional biodiversity. Ecological Applications, 3(2): 209-212.

NatureServe. 2012. NatureServe Explorer: an online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, VA. Available from http://www.natureserve.org/explorer [accessed August 29, 2012].

Nero, R.W. and P. Taylor. 2003. Rusty blackbird. In The Birds of Manitoba. Manitoba Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 378-379.

NLHS (Northern Lights Heritage Services). 2012. *Lake Winnipeg East System Improvement (LWESI) Transmission Project. Cultural Resources Technical Report*. Prepared for Golder Associates Ltd. and Manitoba Hydro. Winnipeg, MB.

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

Parnell, J.F., D.G. Ainley, H. Blokpoel, B. Cain, T.W. Custer, J.L. Dusi, S. Kress, J.A. Kushlan, W.E. Southern, L.E. Stenzel, and B.C. Thompson. 1988. Colonial waterbird management in North America. Colonial Waterbirds 11(2): 129-169.

Pattie, D.L. and R.S. Hoffmann. 1990. Mammals of the North American Parks and Prairies. Donald L. Pattie, Edmonton, AB. 579 pp.

Peek, J.M. 2007. Habitat relationships. In Ecology and Management of the Moose, 2nd Edition. Edited by A.W. Franzmann and C.C. Schwartz. University Press of Colorado, Boulder, CO. pp. 351-375.

Potvin, F., R. Courtois, and L. Bélanger. 1999. Short-term response of wildlife to clear-cutting in Quebec boreal forest: multiscale effects and management implications. Canadian Journal of Forest Research 29: 1120-1127.

Poulin, R.G., S.D. Grindal, and R.M. Brigham. 1996. Common nighthawk (*Chordeiles minor*). In The Birds of North America, No. 213. Edited by A. Poole and F. Gill. The Birds of North America Inc., Philadelphia, PA.

Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, and D.E. DeSante. 1993. Handbook of field methods for monitoring landbirds. U.S. Forest Service Southwest Pacific Research Station General Technical Report PSW-GTR-144. 41 pp.

Rea, R.V., D.P. Hodder, and K.N. Child. 2004. Considerations for natural mineral licks used by moose in land use planning and development. Alces 40: 161-167.

Rempel. R.S., K.A. Hobson, G. Holborn, S.L. Van Wilgenburg, and J. Elliot. 2005. Bioacoustic monitoring of forest songbirds: interpreter variability and effects of configuration and digital processing methods in the laboratory. Journal of Field Ornithology 76: 1-11.

Robertson, B.A. and R.L. Hutto. 2006. A framework for understanding ecological traps and an evaluation of existing evidence. Ecology 87: 1075-1085.

Robertson, B.A. and R.L. Hutto. 2007. Is selectively harvested forest an ecological trap for olive-sided flycatchers? The Condor 109: 109-121.

Rocky Mountain Bird Observatory. 2007. Partners in Flight Population Estimates Database [online]. Available from http://www.rmbo.org/pif_db/laped/query.aspx. [Accessed October 31, 2012].

Ross, A.M. 2007. Spruce grouse distribution, movements and habitat selection: a mid-successional species in an aging forested landscape. M.Sc. Thesis. State University of New York, Syracuse, NY. 111 pp.

RRCS (Renewable Resources Consulting Services Ltd.). 1994. A review of the literature pertaining to the effects of noise and other disturbance on wildlife. EIS: military flight training. An environmental impact statement on military flying activities in Labrador and Québec. Department of National Defence (DND). 155 pp.

Ruggiero, L.F., E. Pearson, and S.E. Henry. 1998. Characteristics of American marten den sites in Wyoming. Journal of Wildlife Management 62(2): 663-673.

Rusz, P.J., H.H. Prince, R.D. Rusz, and G.A. Dawson. 1986. Bird collisions with transmission lines near a power plant cooling pond. Wildlife Society Bulletin 14: 441-444.

Schemnitz, S.D. 1980. Wildlife management techniques manual. Fourth Edition. The Wildlife Society, Washington, DC. 686 pp.

Schindler, D.W. 2005. Determining woodland caribou home range and habitat use in eastern Manitoba. Prepared for the Eastern Manitoba Woodland Caribou Advisory Committee. Manitoba Model Forest, Pine Falls, MB. 77 pp.

Schmidt, C.A. 2003. Conservation assessment for the northern myotis in the Black Hills National Forest South Dakota and Wyoming. United States Department of Agriculture Forest Service, Rocky Mountain Region, Black Hills National Forest, Custer, SD. Available from http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm9_012446.pdf [accessed September 5, 2012].

Seymourville/Manigotagan ATK Workshop Interview. August 22, 2012. Interview conducted by Hani Khalidi at the Seymourville Community Council Office Boardroom.

Shulz, T.T. and W.C. Leininger. 1991. Nongame wildlife communities in grazed and ungrazed montane riparian sites. Great Basin Naturalist 51(3): 286-292.

Sleep, D.J.H., M.C. Drever, and K.J. Szuba. 2009. Potential role of spruce budworm in range-wide decline of Canada warbler. Journal of Wildlife Management 72: 546-555.

Smith, R. E., Veldhuis, H., Mills, G. F., Eilers, R. G., Fraser, W. R., and Lelyk, G. W. 1998. Terrestrial ecozones, ecoregions, and ecodistricts of Manitoba: an ecological stratification of Manitoba's natural landscapes. Land Resource Unit, Brandon Research

Centre, Research Branch, Agriculture and Agri-Food Canada. Research Branch. Technical Bulletin 1998-9E.

Species at Risk Public Registry. 2012. Canada's strategy *Species at Risk Act* [online]. Available from http://www.sararegistry.gc.ca/approach/strategy/default_e.cfm [accessed November 22, 2012].

Steenhof, K., M.N. Kochert, and J.A. Roppe. 1993. Nesting by raptors and common ravens on electrical transmission line towers. Journal of Wildlife Management. 57(2): 271-281.

Stinson, D.W., J.W. Watson, and K.R. McAllister. 2007. Washington state status report for the bald eagle. Washington Department of Fish and Wildlife, Olympia, WA. 86+ pp.

Strickland, M.A., C.W. Douglas, M. Novak, and N.P. Hunziger. 1998. Marten (*Martes americana)*. In Wild furbearer management and conservation in North America. Edited by M. Novak, J.A. Baker, M.E. Obbard, and B. Malloch. Ontario Ministry of Natural Resources, Peterborough, Ontario. pp. 531-546.

Synthen Resource Services. 1995. Road management plan. Project #94-3-03. Prepared for the Manitoba Model Forest by Synthen Resource Services, Winnipeg. 37pp + Appendices.

Takats, L., M. Stewart, R. Todd, R. Bonar, B. Beck, and R. Quinlan. 1999. Habitat suitability index model for the American marten. Manitoba Forestry Wildlife Management Project, Winnipeg, Manitoba.

Tankersley, N.G. and W.C. Gasaway. 1983. Mineral lick use by moose in Alaska. Canadian Journal of Zoology 61: 2242-2249.

Taylor, P. 2003a. Woodpeckers (Family *Picidae*). In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 243.

Taylor, P. 2003b. Common nighthawk. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 238.

Taylor, P. 2003c. Red-headed woodpecker. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. pp. 244-245.

Taylor, P. and G.E. Holland. 2003a. Whip-poor-will. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 239.

Taylor, P. and G.E. Holland. 2003b. Chimney swift. In The Birds of Manitoba, Manitoban Avian Research Committee. Edited by P. Taylor. Manitoba Naturalists Society, Winnipeg, MB. p. 240.

Terrestrial & Aquatic Environmental Managers. 1993. Moose census and habitat evaluation for the Manitoba Model Forest. Prepared for the Manitoba Model Forest, Pine Falls, MB. Available from http://www.manitobamodelforest.net/publications/Moose%20Census%20and%20Habitat%20Evaluation%2092-2-9.pdf [accessed October 10, 2012].

Tewksbury, J.J., L. Garner, S. Garner, J.D. Lloyd, V. Saab, and T.E. Martin. 2006. Tests of landscape influence: nest predation and brood parasitism in fragmented ecosystems. Ecology: 759-768.

Thomas, D.C. and D.R. Gray. 2002. Update COSEWIC status report on the woodland caribou *Rangifer tarandus* in Canada. Committee on the Status of Endangered Species in Canada, Ottawa, ON. 98 pp.

White, C.M., N.J. Clum, T.J. Cde, and W.G. Hunt. 2002. Peregrine falcon (*Falco peregrines*). In The Bird of North America, No. 660. Edited by A. Poole and F. Gill. The Birds of North America Inc., Philadelphia, PA. pp. 146-147.

Wilbert, C.J., S.E. Buskirk, K.G. Gerow. 2000. Effects of weather and snow on habitat selection by American martens (*Martes americana*). Canadian Journal of Zoology 78: 1691-1696.

Wildlife Resource Consulting Services MB Inc. and Silvitech Consulting. 1997. Design and implementation of the Manitoba Model Forest bird monitoring program. Project 96-2-17 Management of the MBMF for the Conservation of Boreal Forest Birds. Prepared for Manitoba Model Forest Inc., Manitoba Department of Natural Resources Wildlife Branch and Parks Branch, Pine Falls Paper Company, Manitoba Forestry-Wildlife Management Project, and Canadian Wildlife Service Prairie and Northern Region. Prepared by Wildlife Resource Consulting Services MB Inc., Winnipeg, MB and Silvitech Consulting, Winnipeg, MB. 94 pp. + appendix.

Wund, M.A. 2006. Variation in the echolocation calls of little brown bats (*Myotis lucifugus*) in response to different habitats. American Midland Naturalist 156: 99-108.

Zielinski, W.J., K.M. Slauson, and A.E. Bowles. 2008. Effects of off-highway vehicle use on the American marten. Journal of Wildlife Management 72(7): 1558-1571.

8.2 Personal Communications

Keenan, Vincent. 2012. Forest Management/Environmental Assessment Services. Pine Falls. July 2012.

Kotak, Brian. 2012. Miette Environmental Consulting. September 30th, 2012.

9 GLOSSARY

Anthropogenic: of, relating to, or resulting from the influence of human beings on nature.

Arboreal: frequenting or inhabiting trees.

Brood parasitism: a reproductive strategy in which one species of bird lays eggs in the nest of another species; also referred to as nest parasitism.

Corvid: bird of the family *Corvidae*, including crows, ravens, jays, and magpies.

Danger tree: tall tree that is close to interfering with transmission line operation and safety.

Effective habitat: an estimate of the percentage of habitat available to support individuals within a wildlife population after subtracting habitat alienated by human influences (e.g., sensory disturbances). Human influences do not include physical habitat losses.

Herbaceous: a plant that has leaves and stems that die down to the soil level at the end of the growing season and does not develop persistent woody tissue. Can also refers to the parts of a plant that die and are shed at the end of a growing season.

Hibernaculum: a shelter occupied during the winter by a dormant animal.

Forb: a non-grassy **herbaceous** species.

Neotropical migrants: species of birds that winter in tropical climates and breed within the temperate, boreal, or arctic regions of North America.

Umbrella species: species selected for making conservation-related decisions, typically because protecting these species indirectly protects the many other species that make the the ecological community of its habitat.