# Lake Winnipeg East System Improvement Transmission Project Environmental Effects Monitoring Plan

Pursuant to Lake Winnipeg East System Improvement Transmission Project *Environment Act* licence #3210 condition #43

Prepared By:


## Licensing and Environmental Assessment
**10/29/2015**

Prepared for:

Manitoba Conservation and Water Stewardship, Environmental Approvals Branch

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# 1.0 INTRODUCTION

## 1.1 BACKGROUND

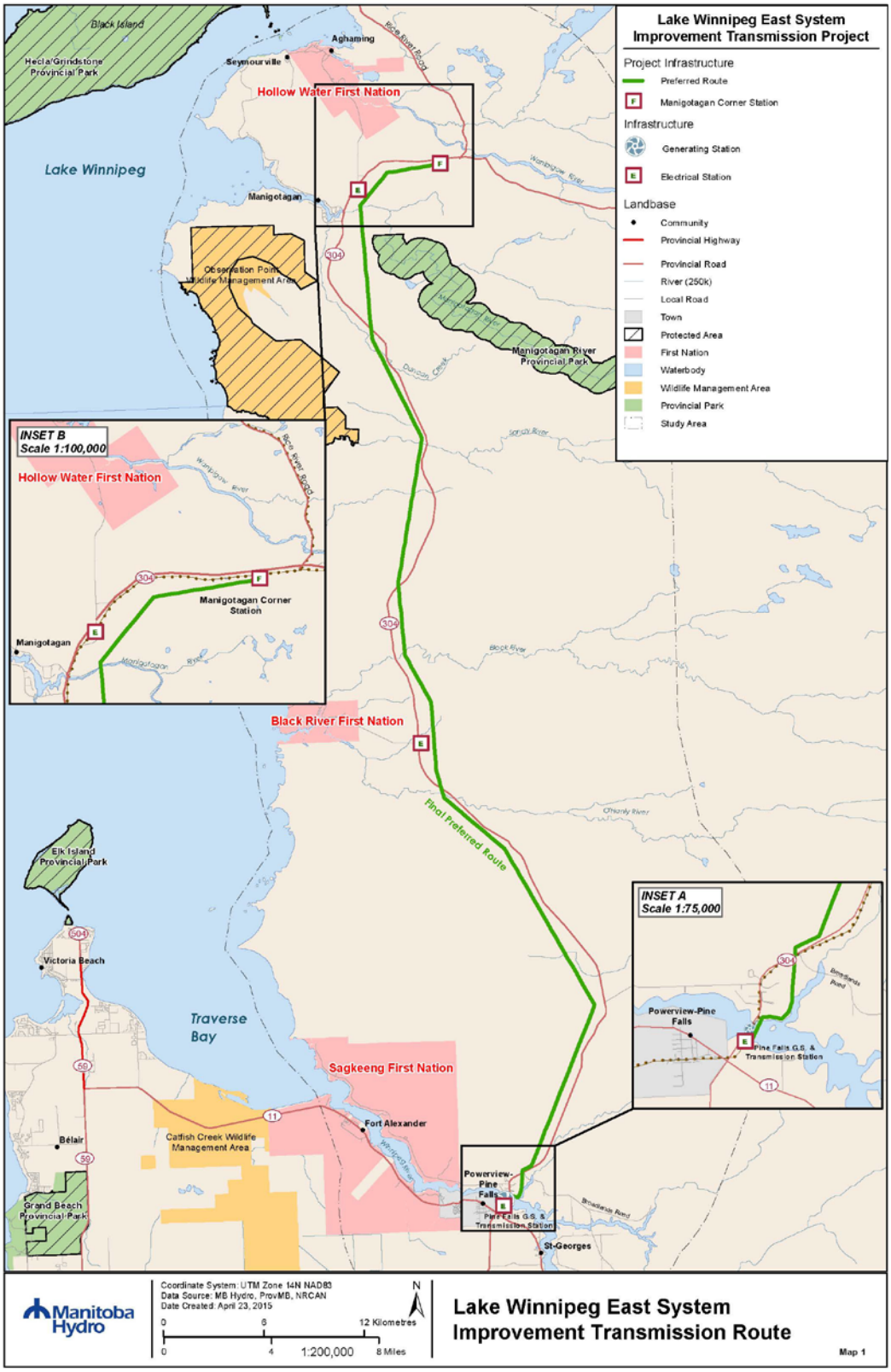
Part of Manitoba Hydro's commitment to environmental protection includes the development of a comprehensive Environmental Protection Program (EPP) for the Lake Winnipeg East System Improvement Transmission Project (the 'Project'). Map 1 illustrates the Project components and Study area. One aspect of this program is monitoring and follow up for environmental components identified in the Lake Winnipeg East System Improvement Transmission Project Environmental Assessment (EA) Report and technical reports which can be found at http://www.gov.mb.ca/conservation/eal/registries/5624lake_winnipeg/index.html.

This document provides the Environmental Effects Monitoring Plan (EEMP), which outlines the various monitoring activities that will occur during the phases of Project development (i.e., pre-construction, construction and post construction).

The Environmental Effects Monitoring Plan is intended to describe how and provide assurance to regulators, environmental organizations, Aboriginal communities and the general public that potential environmental effects caused by the Project will be monitored, evaluated and reported on in a responsible and accountable manner.

Manitoba Hydro has accumulated a wealth of knowledge and lessons learned from previous monitoring programs. The successes of those programs have been leveraged in the development of this plan. Previous weaknesses have been adapted and improved upon to further enhance this plan's approach, methods and key environmental monitoring activities.

As this Environmental Effects Monitoring Plan requires and generates large amounts of data, an Environmental Protection Information Management System (EPIMS) was developed to manage, store and facilitate the transfer of Environmental Protection Program data and information among the Project team. EPIMS will facilitate the transferring of knowledge and experiences encountered on a daily basis during construction activities from Environmental Inspectors and Community Monitors to the Specialists that are responsible for monitoring project effects. As well monitoring results and mitigation measure adaptations will be communicated back to construction staff and contractors. EPIMS is an essential tool, that manages vast amounts of data and information that will be generated through the implementation of this plan, allowing for Manitoba Hydro to adapt from its experiences on this project and apply that knowledge to future developments.




Map 1. Lake Winnipeg East System Improvement Transmission Route

# 2.0 PURPOSE AND OBJECTIVES

## 2.1 PURPOSE

The Lake Winnipeg East System Improvement Transmission Project EA Report, and *Environment Act* Licence conditions identified several key environmental components that require follow-up monitoring. These include:

- Aquatics
- Birds
- Mammals

The purpose of this Environmental Effects Monitoring Plan is to outline the potential effects as identified in the Lake Winnipeg East System Improvement Transmission Project EA Report and the key activities that will be conducted as part of the monitoring and follow-up component of the Environmental Protection Program. The intended goal of this plan is to provide confidence that follow-up monitoring associated with the Project will follow best practices for environmental monitoring.

## 2.2 OBJECTIVES

The objectives of the monitoring activities outlined in this monitoring plan are to:

- Confirm the nature and magnitude of predicted environmental effects as stated in the EA report;
- Assess effectiveness of mitigation measures implemented;
- Identify unexpected environmental effects of the project, if they occur;
- Identify mitigation measures to address unanticipated environmental effects, if required;
- Confirm compliance with regulatory requirements including approval terms and conditions; and
- Provide baseline information to evaluate long-term changes or trends.

Environmental Effects monitoring information will be shared for learning and improvement through regular reporting to regulators.

## 2.3 SCOPE OF WORK

The scope of this Environmental Effects Monitoring Plan will include physical and biological components of the environment.

## 2.4 MANAGEMENT AND COORDINATION

Manitoba Hydro has committed dedicated staff for the implementation of this plan, involvement of community participation, along with retaining highly qualified specialists in appropriate disciplines. The Environmental Protection Information Management System (EPIMS) will play a major role in managing field work, data and communications among the monitoring team.

## 2.5 PUBLIC COMMUNICATIONS AND ENGAGEMENT

In addition to extensive public engagement efforts that have occurred to date throughout the development of the Project, Manitoba Hydro welcomes all members of the public to contact the corporation with questions or comments throughout the construction process. Manitoba Hydro's Project website site will be maintained and updated regularly throughout the project. As noted on the Project website, additional information is always available to the public upon request via:

Toll-free phone number: 1-877-343-1631

E-mail address: LEAprojects@hydro.mb.ca

Mail: Lake Winnipeg East System Improvement Transmission Project

C/O Licensing & Environmental Assessment Dept.
PO BOX 7950 STN MAIN
Winnipeg, Manitoba R3C 0J1

Website: http://www.hydro.mb.ca/projects/expansion/lake_winnipeg_east/index.shtml

## 2.6 ABORIGINAL ENGAGEMENT & TRADITIONAL KNOWLEDGE

Manitoba Hydro made commitments in the EA Report to provide updates, encourage ongoing communication with Aboriginal communities regarding culturally appropriate and site-specific mitigation measures that have been identified as concerns with First Nations, NACCs and the Manitoba Metis Federation (MMF).

Manitoba Hydro also committed to engaging community-based expertise in the construction of the Lake Winnipeg East System Improvement Transmission Project. Manitoba Hydro is funding individuals from local communities to work as Community Liaisons. Community Liaisons will work alongside Manitoba Hydro staff and their contractors with the objectives to keep both the community and Manitoba Hydro informed about the progress and effects of the project while continuing to build a lasting and trusting relationship. Each Community Liaison will communicate project progress to the community and community interests to Manitoba Hydro.

# 3.0 MONITORING REQUIREMENTS

## 3.1 OVERVIEW

As defined under the *Canadian Environmental Assessment Act* (CEAA), monitoring and follow up is required to verify the accuracy of the environmental assessment of a project and determine the effectiveness of measures taken to mitigate potential adverse environmental effects (CEAA 2011). Through monitoring and follow up, EA Report outcomes are realized, communicated to stakeholders and managed through refinement and improvement of mitigation strategies.

The Environmental Protection Program includes two main types of monitoring:

- Environmental monitoring – periodic or continuous surveillance or testing, according to a predetermined schedule, of one or more environmental indicators to establish/enhance knowledge of baseline conditions or to verify the accuracy of an environmental assessment and the effectiveness of mitigation measures.
- Compliance monitoring – observation or testing conducted to verify whether a practice or procedure meets the applicable requirements prescribed by legislation, licence conditions, and/or Environmental Protection Plans.

The compliance monitoring involves the use of dedicated Environmental Inspectors to observe and verify the implementation of the environmental protection plans. Community involvement along with Specialists that are typically Manitoba Hydro staff or Manitoba Hydro contracted consultants with specific expertise in monitoring will perform the environmental monitoring component. Information generated from these programs will be used within an adaptive management approach to improve both mitigation measure effectiveness and monitoring program design.

A number of environmental components were identified in the EA Report and technical reports , *Environmental Act* Licence and First Nations and Metis engagement activities that require monitoring and follow up. For each environmental component, one or more environmental indicators were selected to focus monitoring and follow up efforts. General information on how these environmental indicators will be measured is covered in Section 4.

Table 3-1 provides a list of environmental components and their respective environmental indicators/parameters including the rationale for their inclusion in this plan.

**Table 3-1 Environmental Components Requiring Follow-up Monitoring**

| Environmental Component | Environmental Indicator | Parameter | Rationale[1] |
|---|---|---|---|
| Aquatics | Condition of watercourse and banks | Riparian buffer; ground cover; erosion | Environmental importance; protection of aquatic life |
| Vegetation | Vegetation Species of Conservation Concern | Location, presence and abundance | Regulatory importance; Manitoba *Wildlife Act; Endangered Species and Ecosystems Act.* SARA; MBCDC |
| | Plants and Plant Communities important to Aboriginal peoples | Location, presence and abundance | Community and Environmental Importance |
| | Rehabilitation | Ground cover disturbance around construction areas | Regulatory importance, EA Licence Condition |
| | Invasive and Non-Native Species | Location, presence, distribution | Regulatory importance, EA Licence Condition |
| Birds | Stick Nests | Occupancy, location, mortality | Regulatory importance - MBCA; Manitoba *Wildlife Act* |
| | Bird collision and Bird Diverter Monitoring | Location, mortality and abundance by species | Regulatory importance – MBCA; Manitoba *Wildlife Act* |
| | Bird Species of Conservation Concern | Areas and locations of species by habitat | Regulatory importance – MBCA; Manitoba *Wildlife Act*<br>Regulatory importance - MESEA; SARA; MB CDC |
| Mammals | Moose | Distribution, structure, abundance, mortality | Community and Environmental Importance, EA |

**Table 3-1 Environmental Components Requiring Follow-up Monitoring**

| Environmental Component | Environmental Indicator | Parameter | Rationale[1] |
|---|---|---|---|
| | | | Licence Condition |
| | Whitetail Deer | Distribution | Environmental importance, EA Licence Condition |
| | Wolves | Distribution, and movement in relation to the project.<br>Presence/absence on ROW, Predation rate on moose | Environmental importance, EA Licence Condition |
| Access | Human | Presence and magnitude of use of ROW by humans | Environmental, cultural and societal importance |

[1] *Manitoba Endangered Species and Ecosystems Act* (MESEA); *Species at Risk Act* (SARA); Manitoba Conservation Data Centre (MB CDC); *Migratory Bird Convention Act* (MBCA)

# 4.0 ENVIRONMENTAL COMPONENT MONITORING

This section describes the environmental components and indicators that will be monitored, including: key monitoring activities, task descriptions, duration (length of time over which the key monitoring activity will take place), frequency (number of times the activity will take place) and timing of activities (time of year in which monitoring activity to take place). Environmental Monitor input, Manitoba Hydro commitments, Specialist and Manitoba Conservation and Water Stewardship (MCWS) roles. Manitoba Hydro has developed the plan to address concerns expressed by stakeholders, local communities, First Nations and Metis, and regulators.

Where applicable, Decision Trigger(s)/Threshold(s) for Action have been identified for each environmental component. These decision triggers or thresholds for action are mechanisms to promote adaptive management that cause Manitoba Hydro and its Specialists to stop and further evaluate the monitoring results and, if required, adapt mitigation measures or monitoring activities. Decisions triggers/thresholds cannot be identified for all situations, there are too many parameters and variables and scientific research required. It is for this reason why many government agencies, including Manitoba, have not yet published definitive thresholds for action for different wildlife management scenarios. The development of mitigative actions in response to decision triggers and thresholds being met, will be done in conjunction with MCWS, as some of those actions are not something Manitoba Hydro has the authority or ability to enact.

# 4.1 AQUATICS

## 4.1.1 Fish Habitat

The Project will require overhead line crossings of 28 waterbodies. In addition to these crossings, construction access routes may require additional stream crossings. A potential effect of the Project to fish habitat is the loss of riparian vegetation (vegetation along the water's edge) during construction. Riparian vegetation functions as fish habitat by providing bank stability, food and nutrient inputs (e.g., leaf litter and insect drop), and shading. The loss of riparian vegetation can result in increased sediment in water due to decreased bank stability, increased water temperature and decreased cover for fish. Increased suspended sediments can decrease light penetration resulting in decreased photosynthesis. Sedimentation of streams can bury or create unsuitable habitats for aquatic invertebrates that are eaten by fish, infill spawning habitats and reduce the spawning and feeding success of fish. Post-construction monitoring at stream crossings will be conducted to ensure that the prescribed riparian buffers were maintained and that crossing sites have been adequately rehabilitated where required.

**Objective(s):**

- *To verify the implementation and effectiveness of mitigation prescribed for areas adjacent to watercourses including: riparian buffers, erosion control, and temporary stream crossings.*

**Applicable Project Component(s):** *All project components.*

**Monitoring Activities**

**Table 4-1 Fish Habitat**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Stream crossing assessment | Construction/ Post construction | Stream Crossing Survey | Riparian buffers, ground cover, erosion | Aquatics ESS | 1-3 years | Annual | Spring or Summer | Riparian buffer width (m),<br>Vegetative cover (% cover : % bare ground),<br>Bank stability and erosion (%),<br>Re-vegetation where soil was disturbed (% ground cover : % bare ground) |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from the construction period;*
- *Provide qualified Environmental Inspectors and Site Environmental Officers to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of mitigation performance at Environmentally Sensitive Sites (ESS) sites within project footprint or access routes.*
- *Record observations with photo and waypoint and store in EPIMS*
- *Work with Specialist during field visits to assess mitigation effectiveness, share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of stream crossings requiring site survey and assessment of ROW effects;*
- *Review Environmental Inspector and Monitor daily reports for the performance and implementation of prescribed mitigation measures at each stream crossing site;*
- *Design and conduct specific survey methods that sample aquatic ESS sites and at sites where documentation by environmental inspectors is insufficient or site conditions warrant follow-up to verify accuracy of EA Report predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on stream crossings discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

**Decision Trigger(s)/Threshold(s) for Action**

- *Bank stability and erosion – equal to pre-construction stability, if not equal prescribe site specific rehabilitation measures as required.*

# 4.2 VEGETATION

## 4.2.1 Vegetation Species of Conservation Concern

Species of conservation concern include species of plants that are protected under *The Endangered Species Act* (Manitoba), the federal *Species at Risk Act* or are listed by the Manitoba Conservation Data Centre (MBCDC). These species generally exist in low numbers, play a role in helping to preserve species diversity (e.g., songbirds, invertebrates), and/or have limited distributions.

Eighteen locations for plant species of conservation concern were previously known to occur along the transmission right-of-way and project components (MBCDC records). Field assessments identified three species of concern sites along the transmission line right-of-way local study area.

Construction activities that can negatively affect plant species of conservation concern include the use of heavy equipment (crushing plants) and clearing and grubbing (removal of roots) of vegetation. Another potential effect is herbicide use (during maintenance activities) which not only inhibits the growth of undesirable species, but can also negatively affect desirable species.

**Objectives**

- *Confirm project effects and mitigation on the known sites where species of conservation concern were identified (i.e. Hookers Orchid, Sessile-Fruited Arrowhead, Swollen Sedge).*

**Applicable Project Component(s):** *All project infrastructure.*

**Monitoring Activities:**

**Table 4-2 Vegetation Species of Conservation Concern**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Plant surveys | Construction and Post-construction | Ground surveys for species of conservation concern | Location, presence and abundance | Environmentally Sensitive Sites in Project Footprint | 1-3 years post clearing | Annual | Summer | Stem counts, number of plants in bloom, average plant height, spatial extent of population, canopy cover, nearby satellite populations |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors and Site Environmental Officers to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis.*

*Responsibilities of Environmental Monitor include:*

- *Work with Specialist during field visits to assess mitigation effectiveness, share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential terrestrial vegetation sampling sites and assessment of ROW effects;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential rare plant sampling sites;*
- *Design and conduct specific survey methods that sample for priority plants to verify accuracy of EA Report predictions and effectiveness of mitigation measures implemented;*
- *Conduct ground surveys at known locations within the project footprint during summer after construction completion to document the degree of plant loss and/or disturbance;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on species of conservation concerns discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness in years in which field work occurs; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis*.

**Decision Trigger(s)/Threshold(s) for Action**

- *Decrease in abundance or distribution of vegetation species of conservation concern within ESS.*

## 4.2.2 Plants and Plant Communities important to Aboriginal Peoples

Many plants and plant communities are particularly important for ecological and social reasons. Some of these plant communities include blueberries and medicinal plants that may be impacted by construction and operation of the project. Manitoba Hydro anticipates working with Aboriginal communities to further identify and map these sites so that mitigation measures could be implemented to minimize the effects of the project. Representatives from Aboriginal communities will be contacted and asked to accompany the biologist to the gathering sites.

**Objectives**

- *Identify project effects on plant locations and plant communities important to Aboriginal Peoples.*

**Applicable Project Component(s):** *Transmission Line Final Preferred Route*

**Monitoring Activities:**

**Table 4-3 Plants and Plant Communities important to Aboriginal Peoples**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Plant surveys | Pre-construction | Ground surveys conducted through ATK studies to identify plants and plant community locations | Location, presence and abundance | Project Footprint (high potential sites) | 1 year | Once | Summer | Presence, location data, spatial extent |
| | Construction and Post-construction | Ground surveys to identify impacts to plant and plant communities and document response to clearing and construction. | Location, presence and abundance | Project Footprint | 1-3 years post clearing | Annual | Summer | Presence, location data, number of patches, stem data, spatial extent |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors and Site Environmental Officers to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis.*

*Responsibilities of Environmental Monitor include:*

- *Work with Specialist during field visits to assess mitigation effectiveness, share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential terrestrial vegetation sampling sites and assessment of ROW effects;*
- *Review Environmental Inspector and Monitor daily reports for identification of potential important plant sampling sites;*
- *Conduct ground surveys with a representatives from Aboriginal communities at known important plant locations within the project footprint during summer after construction completion to document the response to clearing and construction;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on important plants discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness in years in which field work occurs; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis*.

**Decision Trigger(s)/Threshold(s) for Action**

- *Significant decrease in abundance and distribution of plants and plant communities important to Aboriginal Peoples compared to adjacent off-ROW locations*

### 4.2.3 Rehabilitation

Rehabilitation mitigates adverse Project effects, controls erosion, controls invasive plant spread, restores wildlife habitat and improves aesthetics. Monitoring is required to verify the implementation and effectiveness of rehabilitation measures, the locations and nature of which are presently unknown, but may include staging areas, construction camps and borrow sites.

**Objective(s):**

- *Determine the location and degree that project areas are disturbed and not naturally revegetating;*
- *Develop rehabilitation prescription for area's requiring active revegetation*

**Applicable Project Component(s):** *All components.*

**Monitoring Activities:**

**Table 4-4 Rehabilitation**

| Key Monitoring Activity | Phase | Task Description | Parameter | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Plot transect vegetation surveys | Post-construction | Survey project footprint for areas that may require rehabilitation prescription. | Ground cover disturbance around construction areas | Rehabilitation Area | 2 year | Annual | Summer | Presence or bare soil, nonnative species, establishment of seeded and planted vegetation |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide post construction digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors and Site Environmental Officers to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of clearing disturbance effects and mitigation performance at ESS sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Use preconstruction digital ortho-rectified imagery as the base map for GIS mapping and field data;*
- *Use the post-construction digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro to create a map of terrestrial habitat cleared and/or disturbed and requiring revegetation;*
- *Develop the rehabilitation prescriptions;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on vegetation areas discovered through monitoring activities;*

- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

**Decision Trigger(s)/Threshold(s) for Action**

- *Disturbed project areas requiring revegetation*

## 4.2.4 Invasive and Non-Native Plant Species

Invasive plants are defined as those plants that are growing outside of their country or region of origin and are out-competing or replacing native plants (Invasive Species Council of Manitoba 2012). Invasive plants are of concern because they can crowd out other plant species and change vegetation composition or other ecosystem attributes. Other non-native plant species that are generally not invasive may outcompete native species under some conditions.

**Objectives**

- *Document the composition and abundance of vegetation at pre-determined sites;*
- *Document the degree of non-native and invasive plant introduction and spread; and*
- *Recommend appropriate control and eradication programs, if there is introduction and/or spread.*

**Applicable Project Component(s):** *All Components*

**Monitoring Activities:**

**Table 4-5 Invasive and Non-Native Plant Species**

| Key Monitoring Activity | Phase | Task Description | Parameter | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Invasive and non-native species survey | Construction | Ground surveys in areas with potential for introduction or spread of invasive plants. | Location, presence, distribution | Project footprint | 2 years | Annual | Summer | Presence/absence of invasive, non-native species, location data, number of patches, stem counts, spatial extent |
| | Post-construction | Ground surveys in areas with potential introduction of invasive plants. | Location, presence, distribution | Project footprint | 1 year | Twice per season | Summer | Presence/absence of invasive, non-native species, location data, number of patches, stem counts, spatial extent |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors and Site Environmental Officers to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of invasive plants within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Review Environmental Inspector and Monitor daily reports for identification of potential invasive and non-native species sampling sites;*
- *Design and conduct specific survey methods that sample invasive and non-native species sites for composition and abundance to verify accuracy of EA Report predictions and effectiveness of mitigation and control measures implemented;*
- *Record findings in the field with geo-referenced photos, marked up maps, and field notes*
- *Report immediately to Manitoba Hydro any unanticipated project effects on invasive and non-native species discovered through monitoring activities;*
- *Prescribe vegetation management options for invasive species control where required;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

**Decision Trigger(s)/Threshold(s) for Action**

- *Establishment and spread of invasive species along ROW*

## 4.3 BIRDS

Birds are protected by a variety of legislation including the *Migratory Birds Convention Act, Species at Risk Act, Wildlife Act*, and *Endangered Species and Endangered Ecosystems Act*. Manitoba Hydro is committed to responsible environmental stewardship, which aims to minimize the environmental effects of the Project components on bird species . This requires a substantial effort as, of the approximately 400 bird species found in Manitoba, about 306 species have been identified as having ranges within the Project Study Area. Many of these species have precise breeding habitat requirements and require specialized habitats at other times of the year such as during migration. 22 of these 306 species are listed under *The Endangered Species Act of Manitoba* (MESEA) or the federal *Species at Risk Act* (SARA).

### 4.3.1 Bird Wire Collisions and Bird Diverter Monitoring

The presence of transmission lines in proximity to areas of high bird activity may lead to bird – wire collisions, which may result in the injury and death of birds. Manitoba Hydro has committed to installing bird diverters along transmission line sections which transect areas of high bird activity. Pre-construction surveys will serve to identify ESS for birds and gauge the level of bird activity at these sites at biological important times such as during migration and the rearing of offspring. Pre and post-construction phase studies will aim to quantify mortality to birds caused by the transmission Line and direct adaptive mitigation strategies to reduce or prevent mortality events.

**Objective(s):**

- *Identify the efficacy of bird diverters;*
- *Bird environmental sensitive site validation and survey;*
- *Monitor bird collisions caused by transmission line infrastructure; and*
- *Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should high levels of avian mortality occur as a result of the transmission line.*

**Applicable Project Component:** *All Components*

**Monitoring Activities:**

**Table 4-6 Bird Wire Collisions and Bird Diverter**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Bird Wire Collisions and Bird Diverter monitoring | Pre -construction phase | Bird ESS validation and survey | Location and abundance by species | Where suitable bird migration stopover and breeding habitat overlap with Project components (e.g., towers, wires). | 1 year | Spring and fall visits | April 1 – October 31 | Abundance, species composition, habitat and bird flights paths |
| | Post Construction | Bird collision monitoring | Location and mortality by species | Selected transmission line sections with and without bird diverters. | 1 year | Spring and fall visits | April 1 – October 31 | Number affected, species composition and habitat |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of high bird activity areas within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential high use bird areas;*
- *Conduct pre-conductor stringing avian flight activity surveys at bird Environmentally Sensitive Sites;*
- *Based on pre-construction survey results, provide recommendations for bird diverter installation;*
- *Review Environmental Inspector and Monitor daily reports for identification of bird-wire collision sampling sites;*
- *Design and conduct specific survey methods that sample bird presence/absence, abundance, mortality and flight paths to verify accuracy of EA Report predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on birds discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

**Decision Trigger(s)/Threshold(s) for Action**

- *Rate of bird collisions are greater than expected based on pre-construction abundance/flight path surveys*

### 4.3.2 Stick Nests

Raptors are protected by the *Migratory Birds Convention Act* and the *Wildlife Act*. If stick nests are identified during pre-construction monitoring activities, stick nests will be monitoring during construction/post-construction period to confirm that buffers are working. An experienced biologist will revisit all of the stick nests identified to monitor nests. Adults, eggs and young will be recorded and photographed. Indicators that the buffers were successful include nest occupancy, incubation and/or the successful fledging of young.

**Objective(s):**

- *Identify raptor nests in Project footprint that require monitoring, removal or relocation; and*
- *Monitor success of relocated nests*

**Applicable Project Component(s):** *Transmission Line Final Preferred Route*

**Monitoring Activities:**

**Table 4-7 Stick Nests**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Raptor nest and mortality | Pre-Construction | Aerial Stick Nest Survey | Nest site locations | Project Footprint | 1 years | Once | Summer | Nests observed on or adjacent ROW |
| | Construction | Raptor Observation Recording | Mortality and nest site locations | Project Footprint | 2 years | Twice per season | Summer | Nests removed or relocated and egg and chick counts in relocated nests and mortality |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Supply nest site, nest removal or relocation activities and mortality locations observed to MCWS; and*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period and a Transmission Line Maintenance System that records raptor nest observations and nest relocations during operation period.*
- *Based on pre-clearing survey results flag buffer zones around active bird nests;*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of raptor nests, mortality and mitigation performance at ESS sites within project footprint;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Conduct pre-clearing non-invasive nest surveys;*
- *Review Environmental Inspector and Monitor daily reports for identification of raptor nests;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on raptors discovered through monitoring activities;*

- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

*Manitoba Conservation and Water Stewardship will be asked to:*

- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

**Decision Trigger(s)/Threshold(s) for Action**

- *Nest discovered within ROW when construction or post-construction overlaps with wildlife reduced risk timing windows*

### 4.3.3 Bird Species of Conservation Concern

Bird species of conservation concern are protected by the *Migratory Birds Convention Act*, the *Species at Risk Act* the *Wildlife Act*, *Wildlife Act* and *Endangered Species and Ecosystems Act*. Baseline data will be collected during the first year of the project. Point counts will be completed in potential high quality habitat types utilized by golden-winged warblers (*Vermivora chrysoptera*) along the RoW and a select number of control points outside the transmission line zone of influence. If the first year pilot study indicates there are no golden-winged warblers in the region of interest, bird species of conservation concern studies will focus on whip-poor-will (*Caprimulgus vociferous*), common nighthawk (*Chordeiles minor*). Other listed species such as Canada warbler (*Cardellina canadensis*) , olive-sided flycatcher (*Contopus cooperi*), rusty blackbird (*Euphagus carolinus*), and red-headed woodpecker (*Melanerpes erythrocephalus*) observations will be collected incidentally.

**Objectives**

- *Identify the location of bird species of conservation concern within or in close proximity to the Project footprint with the purpose of establishing a control-impact monitoring program;*
- *Monitor species of conservation concern or species-habitat associations in close proximity to the transmission line and compare annual site fidelity, abundance or habitat change to nearby reference sites; and*
- *Determine the effectiveness of mitigation measures and, if appropriate, propose revisions to the existing plans or develop new mitigation options should unexpected impacts to birds occur as a result of construction or operation activities.*

**Applicable Project Component(s):** *All Components*

**Monitoring Activities:**

**Table 4-8 Bird Species of Conservation Concern**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Bird species of conservation concern | Pre -Construction phase | Point count pilot study to identify SOCC relative to project footprint | Areas and locations of species by habitat | Applicable project component footprint and nearby reference areas | 1 year | Twice per season | June 1 - July 7 | Presence/absence, species composition, habitat and abundance |
| | Construction and post-construction phase | Point counts to identify SOCC relative to project footprint | Areas and locations of species by habitat | Applicable project component footprint and nearby reference areas | 2 years | Twice per season | June 1 - July 7 | Presence/absence, abundance |

**Methods and Reporting**

*Manitoba Hydro will:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders , First Nations and Metis; and*
- *Participate as a stakeholder in committees or working groups whose purpose is for the ongoing conservation of wildlife.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of bird species of concern and mitigation performance at ESS sites within project footprint.*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to assess mitigation effectiveness, share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential species of concern habitat;*
- *Review Environmental Inspector and Monitor daily reports for identification of bird species of concern;*
- *Design, test (with a pilot study), and conduct specific survey methods that sample site fidelity and abundance and compare to reference sites to verify accuracy of EA Report predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on species of concern discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

*Manitoba Conservation and Water Stewardship will be asked to:*

- *Provide historical and current data of species of concern populations to inform ongoing analyses related to environmental effects monitoring (e.g. population survey data, observations, reports); and*
- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

**Decision Trigger(s)/Threshold(s) for Action**

- *Species of concern point count sites within project footprint have significant reduction in abundance compared to control point counts away from the project.*

# 4.4 MAMMALS

## 4.4.1 Moose

Moose are managed under the *Wildlife Act* and are an important species in the region having ecological, cultural and economic value. The project site is located in Game Hunting Area 26, an area of high conservation concern, and under a partial moose hunting conservation closure. Moose abundance, distribution, and population characteristics will be monitored during and post construction.

Linear corridors may create or remove habitat for moose depending on the habitat types they are traversing. Any linear development through a closed forest will open up the canopy, creating edges that encourage the growth of shrubs, preferred browse species for moose such red osier dogwood, willow spp., trembling aspen and birch saplings. Conversely, corridors that traverse riparian areas already providing good foraging habitat for moose act to remove habitat, reducing the carrying capacity of the landscape. . The degree of impact is proportional to the width and length of the disturbance corridor. Linear corridors may also act to enhance habitat if they serve as travel corridors for moose, ease of movement along corridors can make them attractive travel routes.  However, mortality associated with the use of these potential travel corridors may offset any benefits moose may derive from using them**;** effects on moose populations are also anticipated to arise from increased predation from wolves as a result of their increased rate of movement along the ROW.

In general, moose avoid human related activity. The development of roads into new areas allows for hunting in previously inaccessible areas. Moose have been found to avoid habitat in the vicinity of roads because of human activity, this response is most evident in hunted populations (Jalkotzky, 1997). Mortality associated with ROWs may occur due to increased human access and subsequent increases in hunting or poaching (Jalkotzy et al., 1997; Richard and Doucet, 2003).These effects may not to be necessarily significant at the population level (Richard and Doucet, 1999). Potential effects to moose habitat were primarily mitigated in the project design during the routing and planning process where sensitive moose areas and habitats were avoided. Moose are anticipated to avoid the Project area during noise and other sensory disturbance-related activities of construction, such as road use and creation, construction of the ROW and transmission lines. Lastly ungulates in Manitoba are susceptible to parasites (*P. tenuis*) and diseases; new linear corridors ultimately contribute to improving ungulate movement capabilities which act to facilitate disease and parasite transmission rates

Manitoba Hydro is also supporting a research project to understand the ecology of wolves in eastern Manitoba. The project will include collaring wolves to help determine home range, location of moose kill sites, and diet.

**Objective(s):**

- *Evaluate the spatial dynamics to determine avoidance, attraction or neutral responses associated with the Project ROW;*
- *Investigate the cause of any moose mortalities (Research Project);*
- *Seasonal and annual distribution of moose on ROW*
- *Changes in population state ( population abundance/structure and viability)*
- *Confirm effects predictions in the EA Report and if there are substantial deviations from the assumptions.*
- *Expand the baseline knowledge of distribution, abundance, and population characteristics of moose populations interacting with the Project*

**Applicable Project Component(s)**: *Transmission Line Final Preferred Route*

**Monitoring Activities:**

**Table 4-9 Moose**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| **Distribution** | Pre-Construction/ Construction/ Post Construction | Multi species aerial surveys in the study area  will be conducted in winter. | Distribution,  structure (adult sex ratio, calf/cow ratio) | Local Study Area (5 km adjacent to line) | 2013, 2015, 2017 | Once a year | Winter | Number and sex of moose observed, location in relation to the Project |

**Table 4-9 Moose**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| | Pre-Construction/ Construction/ Post Construction | Ground tracking surveys along predetermined transects to document the seasonal presence and distribution of moose on the ROW. | Distribution, ROW use | Local Study Area | 4 years | Quarterly | Spring, Summer, Fall, Winter | Presence/absence and location of moose tracks, droppings, in relation to the Project |
| | Pre-Construction/ Construction | Moose population survey conducted by Manitoba Conservation and Water Stewardship | Abundance, distribution, vital rates | Game Hunting Area 26 | 1 year 2016 | As available | Winter | Change in moose population from previous survey. |
| **Mortality** | Construction/ Post Construction | Monitor for wolf kills of moose via Research Project. | Aggregation of wolf collar locations at potential kill site | Study Area | 3 years (~lifespan of collars) | Annual | Anytime | Cause of mortality, location of mortality in relation to project |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors and Site Environmental Officers to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders , First Nations and Metis; and*
- *Participate as a stakeholder in committees or working groups whose purpose is for the ongoing conservation of wildlife.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of moose and tracks, mineral licks, human access, ungulate mortality sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro for identification of potential moose habitat and assess project footprint effects;*
- *Review Environmental Inspector and Monitor daily reports for identification of moose observations, mineral licks, human access, and mortality sites;*
- *Design and conduct specific survey methods that sample moose distribution, and mortality, while verifying accuracy of EA report predictions and effectiveness of mitigation measures implemented;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on moose discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*

- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

*Manitoba Conservation and Water Stewardship will be asked to:*

- *Provide historical and current data required to assess moose populations and inform ongoing analyses related to environmental effects monitoring (e.g. harvest data, population survey data, observations, reports); and*
- *Provide guidance regarding mitigation strategies should unexpected impacts occur as a result of the transmission line.*

**Decision Trigger(s)/Threshold(s) for Action**

- *More than one moose mortality along ROW*
- *Project footprint exceeds predicted area within range*
- *Population trend between regional surveys significantly different than previous survey*
- *Mineral lick discovered on or near ROW*

### 4.4.2 Whitetail Deer

Whitetail deer are managed under the *Wildlife Act* and are an important species in the region, having ecological, cultural, and economic value. White-tailed deer are a native species that select early succession deciduous dominant forest patches and riparian habitat. They are considered well adapted to habitat edges such as those created by disturbances. Therefore they are not particularly susceptible to the effects of habitat fragmentation (Stewart *et al.* 2011). Linear disturbances and riparian habitat have a large edge:area ratio which favours white-tailed deer habitat selection. Riparian areas, edge habitats, and linear features function as important habitats for travel and forage. Disturbed vegetation is favoured by white-tailed deer because of the high diversity of plants in those areas (Stewart *et al.* 2011). In northern portions of forested range, white-tailed deer will seasonally "yard-up" in winter ranges to reduce energetic costs of movement through deep snow. Often these winter ranges are conifer-deciduous mixedwood areas that offer winter browse and protection from deep snow (Stewart *et al.* 2011). The project potentially provides improved access of white-tailed deer to more northern portions of their current range. Ingress of white-tailed deer may serve as a vector for increased disease and/or parasite risk to other ungulate species (e.g. moose, woodland caribou). White-tailed deer with meningeal worm (*P. tenuis*) infection rarely display clinical signs of the disease, however infections within other native cervids causes devastating morbidity and mortality (Lankeser 2001), posing a significant threat to cervid species other than white-tailed deer (Campbell & VerCauteren 2011).

**Objective(s):**

- *Evaluate the spatial dynamics to determine avoidance, attraction or neutral responses associated with the Project ROW;*
- *Seasonal and annual distribution of whitetail deer on ROW;*
- *Expand the baseline knowledge of distribution of whitetail deer populations interacting with the Project; and*
- *Confirm effects predictions in the EA Report and if there are substantial deviations from the assumptions.*

**Applicable Project Component(s):** *Transmission Line Final Preferred Route*

**Monitoring Activities:**

**Table 4-10 Whitetail Deer**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Distribution | Pre-Construction/ Construction/ Post Construction | Multi species aerial surveys by Alaskan Trackers conducted in winter. | Distribution, relative abundance | Local Study Area (5 km adjacent to line) | 3 years | Once a year | Winter | Number and location of whitetail deer observed in relation to the Project |
| | Pre-Construction/ Construction/ Post Construction | Ground tracking surveys along predetermined transects to document the seasonal presence and distribution of whitetail deer on the ROW. | Distribution, ROW use | Local Study Area | 3 years | Quarterly | Spring, Summer, Fall, Winter | Presence/absence and location of whitetail deer tracks, droppings, trails in relation to the Project |
| | Construction/ Post Construction | Install trail cameras along construction access points to document presence/absence of whitetail deer at various possible dispersal points along the Project study area. | Distribution | Access sites | 3 years | Continuous | Inspected twice a year. | Presence of white tail deer. |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders , First Nations and Metis;*
- *Participate as a stakeholder in relevant committees or working groups whose purpose is for the ongoing conservation of wildlife.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of whitetail deer, mineral licks, human access, and mortality sites within project footprint or access*
- *Work with Specialist during field visits to share local/traditional knowledge and provide first hand overview of site conditions during construction phase.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro to assess project footprint effects;*
- *Review Environmental Inspector and Monitor daily reports for identification of deer observations, mineral licks, human access, and mortality sites;*
- *Design and conduct specific survey methods that sample whitetail deer abundance and distribution.*
- *Report immediately to Manitoba Hydro any unanticipated project effects on whitetail deer discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including mitigation effectiveness on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

*Manitoba Conservation and Water Stewardship will be asked to:*

- *Provide historical and current data required to assess whitetail deer populations and inform ongoing analyses related to environmental effects monitoring (e.g. harvest data, population survey data, observations, reports).*

**Decision Trigger(s)/Threshold(s) for Action**

- *Project footprint exceeds predicted area of disturbance in EA Report*
- *Deer distribution significantly different than previous survey, illustrating an increase in deer distribution to the north along the ROW.*

### 4.4.3 Wolves

Wolves are managed under the *Wildlife Act* and are an important species in the region, having ecological, cultural, and economic value. Wolf distribution, movements and predation activity will be monitored in response to the project. Direct and indirect project effects will be considered.

The construction and maintenance of linear corridors creates novel habitat for wildlife that inhabit Manitoba. New transmission line corridors have been criticized for creating habitat that benefits some species of wildlife, while hampering others. Prey species populations, especially large ungulates (i.e. moose, elk, deer) are often cited as bearing a major cost of these developments, as predators (e.g. wolves and human hunters), are now able to access and exploit previously inaccessible/intact areas. Manitoba Hydro is proposing to sponsor a PhD research project on the ecology of wolves in eastern Manitoba. The information from the study will help in assessing transmission line project environmental effects, mitigation efforts, on the Lake Winnipeg East System Improvement Project.

Eastern Manitoba is an excellent model for understanding the dynamics between linear corridors, and predator/ prey relationships. Game Hunting Area 26 is currently undergoing an change in moose, deer and wolf population dynamics. This creates an ideal model to understand how wolves target their prey animals, adjust their breeding output, and utilize novel habitats (linear corridors). The collaring and GPS tracking of up to 20 wolves (~10 packs or family units) will allow observation and analysis of an entire population of wolves across a landscape unit. Field study and visitation of all suspected prey kill sites (i.e. moose, deer, beaver) across all seasons will allow researchers to understand dietary needs per wolf/pack, but also location of kill sites relative to linear features. This data will help answer the recurring question regarding what effect transmission corridors have on the ability of wolves to target prey. This study will be part of a larger research program occurring in Manitoba. A similar study in Riding Mountain National Park will look to answer similar questions in a different setting with similar predator prey relationships.

**Objective(s):**

- *Evaluate the spatial dynamics to determine avoidance, attraction or neutral responses associated with the project ROW;*
- *Evaluate wolf movements on or around the project ROW (Research Project);*
- *Investigate predation sites in relation to project ROW (Research Project;*
- *Seasonal and annual distribution of wolves on ROW;*
- *Expand the baseline knowledge of distribution of wolves interacting with the Project; and*
- *Confirm effects predictions in the EA Report and if there are substantial deviations from the assumptions.*

**Applicable Project Component:** *Transmission Line Final Preferred Route*

**Monitoring Activities:**

**Table 4-11 Wolves**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Distribution and movements | Construction/Post Construction | Sponsor a PhD project to deploy GPS collars on wolf packs that occupy the study area. | Distribution, and movement in relation to the project. | GHA 26 | 3 years | Continuous | Year-Round | Movements and home range in relation to the project<br>Location of probable ungulate kill sites in relation to the project |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre-Construction/ Construction/Post Construction | Ground tracking surveys along predetermined transects to document the seasonal presence and distribution of wolves on the ROW. | Presence, distribution | Local Study Area | 4 years | Quarterly | Spring, Summer, Fall, Winter | Presence/absence and location of wolf tracks, droppings, trails in relation to the project |
| | Construction/ Post Construction | Install trail cameras along construction access points to document presence of wolves at access points along the Project study area. | Presence, distribution | Access Sites | 3 years | Continuous | Inspected twice a year | Presence/absence of wolves |
| | Pre-Construction/ Construction/Post Construction | Multi species aerial surveys in the study area (5 km adjacent to row) will be conducted in winter. | Distribution, relative abundance | Local Study Area (5 km adjacent to line) | 4 years | Once a year | Winter | Number and location of wolves observed in relation to the Project |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Provide qualified Environmental Inspectors to conduct regular inspections of mitigation measure implementation;*
- *Summarize results of key monitoring activities in an annual monitoring report;*
- *Share results of key monitoring activities with interested local stakeholders , First Nations and Metis; and*
- *Participate as a stakeholder in relevant committees or working groups whose purpose is for the ongoing conservation of wildlife.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of wolves, ungulate mortality sites within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to share local/traditional knowledge.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro to assess project footprint effects;*
- *Review Environmental Inspector and Monitor daily reports for identification of wolf observations;*
- *Report immediately to Manitoba Hydro any unanticipated project effects on wolves discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

*Manitoba Conservation and Water Stewardship will be asked to:*

- *Provide historical and current data required to assess wolf movements and inform ongoing analyses related to environmental effects monitoring (e.g. harvest data, population survey data, observations, reports); and*
- *Provide guidance regarding mitigation strategies should unexpected impacts occur as a result of the transmission line.*

**Decision Trigger(s)/Threshold(s) for Action**

- *Project footprint exceeds predicted area within range*
- *Significant use of ROW by wolves*
- *Increasing trend in ROW use through distribution surveys significantly different than previous survey*

## 4.5 ACCESS

The Project will require several access routes to access the ROW for construction purposes, both existing and some new. Existing road, trails, transmission lines, these routes may require widening and upgrades to facilitate construction vehicles.

A potential effect of the Project to resource use is the use of the ROW as a point of access to previously inaccessible areas for trapping, hunting and gathering. This increased access may place an excessive pressure on the resource populations. Manitoba Hydro through its public engagement programs received continuous feedback and concern about access the ROW could create, as a result Manitoba Hydro identified the requirement for monitoring of major access points along the ROW. The ROW will be monitored using trail cameras or sensors to track human access from major access points along the transmission line.

**Objective(s):**

- *Monitor seasonal presence and magnitude of human use of Project ROW's*

**Applicable Project Component(s):** *Transmission Line Final Preferred Route*

**Monitoring Activities:**

**Table 4-12 Access**

| Key Monitoring Activity | Phase | Task Description | Parameters | Site Location | Duration | Frequency | Timing | Measurable Indicator(s) |
|---|---|---|---|---|---|---|---|---|
| Human Access Survey | Construction/Post construction | Remote IR trail cameras or sensors at major access points to the ROW to monitor use of the ROW by humans | Presence and magnitude of use of ROW by humans | Major access points intersecting Project ROW | During construction and 4 years post-construction | Continuous | Year-round | Presence and magnitude of use of ROW by humans |

**Methods and Reporting**

*Manitoba Hydro is committed to:*

- *Provide digital ortho-rectified imagery or georeferenced digital video/photo products;*
- *Supply an Environmental Protection Information Management System (EPIMS) that manages all project monitoring data and allows Specialist access to daily inspection and monitoring reports from construction period;*
- *Summarize results of key monitoring activities in an annual monitoring report; and*
- *Share results of key monitoring activities with interested local stakeholders, First Nations and Metis.*

*Responsibilities of Environmental Monitor include:*

- *During construction phase daily activities, record observations of human access within project footprint or access routes;*
- *Record observations with photo and waypoint and store in EPIMS; and*
- *Work with Specialist during field visits to share local/traditional knowledge.*

*Specialist will:*

- *Use the digital ortho-rectified imagery and/or georeferenced video/photo products provided by Manitoba Hydro to assess project footprint and access effects;*

- *Review Environmental Inspector and Monitor daily reports for identification of human access observations;*
- *Report immediately to Manitoba Hydro any unanticipated project effects as a result of human access discovered through monitoring activities;*
- *Analyze, evaluate and report on monitoring findings including human access on an annual basis; and*
- *Through an adaptive management framework, make recommendations for ongoing improvements to the mitigation measures, monitoring plan, methods, analysis and implementation in response to knowledge gained through ongoing monitoring and associated analysis.*

*Manitoba Conservation and Water Stewardship will be asked to:*

- *Provide guidance regarding mitigation strategies should unanticipated effects occur as a result of the project.*

**Decision Trigger(s)/Threshold(s) for Action**

- *Moose mortality by humans accessing via ROW*
- *Increased human prevalence on ROW from survey year to survey year*

# 5.0 REPORTING

Reports detailing results of monitoring activities will be submitted annually to MCWS on or before October 30th as stated in Clause 43 of the Environment Act License. Reports will be generated annually, and provided to Manitoba Conservation and Water Stewardship.

In addition to annual reports summarizing activities and general findings, technical reports will be prepared at appropriate intervals during the construction and post construction phases of the Project. These reports will on a cumulative basis compile and analyze monitoring results during the relevant period, and based on those results, make recommendations concerning the need for any changes to the mitigation or monitoring approach. These reviews will be scheduled at intervals appropriate to the particular environmental component and to the monitoring design established for each component. Manitoba Hydro will present and discuss monitoring results with MCWS, First Nations and Metis on request as the project proceeds.

Any significant unanticipated project effects on wildlife discovered through monitoring activities will be reported immediately to MCWS.

# 6.0 LIST OF ACRONYMS

| | |
|---|---|
| EEMP | Environmental Effects Monitoring Plan |
| CEAA | Canadian Environmental Assessment Act |
| EPIMS | Environmental Protection Information Management System |
| EPP | Environmental Protection Program |
| EnvPP | Environmental Protection Plan |
| ESS | Environmentally Sensitive Sites |
| GPS | Global Positioning Unit |
| GHA | Game Hunting Area |
| MBCA | Migratory Birds Convention Act |
| MBCDC | Manitoba Conservation Data Center |
| MCWS | Manitoba Conservation and Water Stewardship |
| MESEA | Manitoba Endangered Species and Ecosystems Act |
| MMF | Manitoba Metis Federation |
| ROW | Right-of-way |
| SARA | Species at Risk Act |

# 7.0 REFERENCES

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# 8.0 APPENDIX A – DETAILED MONITORING METHODS

# 8.1 AQUATICS

## 8.1.1 Fish Habitat

During project construction surveys will be conducted for each of the 28 watercourses to monitor condition of streambeds and banks. Physical stream data at the crossing will include the following:

- Riparian buffer width (m), measured;
- Vegetative cover (% cover : % bare ground), visually estimated;
- Bank stability (bank height, slope / shape and stability) and erosion (%), visually estimated; and
- Re-vegetation where soil was disturbed (% ground cover : % bare ground)

# 8.2 VEGETATION

This section describes work that will be done to support specific sections of the monitoring program including species of conservation concern, invasive and non-native plants, plants and plant communities important to Aboriginal peoples, and rehabilitation.

## 8.2.1 Species of Conservation Concern

Monitoring the identified populations of species of conservation concern will entail comprehensive stem counts at each of the three ESS sites at which these species were identified in the EnvPP. In order to align with peak bloom period for each species, all surveys will be conducted once within the first two weeks of July each year. The estimated time required at each site will be dependent upon the number of plants and the extent of the population as well as access considerations.

Surveys will occur for 3 years as follows:

- Survey 1 – July (First year during construction)
- Survey 2 – July (Second year during-construction)
- Survey 3 – July (First year post-construction)

Surveys will document the following details (data units are provided in brackets):

- Exhaustive count of all live stems within the population (numerical)
- Number of plants bearing bloom/fruit (numerical/percent)
- Average plant height (centimeters)
- Spatial extent of population (square meters and GIS polygon shapefile)
- Canopy cover (5-point densitometer reading averaged, converted to percent)
- Photographic record from established point (.jpeg file)

- Incidental observations of animal browse, disturbance, trampling (qualitative data)
- General area search for the establishment of satellite populations nearby (qualitative data, UTM coordinates, all of the above-mentioned parameters)

#### 8.2.1.1 Hooker's Orchid

The identified population of Hooker's orchid (*Platanthera hookeri*) is noted in the EnvPP. The peak bloom period for this species is June through July (Gleason and Cronquist 1991).

#### 8.2.1.2 Sessile-fruited Arrowhead

The identified population of sessile-fruited arrowhead (*Sagittaria rigida*) is noted in the EnvPP. The peak bloom period for this species is July through September (Gleason and Cronquist 1991).

#### 8.2.1.3 Swollen Sedge

The identified population of swollen sedge (*Carex intumescens*) is noted in the EnvPP. The peak bloom period for wetland sedges is generally late June through July.

### 8.2.2 Plants and Plant Communities important to Aboriginal Peoples

Monitoring of plants and plant communities important to Aboriginal peoples are an important portion of the vegetation monitoring. Information pertaining to plant gathering sites is provided in both the Cultural Resources Technical Report (NLHS 2012) and the Vegetation Technical Report (Calyx Consulting 2012). Manitoba Hydro has been working with Aboriginal communities to further identify and map these sites and develop mitigation measures to minimize the effects of the project on them.

As berry harvesting was identified in the EnvPP as an ESS which may be impacted, surveys will be conducted to delineate the extent of berry harvest sites and to document their response to clearing and construction within the right-of-way. A similar approach will be taken for other plant species which have been identified as having value to Aboriginal peoples.

A representative from the applicable Aboriginal community will be contacted and asked to accompany the biologist to the gathering sites.

Surveys will occur for 3 years as follows:

- Survey 1 – July (First year during construction)
- Survey 2 – July (Second year during-construction)
- Survey 3 – July (First year post-construction)

Surveys will document the following details (data units are provided in brackets):

- Presence/absence of the identified plant species at each identified location (Yes/No)
- Locational data (centroid UTM coordinates)

- Number of patches (numeric)
- Stem count (numeric)
- Number of plants bearing bloom/fruit (numeric)
- Spatial extent of population (square meters and GIS polygon shapefile)
- Photographic record (.jpeg file)

### 8.2.3 Rehabilitation

In assessing prospective rehabilitation sites, consideration will be given to the concept of ecosystem resilience for sites which show a low degree of impact and are likely to return to a pre-construction state without intervention. For those sites which demonstrate a high degree of disturbance, we will implement an appropriate active rehabilitation approach.

In order to quantify the success of these mitigation efforts (passive or active), monitoring plots will be established at select, representative locations within rehabilitation and re-vegetation areas. Plot monitoring would follow the detailed methodology noting the re-vegetation or establishment of seeded/planted vegetation as well as the presence of non-native species on an annual basis.

Rehabilitation and re-vegetation areas will be monitored on an as-needed basis using the same plot-transect methodology as outlined below.

Plot-transect sampling would be completed to monitor the passive or active restoration of a disturbed area. Plot-transect sampling (including a minimum of one reference plot and one study plot) would occur between the year in which the disturbance is assessed (and 1 year post-construction.

Vegetation surveys will be conducted by two biologists or an biologist working with a subcontractor. The crew will arrive at each plot and install two permanent stakes or markers (one at 0m, a second at 30m) to identify the exact plot location and orientation. Once the plot has been located, a 30m transect tape will be set on the ground at the correct orientation and the quadrat and nested quadrat squares assembled. The crew will take precaution not to trample or damage any plants, in particular any plant species of conservation concern which may be encountered within or adjacent to the plot. Biologists will note site conditions including weather, incidental wildlife and signs of disturbance prior to commencing the plot sampling. Plot sampling will identify all species and record the required details as mentioned in Section a). Upon completion of the plot-transect survey, the crew will remove all rubbish and ensure that data forms are complete and adhere to the standards outlined in the Manitoba Hydro DMP.

Data collected during surveys will be analyzed on an annual basis for each plot in order to provide a critical examination of effects and to gauge the effectiveness of the rehabilitation measures. Statistical analyses will include a year-to-year examination of changes in:

- Species diversity (total number of species documented)

- Percent cover (for all stratum within each plot)
- Frequency (percentile occurrence of herbaceous and shrub vegetation among the five sub-plots)
- Change in canopy cover (densitometer reading)
- Species composition (i.e. species list for transect)
- Community structure (i.e. percent cover divided by stratum)
- Species abundance (i.e. total herbaceous stem count)
- Photo-documentation (predetermined points and directions along transects)

he contractor will utilize a plot-transect based approach acknowledging this method as an industry standard capable of providing the data required for effective analysis. This will involve spacing five 2.5m by 2.5m quadrats at 5m intervals across a 30m transect to survey for shrubs 1-2.5m tall. Within each 2.5 by 2.5m quadrat, a nested 1m by 1m quadrat will account for herbaceous species and low shrubs <1m tall. Surveys will collect data relating to species composition (species list), community structure (percentage cover by stratum) and species abundance (total herbaceous stem count). The composition and structure of non-vascular ground flora (predominantly mosses, fungi and lichens) as well as detritus or water will also be noted within the nested quadrats. To aid in reducing observer bias plant cover will be estimated to the nearest 1% for species <15% cover and nearest 5% for those with higher cover for all strata within the transect. Each plot-transect will be monitored once annually.

Species abundance (total stem count) is recommended as an added parameter of vegetation survey methodology. Given the potential for changes in woody vegetation structure (canopy), soil moisture or invasive species establishment, surveying herbaceous stem counts will enhance the ability to detect changes (positive or negative) within the plot-transect and throughout the larger community.

In order to provide additional documentation of changes in rehabilitation, it is recommended that photographs be taken annually at set intervals and compass bearings along the established transects. This methodology may include a photograph in each cardinal direction (N, S, E, W) at one or several positions along a 30m transect.

## 8.2.4 Invasive and Non-Native Plant Species

In order to efficiently and representatively survey for invasive non-native species, a combination of both ground surveys (at each of the 20 angle tower locations and the Manigotagan Corner Station) as well as a fly-over survey (for the length of the transmission line) will be conducted. As angle tower locations are likely to require an increased amount of heavy equipment and disturbance relating to foundation construction, these sites present themselves as target

locations for invasive species monitoring. As supporting towers and the remainder of the 70km right-of-way may also present an opportunity for invasive species establishment, a helicopter fly-over of the transmission line will identify any notable populations of invasive non-native species which may establish. Should an area be identified during the fly-over, the crew would verify the observation on the ground and document all survey details as per the angle tower survey locations.

Due to the presence of human settlement and agriculture in the vicinity of Powerview-Pine Falls, a ground survey will be conducted in the month of July between angle tower 13 and 20 (including the transmission line right-of-way) to document any existing non-native species which may not be attributed to project construction. Common reed (*Phragmites australis*), for example, can be seen within the ditches of Provincial Road #304 between Northshore Road and Broadlands Road, in the vicinity of angle tower 14.

This workplan proposes the following schedule to conduct surveys for the presence and establishment of invasive, non-native vegetation:

- Survey 1 – July (First year during construction, area of Powerview-Pine Falls)
- Survey 2 – July (Second year during construction, all 20 angle towers)
- Survey 3 – July (Second year during construction, entire PQ95 transmission line)
- Survey 4 – July (First year post-construction, all 20 angle towers)
- Survey 5 – July (First year post-construction, entire PQ95 transmission line)

Comprehensive invasive and non-native species surveys would commence in year 2 of construction as it is very unlikely that introduced species would be apparent in the summer of year 1 following the first winter of work. Many newly established species (native or non-native) are unlikely to produce seed in their first year of establishment.

Surveys will document the following details (data units are provided in brackets):

- Presence/absence of invasive, non-native species at each angle tower location (Yes/No)
- All invasive, non-native species present (scientific name)
- Locational data (centroid UTM coordinates)
- Number of patches (numeric)
- Stem count (numeric)
- Number of plants bearing bloom/fruit (numeric)
- Spatial extent of population (square meters and GIS polygon shapefile)
- Photographic record (.jpeg file)

Additionally, any occurrence of invasive, non-native species observed incidentally during other surveys will be noted. The above-mentioned data parameters will be collected for any incidental observations of invasive, non-native species.

# 8.3 WILDLIFE

## 8.3.1 BIRDS

### 8.3.1.1 Bird Wire Collisions

Searches for dead or injured birds will be performed at a selection of representative sites during peak periods of bird activity in order to determine the efficacy of bird deflectors in higher risk-of collision habitats. Searches will also occur at a select number of sites where effects were not anticipated and/or at sites where bird deflectors are not present. For example, a select number of small creeks that were identified as at low risk for bird-wire collisions, or habitats having a secondary potential for species at risk, will be monitored. If unanticipated effects are encountered such as high numbers of bird-wire strikes, or collisions involving listed species, appropriate mitigation measures will be recommended and additional follow-up monitoring will occur.

Environmentally Sensitive Sites (ESS) that will be monitored for potential bird strike mortalities will include:

- Stick nest sites adjacent to the transmission line;
- Wetland sites with yellow rail and/or least bittern colonies; and
- River crossings.

Each site will be ground surveyed up to 200 m on either side of the water crossing. A 40 m buffer will be used along the transmission line in order to accommodate for birds that may have collided with the line but did not fall directly underneath it. In addition, the shorelines of wide rivers (e.g., Winnipeg River) will be surveyed up to 300 m downstream for birds that may have fallen into the water and floated to shore.

At each plot, transects will be conducted using a 5 or 10 m grid search pattern. The grid spacing will be determined by the transmission line ROW width and based on the relative density of grass, forb and shrub re-growth on the ROW. A 5 m survey grid will be used in areas of dense shrub cover that required closer scrutiny. While surveying, technicians will visually inspect the area for signs of bird-wire collisions, including carcasses and feather clusters. When bird-wire collision evidence is encountered, technicians will record geographic coordinates for the location of the evidence, take photographs of collision evidence and the site, and document a detailed description of the collision evidence. Furthermore, to confirm and ensure the correct identification of the species, feathers may be collected under federal permit.

#### 8.3.1.2 Raptor Nests

Stick nests will be identified through the use of a helicopter and a two-man search team consisting of an experienced wildlife biologist and experienced wildlife technician. All nests observed within 200 meters of the right-of-way (ROW) will be photographed, georeferenced and identified to species if possible. The search crew, if possible, will also set down at each stick nest to collect additional information that would assist in the identification of species. The initial stick nest search has occurred prior to clearing of the ROW in November 2014.

To comply with the *Migratory Bird Convention Act* and licence conditions, if stick nests are identified during pre-construction monitoring activities, stick nests will be monitored during construction/post-construction period to confirm that buffers are working. An experienced biologist will revisit all of the stick nests identified to monitor nests. Adults, eggs and young will be recorded and photographed. Indicators that the buffers were successful include nest occupancy, incubation and/or the successful fledging of young. Monitoring activities would take place between June and August and would include two site visits.

#### 8.3.1.3 Species of Conservation Concern

Baseline data will be collected during the first year of the project. A limited number of point counts will be completed in potential high quality habitat types utilized by golden-winged warblers along the ROW and a select number of control points outside the transmission line zone of influence. If the first year pilot study indicates there are no golden-winged warblers in the region of interest, bird species of conservation concern studies will focus on whip-poor-will, common nighthawk. Other listed species such as Canada warbler, olive-sided flycatcher, rusty blackbird, and red-headed woodpecker observations will be collected incidentally.

Methods that will be used are based on Elzinga et al. (2001), United States Environmental Protection Agency (USEPA 2002) and Hobson et al. (2002). An initial preconstruction visit will be completed on or adjacent to the right-of-way by an experienced wildlife technician using a high fidelity stereo recording device. During the breeding season, sampling will occur about 1/2 hour before sunrise until no later than 10 a.m. Surveys will be conducted only in favourable weather conditions. This monitoring program will be completed between June 1 and July 7th. All bird species singing during the visit will be recorded during 10-minute point counts. The recordings will be processed and interpreted in the laboratory, and screened for listed species occurrences such as golden-winged warbler, using Adobe Audition software.

When the locations of focal species such as the golden-winged warblers are available, an experienced ornithologist will re-visit active sites. During this second visit, golden-winged warbler territories, or potentially, other listed species of concern, will be spot mapped using protocols from Elzinga et al. (2001). Relative abundance or density measures will be reported along with the mapped territories in GIS for future reference.

The methods established for the pre-construction period will be replicated for post-construction monitoring, with a focus on golden-winged warbler habitat. Sites previously containing golden-winged warbler, and potentially, other listed species of concern, will be re-visited. This monitoring program will be completed between June 1 and July 7.

If golden-winged warblers are not detected during pilot studies and monitoring studies shift to goatsuckers, the LWESI transmission line ROW is already known to include large areas of potentially suitable whip-poor-will and common nighthawk habitat. Nighthawk habitat consists of open forests with exposed bedrock adjacent to open lands such as peatlands, sedge meadows, marshes or beaver floods, and regenerating cutovers. Other open areas such as pastures and hayfields are located in the southern extent of the study area. Whip-poor-will prefer open woodlands with little understory as they nest on the ground and hunt flying insects from unobstructed perches (COSWIC 2009).

Methods that will be used to assess common nighthawk and whip-poor-will be similar to the criteria described in Fish and Wildlife Branch (2015) and Bird Studies Canada (2014) respectively. Changes to the procedures described in these survey protocol reports will include the use of passive survey elements only (i.e., playback will not be used), and, in cases where access is difficult, remote audio-recording units will be used in lieu of surveyors. During the breeding season, sampling for common nighthawk will begin at sunset, and continue until the end of the dusk crepuscular period (i.e., about 30 minutes after sunset). Whip-poor-will surveys will begin 30 minutes after sunset, and only during the night. Whip-poor-wills also call more frequently and for longer periods when a bright moon is visible. As such, the week before a full moon will be used to selected the sample period where practicable. For both species, surveys will be conducted only in favourable weather conditions. Surveys will not be performed under cold conditions (less than 7 degrees C, or not proceed if there is anything greater than very light precipitation or when wind speeds are greater than 20 km./hr. For whip-poor-will, surveys will be avoided if the moon is not visible (i.e., due to heavy cloud cover or has set). Common nighthawks, and to an extent, whip-poor-will are late migrants and nesters, so survey schedules must reflect their breeding activity period. In the boreal forest, surveys should be conducted between June 15 and July 31. Two surveys will be performed, one in June and the other in mid-July to maximize the probability of detection for both species.

The study design for goatsuckers is a control-impact design. To minimize the potential for double-counting individuals, sample points will be located no closer than 1 km apart. A minimum of 15 point count stations will be selected in favourable habitats for each species, for a total sample of 30 point count stations. The paired design will include 5 points on the transmission line RoW, 5 points located no less than 1 km from the transmission line RoW in comparable habitat, and 5 points in similarly favourable habitat beside PR 304. All bird species singing during the visit will be recorded during 10-minute point counts. The recordings will be processed and interpreted in the laboratory, and screened for common nighthawk and whip-poor-will using Adobe Audition software. Presence/absence and if possible, relative abundance, will be documented. Additional information collected for the study area will include time, wind speed, cloud cover, precipitation, and sunset and moonrise times.

## 8.3.2 MAMMALS

### 8.3.2.1 Whitetail Deer

**Aerial Surveys**

Aerial surveys for ungulates in the study area will be conducted in the winter when deer and moose are easiest to observe. This monitoring will document the relative distribution and abundance of deer in the study area in order to compare with pre-construction conditions. The Alaskan Trackers will be contracted to conduct surveys at 500 m intervals within 5 km adjacent to the project ROW. Surveys will be flown only when weather conditions and snow depth are adequate. Surveys will be conducted under the following parameters:

1. Provide waypoint files and track files for each survey aircraft.
2. Observations to be recorded
    a. Caribou;
    b. Caribou tracks;
    c. Moose;
    d. Moose tracks;
    e. White-tailed deer;
    f. White-tailed deer tracks;
    g. Wolves;
    h. Wolf tracks;
    i. Wolf kill sites;
    j. Wolverines;
    k. Wolverine tracks;
    l. People on or near ROW;
    m. Human activity (i.e., snowmobile tracks, snowmobile access points to the ROW, hunter kill sites, other signs of active use).

3. For all above listed species the main objective is determining presence and distribution. For most species, if tracks can be identified, there is no need to follow them to get a count of individuals if the individuals are not in sight (exceptions in points 6 and 7 below).

4. For snowmobile tracks, survey aircraft will follow the tracks to determine points of access entrance onto the ROW from trails, roads, drainages (frozen), other passage corridors (e.g., cut lines) or communities – creating a GPS track file as they go to document travel routes.

5. For wolves, moose and caribou tracks, follow fresh tracks to locate animals and determine pack size or determine numbers of adults and numbers of calves in the group.

### Ground Tracking Sign Surveys

A before-after-control-impact (BACI) study design will be developed to help identify any impact on mammals (e.g. whitetail deer) in response to the project. Surveys will begin in Year 1, before construction, and continue through Year 4, two years after construction is complete.

Ground tracking sign surveys will be conducted seasonally, four times per year, at five project sites spaced along the project route. Each of the five project sites will be paired with a control site, in similar adjacent habitat, no less than 500 meters away. At each project and control site, seven 180m transects will be established that run perpendicular to the ROW corridor. Each transect will be spaced 100 meters apart, and extend equally on either side of the project ROW . At 30 meter intervals along each transects, a biologist and/or assistant will record the level of observed mammal sign on a scale of 0-4.

- 0 – No sign
- 1 – Very Minimal sign (1 set of tracks)
- 2 – Minimal sign (2 set of tracks)
- 3 – Moderate Sign (3 set of tracks, or droppings)
- 4 - Heavy sign (3+ sets of tracks, or droppings, beds)

If mammal sign is shown to be very sparse, this scale may be reduced to a simple presence/absence.

The following models will be used to establish tests between variables using analysis of variance:

- Mammal sign vs. site (project or control) and Year (1,2,3,4);
- Mammal sign vs. area (ROW or adjacent to ROW) and Year (1,2,3,4);
- Mammal sign vs. season (summer, fall, winter, spring), and site (project or control) and Year (1,2,3,4);

As mammal sign may be sparse, breakdown may need to be done with non-parametric statistical analysis, possibly using Kruskall-Wallace one-way analysis of variance.

Additional information will be collected at each survey location and transect:

- condition of snow (depth, date of last snow fall), wind speed, temperature, canopy cover, dominant vegetation species, soil moisture, general browsing evidence, antler sheds, carcasses, vehicle trails.

### Trail Camera Surveys

Trail cameras will be installed at six construction access points along the project study area. As described in the Access Management Plan, most of these access points are on existing trails. Cameras will be installed at the start of the construction period and maintained for three years, except during active construction in the area. The cameras will track the presence or absence of moose along all the construction access points along the entire project study area.

The data will be reviewed to detect changes in:

- Whitetail deer presence vs. time (Year 1, Year 2, Year 3, Year 4),

#### 8.3.2.2 Moose

**Aerial Surveys**

Aerial surveys for ungulates in the study area will be conducted in the winter when deer and moose are easiest to observe. This monitoring will document the relative distribution and abundance of moose in the study area in order to compare with pre-construction conditions. The Alaskan Trackers will be contracted to conduct surveys at 500 m intervals within 5 km adjacent to the project ROW. Surveys will be flown only when weather conditions and snow depth are adequate. See Deer Section 8.3.2.1 above for parameters.

Surveys will be flown for three years, beginning during the first winter of construction.

The abundance (total number of moose counted) and relative distribution (average distance from the ROW) of moose will be evaluated to determine changes from pre to post project construction.

**Ground Tracking Sign Surveys**

A before-after-control-impact (BACI) study design will help identify any impact on mammals (e.g. moose) in response to the project. Surveys will begin in Year 1, before construction, and continue through Year 4, two years after construction is complete.

Ground tracking sign surveys will be conducted seasonally, four times per year, at five project sites spaced along the project route. Each of the five project sites will be paired with a control site, in similar adjacent habitat, no less than 500 meters away. At each project and control site, seven 180m transects will be established that run perpendicular to the ROW corridor. Each transect will be spaced 100 meters apart, and extend equally on either side of the project ROW . At 30 meter intervals along each transects, a biologist and/or assistant will record the level of observed mammal sign on a scale of 0-4.

- 0 – No sign
- 1 – Very Minimal sign (1 set of tracks)
- 2 – Minimal sign (2 set of tracks)
- 3 – Moderate Sign (3 set of tracks, or droppings)
- 4 - Heavy sign (3+ sets of tracks, or droppings, beds)

If mammal sign is shown to be very sparse, this scale may be reduced to a simple presence/absence.

The following models will be used to establish tests between variables using analysis of variance:

- Mammal sign vs. site (project or control) and Year (1,2,3,4);
- Mammal sign vs. area (ROW or adjacent to ROW) and Year (1,2,3,4);

- Mammal sign vs. season (summer, fall, winter, spring), and site (project or control) and Year (1,2,3,4);

As mammal sign may be sparse, breakdown may need to be done with non-parametric statistical analysis, possibly using Kruskall-Wallace one-way analysis of variance.

Additional information will be collected at each survey location and transect:

- condition of snow (depth, date of last snow fall), wind speed, temperature, canopy cover, dominant vegetation species, soil moisture, general browsing evidence, antler sheds, carcasses, vehicle use.

### Trail Camera Surveys

Trail cameras will be installed at six construction access points along the project study area. As described in the Access Management Plan, most of these access points are on existing trails. Cameras will be installed at the start of the construction period and maintained for three years, except during active construction in the area. The cameras will track the presence or absence of moose along all the construction access points along the entire project study area.

The data will be reviewed to detect changes in:

- Moose presence vs. time (Year 1, Year 2, Year 3, Year 4)

### Game Hunting Area Surveys

On regular intervals, Manitoba Conservation and Water Stewardship conduct gasaway style moose population surveys in Game Hunting Area 26. Survey results provide information on population size, distribution, structure and vital rates. Manitoba Conservation and Water Stewardship will be asked to share the results of the moose survey with Manitoba Hydro in order to help better understand any project related effects.

### Mortality

Data for moose mortality monitoring will be collected annually. Monitoring will rely on reports from Project workers or other people in the construction area, and Manitoba Conservation and Water Stewardship harvest and mortality records.

Mortality due to collisions with vehicles will be monitored via reports from Project workers. A “Wildlife Incident/Mortality Form” that includes such information as date, time, location (by map), vehicle speed, attempted evasive action, injuries, damage, animal behavior prior to the accident, disposition of remains, and other relevant data will be provided by Manitoba Hydro to the Manitoba Conservation and Water Stewardship as incidents occur.

Moose mortality monitoring will also be a component of the wolf collaring project.

#### 8.3.2.3 Wolves

**Ground Tracking Sign Surveys**

A before-after-control-impact (BACI) study design will be developed to help identify any impact on mammals (e.g. wolves) in response to the project. Surveys will begin in Year 1, before construction, and continue through Year 4, two years after construction is complete.

Ground tracking sign surveys will be conducted seasonally, four times per year, at five project sites spaced along the project route. Each of the five project sites will be paired with a control site, in similar adjacent habitat (as per Forest Resource Inventory, no less than 500 meters away. At each project and control site, seven 180m transects will be established that run perpendicular to the ROW corridor. Each transect will be spaced 100 meters apart, and extend equally on either side of the project ROW . At 30 meter intervals along each transects, a biologist and/or assistant will record the level of observed mammal sign on a scale of 0-4.

- 0 – No sign
- 1 – Very Minimal sign (1 set of tracks)
- 2 – Minimal sign (2 set of tracks)
- 3 – Moderate Sign (3 set of tracks, or droppings)
- 4 - Heavy sign (3+ sets of tracks, or droppings, beds)

If mammal sign is shown to be very sparse, this scale may be reduced to a simple presence/absence.

The following models will be used to establish tests between variables using analysis of variance:

- Mammal sign vs. site (project or control) and Year (1,2,3,4);
- Mammal sign vs. area (ROW or adjacent to ROW) and Year (1,2,3,4);
- Mammal sign vs. season (summer, fall, winter, spring), and site (project or control) and Year (1,2,3,4);

As mammal sign may be sparse, breakdown may need to be done with non-parametric statistical analysis, possibly using Kruskall-Wallace one-way analysis of variance.

Additional information will be collected at each survey location and transect:

- condition of snow (depth, date of last snow fall), wind speed, temperature, canopy cover, dominant vegetation species, soil moisture, general browsing evidence, antler sheds, carcasses, vehicle use.

**Trail Camera Surveys**

Trail cameras will be installed at six construction access points along the project study area. As described in the Access Management Plan, most of these access points are on existing trails. Cameras will be installed at the start of the construction period and maintained for three years, except during active construction in the area. The cameras will track the presence or absence of wolves along all the construction access points along the project study area.

The data will be reviewed to detect changes in:

- Wolf presence vs. time (Year 1, Year 2, Year 3),

**Wolf Research Project (Draft)**

Manitoba Hydro will sponsor a PhD study on the ecology of wolves in eastern Manitoba, which will involve deploying GPS collars on wolves that occupy the project study area. These collars will be deployed as prescribed by Manitoba Conservation and Water Stewardship. The researcher will utilize the daily GPS collar data to evaluate wolf movements and home range as they relate the Project study area. The data will be used to determine resource selection by wolves of linear features.

When a GPS collar signals a mortality an investigation will be initiated to try to determine cause of death. GPS collar data will be monitored for indications of wolf predation events (killing an ungulate). When possible, an investigation of the suspected predation site will be conducted to identify prey animals (species, age, sex). This information will be analyzed for spatial correlations with landscape features, including the ROW.

## 8.4 ACCESS

Access will be carefully managed throughout the entire construction phase of the project, as outlined in the Lake Winnipeg East System Improvement Transmission Construction Access Management Plan. Since the project site closely parallels PR#304, and transects an area of previous forestry development, very little new access will need to be developed. All 25 proposed access routes are pre-existing linear disturbances, and only two will be need to be lengthened to provide improved access to the RoW.

To help monitor any changes in the number of humans utilizing the access trails, a before and after study design has been developed. The three all-season access routes that transect the project site were monitored by trail cameras in 2014 and 2015 to gather baseline information on existing levels of human use. These three all-season access routes will continue to be monitored by cameras for up to three years after construction.

The data will be reviewed to detect changes in:

- Human presence vs. time (Year -1, Year 0, Year 1, Year 2, Year 3),

In addition, six additional access points (dry and winter access only) will be selected for monitoring by trail cameras for levels of human use for up to three years after construction.

The data will be reviewed to detect changes in:

- Human presence vs. time (Year 1, Year 2, Year 3),

In addition, Manitoba Hydro is experimenting with the deployment of TRAFx data loggers. These devices are used extensively in the road management industry to monitor vehicle use.

They are designed to be discretely installed along access points to provide accurate number of vehicles utilizing specific areas including detailed date and time information. If these data loggers prove reliable, Manitoba Hydro may deploy them, in addition to or instead of, trail cameras to better understand how humans are utilizing access routes post construction.

Information from these access monitoring studies will help in understanding the effectiveness of mitigation measures and inform any adaptive management requirements. Environmental Inspectors and Monitors will document any ROW use by the public during the active construction period.