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Bipole III Transmission Project

Integrated Vegetation Management Plan

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List of Revisions

Number	Nature of revision	Section(s)	Revised by	Date

Preface

Manitoba Hydro would like to acknowledge that this Project will be located in the traditional territories of the Anishinabe, Cree, and Dakota people and the homeland of the Metis Nation.

This document presents the Integrated Vegetation Management Plan (IVMP) for the operation of the right of ways associated with the Bipole III Transmission Project (the Project). It is intended to provide information and instruction to Manitoba Hydro employees as well as contractors, regulators and members of the public. The Plan provides regulatory context as well as general considerations and guidance pertinent to vegetation management in the Project area within Manitoba. This plan lays out an approach to vegetation management that works to create and maintain a variety of habitats on the right of way (ROW) important to Indigenous peoples and species of conservation concern. Inspection and compliance along with monitoring and evaluation programs are described to confirm adherence to required actions including documentation and reporting.

Manitoba Hydro employees and contractors are encouraged to contact the Line Maintenance Environmental Specialist if they require information, clarification or support. Indigenous communities, regulators, landowners and the public are to direct any inquiries about this Plan to:

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Table of Contents

List of Tables

1.0 Introduction

Manitoba Hydro, like all North American utilities, must manage vegetation in a cost effective manner while meeting regulatory requirements along the transmission line corridors that it owns and operates. Currently, Manitoba Hydro operates and maintains over 18,000 km of transmission facilities, with new development being proposed to meet Manitoba's energy requirements.

This Integrated Vegetation Management Plan (IVMP) is intended to be used by the Transmission Business Unit, its employees and contractors to guide the vegetation management work on the Bipole III Transmission Project rights of way (ROW). The transmission line ROW's (line ID) included in the Project are:

- Bipole III Transmission Line (DC5 and DC6)
- Keewatinohk Construction Powerline (KN 36 Tap)
- Keewatinohk Ground Electrode (KEE ELECT)
- Keewatinohk to Henday AC Collectors (K64H,K63H,K62H,K61H)
- Long Spruce to Keewatinohk AC Collector (L61K)
- Riel Ground Electrode (RIE ELECT)

1.1 Background

It is critically important to maintain the flow of electricity throughout the grid to ensure reliability for our customers and safety for Manitobans. Employing integrated vegetation management is key to preventing outages throughout the system. There are several reasons why an outage can occur and in North America, one of the common causes is trees. Trees can cause outages in two ways: 1) When all or part of the tree falls and lands on the conductor and 2) When a tree naturally grows within close proximity of the conductor, allowing electricity to arc from the conductor to the tree and move to the ground.

Trees have been responsible for significant outages on the North American Electric Power System over the last few decades. In July 1996, 2.2 million customers were affected by a disruption of the Western Electrical Grid. In August of that same year, 7.5 million customers were affected by another disruption to the Western grid. In August 2003, 50 million customers in Canada and the United States were affected by an outage on the Northeast Electrical Grid. In each case, investigations of these outages found that the outage would have been prevented had the trees not been allowed to grow into close proximity of the transmission facilities.

1.2 Commitment to environmental protection and Indigenous engagement

Manitoba Hydro integrates environmentally responsible practices in all aspects of our business. Environmental protection can only be achieved with the involvement of Manitoba Hydro employees, consultants, contractors, Indigenous communities and organizations and the public during the operational phase of the Project.

The use of an IVMP is a practical and direct implementation of Manitoba Hydro's environmental policy and its commitment to responsible environmental and social stewardship. It is a proactive approach to manage potential effects of vegetation management activities on the environment.

Manitoba Hydro is committed to implementing this IVMP and requiring contractors to follow the terms of this and other applicable plans within the Environmental Protection Program.

Manitoba Hydro is committed to seeking input on this plan from Indigenous communities through the project First Nations and Metis Engagement Process (FNMEP). Manitoba Hydro representatives have met with Indigenous communities during project engagement and understand that vegetation management is a critical concern.

To date Manitoba Hydro has heard extensive comments and concerns through its engagement processes, Clean Environment Commission Hearing related to the use of herbicides as part of its IVMP. Key comments and concerns heard from the public and Indigenous communities to date include:

- Contamination of surface and groundwater related to herbicide runoff;
- Contamination of the land related to herbicide use;
- Effects to animals who live around areas that are sprayed with herbicides or eat vegetation affected by herbicides;
- Effects to specific sites, such as locations of berry picking, medicinal plant harvesting, or sites where rare plants are found should be set aside as non-herbicide zones;
- Reduction or affect to the power of culturally or spiritually-important plants;
- Questions about the frequency of spraying, and the method and machinery used for spraying;
- Recommendation that Manitoba Hydro use 100 m or more as a minimum for the riparian buffer zone to reduce the risks of herbicides leaching into water;
- Notice of upcoming vegetation control programs with an opportunity for feedback; and
- Requirement for signage of when and where herbicides are applied.

Key mechanisms Manitoba Hydro is using in addressing the above comments and concerns are:

- Working with and listening to Indigenous communities affected by the Project;
- Developing and sharing this plan to be open and transparent about how decisions are made with respect to herbicides when used as a component of an integrated vegetation management approach;
- Committing to landowner and Indigenous engagement in planning of herbicide treatments along the ROW through Manitoba Hydro First Nation and Metis Engagement processes;
- Committing to following applicable Provincial and Federal acts and regulations pertaining to the application of herbicides;
- Identifying Environmentally Sensitive Sites (ESS) within Environmental Protection Plans such as riparian areas near watercourses or wetlands, or areas designated for the protection of Plant Species of Concern and Traditional Use Plant Species;
- Implementing at a minimum a 30 m riparian pesticide free buffers that meets all current regulatory requirements in Manitoba;
- Implementing a 30m pesticide free buffer for the protection of Plant Species of Concern and Traditional Use Plant Species ESS; and
- Posting of signage with application details within treatment area for 30 days following herbicide application.

1.2.1 Ongoing Indigenous Engagement

Manitoba Hydro will engage with Indigenous communities as vegetation management activities are scheduled along the Project to discuss project including additional information about traditional use areas and environmental features on the right of way for consideration during integrated vegetation management planning, including timing and treatment selection.

1.3 Integrated vegetation management approach

This document outlines the Integrated Vegetation Management Plan (IVMP) for the maintenance of the transmission line rights of way (ROW).

The basic principles of integrated vegetation management are to:

- Remove and/or control the incompatible tall-growing woody species wherever necessary;

- Encourage compatible low-growing plant communities that compete with and inhibit the establishment or spread of tall-growing species;
- Allow for "multiple-use" of ROWs by compatible alternatives;
- Respect traditional land uses, practices, and protect sites of importance; and
- Minimize adverse impacts on the environment.

Integrated Pest Management (IPM) is a decision-making process for managing pests (in this case vegetation that is incompatible with power lines) in an effective, economical and environmentally sound way. This IVMP is developed following an IPM planning approach that describes:

- A program for controlling vegetation populations along transmission rights-of-way using the principles of integrated vegetation management;
- The process for planning, selecting, using and evaluating treatment methods within that program;
- The methods of handling, preparing, mixing, applying and otherwise using herbicides within the program;
- The measures for mitigating environmental effects that may result from the vegetation management activities; and
- The procedures for ensuring NERC FAC-003 compliance, including prioritizing of hazardous vegetation conditions and emergencies.

1.4 Objective of the integrated vegetation management program

The long-term goal of the IVMP is the conversion of the right of way from dense stands of tall growing vegetation (incompatible), into low-growing (compatible) stable plant communities compatible with the safe and reliable operation of the Transmission System. Manitoba Hydro uses a variety of industry standard techniques to manage target vegetation on and off the ROW. Specifically; the integrated vegetation management practices focus on vegetation that can have the potential to grow and/or fall, into or within the arcing distance of the transmission lines and or facilities. The natural regeneration of woody incompatible tree species must be controlled to maintain a safe and reliable transmission system.

The Program objectives are to:

- Maintain NERC compliance: To maintain the integrity of the transmission system to ensure that there are no outages due to interference and/or contact with the conductors from vegetation;

- Provide access to all infrastructure within the transmission system for inspection and maintenance;
- Reduce the risk of fires and electric shock caused by flash overs;
- Utilize maintenance methods that are legal, safe, and economically feasible to the utility industry; and
- Develop and promote land use practices with land owners that discourage development of incompatible tree species (e.g. pastures, wildlife food plots and habitat, agriculture, etc.); and

Manitoba Hydro strives to achieve the program objectives with the consideration of environmental stewardship by:

- Encouraging a stable, compatible plant community;
- Selectively controlling only incompatible species;
- Working to understand and address concerns around vegetation management from Indigenous communities, landowners and the public;
- Reducing environmental effects of vegetation maintenance operations; and
- Enhancing biodiversity.

Manitoba Hydro employs four primary methods of managing the ROW to achieve the above objectives:

- Selective control - Wherever possible, control methods target only tall-growing vegetation and retain, encourage or introduce desirable low-growing species, particularly shrubs and traditional use plants that are naturally present on the site, since this helps to suppress tall-growing species.
- Compatible use - Encourage activities and land uses on the ROW that will not conflict with transmission lines and that control or prevent the growth of tall trees, such as recreational or agricultural uses.
- Limited clearing required - Areas where limited vegetation exists (agricultural areas) or when trees at their mature height will never come within the “limits of approach” (minimum allowable distance between vegetation and the conductor) at the maximum “conductor sag” (degree to which the line could sag towards the ground) and does not impede with access to infrastructure. Limited clearing sites are those that will likely never require vegetation maintenance because they pose little threat to the safe operation of transmission lines.

- Altering existing vegetation - In rare cases where it is un-feasible to remove vegetation from along the edges of the ROW, existing vegetation can be modified by pruning or trimming to maintain clearances from transmission lines.

The advantages of successfully establishing a low-growing stable plant community include:

- Enhances biodiversity by increasing the number of low-growing forage species and enhancing the available wildlife habitat;
- Minimizes opportunities for tree species establishment and thereby reduces disruption and damage to the natural environment;
- Allows people and communities to use the ROW more effectively for berry-picking or medicinal plant gathering;
- Increases public safety by reducing the risk of tree contact to lines and thereby reducing the fire hazard;
- Increases operational reliability;
- Permits access and maintains lines of sight for maintenance;
- Reduces the total area requiring future treatment, and reduces herbicide use over time; and
- Reduces long-term vegetation maintenance costs.

1.5 Roles and responsibilities

Manitoba Hydro has the following personnel involved in the design and implementation of the IVMP:

- Vegetation Management Specialists
- Environmental Specialists
- Line Maintenance Manager
- Line Maintenance Supervisors
- Line Inspectors
- Live Line Journeymen
- Line Patrollers
- Contractors/consultants

All personnel involved with vegetation management meet Manitoba Hydro guidelines of qualification, supervision and/or training. Manitoba Hydro personnel working in the field will have passed at minimum, a 4-level, modular-based patroller training course that includes modules on vegetation issues (Patrollers), or will have lineman training that includes basic vegetation training (Line Inspectors and Live Line Journeymen) or be

directly supervised by qualified employees. Completion of all training is documented in employee personnel files.

All other personnel working with the IVMP are qualified based on a combination of their education, their experience, and the nature of their position (Line Maintenance Manager, Line Maintenance Supervisors, Engineers, and Vegetation Management and Environmental Specialists).

Manitoba Hydro also hires consultants/contractors to assist with development and at times the implementation of integrated vegetation management work within the transmission right of way. The contract selection process ensures that consultants/contractors and their personnel are qualified and trained to work safely around high voltage lines. In addition, contractors work under the supervision of qualified Manitoba Hydro personnel while performing integrated vegetation management work.

1.6 Environmental considerations

There are numerous environmental sensitivities within and along the ROW, that have specific mitigation measures developed to protect them including retention of vegetation. These sites are called Environmentally Sensitive Sites (ESS) and will be identified in the Environmental Protection Plan map books.

A key consideration in the development of the initial clearing prescriptions for the ROW was the concept of retaining low lying vegetation in the following prescribed areas:

- 30-85m riparian buffer zone on all creeks, streams, rivers and wetlands (the width of the riparian buffer is based on slope of land entering waterway as described in the Riparian Buffer Table in the EnvPP);
- Visual line of site buffers along select roads and trails;
- Environmentally Sensitive Sites with mitigation measure specifying vegetation retention (traditional use plant harvest areas, sensitive wildlife areas, etc.)

1.6.1 Managing Moose and Boreal Woodland Caribou habitat

Manitoba Hydro in conjunction with Manitoba Sustainable Development has implemented special ROW clearing prescriptions along the ROW during development of the Project to mitigate effects on moose and boreal woodland caribou. These prescriptions along with ongoing line maintenance mitigation measures are described in the Moose and Woodland Caribou Sensitive Range Delineation and Mitigation Plans (January 11, 2016). Mitigation

measures implemented during construction related to vegetation along with operational requirements for each area include:

Wabowden Woodland Caribou Sensitive Area

- Right-of-way clearing within area identified will not include shear blading except for areas for access, conductor stringing trails, and tower footprints. Selective cutting methods will only be used to remove danger trees that exceed a 40 degree Line of sight from 12m offset from centerline within the ROW and any trees outside the ROW, to maintain low tree, shrub and herb plant communities on the ROW.
- Annual ground inspection of towers to occur late in winter season to avoid creating packed snow trails that facilitate predator use of the ROW.
- Maintenance trails to be maintained to reduce line of sight for hunters and predators.

The Bog Woodland Caribou Crossing Area

- Extension of wildlife crossing and vegetation management measures to the 230 kV line running adjacent to the Bipole III transmission line in this range. Location of specific measures on the 230kV line to be determined in conjunction with Wildlife Branch.
- Right-of-way clearing within crossing areas identified will use low ground disturbance methods except for areas for access, conductor stringing trails, and tower footprints where some level of ground disturbance is required. Full ROW clearing using low ground disturbance methods in those portions of the 4 caribou crossing areas where Lidar imagery indicates vegetative cover in excess of 10 meters in height. Note, full ROW clearing means removal of treed cover through low ground disturbance methods (including shear blading) that retain organic and lichen cover to the extent possible.
- Selective removal of danger trees in the balance of the 4 caribou crossing areas where Lidar imagery indicates vegetative cover generally being less than 10 meters in height. Selective removal in this context means any tree intersecting the 40° angle from the edge of the existing shear bladed center line
- Maintenance trails to be maintained to reduce line of sight for hunters and predators.
- At PTH 10 crossing a low tree and shrub vegetated buffer zone will be left at the edge of the ROW to reduce visibility and access on to the ROW from the highway.

Due to the lack of understory (i.e. low tree and shrubs) no buffer is currently in place at the crossing at PTH 60; however, it will be managed to allow for natural re-vegetation establishment that will act as a future visible barrier during operations. If re-vegetation does not occur naturally Manitoba Hydro will plant compatible shrub species to create a vegetated buffer. A maintenance trail will still be needed on to the ROW from the highway.

Tom Lamb Sensitive Moose Range

- Right-of-way clearing within area identified will not include shear blading except for areas for access, conductor stringing trails, and tower footprints. Selective cutting methods will only be used to remove danger trees outside the ROW and any trees within the ROW in excess of 5m, to maintain low tree, shrub and herb plant communities.
- Right-of-way clearing within area identified in will not include shear blading except for areas for access, conductor stringing trails, and tower footprints. Selective cutting methods will be used to remove danger trees outside the ROW and any trees within the ROW in excess of 5m to maintain low tree, shrub and herb plant communities
- Maintenance Trails slash piles will be stockpiled every 400m in a staggered formation across the ROW during initial clearing in mature treed areas and other areas where possible, except on centerline trail. Piles will be placed adjacent to the centerline trail until after construction, at which time they will be moved on to the trail to reduce line of sight along the trail and in a manner that provides maintenance access. This is to be done to the satisfaction of the supervising officer and Regional Wildlife staff.

GHA 14A Sensitive Moose Range

- Right-of-way clearing within area identified will not include shear blading except for areas for access, conductor stringing trails (24m), and tower footprints. Selective cutting methods will be used to remove danger trees outside the ROW and any trees within the ROW in excess of 5m, to maintain low tree, shrub and herb plant communities
- Maintenance trails to be maintained to reduce line of sight for hunters and predators.

GHA 19A Sensitive Moose Range

- Construction access trail clearing width will be limited to 12m wherever possible, and not to exceed a maximum of 24m in width.
- Shear-blade clearing of low-growth vegetation such as willows will be avoided where possible.
- Guyed tower heights have been designed to allow 15m tall treed vegetation to be retained during initial clearing. These taller towers result in the guy wire anchors being installed outside of the ROW. This exceedance of ROW was previously approved on June 4, 2014
- Maximum allowable tree height not to exceed 15m
- Clearing widths must be limited to 12m along the subject access trail during operations and maintenance of the development.

2.0 Regulatory Context

In Manitoba, vegetation management activities are primarily regulated through *The Crown Lands Act, The Environment Act*, *The Pesticide and Fertilizers Control Act* and their related regulations. Manitoba Hydro applies to Manitoba Sustainable Development for applicable work and pesticide use permits when vegetation management treatments are planned on the ROW. As a result of the above regulations, vegetation management activities are subject to compliance inspections by Conservation or Environment Officers.

Additionally, by way of the Reliability Standards Regulation 25/2012 under *The Manitoba Hydro Act,* Manitoba Hydro must comply with North American Electric Reliability Corporation (NERC) standard FAC-003. The FAC-003 Transmission Vegetation Management Standard's purpose is:

"To maintain a reliable electric transmission system by using a defense- in-depth strategy to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW, thus preventing the risk of those vegetation- related outages that could lead to Cascading."

Environment Act Licence #3055 issued for the Bipole III Transmission Project has several Licence conditions related to vegetation management for the Development:

> *36. The Licencee shall, in consultation with the Forestry Branch, manage vegetation along the transmission right-of-way in coniferous dominated forest to retain the coniferous character.*
>
> *48. The Licencee shall, during maintenance of the Development in Environmentally Sensitive Sites (ESSs) identified in the EPP related to traditional plant harvesting:*
>
> *a) clear vegetation using only low impact methods including hand clearing;*
>
> *b) not apply herbicides in the ESSs and within a buffer from the sites, unless a vegetation management agreement stating otherwise is developed with the First Nations, Metis communities and local Aboriginal communities that utilize the specific sites; and*
>
> *c) post signs indicating herbicides have been applied in areas along the transmission line right-of-way when and where herbicides have been applied in the vicinity of the ESSs. The postings shall be left in place for one month after the application has occurred.*
>
> *49. The Licencee shall, during construction and maintenance of the Development, clear only tower locations, danger trees, and trees in excess of 17 meters in height within the transmission line right-of-way along the approximately 8 kilometer long section of Game Hunting Area 19A, which is currently inaccessible by means of existing fence lines and trails.*

Condition 49 was updated in document filed and approved by Environmental Approvals Branch called Moose and Caribou Sensitive Range Delineation Plans dated January 11, 2016:

- *Guyed tower heights have been designed to allow 15m tall treed vegetation to be retained during initial clearing. These taller towers result in the guy wire anchors being installed outside of the ROW. This exceedance of ROW was previously approved on June 4, 2014 (Appendix C)*
- *Maximum allowable tree height not to exceed 15m*

50. The Licencee shall leave wildlife trees, where possible, throughout the Development right-of-way where they do not pose a hazard.

51. The Licencee shall, in consultation with Wildlife Branch, manage the Development right-of-way from Swan River northward to discourage population increase and distribution of white-tailed deer.

52. To ensure no net loss of wetlands, the Licencee shall, during construction and maintenance of the Development, maintain a minimum 30 meter riparian buffer zone immediately adjacent to wetlands and the shoreline of lakes, rivers, creeks, and streams. Within the riparian buffer zone:

a) trees that must be removed shall be cleared using only low impact methods including hand clearing;

b) all existing low growth vegetation such as grasses, shrubs, and willows shall be maintained;

c) the application of herbicides shall be prohibited; and

d) any affected wetland area will be restored, replaced or offset as approved by the Director to ensure no net loss of wetlands.

60. The Licencee shall, for approval of the Director, submit a vegetation control plan for line maintenance. The plan shall consider Integrated Pest Management (IPM) strategies and shall eliminate the use of herbicides during maintenance unless there are no other feasible means available. If herbicides are used, the Licencee shall adhere to the ***Pesticides Regulation 47/2004,*** *or any future amendment thereof, for the storage, handling and application of pesticides in conjunction with the Development.*

61. The Licencee shall not, during maintenance of the Development, use herbicides in Wildlife Management Areas, unless otherwise approved in the vegetation control plan referenced in Clause 60 above.

62. The Licencee shall not use herbicides in bog areas during maintenance of the Development.

Definitions:

"bog" *means a peat-covered wetland in which the vegetation shows the effects of a high water table and a general lack of nutrients. The surface is often raised relative to the surrounding landscape and isolated from mineralized soil waters. At least 40 cm of peat are present. The plant community is dominated by cushion-forming Sphagnum mosses (peat mosses), ericaceous shrubs and black spruce trees;*

3.0 Integrated pest management

This IVMP utilizes the concept of integrated pest management and includes the following elements:

- Prevention;
- Identification;
- Monitoring;
- Treatment thresholds;
- Treatment options; and
- Evaluation

The most effective pest control (for the purposes of this plan "pest" refers to vegetation) is typically the result of an integrated approach, using a combination of strategies and methods and allowing natural processes to manage the pest. It balances the direct costs, and the social and environmental implications with the benefits of the pest control.

3.1 Prevention

Prevention is a key component of a vegetation management program with the goal of preventing vegetation that poses a risk to safety or reliability from developing or worsening. Preventative measures such as regular vegetation management cycles, hazard tree identification and integrated planning are aimed at stopping the initial growth and spread of incompatible vegetation.

Vegetation Management Cycles

- Designed to ensure public safety and reliability are maintained.
- Cycle times range from 2 to 10 years.
    - Where the growing season and soil conditions are not favorable, a cycle can be 10 years, while in the urban areas of southern Manitoba with high growth rates the cycle could be as short as 2 years.

Hazard Tree Identification

- Occurs during line patrols and includes criteria such as dead, dying or infirm trees due to physical conditions (snow/ice loading, lightening, etc.) or forest health issues, (Dutch elm disease, stem decay, emerald ash borer).

Integrated Planning

- Setting and enforcing clearance specifications for new construction including ROW width and danger tree clearing standards.
- Compatible land use planning to incorporate agricultural crops, livestock grazing, recreational or industrial uses.

3.2 Identification

The primary target-vegetation to be controlled on transmission ROWs are trees that have the potential to reach or exceed the limits of approach to the line (see 3.4.2 for information on limits of approach).

The following species represent the majority of target trees growing along the ROW. Any plant that could interfere with access to and maintenance of transmission structures will also be controlled, such as thorny bushes and vines.

Table 1: Primary Target Species along Transmission Lines

Common Name	Scientific Name
Conifers	
Pine	*Pinus spp.*
Spruce	*Picea spp.*
Fir	*Abies spp.*
Larch	*Larix spp.*
Deciduous	
Alder	*Alnus spp.*
Birch	*Betula spp.*
Aspen	*Populus tremuloides*
Deciduous	
Poplar	*Populus spp.*

Common Name	Scientific Name
Maple	*Acer spp.*
Cherry	*Prunus spp.*
Willow*	*Salix spp.*
Oak	*Quercus spp.*
Ash	*Fraxinus spp.*
Elm	*Ulmus spp.*

*Although many willows only attain shrub size, several species attain tree size, are fast growing, and sucker from the root collar. Willow species are very hard to distinguish and for this reason, are targeted as a species to manage on the corridor.

3.2.1 Traditional use plants and species of conservation concern

A number of plants and plant communities were identified as being particularly important to Indigenous peoples (e.g., Assiniboine River, blueberry sites near Cowan). These areas are valued for gathering food and medicines and harvesting plants and trees.

There are hundreds of species of traditional use plants along with several species of conservation concern (SOCC) identified within the ROW. Areas where SOCC's or traditional use plant harvesting areas have been identified are included as Environmentally Sensitive Sites (ESS) within applicable environmental protection plan where they are buffered and mitigation developed to minimize their disturbance.

3.3 Monitoring

Manitoba Hydro's transmission inspection process is designed to conduct inspection of 100% of all the transmission lines ≥230kv, and electric transmission corridors on an annual basis; this inspection encompasses vegetation inventory and may include facilities inspection (structures, conductors, and wires). Vegetation inspection data collected during line patrolling provides information needed to decide whether treatments are necessary, optimize timing of treatment, and the most suitable treatment method. During and/or following the inspection process all pertinent information and findings are entered into

Manitoba Hydro's Transmission Geographic Information System (TGIS). All previous and prescribed vegetation management treatments and environmentally sensitive sites are stored in TGIS. Within this central database, the annual maintenance activities including vegetation treatments are identified and tracked. Patrols may be conducted by ground or air, and are completed once per calendar year, no more than every 18 months, on every span in the 230kv and higher lines within the transmission system.

3.3.1 Patrol Information

The following aspects are considered when patrolling the lines to determine vegetation work timing and method:

- Tree heights and priority of vegetation to be managed;
- Proximity of vegetation to limits of approach;
- Imminent threats, i.e., dead, dying, and leaning trees, and root rot pockets (on the ROW and along the edge);
- General condition of off-ROW danger tree strip;
- Width of the ROW edge (narrowing or encroachments);
- The relative density of deciduous or coniferous target trees, expressed in percentage cover of the site;
- Compatible vegetation that could be retained;
- Terrain characteristics that help determine the appropriate work method, such as steep slopes;
- Terrain features such as topographical features, eroded or erosion-prone areas, bare-ground areas, and hazards such as large rocks and stumps;
- Special conditions, such as compatible land use issues, property encroachments, and other concerns;
- The environmental conditions and features of the treatment area, such as riparian issues, wildlife issues, and other environmental concerns;
- Damage to structures and lines; and
- Road access conditions, including gates, locks, road surface, culvert conditions, etc., and other factors that will dictate the types of equipment that can be brought onto the site.

The following information is collected during patrols:

- Evaluation on the efficacy of previously undertaken vegetation management;
- Areas where vegetation management must be conducted;
- Areas that can be deferred for future vegetation management

- Areas of noxious or invasive weeds;
- Methods to be used in each of these identified areas; and
- Relative priority of the work.

3.4 Treatment thresholds

The action thresholds on and or off the ROW that necessitate vegetation management are:

- The presence of incompatible species of vegetation that could grow into the conductors or limits of approach, or NERC Minimum Vegetation Clearances from inside and/or outside of the ROW;
- The presence of tall growing trees that could fall into or onto the conductors from inside and/or outside the ROW; and
- Vegetation blocking access to the transmission infrastructure.

3.4.1 Clearance requirements

To determine when vegetation must be controlled at a particular site, the following factors related to the clearance requirements for the transmission line will be evaluated:

- Limits of approach;
- Maximum conductor sag;
- Growth rate and mature vegetation height;
- Unusual terrain features that may result in a low conductor to ground clearance; and
- Maximum conductor swing.

Lines can also be threatened by trees growing adjacent to the ROW. Therefore, another aspect in determining action thresholds is identifying and rating hazard and danger trees along the edges of the ROW (the trees most likely to fall into the lines).

Manitoba Hydro's minimum tree to conductor clearances under all rated operating conditions are those set forth in Manitoba Hydro Transmission Line Design Guideline No. MH-TLD-GL-001, (See Table 2)

Table 2: Minimum Vegetation to Transmission Conductor Clearances.

Line Voltage	Minimum Clearance (meters)
138 kV	4.5
230 kV	4.5

500 kV DC	6.0

3.5 Timing and treatment selection criteria

Criteria used to select the treatment method are based on numerous factors including:

- Current and adjacent land use;
- Land ownership;
- Landowner permission;
- Effectiveness of previous treatments;
- Presence of identified Environmentally Sensitive Sites such as riparian areas, traditional use plant areas, species of conservation concern
- Site conditions such as soil type, species, terrain, stem density;
- Proximity of known organic farms, water sources, bodies of water and environmentally sensitive sites;
- The possibility of adverse impacts to wildlife, fish, surrounding land, workers and adjacent residents;
- Safety of workers and the public;
- Security;
- Timing of treatment including reduced risk timing windows for treatment options, such as riparian areas due to fish spawning windows, or concerns around bird nesting areas, seasons, weather conditions;
- Cost and availability of treatment options;
- Regulatory requirements;
- Site accessibility; and
- The consequences of no treatment.

3.6 Treatment options

To prevent vegetation related electrical flashover, and/or outages, trees on and off the ROW must not be permitted to grow or fall within the clearance standards as specified in Table 2. Right of way design criteria (permissible tree heights and cleared width ROW) account for maximum designed conductor sag and sway.

Control practices include a combination of the following:

- Manual and mechanical clearing;
- Alternative treatments or land uses; or
- Herbicide.

Vegetation control on Manitoba Hydro's ROWs are achieved primarily through mechanical control (wheeled or tracked prime movers with drum or rotary cutters, mulcher, feller-bunchers, bulldozers with modified brush blades, etc.,), herbicides, and manual control (chain saws, brush saws, and brush axes).

3.6.1 Manual and mechanical treatment methods

This section describes the various manual and mechanical vegetation management techniques that Manitoba Hydro uses on transmission ROWs including brushing, mowing, girdling, blading, and pruning. The following sections will provide further details on the techniques including:

- Description of the technique;
- Selection criteria for techniques; and
- Benefits and limitations of the technique.

3.6.1.1 Brushing

Brushing is the most commonly used manual vegetation management technique on transmission lines, and is sometimes combined with the herbicide cut-surface method.

Description of techniques

Brushing is the removal of individual stems that will eventually grow into transmission lines by hand tools, such as chainsaws or circular brush saw. Tall-growing tree species are cut down within a few inches of the ground line. Brushing is focused on target species, preserving the maximum amount of low-growing species.

Selection criteria

Brushing is the preferred method in the following situations:

- In areas with a well-established low-growing plant community;
- In combination with mowing;
- In difficult terrain with limited machine access, e.g., around guy wires, steep slopes, and riparian areas; or

- In areas where environmental or social concerns warrant.

Although generally confined to ROWs, brushing may be extended beyond the ROW edge to improve long-term line security by removing hazard trees that could fall onto the line from the edge.

Brushing is not preferred in the following circumstances:

- For high densities of target trees (>10,000 stems /ha conifer and >20,000 stems/ha of deciduous);
- Areas where mowing is a suitable alternative;
- Areas with high aesthetic concerns;
- Areas with a high fire risk; and
- Areas where trees are of a size (approx. 5m tall) that when cut will leave debris levels that exceed 1 meter in height.

Advantages of brushing

- Brushing allows the immediate removal of target vegetation, with complete retention of low-growing compatible species;
- Conifer trees cut below the lowest branch are permanently controlled;
- Brushing allows spot treatment with herbicides to prevent stumps from re-sprouting;
- Brushing protects areas close to fish-bearing streams and other environmentally sensitive areas, since it can be done without causing excessive erosion or damage to the streambed; and
- Brushing is beneficial in areas where target vegetation is widely scattered.

Limitations of brushing

- Brushing is labour intensive and can be dangerous to workers in steep terrain;
- Brushing is more difficult in dense vegetation;
- It can increase the fire risk if there is a buildup of debris;
- In the absence of follow-up herbicide treatment, deciduous stumps can re-sprout repeatedly (into coppices) each time they are cut, resulting in increased stem densities, growth rates, clearing costs, and shortened treatment cycles in subsequent years; and
- Aesthetics of brushing may be a public concern due to the buildup of debris.

3.6.1.2 Mowing

Mowing technique is used to where there are tall and/or high-density target species or to control grass height and weeds in urban areas.

Description of techniques

Mowing is the cutting of target vegetation with wheeled or track-mounted heavy- duty rotary or flail cutters. A heavy-duty tractor or excavator is equipped with the cutting head and driven over the ROW to cut target vegetation.

Selection criteria

Mowing is the preferred method where the terrain allows, and in areas:

- To control grass height on Urban ROW's
- With high densities of target trees (>10,000 stems /ha conifer and/or >20,000 stems/ha of deciduous); and
- Where trees are of a size (approx. 5m tall) that when cut will leave debris levels that exceed 1 meter in height.

In general, mowing is not the preferred method in the following areas:

- Where low-growing compatible species are well-established and there are low stem densities of target vegetation;
- In areas with a dense understory of low-growing compatible species and high stem densities of target vegetation (an excavator machine with mulching or mowing head should be used);
- In areas with rocks that can cause excessive damage to cutting heads (unless an excavator with an articulating mower is used);
- In areas that are developed or have high public use because of the risk of flying debris when mowing;
- In unfrozen boggy or wet areas where excessive rutting and soil compaction and damage could occur;
- On steep slopes; or
- In riparian areas.

Advantages of mowing

- Mowing mulches the vegetation into smaller pieces that readily biodegrade, which reduces fuel loading fire hazards;
- Mowing is seasonally effective, inhibiting growth from spring through late summer. This is important in areas where herbicide follow-up treatment is not possible;
- In non-selective mowing (Hydro-axe or Kershaw), all vegetation is cut to ground, leaving a level ROW and facilitating future herbicide applications that use mechanical delivery systems;
- In mowing directed only towards target vegetation (hydraulic excavator, rotary disc, or flail), the ROW retains biodiversity and existing low ground cover;
- Target vegetation can be removed faster and more economically than other methods;
- Work progress and workmanship are clearly visible; and
- Using machines is generally less hazardous to the operator than using hand-held equipment.

Limitations of mowing

- Mowing is not generally suitable in riparian areas, and should not be used there unless a site-specific riparian prescription has been produced and approved;
- Mowing can promote heavier regrowth of deciduous vegetation;
- Mowing is often limited by terrain, such as large rocks, stumps, and bodies of water;
- In wet terrain, machines cannot operate effectively and could damage the environment;
- Mowing mulches the brush using a high-speed, mowing/flailing action, which can leave ROWs unsightly, hazardous, and subject to public complaints;
- Mowing may result in rutting, track marks, or degradation of the ROW surface; and
- Mowing should not be used on slopes greater than 30% because most machines are unsafe to operate.

3.6.1.3 Girdling

The girdling procedure is usually limited to single-stemmed, deciduous trees on transmission lines, but can also be carried out on some conifer species when required.

Description of techniques

Girdling involves cutting one or more strips of bark from around the entire tree trunk with a special girdling tool or other hand tool. The bark strips are removed along with other tissue down to the sapwood. After the bark has been severed, the tree is left to die. The above-ground parts continue to grow, but the roots starve and the tree slowly dies. Only girdling and herbicide applications will kill deciduous species. They will re-sprout if mowed or slashed.

Selection criteria

- Girdling is most often used in riparian areas or other environmentally- sensitive sites;
- Girdling is generally not used on trees of small diameter, since they may break at the girdle, causing the tree to re-sprout;
- Girdling is not acceptable in areas where the target vegetation will reach limits of approach within two growing seasons;
- Girdling should not be used for stem densities of over 15,000 stems per hectare because it is not practical, effective, or cost-effective. Also, the amount of standing dead stems may create a fire hazard;
- Girdling is not acceptable in situations where tree failure could lead to worker or public injury or property damage;
- Conifers are never girdled unless they are part of a riparian prescription; and
- Girdling is effective on alder, birch, and willow species. Girdling is not as effective on northern black cottonwood and small-diameter aspen poplar because of prolific re-sprouting.

Advantages of girdling

- Girdling promotes retention of vegetation cover and increased site stability due to root structure retention;
- Girdling may have greater public acceptance than herbicide use;
- Girdling is not limited by difficult terrain;

- Girdling is flexible, because individual stems and species can be removed or left on a tree-by-tree basis; and
- Girdling creates habitat for small mammals and birds.

Limitations of girdling

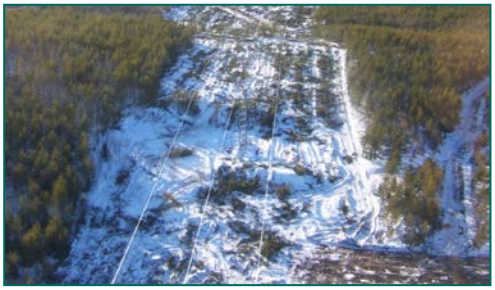
- Girdling cannot be used effectively over large areas or in dense brush, because it becomes too laborious and costly;
- Close inspection and careful work are required to ensure adequate depth and width of the girdles is maintained;
- Tools are not effective on large stems with thick bark;
- If stems have many live branches below breast height (1.3m above ground), additional work with hand tools will be required to remove the branches;
- The dead trees remain standing for 2–3 years, which may be objectionable in highly visible areas;
- The use of hand tools may be hazardous to workers;
- Blowdown of dead trees may pose a safety problem alongside well-travelled areas, or to workers re-entering the area; and
- Workers must be experienced girdlers, since poor girdling results in re-sprouts or premature blowdown with re-sprouts.

3.6.1.4 Blading

Blading is generally confined to remote areas with a high density of target vegetation, where winter access is required.

Description of techniques

Blading is the mechanical grubbing and grading of the transmission ROW using excavators or bulldozers to remove all existing vegetation.



Selection criteria

Blading is an acceptable method in the following situations:

- To clear land for economically viable and sustainable grazing or agriculture;
- To create a shift to low-growing vegetation species in areas with a high density of target vegetation; and
- To maintain inaccessible portions of ROWs due to frozen ground access requirements.

Advantages of blading

- Blading clears the site completely of vegetation and stumps, leaving it prepared for reseeding with desirable vegetation (i.e., to create new and enhanced habitat) or conversion to compatible use;
- Benefits the property owner by providing a better use of the land base, such as for pastureland; and
- Using heavy equipment is generally less hazardous to the operator than using hand-held equipment.

Limitations of blading

- Blading is only a temporary measure since it exposes bare soil, thereby opening the area for infiltration by unwanted species, including noxious or invasive weed species;
- Root-suckering species and re-sprouting species are not totally removed by blading, thereby increasing multi-stemmed regeneration of unwanted species; and
- Blading leaves the area temporarily exposed to the elements, resulting in possible erosion.

3.6.1.5 Pruning

Pruning is the removal of branches or limbs in order to direct and control tree growth away from transmission lines.

Description of techniques

The term pruning generally implies the use of proper arboricultural practices. It is not trimming, which refers to the cutting back of vegetation to a uniform distance; and it is not topping, which refers to cutting tree limbs back to a stub, bud, or a lateral branch.

Pruning is the only suitable vegetation management method for areas where tree removal is not a feasible option, generally topping of trees is not a recommended practice.

Selection criteria

In most instances, Manitoba Hydro does not support pruning trees on transmission lines because of the clearances that must be maintained between the lines and the trees.

Trees should be removed at ground level. However, pruning may be the best management technique in the following circumstances:

- Where it is cost-effective compared to tree removal;
- Where the main stem is not on the ROW, but branches encroach on the ROW; and
- Where trees are required for wildlife habitat or to protect riparian areas.

Tree removal will be carried out if pruning operations cannot provide both adequate clearance and healthy, aesthetically acceptable trees.

Advantages of pruning

- Trees are not removed and still provide aesthetic and other functions;
- Pruning influences the direction of branch growth so that trees can be directed away from conductors;
- Pruning can minimize adverse effects on tree health, and over time, reduce line clearing workload and risk from unhealthy trees; and
- A pruned tree provides wildlife habitat and retains aesthetics, as opposed to a removed tree.

Limitations of pruning

- Pruning is usually costlier than removal because trees may need to be pruned repeatedly;
- Pruning requires a skilled, experienced arborist. Improper pruning techniques can seriously damage trees and result in unhealthy, unsightly, or hazardous trees that may require off-cycle remedial work; and

- Pruned trees remain in proximity to transmission lines and have hazard potential, while removed trees do not.

3.6.2 Alternative treatments/land uses

There is increasing public demand for secondary uses of transmission ROWs. Manitoba Hydro is supportive of these secondary uses provided that they are compatible with the safe operation and maintenance of the line.

3.6.2.1 Description of techniques

Alternative treatment methods include:

- Agriculture and livestock grazing;
- Native grass and seed production; or
- Recreational corridors or public greenways.

Selection criteria

In most instances, Manitoba Hydro investigates with adjacent or eased landowners compatible alternative treatments/land uses; where a landowner has committed to the treatment through an agreement, and the use/associated development is considered compatible with the safe operation of the transmission line.

Advantages of alternative treatments/ land uses

- Produce natural low growing vegetation;
- Reduce or eliminate tall growing vegetation by out-competing them for space, light and nutrients;
- May reduce the need for herbicide application;
- May reduce vegetation management costs; and
- Enhance wildlife habitat.

Limitations of alternative treatments/land uses

- May require continuous grass mowing;
- May require prescribed burning;
- Requires co-operating landowners; and
- May reduce access to infrastructure during maintenance and patrols.

3.7 Herbicides as part of an integrated vegetation management plan

The safe and cautious use of herbicides is an essential part of maintaining a safe and reliable transmission system in a financially and environmentally responsible manner. Herbicide use accounts for less than a quarter of Manitoba Hydro's vegetation management program. The use of herbicides is strictly controlled by regulations and Manitoba Hydro application practices.

A repetitive cycle of only manual/mechanical treatments promotes suckering of some tree species dramatically increasing the density of tall growing species, essentially creating a larger vegetation management challenge over time. Manitoba Hydro's Integrated Vegetation Management program only uses herbicides in conjunction with its manual/mechanical control methods on a site–specific basis to establish a stable, low growing plant community. The use of herbicides can dramatically increase the time periods (cycles) between vegetation management activities, which reduces overall disturbance to people and wildlife. Herbicides are applied in accordance with applicable provincial and federal laws and regulations, and are registered with the Pest Management Regulatory Agency (PMRA) of Health Canada.

Why does Manitoba Hydro even consider using herbicides instead of just doing mechanical and manual methods for tree control?

Fire risk

Tree cutting or brushing operations using chainsaws may build up vegetative debris on rights-of-way over time, which increases the "fuel load," or risk of fire.

Frequent disturbances

Reliance on mechanical methods requires more frequent intrusions onto the site, which increases the disturbance to wildlife and the environment due to repeated entries for mechanical treatment. This is because treatments like mowing or blading lead to shortened maintenance cycles due to rapid re-sprouting and increased density of deciduous vegetation.

In contrast, herbicides provide more selective long-term control, reducing the need for frequent manual or mechanical treatments.

Increased regrowth and density

Without the complementary use of herbicides, continuous mechanical cutting results in increased stem (tree) density and decreased control and effectiveness over time. Trees

such as alder, birch, aspen, and maple re-sprout quickly from cut stumps, resulting in even higher densities of tall- growing trees after repeated mowing or slashing. Follow-up use of herbicides prevents this re-sprouting and greatly extends the duration of vegetation control.

Continuous mowing on a right-of-way also increases the root mass from cut stumps and root stocks. This leaves roots to regrow vigorously each spring.

Environmental risks

There is greater potential for mowing or slashing to destroy bird nests and habitat for burrowing animals, compared to herbicide applications.

Mechanical methods often use heavy equipment that is more likely to damage non-target vegetation and the natural environment.

Heavy mechanical equipment can cause rutting, track marks, or degradation of the ground surface.

Mechanical equipment has a higher inherent carbon footprint from fuel consumption and emissions.

Safety hazards

The use of hand tools and mechanized equipment can be hazardous. The risk of accident and injury among workers is far greater when using mechanical means of controlling vegetation than when applying herbicides.

Some equipment may be impractical to use in remote or inaccessible areas, as well as dangerous in some terrain, such as on land with steep slopes or large rocks.

Increased slash and root mass from the sole use of mechanical methods creates physical hazards for wildlife, people, and equipment, and impedes service vehicle access.

3.8 Herbicides

Some herbicide products may have the identical active ingredient but a different trade name and a different Pesticide Control Product (PCP) number issued by the federal Pest Management Regulatory Agency (PMRA). These herbicides are considered equivalent and can be used under this IVMP. Manitoba Hydro may consider use of the following active ingredients on the ROW for tree control:

- Triclopyr
- Aminocyclopyrachlor / Metsulfuron methyl

- Aminopyralid / Metsulfuron-methyl
- Picloram
- 2,4-Dichlorophenoxyacetic (2,4-D)
- Imazapyr

In the future, as new products are developed and/or adopted for use by Manitoba Hydro, they will be added to this

3.9 Description of herbicide treatment methods

This section describes the basal bark, cut surface, mechanized cut surface, selective foliar, broadcast foliar, and injection treatment methods and discusses selection criteria and the advantages and limitations of each.

3.9.1 Basal bark

Basal bark treatment involves applying herbicide onto the bark of the target tree at the lower part of the stem.

Description of technique

The herbicide penetrates the bark into the cambium layer and diffuses throughout the tree and the roots, to prevent re-sprouting. It is applied with a low-volume backpack or hand-held sprayers with a positive shut-off system.

Selection criteria

- This treatment is best used on small deciduous trees under approx.4m in height; and
- At very high stem densities, basal treatment may not be practical, effective, or cost-effective. Also, the amount of standing dead stems may create a fire hazard.

Advantages of basal bark

- It is less labour intensive than manual brushing and girdling;

- It is suitable for sensitive areas including riparian, or remote and difficult-to-access areas;
- It treats only targeted individual stems and so is appropriate for areas with low densities of target trees;
- It removes the canopy over a three-year period, allowing a low-growing plant community to establish;
- The potential for spray drift is reduced;
- There is minimal risk of herbicide exposure to workers or the public due to the targeted nature of the treatment; and
- A small amount of product is applied per hectare.

Limitations of basal bark

- Dead foliage may be objectionable.
- In areas of low clearance, surviving treated stems may continue to grow.

3.9.2 Cut surface

Cut surface is a directed technique, which reduces the impact on non-target species. It also minimizes herbicide use and optimizes natural control.

Description of technique

This method (also called cut-and-treat) is used in conjunction with brushing in deciduous stands. The tree is cut as low as possible to the ground, and herbicide is applied by backpack sprayer or brush to the cut surface of the stump to limit re-sprouting.

Selection criteria

- The cut surface treatment is used in areas where basal bark treatment is not optimal, such as where standing dead trees are an aesthetic concern (e.g., alongside roadways), or in low conductor-to-ground situations; and

- Cut surface treatment is highly effective on most species that do not sucker from their roots.

Advantages of cut surface

- Cut surface treatment can be used in any terrain;
- No standing dead foliage remains, making this technique desirable in highly visible areas;
- There is minimal risk of herbicide exposure to workers or the public due to the directed nature of the treatment;
- Herbicide is limited to the stump surface, resulting in minimal impact on fish, wildlife, or the environment; and
- It removes the canopy, but increases low-growing forage for wildlife.

Limitations of cut surface

- Improper application can result in unsuccessful treatment, and may require re-application of the herbicide;
- Treatment results in reduced forage and cover in the short term; and
- It is a labour intensive method and not cost-effective for dense stands.

3.9.3 Mechanized cut surface

Mechanized cut surface is when the tree is cut by a mower and herbicide is applied to the surface of the cut stump at the same time.

Description of technique

This treatment method uses a wiper or wetted blade mounted on the underside of a mowing deck, to apply herbicides onto the cut surfaces of the target trees.

Selection criteria

- Mechanized cut surface treatment is highly effective on most species that do not sucker from their roots;
- Use in rural/urban areas where risk of damage to herbicide drift greater; and

Advantages of mechanized cut surface

- Mechanized cut surface is an efficient method for managing the re-sprouts of high-density target vegetation;
- No standing dead foliage remains, making this technique desirable in highly visible areas;
- There is minimal risk of herbicide exposure to workers or the public due to the directed nature of the treatment;
- Herbicide is limited to the stump surface, resulting in minimal impact on fish, wildlife, or the environment;
- It removes the canopy, but increases low-growing forage for wildlife; and
- It targets specific vegetation, with adjustable application rates and dosages.

Limitations of mechanized cut surface

- It is not as selective as backpack basal application;
- Buffer zones may be required to protect pesticide-free zones, depending on wind direction and topography;
- Caution must be exercised to avoid treating areas where desirable species may be affected;
- There may be a short-term decrease in vegetation forage species;
- Mechanized cut surface is often limited by terrain, such as steep slopes, large rocks, stumps, and bodies of water;
- In wet terrain, machines cannot operate effectively;

- Mechanized cut surface may result in rutting, track marks, or degradation of the ROW surface; and
- It should not be used on slopes greater than 30% because most machines are unsafe to operate.

3.9.4 Selective foliar

Manual foliar treatment uses backpack sprayers to apply herbicide to the foliage (leaves) of the vegetation.

Description of technique

Selective foliar treatment sprays herbicides onto the foliage of individual trees or small clusters of trees, using a hand held nozzle directed by the operator to selectively treat target species, this could be a manually-operated, low-volume, pressurized backpack or a high pressure/volume hose and handgun with a positive shut-off system.

Selection criteria

- If target vegetation is below 1.5m in height, it allows for better coverage, and will reduce the potential for operators to overreach;
- It is often used to treat re-sprouts one to two years after the area has been mowed or brushed;
- At very high stem densities or large areas, backpack foliar treatment may not be practical, effective, or cost-effective; and
- It is the preferred treatment for noxious and invasive weed control.

Advantages of selective foliar

- Selective foliar is the most efficient method for managing the re-sprouts of low-density target vegetation; and
- Specific target vegetation is treated, through direct control of nozzle by applicators trained in target species identification, minimizing non-target application.

Limitations of selective foliar

- Buffer zones may be required to protect pesticide-free zones, depending on wind direction and topography;
- The recommended treatment height of target species is 3m or less;
- Caution must be exercised to avoid treating areas where non-target species may be affected.

3.9.5 Broadcast foliar

Broadcast foliar treatment uses vehicle mounted sprayers to apply herbicide to the foliage of the vegetation.

Description of technique

This treatment method uses a fixed nozzle or boom-directed nozzle mounted on a vehicle such as a skidder, flex-trac, or an ATV, to spray herbicides onto the foliage of target trees. This method often uses a Radiarc nozzle.

Selection criteria for broadcast foliar

- This method is optimally used on areas that have been previously mowed or hand-slashed to reduce re-sprouts;
- It is often used to treat re-sprouts one to two years after the area has been mowed or slashed; and
- It is recommended for use when there is a high density of target cover at a uniform height. This will reduce the potential for spray runoff to the ground.

Advantages of broadcast foliar

- Broadcast foliar is an efficient method for managing the re-sprouts of high-density target vegetation;
- It targets specific vegetation, with adjustable application rates and dosages; and

- The Radiarc nozzle reduces the amount of herbicide used as optimal sized droplets for the weather conditions are produced, providing coverage of the foliage with limited runoff or drift caused by too large or too small of droplets.

Limitations of broadcast foliar

- Both target and non-target species are treated;
- There is more potential for drift than a selective foliar application;
- Buffer zones may be required to protect pesticide-free zones, depending on wind direction and topography;
- Caution must be exercised to avoid treating areas where desirable species may be affected;
- Broadcast foliar is often limited by terrain, such as steep slopes, large rocks, stumps, and bodies of water;
- In wet terrain, machines cannot operate effectively;
- Broadcast foliar equipment due to its size may result in rutting or disturbance of the ROW; and
- It should not be used on slopes greater than 30% because most machines are unsafe to operate.

3.9.6 Injection techniques

Injection techniques utilize a lance or hatchet to inject herbicide into the cambium layer of the bark of a tree.

Description of technique

There are two injection techniques used: mechanical injection and hack-and-squirt. In mechanical injection, a small capsule containing glyphosate is injected into the stem of the target tree or stump by means of a battery- powered drill or automatic loading lance. The herbicide is slowly released into the sapwood. Hack-and-squirt uses a small axe, machete, or hatchet to cut through the thick bark and into the sapwood. Glyphosate is then squirted into the cut with a bottle.

Selection criteria

- An injection technique should be used when the cut surface method cannot be done;
- It should not be used when there is a risk to line security because the trees do not die immediately;
- It is effective on re-sprouting stumps, provided the capsules are applied to live tissue;
- It can be used in areas of limited access;
- It may also be a good choice around riparian areas;
- Larger-diameter trees are not effectively controlled by injection;
- It is not effective on aspen poplar; and
- Blowdown of dead trees may pose a safety problem alongside well- travelled areas, or to workers re-entering the area.

Advantages of injection technique

- Injection techniques are highly selective and injury to surrounding species is uncommon;
- It is effective on certain species, such as red alder, and for larger trees that cannot be managed with basal applications;
- It is not limited by terrain;
- It is easily learned and safe for the applicator;
- Herbicide use is minimal and self-contained. The potential for worker and public exposure is reduced;
- It reduces the possibility of environmental contamination because it is so directed (although shell casings may be left onsite);
- It removes the canopy, but increases low-growing forage for wildlife; and
- It can be done at any time during the year.

Limitations of injection technique

- In highly visible areas, dead foliage of standing trees may be objectionable;
- Capsules are not bio-degradable;
- There is higher risk of line clearances being compromised because trees continue to grow after treatment, and trees may be occasionally missed for treatment.
- The method is labour intensive; and
- Capsules are not readily available.

4.0 Environmental protection

To address environmental protection requirements this plan is supported by the following documents that outline protection measures, buffers and setbacks, best practices, guidelines and regulatory requirements:

- Environmental Protection Plans
- ANSI A300 Standards for Tree Care and Operations
- Manitoba stream crossing guidelines for the protection of fish and fish habitat
- Timber Harvesting Practices for Forestry Operations in Manitoba (MB Sustainable Development)
- Forest Management Guidelines for Riparian Management Areas (MB Sustainable Development)
- Pesticide Application Requirements For Manitoba Hydro Employees And Contractor

4.1 Sensitive Areas

The integrated vegetation management plan is a guideline that identifies the typical management of vegetation along the transmission ROW, however there may be specific areas that have been identified as sensitive (environmentally, culturally or socially) where special management of vegetation may apply. These areas will be identified as ESS in the applicable Environmental Protection Plan.

5.0 Decision making framework for herbicide use

Due to regulations and easement agreements, the decision to use herbicides is complex and takes into account a variety of factors, one of which is land tenure. Below is the decision making framework for herbicide treatment for tree control on Crown land, herbicides may be used as a treatment method for an area if the answer is "yes" to all of the questions below:

- Is the area outside of a 30 m "no herbicide buffer" to those Environmentally Sensitive Sites (ESS) that are sensitive to herbicide application, including riparian areas near watercourses or wetlands and areas designated for the protection of plant species of concern and traditional use plant species?
- There are no known organic farms within the treatment area?
- Is the area accessible in summer for foliar application?
- Has tree density (>1000s of stems per/hectare) and distribution reached levels that other management options are not economically feasible to control the vegetation (i.e. re-sprouting species such as poplar)?
- Have notifications been made through the First Nations and Metis Engagement process and Pesticide Use Permit Notification process?
- Have modifications to the treatment program (herbicide, location, timing, method) been considered to address concerns received from notification process?

Manitoba Hydro designed the above framework to be utilized by vegetation management specialists as the decision to use any particular treatment method is not as simplistic as yes or no, but must balance numerous environmental factors, many of which are site specific.

5.1 Private land

Manitoba Hydro seeks permission from private land owners to apply herbicides for weed or tree control, if permission is not granted manual or mechanical methods are utilized.

6.0 Communication

6.1.1 Landowner and Indigenous Engagement

Manitoba Hydro is committed to seeking input on this plan, and any herbicide treatments proposed under this plan on Crown land, from local Indigenous communities through engagement prior to specific vegetation management activities in the vicinity.

Landowners will be contacted to discuss vegetation management treatments when they are proposed to occur on their property.

6.1.2 Notice of intent

Manitoba Hydro advertises all planned herbicide treatments on transmission ROW's for the upcoming year in the Winnipeg Free Press and local newspapers as part of the Manitoba Sustainable Development Pesticide Use Permit Application requirements. Indigenous communities, the public and other organizations may submit comments to Manitoba Sustainable Development's Environmental Approvals Branch for consideration when reviewing Manitoba Hydro's application.

6.1.3 Posting of treatment notices

Prior to herbicide treatment, signs will be posted in locations so that they are clearly visible and legible within the treatment area and/or at the access routes to the transmission ROW. The signs shall remain posted for 30 days following herbicide application and contain the date of application, herbicide used and contact information.

7.0 Monitoring and Follow-Up

After vegetation management work has been completed at a site, information may be collected to evaluate the effectiveness of the treatment, and measure the results against the treatment objectives.

The purpose of monitoring treatments is to:

- Evaluate achievement of treatment objectives;
- Review application technique implemented and alternatives;
- Investigate if any negative environmental impacts occurred and take corrective action where necessary; and
- Adapt future vegetation management prescriptions based on knowledge acquired.

Evaluation of the site will require that records of treatment results, effectiveness, and impacts be kept. Data collected during evaluations will consist of qualitative and quantitative observations. These observations may be documented by photographs, field notes, and in some cases representative sample plot measurements.

8.0 Reporting

Manitoba Hydro reports all herbicide usage annually to Manitoba Sustainable Development as part of the reporting obligations of the Pesticide Use Permit.

8.1.1 Records Management

Information is a very important element of the IVMP. The implementation of good record management helps ensure that Manitoba Hydro is compliant with any legal requirements and can improve the way various activities are conducted. Any records associated with the IVMP will be filed, retrieved and maintained in the Transmission GIS or other applicable record management system.