Integrated Vegetation Management Plan

For BC Hydro Transmission and Distribution Power Line Corridors

IVMP #: 105-0988-22-27

Expires on Nov.2, 2027

Version 1.1, October 31, 2023

Acknowledgements

BC Hydro acknowledges that all of our infrastructure is located on lands where First Nations peoples have resided since time immemorial. We recognize that BC Hydro's system and operations have affected those lands, and we share a responsibility to act as stewards for the lands.

Version History

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Signing Authority:

This document is the responsibility of BC Hydro's Transmission and Distribution Vegetation program**:**

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Notice: Both federal and provincial legislation contain information required and pertinent to this *Integrated Vegetation Management Plan for BC Hydro Transmission and Distribution Power Line Corridors*. As well, many other individuals, organizations, companies, and vegetation experts have cooperated in providing information and sources for this IVMP document.

This IVMP document is essentially a set of best practices and guidelines compiled from knowledgeable and experienced industry and government personnel. It is intended to provide the owner, operator, and contractors with advice regarding the specific topic. The recommendations set out in this IVMP are meant to allow flexibility and must be used in conjunction with competent IPM practices and judgment. It remains the responsibility of the user of the IVMP to judge its suitability for a particular application.

If there is any inconsistency or conflict between any of the recommended practices contained in the IVMP and the applicable legislation requirements, the legislative requirements shall prevail. Every effort has been made to ensure the accuracy and reliability of the data and recommendations contained in the IVMP.

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Chapter 1, Introduction

About BC Hydro

BC Hydro is a British Columbia provincial Crown corporation and one of the largest electric utilities in Canada. The company's mandate is to generate, purchase, transmit, distribute, and sell electricity.

BC Hydro distributes electricity produced by several hydroelectric, thermal, and other generation facilities to the majority of BC's population. BC Hydro also purchases power from Independent Power Producers (IPPs) or from the open market.

Hydroelectric plants consist of a dam, a reservoir, a powerhouse, and a switchyard. At each hydroelectric plant, water from a reservoir flows into the powerhouse. The flowing water turns turbines (rotating blades) which in turn drive generators. Thermal plants operate similarly except the energy used to turn the turbines is produced by natural gas, diesel, or biofuels. Generators convert the turbine's mechanical energy into electrical energy. Transformers located within switching stations convert the generators' low voltage electricity to a higher voltage between 60,000–500,000 volts, to move power over long distances via transmission lines to substations.

BC Hydro has over 18,600 km of transmission lines within power line corridors that cover approximately 77,700 ha of land. In substations, the voltage is reduced for delivery to customers over distribution lines that operate at voltages below 35,000 volts. BC Hydro has over 50,650 km of overhead primary distribution lines located primarily along road allowances.

About this Plan

This document is an Integrated Vegetation Management Plan (IVMP) for the maintenance of vegetation on transmission and distribution power line corridors operated by British Columbia Hydro and Power Authority (BCH). It has been prepared in accordance with Section 58 of the Ministry of Environment's *Integrated Pest Management Regulation,* or IPMR (note subsection references in major headings) and is based on **Integrated Pest/Vegetation Management (IPM)** principles.

The Ministry of Environment requires a Pest Management Plan to include the following information:

- The program for controlling vegetation along power line corridors, using the principles of integrated vegetation management
- The process for planning, selecting, using, and evaluating control methods within that program
- The methods for handling, preparing, mixing, applying, and otherwise using herbicides within that program
- ***This plan does not include aerial applications of herbicides.***

In addition to following the Integrated Pest Management Act and Regs, BC Hydro also follows legislation as identified in the BC Hydro and Power Authority Act, which specifies other statutes that are to be followed. This includes, but is not limited to; BC Heritage Conservation Act, Wildfire Act, Water Sustainability Act and Environmental Management Act. Further, best management practices and internal BC Hydro Vegetation Standards are employed to help ensure other values are managed in a responsible manner, including specific Federal legislation, such as the Species at Risk Act and Migratory Bird Convention Act. This IVMP does not include a detailed list of all screening activities carried out at a site specific level in preparation of a work package.
During the compilation of work packages, a full environmental data review takes place which enables BC Hydro to select work methods that either avoid or minimize important features and resources and/or potentially provide compensation. For example, each work site is checked to determine whether it overlaps with any registered archaeological sites, and if so, specific work instructions are written to ensure the Heritage Conservation Act is being adhered to.

Integrated pest management (IPM) as defined by the *Integrated Pest Management Act* is a process for managing **pest** populations that includes the following elements:

- Planning and managing ecosystems to prevent organisms from becoming pests;
- Identifying pest problems and potential pest problems;
- Monitoring populations of pests and beneficial organisms, damage caused by pests and environmental conditions;
- Using injury thresholds in making treatment decisions;
- Supressing pest populations to acceptable levels using strategies based on considerations of:
  - Biological, physical, cultural, mechanical, behavioural and chemical controls in appropriate combinations, and
  - Environmental and health protection; and
- Evaluating the effectiveness of pest management treatments.

Integrated vegetation management (IVM) is a system of managing plant communities in which compatible and incompatible vegetation is identified, action thresholds are considered, control methods are evaluated, and selected control(s) are implemented to achieve specific objectives. Choice of control methods is based on effectiveness, environmental impact, site characteristics, safety, security, and economics. IVM is considered a **best management practice** in utility vegetation management as the most effective, safe, economical, and environmentally sound procedure(s) for maintaining electric rights-of-way. (From ANSI Standard A300, part 7.)

Pest: an organism that is damaging, noxious, or a nuisance. For the purposes of this plan the focus is on vegetation that can interfere with the safe and reliable operation of the power system or damage equipment or facilities.

Best Management Practices are the best available and industry-recognized courses of action based on scientific research and current knowledge of a given discipline, considering the benefits and limitations of existing options.

This IVMP is intended to be used by BC Hydro, its agents, and contractors when carrying out vegetation management work on all power line corridors. It also confirms BC Hydro's strategy to employ herbicides under the *Integrated Pest Management Act* (IPMA) and the *Integrated Pest Management Regulation* (IPMR).

This plan does ***not*** cover vegetation control or herbicide use at other BC Hydro facilities such as electrical substations, generation switchyards, generating sites (hydroelectric dams or thermal plants), communications sites, storage sites, administrative buildings, or land owned or leased for future facilities. Vegetation management at these facilities is covered by a separate IVMP.

Person Responsible, Section 58(1)(b)(c)

58 (1) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following identifying information;

(b) the person responsible for managing pests in relation to the land described in paragraph

(c) the name and phone number of an individual who is the principal contact for information relating to the pest management plan.

The person listed below is responsible for administering the IVMP provincially and is the principal contact for information relating to the plan:

Rhonda Kariz, Vegetation Work Planning and Process Auditor, Integrated Planning Dept., 250-549-8582.

Geographic Boundaries, Section 58(1)(a)

58 (1) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following identifying information;

(a) a description of the geographic boundaries of the area to which the plan applies and maps or diagrams showing the proposed treatment areas within that area;

This IVMP includes all BC Hydro-managed transmission and distribution lines in British Columbia. For operational purposes, BC Hydro divides the province into four regions: Vancouver Island, Lower Mainland, Southern Interior, and Northern Interior. Each of these regions has differing characteristics and needs.

The IVMP covers all areas in the province wherever BC Hydro has transmission or distribution assets.

More specifically, the IVMP covers vegetation management, including the use of herbicides, within or adjacent to the boundaries of BC Hydro transmission or distribution power line corridors. It also covers Hydro facilities associated with these corridors, such as:

- Helicopter landing pads
- The base of towers and other electrical structures
- Lands occupied by equipment storage sheds
- Access roads and adjacent lands leading to the ROW or other facilities that BC Hydro manages
- Highway easements
- The base of woodpole structures

It also covers areas where:

- BC Hydro structures and equipment are located
- BC Hydro is authorized to manage as per Section 20 of the *BC Hydro & Power Authority Act*
- BC Hydro is authorized to manage as per its right-of-way agreements
- Areas adjacent to the ROW that are currently under active management

Finally, the IVMP allows the treatment of noxious weeds and invasive plants on all power line corridors and areas listed above.

Transmission Lines

BC Hydro maintains over 18,600 km of transmission lines (60 kV to 500 kV) along 13,595 km of corridor covering over 77,700 ha. We will be adding further transmission lines over the five-year period covered by this plan to meet the growing needs for electric power in B.C. Most transmission corridors run cross-country in rural or undeveloped areas on statutory rights-of-way but many lower voltage 69 kV circuits are along road allowances. The legal widths of transmission rights-of-way vary from 10 metres to about 300 metres. Individual transmission lines vary in length from 1 to 500 kilometres.

A map of the provincial transmission system can be found at the following site:

https://www.bchydro.com/energy-in-bc/operations/transmission/transmission-system/maps.html

Right-of-way (ROW): usually defined legally as the right to pass over or use land owned by another party for a specific purpose, e.g. to build, operate and maintain a power line, roadway or railway. Most transmission and some distribution lines owned and maintained by BC Hydro are situated on statutory rights of way that spell out the legal rights and obligations of both the utility and the landowner. ROWs may pass over Crown lands, First Nations treaty or reserve lands, or private property.

Distribution Lines

BC Hydro maintains approximately 50,650 km of overhead distribution lines (less than 35,000 volts) across B.C. Most distribution lines in B.C. are located on Ministry of Transportation rights of-way or municipal road allowances. A few distribution lines are located:

- Cross country in rural or undeveloped areas (i.e., areas where power lines pass through undeveloped land and are not accessible by road)
- On private land easements or Crown rights-of-way
- On a license of occupation

The corridor width is generally five to seven metres but may be much wider on cross-country sections.

Areas where BC Hydro does not carry out distribution operations include: the City of New Westminster, the City of Kelowna, areas of the Kootenay and Boundary Districts between Creston and Rock Creek, the Similkameen Valley, and the Okanagan Valley south of Summerland to the Canada/US Border.

A map depicting the geographic boundaries of the BC Hydro distribution service area is found at the following site:

https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/safety/bchydro-service-area-map.pdf

Why Control Vegetation?

BC Hydro must control vegetation under, above, and near its power lines in order to maintain the safe and reliable transmission and distribution of electricity to its customers.

BC has some of the tallest and fastest-growing trees in North America. Many can pose risks to the safe and reliable operation of the power system if they come in close proximity to energized equipment. This includes but is not limited to conifer species such as Douglas-fir, spruce, and pine; and deciduous species such as alder, birch, aspen/cottonwood (poplar species), and maple.

BC Hydro's vegetation management program must:

- Minimize public and worker safety hazards

- Reduce the number of outages due to vegetation growing-into or falling-onto power lines
- Reduce the risk of fires caused by trees contacting the lines
- Allow access and lines of sight for maintenance and security

BC Hydro is also mandated to manage its transmission and distribution power line corridors as per section 20 of the *BC Hydro Power and Authority Act*, and according to the terms of right-of-way agreements.

As a utility in North America and as directed by the British Columbia Utilities Commission (BCUC), BC Hydro is required to adhere to the North American Electric Reliability Corporation (NERC) standard FAC-003-3 or subsequent versions, *Transmission Vegetation Management*. This standard is designed to avoid wide-scale outages on the bulk electric transmission system by preventing trees from growing-into the power lines as well as minimize the risk of trees falling-into the power lines.

BC Hydro manages vegetation on its power lines on a cyclical basis using a variety of manual, mechanical, cultural, biological, and chemical **control methods**. This includes pruning, hazard tree removal, mowing, brushing, grubbing, girdling, and herbicide application as well as encouraging compatible use of the land. The method or combination of methods chosen to control vegetation on a particular site is based on the IVM decision-making process outlined in this document.

Control methods:

- *Manual and Mechanical control* are physical controls of vegetation that include activities such as pruning, hazard tree removal, mowing, brushing, grubbing, and girdling.
- *Cultural control* is management of vegetation in a way that suppresses the growth of incompatible target species through the use of crops, pastures, parks or other managed landscapes, e.g. compatible use.
- *Biological control* methods involve the reduction or suppression of unwanted organisms by introducing or enhancing the presence of natural enemies, such as insects, fungi, or compatible competitive plants. It is often used in noxious weed/invasive species control.
- *Chemical control* is management of incompatible vegetation through the use of herbicides.

Objectives of the Vegetation Management Program

The purpose of vegetation management is to implement cost-effective programs that will maximize public and worker safety and service reliability.

BC Hydro will utilize the principles of Integrated Vegetation Management to control **target vegetation**. Regular inspections of the transmission and distribution system are conducted to determine when vegetation needs to be managed based on electrical clearance requirements and to determine the

location of **hazard trees**. Where possible, vegetation that could grow-into or is expected to fall onto transmission or distribution lines is removed. If removal is not possible, pruning of trees using proper arboricultural practice is completed to achieve the required safe clearances as described in this IVMP.

Target Vegetation: for power line corridors, any plant species capable of contacting or growing within the limits of approach of power lines must be managed to ensure the safe and reliable operation of the power system.

Hazard tree: a tree that has a defect or adverse environmental condition that predisposes it to failure, and which has a target that can be damaged if it falls (e.g. a power line, electrical equipment, buildings, people, etc.). Tree risk assessments are used to identify hazard trees and those with significant risk indicators are then prioritized for removal to protect public and worker safety, property and power system assets.

The long-term objective, where possible, is the conversion of the power line corridors from dense stands of tall-growing species that are created by continuous mowing and brushing into low-growing stable plant communities of more desirable plants, such as compatible berry bushes, low-growing shrubs, and wildflowers.

There are four main ways of managing the utility corridors to achieve the goal of a stable low-growing plant community:

Selective control — Control methods are targeted at specific vegetation, based primarily on height and species, so that low-growing species are left intact and encouraged. Shrubs and indigenous plants that are naturally present on the site will help to suppress tall-growing species.

Compatible use — BC Hydro encourages the use of power line corridors for activities that will not conflict with safe and reliable operation of transmission or distribution lines, such as recreational or agricultural uses.

No clearing required (NCR) — Areas do not need to be cleared where 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). NCR sites are those that will never require vegetation maintenance because they pose no threat. This scenario is most applicable to transmission lines.

Altering existing vegetation — In cases where it is impractical to remove undesirable species from along the edges of the corridor, existing vegetation can be modified by pruning to maintain clearances from conductors, thus protecting the power lines.

The vegetation management program objectives are to:

- Comply with the provisions of the IPMA and all applicable government laws or regulations and BC Hydro corporate policies.
- Ensure vegetation management practices and procedures (including herbicide use) are safe; environmentally sound, practical, effective, socially responsible, and cost efficient.
- Respect agreements with the public, landowners, and other stakeholders.
- Respect First Nations' aboriginal and treaty rights.
- Communicate our vegetation management activities with clarity to the public.
- Employ innovative practices.
- Integrate vegetation management information with a geographical information system (GIS) to better plan and track work history and identify key features on the utility corridor.
- Utilize a hazard tree rating and removal system.

Benefits of a Low-growing Plant Community

In combination with other control methods, herbicides can assist BC Hydro by restricting the growth of tall-growing vegetation while promoting growth of favorable, low-growing species. Once this site conversion is complete, it requires less intensive maintenance, which reduces disruption to the natural environment over the long term and helps reduce herbicide use. Over time, this can reduce impacts on fish, wildlife, water bodies, and the general public.

Successfully establishing a low-growing stable plant community has many advantages. It:

- Increases public safety and system reliability by reducing the risk of tree contact with power lines
- Enhances biodiversity by increasing the number of low-growing forage species and improving wildlife habitat on utility corridors
- Improves the recreational opportunities on utility corridors by eliminating dense thickets and slash
- Improves aesthetics as utility corridors are becoming important green spaces
- Allows people and communities to use utility corridors more effectively for hiking, biking, berry-picking, or other compatible uses
- Permits access and maintains lines of sight for maintenance
- Reduces the total area requiring future routine vegetation control
- Results in sustainable long-term vegetation maintenance costs

Reasons for Herbicide Use

The careful, limited use of herbicides is an essential part of IVM on BC Hydro power line corridors, as they provide effective vegetation control especially when used in combination with other physical, cultural, and biological control methods. On an annual basis, herbicide use accounts for approximately 12% of BC Hydro's vegetation management work on transmission and less than 5% on

distribution. Herbicides are used only in specific circumstances in carefully selected areas.

Selective Use of Herbicides

Using IVM, BC Hydro applies low amounts of herbicides to selectively control undesirable vegetation (mostly tall-growing trees and noxious weeds). Selective use of herbicides allows desirable low-growing vegetation to flourish, such as grasses, wildflowers, ferns, and low-growing native shrubs.

Most targeted applications on power line corridors are completed with hand-held sprayers. Herbicides may also be injected into tree stems or brushed onto the cut surfaces of stumps to prevent regrowth. BC Hydro does not utilize aerial (helicopter or airplane) spraying of herbicides on its power line corridors.

Compared to previous decades, today's herbicide applications are more selective than ever before, and BC Hydro is continually reviewing new herbicide products, new technologies and alternative vegetation treatments.

Herbicide: a pesticide used to control or manage plants. Pesticides are a chemical substance or mixture of substances intended for killing, controlling, or managing organisms considered to be pests.

Deciduous Tree Control

Herbicides are used primarily on tall-growing deciduous species because they are fast-growing and quick to re-sprout, compared to conifers. When conifers are cut below the lowest branch, they will not regrow. The quick re-sprouting of deciduous species creates more biomass and more debris for the next cycle. As stem densities increase, the ability of wildlife and people to access and use the right-of-way diminishes and the slash buildup can pose risks in the spread of wildfire. Use of herbicides will prevent this re-sprouting and reduce those risks.

Environmental Benefits

The *Migratory Bird Convention Act* prohibits the disturbance or destruction of birds' nests. BC Hydro cannot feasibly conduct all vegetation management outside of the bird nesting season, but some selective herbicide application methods can allow effective control of vegetation without damaging nests.

Studies indicate that herbicide-managed sites can have a greater volume of wildlife forage compared to mowed sites. This is because the site objective of a low-growing stable plant community favours vegetation species used by browsing wildlife.

Some vegetative species at risk can be protected by using a stem-applied treatment to control competing target species. Instead of sites being taken over by rapid, high-density regrowth from physically cut deciduous species, treated stems die slowly, allowing sensitive plant species more time to grow and thrive.

Limitations of Physical Methods

The use of non-chemical control methods alone has proven to be ineffective for the long-term management of undesirable vegetation on power line corridors. This is especially true in B.C., where transmission and distribution lines often run through remote geographic areas.

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.

BC Hydro is subject to the *Wildfire Act* and *Regulation*, which requires us to maintain power line corridors in a condition that would not start or cause a fire to spread. Therefore, we must implement programs to reduce the fuel load created from vegetation management activities.

Frequent Disturbances

Reliance on physical control methods requires more frequent intrusions onto a site as deciduous targets with well-established root systems grow rapidly and form dense thickets with repeated cutting. In turn, this increases the disturbance to wildlife and the environment.

In contrast, herbicides provide more selective long-term control, reducing the need for frequent manual or mechanical treatments. A 2005 BC Hydro study showed that over a 10-year period, using only brushing to control vegetation would cost almost twice as much as combining brushing with herbicides. Selective herbicide use reduced the target densities requiring control in the subsequent maintenance cycles and also reduced slash debris which needed to be managed.

Increased Regrowth and Density

Without the complementary use of herbicides, continuous physical cutting of target vegetation on some sites results in decreased vegetation control effectiveness over time. Trees such as alder, birch, aspen/poplar, and maple re-sprout quickly from cut stumps and established large root systems, resulting in high densities of tall-growing trees after repeated mowing or brushing. Follow-up use of herbicides prevents this regrowth and reduces target densities to manageable levels.

Environmental Harms

Some physical techniques such as mowing may facilitate soil erosion which can negatively impact fish-bearing water bodies.

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

Physical techniques often use heavy machinery that is more likely to damage non-target vegetation and the natural environment.

Mechanized equipment can cause rutting, track marks, or degradation of the ground surface. For this reason, mechanical methods often cannot be used in areas with archeological features that could be disturbed.

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 selectively 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. In these areas, brushing or selective herbicide applications are the only feasible techniques to control vegetation.

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.

Control of Invasive Plants and Noxious Weeds

Control of noxious weeds and their seeds is regulated by the *Weed Control Act* of British Columbia. Noxious weeds are invasive plants that can displace native vegetation and reduce wildlife habitat and forage.

Noxious weeds are plants that are injurious to public, health, crops, livestock, land, or other property and which must be controlled under the *BC Weed Control Act*. For the purposes of the IPMR, a weed or invasive plant is defined to include the entire plant in all its growth stages, including roots, seeds, rhizomes, runners, suckers, shoots, seedlings and mature plants.

An **invasive plant** is an alien plant species that has the potential to rapidly spread and pose undesirable or detrimental impacts on humans, animals, or ecosystems.

Herbicides are an important method used to control invasive plants and prevent their spread and are often the most economic and environmentally sound solution. Physical methods alone often cannot control invasive plants, especially when they become established. For example, mowing stimulates the production of species such as orange hawkweed, thereby increasing the weed population. Also, mechanical techniques can spread noxious weed seeds to other locations.

BC Hydro is not subject to the *Weed Control Act.* However, BC Hydro recognizes the environmental damage caused by noxious weeds and has implemented programs to control noxious weeds on sites such as substations, office sites, dams, power facilities, and power line corridors. Vegetation management personnel and contractors are trained to identify the species of noxious weeds on

the Provincial list through education programs. Workers are also familiar with ways to reduce the spread of noxious weeds, such as inspecting vehicles. Finally, BC Hydro supports research into new control methods, such as the use of insects for biological control.

Regulation and Safety of Herbicides

The safety of the public, BC Hydro staff, and its contractors is paramount. The herbicides used by BC Hydro are approved by Health Canada's Pest Management Regulatory Agency (PMRA). All registered herbicides have undergone stringent evaluation and testing by the PMRA to ensure they pose no unacceptable risks to people and the environment when used according to the label.

All herbicide use must abide by applicable federal and provincial legislation and regulations, including BC's IPMA and IPMR, and the federal Pest Control Products Act. It is illegal to treat pests with products not governed by this legislation or to use a herbicide in a manner inconsistent with its product label. Applications are planned carefully, using registered herbicides formulated for specific application methods.

Extra caution is exercised when herbicides are applied around environmentally sensitive areas and areas in the vicinity where food for human or livestock consumption is grown or located.

BC Hydro recognizes the importance of protecting aquatic, marine, and riparian ecosystems to ensure their long-term sustainability. Pesticide-free Zones (PFZ) protect environmentally sensitive areas, such as bodies of water, watersheds, wells (domestic and agricultural), and water intakes. A PFZ is a zone (usually 10m or as noted on a label) around an area of land that must not be treated with pesticides and must be protected from pesticides moving onto it. Herbicide applicators do not apply herbicides within PFZs.

Herbicides are applied by Certified Pesticide Applicators, who are licensed by the Province after writing a provincial exam. They are specially trained and qualified to apply herbicides safely, following stringent legislative requirements.

BC Hydro's Work Planning Process

BC Hydro operates under a long-term strategic vegetation maintenance plan as well as annual operational plans. Planned activities are based on the growth rates of target vegetation and proximity to the power lines as determined by inspection. This information is used to optimize the length of the maintenance cycle for a given vegetation management area, as well as to estimate future work and budget requirements.

This province wide IVMP provides general guidance for the use of herbicides within an integrated vegetation management decision-making process. Before herbicides are applied at a specific location, a detailed site prescription is prepared for the site, including maps that identify all bodies of water and other environmental issues. BC Hydro's standard operating procedures are provided to contractors before work begins. Layout crews flag the work areas in the field to

ensure that all PFZs have been properly identified and marked before any herbicide applications begin. Where appropriate, individuals are notified before work begins and signs are posted at all treatment sites.

Chapter 2, Elements of Integrated Vegetation Management

This chapter describes BC Hydro's Integrated Vegetation Management Program, as per Section 58 of the provincial IPMA (information required for Pest Management Plans). It covers:

- Prevention program – Section 58(2)(a)
- Identification of species – Section 58(2)(b)(ii)
- Monitoring program – Section 58(2)(c)(i)(ii)(iii)
- Action (injury) thresholds – Section 58(2)(d)(i)(ii)
- Treatment methods – Section 58(2)(e)(i)(ii)(iii)(iv)
- Evaluation program – Section 58(2)(f)

Prevention, Section 58(2)(a)

58 (2) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following integrated pest management elements;

(a) a description of the program that will be employed to prevent organisms from becoming pests;

Prevention means stopping target vegetation from becoming established, as opposed to treating existing target vegetation. BC Hydro's vegetation management program is preventive in nature when stable, low-growing plant communities are established along power line corridors.

Examples of preventive measures that BC Hydro uses on utility corridors include:

- **Natural controls**, primarily the establishment of stable, low-growing plant communities that out-compete taller growing species
- **Site preparation**, such as seeding programs to reduce establishment of target vegetation in disturbed areas with exposed soils or removal of stumps and roots
- **Compatible use**, such as agricultural crops, golf courses, or parking lots
- **Non-vegetation techniques** to provide more clearance, such as physical re-contouring of the land, and raising conductor heights to avoid contact with vegetation

Planting the Right Tree in the Right Place

Trees along road allowances and boulevards often exceed 6 metres in height at maturity and may pose safety and reliability risks depending on their location

relative to the power lines. BC Hydro works with local governments and landowners to replace incompatible trees that must be removed, with more suitable species that require much less maintenance.

A list of ornamental trees and shrubs that are compatible with transmission and distribution lines can be found in the BC Hydro publication entitled *Planting Near Power Lines – A Guide to Vegetation Recommended for Planting and Growing Near Power Lines.* It is available at this link: https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/safety/planting-near-power lines.pdf

Clearing for New Line Construction

Initial clearing of vegetation for power lines establishes future vegetation management activities and associated long-term costs. When a new power line corridor is constructed, all tall-growing target tree species or other incompatible vegetation are removed within the right-of-way, as well as any hazard or non-windfirm trees outside the corridor that could fall into the power lines.

Whenever possible, tall-growing species are selectively removed, leaving low-growing species intact and undisturbed. Deciduous species can aggressively re-sprout from the stump or roots after being cut, forming dense thickets. They may be selectively treated with herbicide to avoid this.

Identification of Species,
Section 58(2)(b)(ii)

58 (2) (b) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following integrated pest management elements – either:

> *(i) a description of the program that will be employed to identify pests targeted by the plan, or*
> *(ii) identification of the pests targeted by the plan;*

The primary target vegetation to be controlled on transmission and distribution corridors is trees that have the potential to reach or exceed the limits of approach to the line (see page 21, *Action Thresholds*, for information on limits of approach). A physical and/or chemical treatment method is often used to control such trees, with herbicides used primarily on deciduous tree and invasive weed species. Most other vegetation along power line corridors can remain to improve biodiversity and to act as competitive cover to reduce the regrowth of target vegetation.

The accurate identification of target vegetation, on or adjacent to BC Hydro power line corridors, is important for these reasons:

- Control may or may not be required, depending on vegetation growth rates, height at maturity, characteristics such as susceptibility to rot, windthrow, or branch-breakage, and physical location.

- Control methods may differ depending on the plant species. Some may be easily controlled by non-chemical methods, while others may only be effectively managed through a combination of physical, cultural and chemical methods.

Vegetation Categories

Categories of vegetation encountered along and adjacent to BC Hydro power line corridors include:

- **Desirable vegetation** comprises species that when mature will not interfere with the power system or the overhead conductors, either due to their maximum growth height, proximity to the lines, or a combination of both. This includes ferns, grasses, sedges, wildflowers, and low-growing shrubs and trees. The vegetation management approach to all desirable vegetation is to encourage its retention and propagation. The presence of appropriate low-growing vegetation inhibits the growth of less desirable species.

- **Target vegetation** includes trees or shrubs growing on and adjacent to BC Hydro corridors that are likely to grow into or fall onto overhead conductors, grow within limits of approach or interfere with other maintenance activities. In some cases, vines must be controlled because they can climb utility poles and severely reduce access to structures and create electrical hazards.

- **Hazard trees** have a defect or adverse environmental condition that increases their risk of failure, and can cause damage if they fall onto a power line, electrical equipment, buildings, people, etc. Tree risk assessments are used to identify hazard trees and those with significant risk indicators are prioritized for removal to protect public and worker safety, property, and power system assets.

- **Noxious weeds or invasive plants** are introduced plants that can compete with or displace native species and disrupt natural ecosystems. The need for their control is outlined in the Provincial Invasive Species Strategy and the *Weed Control Act*.

Target vegetation and hazard trees are the primary focus of the vegetation management program to ensure a safe and reliable power system. BC Hydro also works with landholders to cooperatively manage and control noxious weeds or invasive plants where they are a concern.

Primary Target Vegetation

The following species represent the majority of target trees growing along the BC Hydro-managed power system; species will vary by region. In some areas of low clearance, tall shrubs or bushes also must be controlled. Any plant that interferes with access to and maintenance of the power system will also be controlled, such as thorny bushes and vines. Many ornamental species are

problematic when planted directly under or near the power lines because of their height or canopy width when they mature.

Most of the trees in Table 1 are native and common to B.C., but some are introduced or cultivated (e.g., black locust, catalpa, tulip tree, horse chestnut, London plane tree).

Table 1: Primary Target Species found along Power Lines in B.C.

Common Name	Scientific Name
Conifers	
Douglas-fir	*Pseudotsuga menziesii*
Western red cedar	*Thuja plicata*
Yellow cedar	*Chamaecyparis nootkatensis*
Pine	*Pinus spp.*
Spruce	*Picea spp.*
True fir	*Abies spp.*
Western Hemlock	*Tsuga heterophylla*
Larch	*Larix spp.*
Flowering Trees	
Alder	*Alnus spp.*
Birch	*Betula spp.*
Aspen	*Populus tremuloides*
Poplar/Cottonwood	*Populus spp.*
Maple	*Acer spp.*
Cherry	*Prunus spp.*
Willow	*Salix spp.*
Arbutus	*Arbutus menziesii*
Black Locust	*Robinia pseudoacacia*
Catalpa	*Catalpa spp.*
Tulip Tree	*Liriodendron tulipifera*
Horse Chestnut	*Aesculus hippocastanum*
Dogwood	*Cornus spp.*
Oak	*Quercus spp.*
Mountain Ash	*Sorbus spp.*
London Plane Tree	*Platanus acerifolia*
Hawthorn	*Crataegus spp.*

Monitoring Program, Section 58(2)(c)(i),(ii),(iii)

58 (2) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following integrated pest management elements:

(c) a description of the monitoring program that will be employed before or during the pesticide use for assessing pest populations, environmental conditions and damage caused by pests, which program must include a description of

(i) the monitoring methods,
(ii) the frequency of monitoring, and
(iii) the data that will be collected;

Monitoring of potential target vegetation through regular inspections and line patrols is an essential planning tool used to determine if vegetation maintenance is required, which control or combination of controls is needed, and the timing of maintenance to reduce the possibility of vegetation coming into contact with power lines.

Monitoring: is an activity in the IVM process where regular site inspections are used to determine whether treatments are necessary to meet site objectives, to identify the best timing for treatments, and post treatment to review and evaluate how the applied control methods are working.

BC Hydro monitors target vegetation, including hazard trees, on a regular basis. Urgent public safety or system integrity threats are dealt with immediately as corrective maintenance. Otherwise, inspections and patrols are used to develop and refine long-range and annual vegetation maintenance plans.

Biophysical Inventories

BC Hydro has extensive biophysical inventory information collected along its power line corridors. Information identified and collected includes:

- Vegetation Management Areas (VMAs; see below for definition)
- Streams and other bodies of water, and their characteristics
- Drinking water sources such as wells, points of diversion, and community watersheds
- Vegetation communities – biogeoclimatic zone, species density, percent coverage, growth rates, species composition, presence of noxious weeds, presence of threatened or endangered plants
- Conductor to ground clearances
- Terrain features, including degree of slope and aspect, eroded or erosion prone areas, and hazards such as large rocks and stumps
- Heritage information – archaeological sites, First Nations traditional uses
- Special conditions and features, such as compatible land use (agriculture, rangeland, recreation, berry picking), property encroachments, and other concerns

- Environmental conditions and features of the treatment area, such as riparian issues, wildlife issues, and other environmental concerns
- Access information, including roads, road surfaces, gates, locks, culverts, fords, helipads, etc.

All data collected is entered into a Geographic Information System (GIS) database that contains information related to vegetation management on corridors, including treatment history, patrol and inventory updates, site maps, prescriptions, environmental and consultation issues, landowner agreements, contracts, and so on.

Monitoring Method

The main monitoring method consists of aerial or ground patrols.

Patrols are inspections of the power line corridor to gather information within **Vegetation Management Areas (VMAs)**, which are defined as corridor segments or circuit blocks that have relatively uniform characteristics (e.g. vegetation, terrain, land use, etc.) and can be managed with the same long-term site objectives. This allows BC Hydro to track maintenance history and costs over time and to evaluate the effectiveness of the vegetation program so that the power system operates safely and reliably.

Frequency of Inspections

Distribution circuits are monitored on a cycle. The cycle is determined by species composition, projected growth rates, and clearance requirements (distance from energized electrical equipment) within the VMA. Typically, distribution VMAs are inspected every 3 to 5 years, a few months ahead of scheduled maintenance, in order to update the vegetation inventory used to define work, refine work timing and allocate budgets as necessary to maintain the required vegetation clearances to the conductors.

Transmission circuits are patrolled at least once per calendar year from end to end, with no more than 18 months elapsing between inspections as required by regulation. Because of the importance of transmission lines to the reliable operation of the power system and the rapid growth rates of some target species, most BC Hydro transmission circuits are patrolled twice per year, usually in the spring and fall.

Any outages or knowledge of poor conditions along a transmission or distribution corridor may also require additional patrols to identify and mitigate risk. Over time, BC Hydro has refined its patrol cycles based on local knowledge of the area, so it is known which areas need more frequent patrols or specific monitoring requirements. In addition to regular inspections, extra patrols are conducted whenever there is a sustained outage to identify and address the cause.

Monitoring Information Collected

Information collected during inspections and considered when monitoring vegetation growth to determine work timing and method selection includes:

- Tree heights and proximity to limits of approach
- Imminent threats, e.g.., dead, dying, and leaning trees, root rot pockets (on the maintained corridor and along the edge)
- General condition of the danger tree strip adjacent to the maintained corridor
- Maintained width of the corridor in relation to the statutory ROW (narrowing or encroachments)
- Relative density of deciduous or coniferous target trees, expressed in percentage cover of the site
- Compatible vegetation that should be retained
- Fuel loading potential of the site and debris management required
- Damage to structures and lines
- 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

This information is used to determine:

- Areas where vegetation management must be conducted, to help develop and execute the annual work plan
- Methods to be used in each of these identified areas
- Relative timing of the work during the treatment year
- Environmental or social issues that may impact work
- Hazard tree ratings
- Estimated work volume and equipment required to perform the work

Noxious Weeds

Noxious weeds are primarily monitored by regional weed committees and are entered into a database administered by the Province of BC.

Hazard Tree Inventories

Monitoring information is used to identify hazard trees on the BC Hydro system, which is a critical and ongoing activity. The criteria to be used for determining the hazard tree priority rating and to undertake a tree defect evaluation are based on type and severity of defect(s), tree species, and the location of the target tree. The power lines exist in a dynamic environment due to the continuous growth and decline of tall growing vegetation in and around the corridor. Thus, the hazard tree inventory is updated regularly depending on the relative risks present on a corridor. Hazard trees in the inventory are systematically prioritized for removal based on their risk rating.

Action (Injury) Thresholds,
Section 58(2)(d)(i),(ii)

58 (2) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following integrated pest management elements:

(d) a description of the injury thresholds that will be applied in deciding whether a pesticide treatment is necessary and on explanation of

(i) how the thresholds were chosen, and
(ii) how the thresholds will be applied;

An **action threshold** (also called an injury threshold or hazard level) is used to determine when pest control becomes necessary or desirable to avoid damage.

The **Action Threshold** is the point at which vegetation control on the power system becomes necessary to maintain public and worker safety and to minimize the risk of outages. Clearance limits to energized equipment are the primary basis for setting action thresholds, but incompatible plant species growth, height, density, location, condition, and control costs are also considered in determining the timing and selection of control methods.

BC Hydro controls tall-growing trees or vegetation that has the potential to reach or exceed the limits of approach to the line.

How Action Thresholds are Chosen

Clearance Requirements

To determine when vegetation must be controlled at a particular site, the following factors related to the clearance requirements for transmission or distribution power lines are evaluated:

- Limits of approach
- Maximum conductor sag
- Maximum conductor swing
- Mature vegetation height
- Growth rates of target species
- Unusual terrain features that may result in a low conductor to ground clearance

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

Limits of Approach

Limits of approach are the primary consideration for vegetation management work on power line corridors. However, work must also be practical, efficient, cost-effective, safe, and consider environmental impact.

Limits of approach – The defined distance a person, machine, or conductive material (such as a tree) can be in relation to energized conductors based on the circuit voltage and **flashover** distance. Limits of approach are a key criterion for determining action thresholds in utility vegetation management programs and set safe working limits for qualified or unqualified workers under WorkSafe BC Occupational Safety and Health (OSH) regulations and BC Hydro Safety Practice Regulations (SPRs).

Flashover: a disruptive electric discharge across an insulating medium such as an air gap, for example between vegetation and a high-voltage circuit. Electricity can flow across an air gap if vegetation is within close enough proximity. The trees do not have to be in direct physical contact with the energized equipment to cause an outage. The flashover distance depends on many variables, including the circuit voltage, altitude, air temperature, and relative humidity.

Other circuit attributes, such as designed maximum conductor sag and swing (from wind, snow/ice, and thermal loadings), are also considered in determining required clearances to vegetation.

Table 2 shows the limits of approach used as the basis for operational tree clearing on BC Hydro transmission lines. Operational clearances should ideally be achieved at all times. Actual site clearances take into account local conditions and the vegetation maintenance cycle. Where operational clearances cannot be achieved, mitigation plans are put into place in order to minimize system risks to ensure safety and reliability.

Table 2: Limits of Approach and Operational Clearances to Vegetation for Transmission Circuits

	Limits of Approach					
Nominal Voltage, phase to phase	69kV	138kV	230kV	287kV	345kV and HVDC	500kV
Limits of approach for: 1) unqualified workers; 2) all uninsulated equipment	3.0m	4.5m	4.5m	6.0m	6.0m	6.0m

The decision to initiate treatment of vegetation on distribution corridors is based on the presence of target vegetation that has the potential to grow or fall into the lines and energized equipment. Growth rates of the target species determine the maintenance cycle and inspections identify the work necessary to maintain clearance to the distribution conductors through the duration of a given cycle. Clearances are achieved at the time of work to prevent flashover through to the

end of the maintenance cycle, and to avoid sustained direct contact with the primary conductors which could result in a power outage or increase fire hazard.

Table 3 shows general vegetation clearance specifications for distribution circuits, which can be modified to account for regional or local growth conditions.

Table 3: General Vegetation Clearance Specification on Distribution Circuits

Conifers	All Conductors
Overhead clearance	5.0 m
Side clearance	3.0 m field side and road side
Under clearance	To the ground
Deciduous/ Broadleaf Trees	All Conductors
Overhead clearance	5.0 m
Side clearance	5.0 m field side and road side
Under clearance	To the ground

BC Hydro also has extensive hazard tree programs on the transmission and distribution system to identify, monitor, and remove trees to mitigate fall-into risks.

How Action Thresholds Are Applied

Vegetation Management Cycles

Vegetation management is conducted on a cyclical basis. Maintenance schedules are determined for each area to be treated and optimized within Vegetation Management Areas (VMAs) to ensure appropriate and timely treatment.

The length of the vegetation management cycle on transmission lines will vary depending mostly on growth rates. Generally, the cycle ranges from 4–12 years. Areas that have very high growth rates or low clearance may require a shorter two or three-year cycle. Distribution cycles typically vary from 3 to 7 years around the province.

A number of other factors help determine the length of the management cycle, in particular, fuel loading on the transmission system. Within 300m of forested and grassland areas, Section 10 of the provincial *Wildfire Regulation* requires BC Hydro to maintain corridors in a manner that prevents any fire from spreading. Therefore, some areas may need to be managed before the target species grow too tall because they create too much biomass when cut.

Timing of Treatment

Once it has been determined that a particular site requires treatment, other concerns come into play to determine the specific timing. For example:

- Forest access may be closed due to fire hazard.
- There may be snow on the ground, preventing treatment.
- There may be closures around riparian areas due to fish windows, or around bird nesting areas during nesting season.

Treatment timing also depends on the control method used, as some treatments are more effective at different stages of the growth cycle. For instance, herbicide treatments are most effective when trees are actively growing and are often best used in combination with other treatment methods. An example of this is the use of herbicides to selectively treat deciduous targets a year or two after target high-density sites are mowed or brushed. Ensuring that herbicide applications are as effective as possible will help reduce the need for future herbicide use at a site.

Other Threshold Criteria

BC Hydro controls invasive weed or vegetation that could interfere with its other objectives for corridor vegetation management. In urban areas, aesthetics is a major objective and might preclude the presence of any vegetation except grass, shrubs, and low-growing ornamental species on corridors used as walking paths or other similar compatible use.

Weeds and trees also need to be controlled along access roads and helicopter landing pads adjacent to remote power lines, to ensure safe access and driving. Tree limbs hanging down into the access road or landing pad, and debris around roads and landing pads are managed. Vegetation around the base of wood pole structures is controlled to minimize the risk of fire.

Treatment Methods, Section 58(2)(e)

58 (2) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following integrated pest management elements:

(e) pest treatment options including

(i) a description of the pesticide and non-pesticide treatment methods of controlling pests that may be used,

(ii) the rationale for selecting the treatment methods described under subparagraph (i),

(iii) the benefits and limitations of each treatment method described under subparagraph (i), and

(iv) a description of how a decision to use treatment methods will be made.

IVM involves the use of different techniques to control undesirable vegetation.

Method Selection

A decision-making process for choosing treatment methods ensures that the most suitable, effective, and economical method or combination of methods is selected for an area to be treated, taking into account various assessment criteria. Specific techniques are not always appropriate for use in every region or situation.

Using criteria outlined below, BC Hydro evaluates the control methods that best suit the vegetation management site. The overall objective for a site and the prescription will guide the choices (see page 12, *Site Objectives*). The best methods are those that will meet the long-term site objective. Treatments are optimally timed for maximum efficacy, with consideration given to seasonal growing conditions, weather, and requirements for riparian areas, species at risk, and migratory birds.

Assessment Criteria

The treatment method chosen is justified and evaluated against the following assessment criteria:

Environmental, Social, and Economic Considerations

- Safety and reliability considerations
- Environmental sensitivities on the corridor and in surrounding areas
- Public and stakeholders
- Government requirements and considerations (federal, provincial, First Nations, and local government)
- Cost of treatment
- Labour and equipment resources
- Scope of the work
- Aesthetics

Effectiveness and Timing

- Consequences of not treating or delaying treatment
- Benefits vs. limitations of each method
- Efficacy
- Short vs. long term impacts
- Review of timing based on action thresholds
- Limits of approach
- Circuit criticality
- Condition based assessments including time since last treatment
- Debris management and fire risk mitigation
- Seasonal timing of treatment

Suitability for Site

- Site objectives
- Density of target stems

- Stem height and diameter
- Species (conifer/deciduous)
- Terrain (slope, aspect)
- Accessibility of the site
- Drinking water sources
- Riparian areas
- Biogeoclimatic zones and soil type
- Compatible and other land use
- Retention of compatible ground cover

Where herbicide use is considered for a site, additional assessment criteria include:

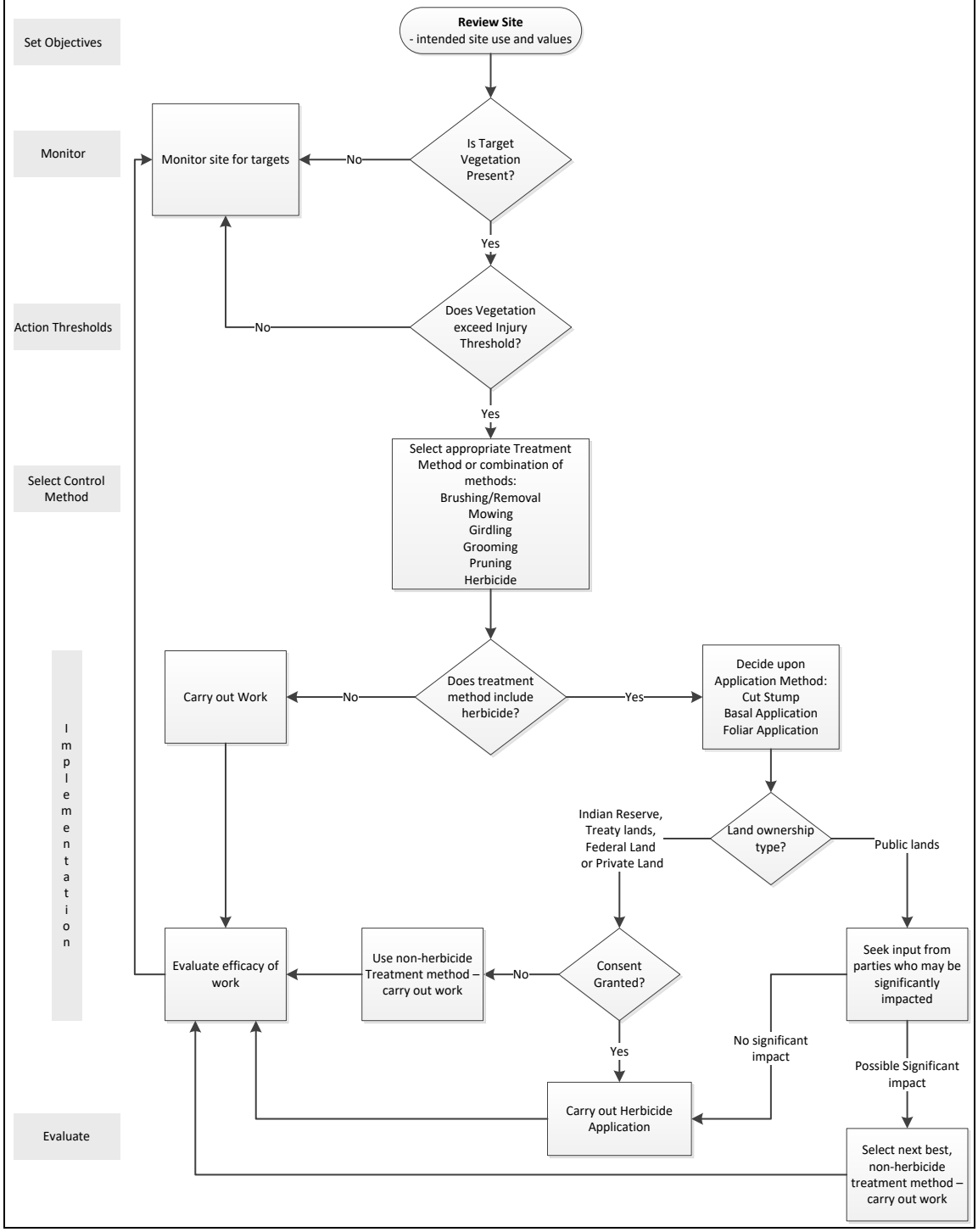
- Soil residual activity – activity of any herbicide residue present in the soil and rate of break down in the environment
- Mobility in soil and water of various herbicides
- Mode of action – the way in which the herbicide affects a plant
- Selectivity – the ability of some herbicides to affect specific types of vegetation while not having any impact on other plant species
- Toxicity – herbicides with very low to low environmental/health impact to humans, fish and wildlife are given priority.
- Type of tree –
  - Coniferous trees generally do not require herbicides for control as long as the lowest whorl of branches can be removed.
  - Deciduous trees re-sprout and become more difficult and expensive to manage after repeated cuttings.
- Size of tree –
  - Small trees, often < 1.5m in height are best controlled by a foliar application of herbicides.
  - Larger trees are best controlled by basal applications such as stump treatment or stem treatment.
- Proximity to water/wells –
  - PFZs are set around water bodies to prevent herbicides from entering the area.
  - All label and regulatory directions are followed.
  - A few select herbicides are allowed close to water to control noxious weeds, but these must adhere to strict regulatory conditions for use.
- Use of land – timing of herbicide use or technique may be modified to avoid berry/food/plant harvest

To minimize impacts to desirable vegetation in the treatment area and reduce the amount of herbicide used, the most suitable herbicide for the job is selected in consideration of application technique and equipment.

IVM Decision-making Flowchart

The following flowchart shows the decision-making process that personnel will follow when choosing a vegetation management technique.

Integrated Vegetation Management Decision-Making Flowchart for Target Vegetation



The IVM control methods proposed for use on target vegetation on or adjacent to BC Hydro power line corridors include:

- Manual and mechanical (physical)
- Cultural (natural)
- Biological
- Chemical (herbicide) methods
- A combination of any of the above

The sections below describe the various vegetation management controls that BC Hydro uses on transmission and distribution corridors. It covers the:

- Description of the technique
- Selection criteria for control methods
- Benefits and limitations of each control technique

Manual and Mechanical Controls

BC Hydro will use the following manual and mechanical techniques for this IVMP:

- Brushing
- Mowing
- Grooming
- Girdling
- Pruning

Brushing

Brushing (also called slashing) is the removal by hand tools of individual stems of vegetation that will eventually grow into power lines or limits of approach. Stems are typically cut down as close to the ground as safely possible. In addition, a technique often employed in riparian areas may be used, which involves cutting taller trees at a higher height, then girdling the stem to prevent re-sprouting.

Brushing is the most commonly used manual vegetation management technique on transmission lines and is sometimes combined with the herbicide cut-surface method to reduce sprouting of new shoots from the root system of broadleaf plants. Conifers when cut below the lowest green branch whorl will not regrow. Tools used in brushing include chainsaws or circular brush saws.

Generally, brushing is most effective when the target vegetation is more likely to die after being cut, for example in late summer dry periods after seasonal growth. Brushing can be highly selective and is usually directed only to target stems, preserving the maximum amount of low-growing compatible species.

Selection Criteria for Brushing

Brushing is the preferred method in the following situations:

- In areas with a well-established low-growing plant community

- In difficult terrain with limited or no machine access, e.g., around guy wires, steep slopes, and riparian areas
- When environmental risk over use of other methods is considered to be high

Although generally confined to corridors, brushing may extend beyond the corridor edge to improve long-term line security by removing trees that could fall onto the power lines from the edge. This is done in consultation with the landowner and usually performed where there is mutual benefit (e.g., rangeland use).

Brushing is not preferred in the following circumstances:

- Where target vegetation is present in high densities
- Areas where mowing is a suitable alternative
- Areas where slash debris would be unsightly or pose safety risks to humans, wildlife or grazing domestic animals
- Areas with a high fire risk
- Areas where trees are of a size (generally > 15 cm diameter) that when cut will leave debris levels that violate BC Hydro's fuel management standard or the *Wildfire Act*

Benefits of Brushing

- Brushing allows the immediate removal of target vegetation with minimal disturbance to low-growing compatible species.
- Conifer trees cut below the lowest branch are permanently controlled.
- Brushing allows spot treatment with herbicides to prevent deciduous or broadleaf species from re-sprouting from the stump or roots.
- 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.
- 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 to carry out in dense vegetation.
- It can increase the fire risk if there is a buildup of debris (leaves, stems, etc.).
- In the absence of follow-up herbicide treatment, deciduous stumps can re-sprout repeatedly (into coppices) each time they are cut, resulting in dense thickets, increased growth rates, clearing costs, and shortened treatment cycles in subsequent years.
- Aesthetics of brushing may be a public concern due to the buildup of slash debris.
- Brushing has a larger carbon footprint due to increased use of fossil fuels

Mowing

Mowing is the cutting of target vegetation with wheel or track-mounted heavy-duty rotary or flail cutting machines. A heavy-duty tractor or excavator is equipped with the cutting head and driven over the corridor to cut target vegetation. This method is primarily used for transmission lines in conifer-prone areas and to reduce high-density deciduous areas. It is also used along distribution roadside corridors in rural or uninhabited areas.

In some situations, machines such as a “Rolly chipper” or “feller buncher” may be used to cut down mature trees within or along the edge of the corridor in order to widen the existing ROW or remove hazard trees. If a logging operation is being conducted, BC Hydro follows all requirements as regulated by the BC Ministry of Forests, Lands and Natural Resource Operations (FLNRO).

Selection Criteria for Mowing

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

- With high densities of target trees
- With trees of a size that when cut will leave debris levels that violate BC Hydro's fuel management standard or the *Wildfire Act*

In general, mowing should not be used:

- On target trees of large diameter (mowing larger stems is impractical)
- Where low-growing compatible species are well-established and there are low stem densities of target vegetation
- In areas with rocks that can cause excessive damage to cutting heads
- In areas that are developed or have high public use because of the risk of flying debris
- In areas with stumps that create accessibility problems
- In boggy or wet areas where excessive rutting, soil compaction and/or erosion could occur
- On slopes that create a worker safety hazard
- In riparian areas

Benefits of Mowing

- Mowing mulches the vegetation into smaller pieces that readily biodegrade, which reduces fuel loading and fire risks.
- 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 areas where fast-regenerating ground covers are plentiful, re-sprouting of unwanted vegetation is suppressed.
- In non-selective mowing and where little compatible vegetation exists, all vegetation is cut to ground, which may release compatible vegetation to grow and may facilitate future herbicide applications to control deciduous target regrowth

- In selective mowing directed only towards target vegetation, the utility corridor 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.
- 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 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 by causing soil compaction and rutting.
- Mowing mulches the brush using a high-speed rotary or flailing action, this can leave ragged stumps which may be unsightly, hazardous, and subject to public complaints.
- Mowing may result in rutting, track marks, or degradation of the ground surface.
- Mowing should not be used in areas where archaeological or cultural heritage sites are present to avoid disturbance.
- Mowing generally should not be used on slopes greater than 30% because most machines are unsafe to operate on steeper grades unless they are specially designed for such work.

Grooming

Grooming is the mechanical grubbing and grading of the corridor using excavators or bulldozers to remove all existing vegetation. The exposed soils are then seeded with grass or other low-growing species to prevent the growth of unwanted tall-growing species. Grooming is generally confined to areas with a high density of target vegetation and is used to convert the site to one requiring little or no maintenance, e.g. rangelands. The advantage of grooming over mowing is that stumps are also removed. It may also be used in localized areas where individual stumps are grubbed out with a hoe in order to eliminate chronic regrowth of target vegetation and where herbicides cannot be used.

Grooming uses a combination of the following techniques:

- Mowing
- Machine-raking or brush-blading
- Ploughing or disking
- Rough grading / harrowing
- Seeding and fertilizing

Selection Criteria for Grooming

Grooming is an acceptable method in the following situations:

- To clear land for viable and sustainable grazing or agricultural use
- To re-contour the ground to increase the clearance to the conductor
- To create a shift to low-growing vegetation species in areas with a high density of target vegetation
- In response to requests of local government agencies or private property owners
- To maintain road access

In general, grooming should not be used:

- On target trees of large diameter (impractical)
- Where low-growing compatible species are well-established and there are low stem densities of target vegetation
- In areas with rocks that can cause excessive damage to clearing equipment
- In boggy or wet areas where excessive rutting and soil compaction and damage could occur
- On slopes that create a worker safety hazard
- In riparian areas
- In areas with archaeological or culturally sensitive sites that may be disturbed using mechanical equipment

Benefits of Grooming

- Grooming clears the site completely of vegetation and stumps, leaving it properly prepared for reseeding with desirable vegetation (i.e., to create new and enhanced habitat) or conversion to compatible use.
- Grooming and reseeding benefit the property owner by providing compatible use of the land base, such as for pasture or range land.
- BC Hydro benefits because of the reduced ongoing maintenance required under the power lines for electrical safety.
- Using heavy equipment is generally less hazardous to the operator than using hand-held equipment.

Limitations of Grooming

- Topography and soil conditions must be suitable for grazing or economic agricultural use, if the site is to be converted to this use.
- Bulldozing 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 if not properly reseeded.
- Root-suckering species and re-sprouting species are not totally removed by bulldozing, thereby increasing multi-stemmed regeneration of unwanted species.
- Grooming leaves the soil temporarily exposed, resulting in possible erosion.

Girdling

Girdling (also called frilling) is a manual technique that involves cutting one or more strips of bark from around the entire tree trunk with a special cutting tool, saw or chain. The bark strips are removed along with other tissue down to the sapwood. This procedure is usually limited to single-stemmed, deciduous trees but can also be carried out on selected conifer trees when required.

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 for Girdling

Girdling is a preferred method in the following situations:

- In riparian areas or other environmentally sensitive sites.
- Control of scattered individuals of alder, birch, and willow species.

In general, girdling should **not** be used:

- On trees of small diameter, since they may break at the girdle, causing the tree to re-sprout.
- On black cottonwood, balsam poplar and small-diameter (less than 5cm) aspen because of prolific re-sprouting.
- In areas where the target vegetation will reach limits of approach within two growing seasons, unless the tall brushing and girdling technique is used.
- For stem densities of over 15,000 stems per hectare because it is not practical or effective and is prohibitively expensive. Also, the amount of standing dead stems may create a fire hazard and when they fall impede access to people or wildlife.
- In situations where tree failure could lead to worker or public injury or property damage. In these cases, girdling may only be done via the tall brushing and girdling method.
- On conifers unless they are part of a riparian prescription or if the tree is retained as a wildlife tree.
- On maple species with coppices of more than five stems, or where the root collar is over half a metre in size. Maples this size will not be killed using girdling, as each stem would have to be cut and the tree may still re-sprout from the stump or roots.

Benefits of Girdling

- Girdling promotes retention of vegetation cover and increased site stability due to root structure retention. For this reason, it is useful in riparian areas or where slope stability may be an issue.
- Girdling is not usually limited by difficult terrain.
- Girdling is flexible, because individual stems and species can be removed or left on a tree-by-tree basis.

- Girdling increases low-growing forage vegetation for wildlife and habitat for small mammals and birds. There is no danger to wildlife.
- Deciduous overstory is removed naturally over several years, giving conifers and low-growing understory time to adjust to new environmental conditions.

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 is 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.
- Workers must be experienced girdlers, since poor girdling results in re-sprouts or premature blowdown with regrowth.

Pruning

Pruning is the removal of branches or limbs in order to direct and control tree growth away from power lines. 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 and/or the main leader back to an indiscriminate point. BC Hydro strongly promotes the concept of planting “the right tree in the right place” to have safe and compatible vegetation near power lines that does not require repetitive pruning.

Pruning is the approved vegetation management method for areas where tree removal is not an acceptable option. It is the most common control method on much of the distribution system and on some lower voltage transmission lines, particularly in urban or built up areas or where circuits are situated along road allowances that permit the use of bucket trucks. In most instances, BC Hydro does not support pruning trees on higher voltage transmission lines because of the clearances that must be maintained between the lines and the trees and because most high-voltage transmission lines run cross country making it difficult to safely climb and prune trees.

Selection Criteria for Pruning

Pruning may be the best management technique in the following circumstances:

- Where it is cost-effective compared to tree removal
- Where there is significant public opposition to tree removal, and there is no legal right-of-way agreement

- Where the main stem is outside the right-of-way but has branches growing from the side toward the conductors
- Where trees are required for wildlife habitat or to protect riparian areas
- Where a stable, healthy, treed edge is adjacent to the power lines and only needs side pruning to maintain clearances
- Where it keeps tree branches far enough away from the power line to meet the term of the maintenance cycle

In general, distribution circuits (<35 kV) and lower voltage transmission circuits (69kV and 138kV) have corridors narrow enough that edge trees will require pruning to maintain safe clearances.

Pruning should not be used in the following situations:

- Where the tree trunk is too close to the power line to safely leave it in place and the tree needs to be topped or severely cut to maintain clearance
- Where the tree is in declining health and should be removed or replaced with more suitable vegetation.
- Where the cost to maintain the tree exceeds the cost of removal.

Benefits 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.
- A pruned tree provides wildlife habitat.

Limitations of Pruning

- Pruning is usually costlier than removal because trees need to be pruned repeatedly.
- Pruning must be performed by a Certified Utility Arborist (CUA), a skilled experienced operator, because of the proximity of vegetation to the conductors. CUAs are specially trained to work safely near energized lines and have specialized equipment to perform their work safely.
- Improper pruning techniques can seriously damage trees and result in unhealthy, unsightly, or hazardous trees that may require off-cycle remedial work.
- Pruned trees remain in proximity to power lines and have hazard potential, while removed trees do not.

Cultural/ Natural Control

Cultural control is where vegetation is managed in a way that precludes the growth of incompatible target species through the use of crops, pastures, parks, or other managed landscapes. Conversion of corridor segments from stands of tall-growing target vegetation to rangeland, agricultural crops, or other compatible

uses such as parks with suitable low-growing vegetation are all forms of cultural control.

In other areas, the landscape may be managed to encourage the establishment of native low-growing plant species adapted to the site so that the growth of tall, target vegetation is eliminated or suppressed. Where appropriate, BC Hydro actively encourages the establishment of suitable low-growing vegetation to replace tall-growing species. This is sometimes called natural control.

Selection Criteria for Cultural/Natural Control

Where plant competition is feasible on a power line corridor, manual, mechanical, and chemical control techniques that enhance compatible vegetation are carefully selected to prepare the site for conversion to culturally managed sites.

Cultural/natural control may be a favoured management method in the following circumstances:

- Replanting with appropriate, low-growing vegetation can be an effective vegetation management technique, particularly in small areas with high public exposure, or in riparian habitats or shelterbelts.
- Where the corridor is suitable to compatible use such as cropping, rangeland, nurseries, or parkland and is consistent with adjacent land use.
- Where the compatible land use is actively managed by others, usually privately owned lands or lands managed actively by a government agency – provincial, local, First Nations, etc.

Cultural control may not be feasible in the following situations:

- Where it would be difficult to maintain plantings
- Where suitable nursery or seed stock may be hard to source or be prohibitively expensive

Benefits of Cultural/Natural Control

- The corridor is managed in a way that enables multiple uses that are compatible with the power system and provides multiple resource values over a long period.
- When land is effectively converted to compatible cultivated or natural cover, it effectively suppresses the growth of tall, incompatible vegetation or reduces its volume, making it easier to maintain the power line corridor with reduced frequency or magnitude of disturbance.
- It may be used to manage complex riparian sites or areas with unstable slopes, using bioengineering techniques with living plants or a combination of plants and structural materials that help prevent erosion (e.g., hydroseeding, grass seeding, live staking, or wattles).
- It may have initial higher costs to convert an area but may have lower long-term costs through reduced ongoing maintenance.

Limitations of Cultural/Natural Control

- Lack of available appropriate sites for conversion (e.g., Christmas tree farms may only be suitable on high-voltage transmission ROWs with sufficient clearance to make the venture feasible)
- High cost or inability to have others manage the site over the long-term, resulting in abandonment of the initiative
- Difficulty in establishing and maintaining suitable crops or cover and the risk of increasing undesirable vegetation (tall-growing targets or noxious/invasive weeds) through site disturbance

Biological Control

Biological control is the reduction or suppression of unwanted organisms by introducing or enhancing the presence of natural enemies. It is often used in noxious weed or invasive plant control by introducing insects that selectively control specific weeds but do not damage other vegetation. With respect to utility vegetation management and control of tall-growing vegetation, there is currently a fungus that has been used as a biological control agent for some woody broadleaf species. There are no insects currently available which control woody target species.

Biological control may be used in utility vegetation management on noxious weed species known to have an effective biocontrol agent.

The fungus, *Chondrostereum purpureum, (Chontrol)* is a registered biological agent used to control target deciduous trees and shrubs. This fungus is a primary invader of wounded deciduous trees. It works over a period of one to two years by slowly killing the tree and shrub. Under the right conditions, it can effectively control deciduous trees that are prone to re-sprouting. This fungus offers several benefits: it is non-toxic to humans and animals; it affects only the plant to which it is applied (so there is no danger of contaminating bodies of water) and will not kill desirable vegetation such as grasses. It is applied to cut stumps in a paste formulation.

Biological control may **not** be feasible in the following situations:

- Where conditions are not favourable to the introduction or survival of the biocontrol agent, which limits its ability to effectively control the target vegetation
- Where no suitable biocontrol agent exists for the vegetation species being managed. Currently, limited biocontrol agents are available for utility vegetation management.

Benefits of Biological Control

- May provide very selective control of problem vegetation, especially some species of noxious weeds
- Low impact to the environment as it creates less site disturbance unlike any other manual, mechanical, or cultural control method and some herbicide application techniques

Limitations of Biological Control

- The very specific nature of the organisms that are registered and available for use
- The limited amount of species and areas that can be controlled using this method
- Labour-intensive technique that requires very specific site conditions for effective application (timing, weather, temperature, etc.)
- Use restrictions in some cases where economic crops (e.g. orchards) are present in proximity to the area requiring control

The introduction of insect biocontrol agents on power line corridors for noxious weed control may limit options for the control of tall-growing vegetation targets, so sites must be carefully chosen and recorded.

Biological control may become move viable as an increased number of biological agents become available. However, research of new biocontrol agents is very time consuming and expensive and it takes years to determine if a potential agent is promising or effective and has no impacts on non-target species. The registration and regulation of biocontrol agents is an involved process to get a new product to market. BC Hydro will monitor any products that become available and add them to the list of vegetation management techniques, where appropriate and operationally feasible.

Chemical (Herbicide) Control

This section describes the various herbicide techniques that BC Hydro uses on power line corridors to control vegetation. It covers:

- Cut surface
- Basal bark
- Backpack foliar
- Mechanized foliar
- Injection techniques
- ***This plan does not include aerial applications of herbicides***.

Cut Surface

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

Cut surface is a directed technique, which reduces the impact on non-target species. It also minimizes herbicide use while allowing adjacent, non-target species to thrive (optimizes natural control).

The current herbicide of choice for cut surface treatments is triclopyr. Glyphosate is preferred in environmentally sensitive areas, and imazapyr may be used on dense clumps of hard-to-control species such as bigleaf maple.

Selection Criteria for Cut Surface Treatment

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

Benefits 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, which helps protect adjacent environmental factors such as fish and wildlife,
- 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.
- It is a labour-intensive method and not cost-effective for dense stands.

Basal Bark

Basal bark treatment involves applying herbicide onto the bark of the target tree. 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 for Basal Bark Treatment

- The method is best used on small deciduous trees under about 4m in height.
- 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.

Benefits of Basal Bark

- It is less labour-intensive than manual brushing and girdling.
- It is suitable for remote or 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.
- A small amount of product is applied per hectare.
- Can be used in areas where there are environmental sensitivities or plant species that need to be protected

Limitations of Basal Bark Application

- Dead foliage may be objectionable.
- In areas of low clearance, surviving treated stems may continue to grow for a short period of time resulting in unsafe conditions

Backpack Foliar

Backpack foliar treatment sprays herbicides onto the foliage of individual trees or small clusters of trees and tall growing shrubs, using a manually-operated, low-volume, pressurized backpack with a positive shut-off system.

Selection Criteria for Foliar Treatment

- The terrain must have good foot access to reduce the risk of tripping and falling by applicators.
- Optimally, target vegetation is below 1.5m in height, as this 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 slashed.
- It is the main treatment used for noxious and invasive weed control.

Benefits of Backpack Foliar

- Backpack foliar is the most efficient method for managing the re-sprouts of high-density target vegetation (for example, 1-2 years after mowing or brushing).
- It targets specific vegetation, with adjustable application rates and dosages.

Limitations of Backpack Foliar

- Buffer zones may be required to protect PFZs (see page 61), depending on wind direction and topography.
- Applicators should not treat foliage above their heads for safety reasons which limits the height of target vegetation that can be suitably treated
- 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 Foliar

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

Selection Criteria for Mechanized Foliar Treatment

- This method is optimally used on areas that have been previously mowed or hand-slashed to reduce re-sprouts of target species and where minimal compatible vegetation is present.
- 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.
- It is an excellent treatment for noxious and invasive weed control.

Benefits of Mechanized Foliar

- Mechanized 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.
- Nozzles can reduce the amount of herbicide used because well-defined droplets are produced, resulting in good coverage of the foliage with limited runoff.

Limitations of Mechanized Foliar

- It is not as selective as backpack foliar application.
- There is more potential for drift than a backpack foliar application.
- Buffer zones may be required to protect PFZs (see page 61), 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 foliar is often limited by terrain, such as steep slopes, large rocks, stumps, and bodies of water.
- In wet terrain, machines cannot operate effectively.
- Mechanized foliar may result in rutting, track marks, or degradation of the ROW surface.
- It should not be used on slopes greater than 30% because most machines are unsafe to operate on steeper terrain.

Injection Techniques

There are three injection techniques used – mechanical injection, hack-and-squirt and injection. In mechanical injection, a small capsule containing herbicide 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. Syringe applicators have been effectively used to inject herbicide into stems of invasive species such as Japanese knotweed. Hack-and-squirt uses a small axe, machete, or hatchet to cut through the thick bark and into the sapwood. Herbicide is then squirted into the cut with a bottle.

Selection Criteria for Injection Techniques

- An injection technique can be used when the cut surface method cannot be done.

- It should not be used when there is a near-term 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 where permitted.
- Larger-diameter trees are not effectively controlled by injection, but can be controlled by hack-and-squirt
- It is not effective on bigleaf maple or aspen poplar.
- Blowdown of dead trees may pose a safety problem alongside well-travelled areas, or to workers re-entering the area.

Benefits of Injection Techniques

- 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 virtually eliminated.
- It virtually eliminates the possibility of environmental contamination because it is so directed (although shell casings may be left onsite in capsule injection).
- It removes the canopy but increases low-growing forage for wildlife.
- It can be done at any time during the year on woody targets.

Limitations of Injection Techniques

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

Evaluation, Section 58(2)(f)

A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following integrated pest management elements:

58 (2) (f) a description of the monitoring program that will be employed for evaluating the effectiveness of the pesticide use on pest populations and the environment, including effects on organisms other than targeted pests, by comparison with the information collected under the program described in paragraph (c), which program must include a description of

(i) the monitoring methods,
(ii) the frequency of monitoring, and
(iii) the data that will be collected.

BC Hydro carries out comprehensive evaluations to ensure effectiveness of its vegetation management program. It includes:

- **Contract inspections** – As work projects are carried out, site inspections are performed to ensure proper procedures and work specifications are followed.
- **Post-treatment evaluations** – These include quality assurance assessments and audits to ensure program objectives are met.
- **Continuous improvement** – New techniques and products are identified and incorporated where appropriate.

After vegetation management work has been completed at a site, information is collected to evaluate and measure the treatment results against the planned site objectives.

The purpose of evaluating vegetation management work is to:

- Achieve site objectives
- Assess program effectiveness and adjust work plans accordingly
- Determine the success/efficacy of treatment techniques
- Ensure no negative environmental impacts occurred
- Take corrective action where necessary

The treatment method used is deemed effective if it resulted in the overall reduction of tall-growing target vegetation and the promotion of low-growing, stable, non-target plant communities to prevent grow-into outages and minimize fall-into outages for a safe and secure power system.

Evaluation of the site also adheres to Section 35(2) of the IPMR, which requires that records of treatment results, effectiveness, and impacts be kept. Evaluation results are used to revise site prescriptions and to provide the basis for improvements and changes to the vegetation management process.

Evaluation Methods of Herbicide Applications

Evaluations of herbicide applications are visual in nature and are typically conducted on the ground. The exact timing and procedure will depend on the treatment methods used, the geographic area, the type and condition of the site, the vegetation being controlled, and the season. All areas treated with herbicide are evaluated, but not 100% of each treatment area. BC Hydro takes reasonable efforts to ensure that sites are evaluated within one year of the treatment.

Evaluation results are used to revise site prescriptions and to provide the basis for improvements and changes to the program. BC Hydro considers the following in evaluation of any herbicide applications:

- Effectiveness of the herbicide treatment in controlling the target vegetation
- Need for follow-up treatments
- Amount of herbicide used
- Need to adjust application rate
- Cost-effectiveness of the treatment program
- Any impact of the herbicide application on the surrounding areas
- Incidental impacts to non-target species

Data Collected and Frequency of Evaluation

During contract inspections, herbicide treatment sites are reviewed for accuracy of application and the following data is collected:

- Cut surface – Look for marker dye on stumps.
- Basal – Look at the stem to ensure a proper wrap was made.
- Foliar – Check for droplet coverage on leaves and for foliar decline (wilting, browning).
- Injection – Check the number and placement of cuts, capsules, drills, and plugs.

Incidental treatment of non-target species is identified by looking for signs of spray on vegetation compatible with power lines. In addition, buffer zones and PFZs are checked for signs of spray drift.

Within a year after application and during regularly scheduled patrols, the site is evaluated for target mortality to ensure that program objectives were met.

Data collected during evaluations consists of qualitative and quantitative observations of mortality of targeted vegetation. These observations are documented by photographs, field notes, or representative sample plot measurements.

Research

To ensure the most up to date research, tools, and techniques for vegetation management are considered and incorporated into both operational and strategic vegetation plans, BC Hydro works in conjunction with:

- Integrated Vegetation Management Association of BC (IVMA)
- Invasive Species Council of BC (ISCBC)
- International Association of Arborists (ISA)
- Utility Arborists Association (UAA)
- FP Innovations
- And others

In addition, information is reviewed on an ongoing basis to ensure new and potentially better control methods or herbicide products are used where possible.

Chapter 3, Herbicide Use and Handling

This section covers the responsible use and handling of herbicides, as per Section 58 of the IPMR (information required for Pest Management Plans). It includes:

- Transportation — Section 58(3)(a)(i)
- Storage — Section 58(3)(a)(ii)
- Mixing, Loading and Applying Herbicides — Section 58(3)(a)(iii)
- Disposal — Section 58(3)(a)(iv)
- Spill response plan — Section 58(3)(a)(v)
- Pre-treatment inspection procedures – Section 58(3)(b)(iv)
- Equipment maintenance and Calibration — Section 58(3)(b)(v)
- Weather monitoring – Section 58(3)(b)(vi)
- Herbicides Used and Application Methods – Section 58(3) (c)

Responsible Use of Pesticides

The careful, limited use of herbicides is an important and necessary part of vegetation management on power line corridors. When herbicides must be used, BC Hydro takes all reasonable precautions to ensure they are used safely and responsibly.

There are many ways in which BC Hydro reduces the impact of herbicides, for example, by using the least amount possible to achieve expected outcomes and ensuring that applications are conducted properly by qualified personnel. By including herbicides in an integrated pest management program, target vegetation can be reduced to a level that allows for a longer period of time between management cycles and an overall reduction in tall growing, target species.

Requirements for Certified Applicator

Any individual or company (i.e., a Contractor) that provides a service to BC Hydro by applying commercial or industrial herbicide must have a valid B.C. Pesticide User Service License.

Herbicide applications are to be performed or supervised by a Certified Pesticide Applicator with a Certificate in the Industrial Vegetation and Noxious Weed Control or Forestry General or Forestry Non-Broadcast categories. The name

and certificate numbers of the applicator(s) who will supervise the work must be recorded on the Daily Operations Record (DOR).

The Certified Pesticide Applicator must, as per the IPMR:

- Be in continuous attendance at the work site while herbicides are being applied
- Supervise no more than four certified assistant applicators at one time
- Maintain continuous contact, auditory and/or visual, with each assistant certified applicator being supervised
- Be within 500m of persons being supervised
- Have proof of certification at or near the treatment location so it is readily available for inspection during herbicide use (if possible, the certificate should be kept at the mix site, in the vehicle used by an application crew during a treatment, or on the applicator's person at all times, such as in a wallet or pocket; the certificate can be a copy to avoid loss or damage of the original)
- Comply with requirements set out in Division 7 of the IPMR, Records and Reporting Requirements

Herbicide Transportation, Section 58(3)(a)(i)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

A description of the methods of handling, preparing, mixing, applying and otherwise using pesticides that will be employed under the plan including a description of the following procedures:

(i) procedures for safely transporting pesticides;

Personnel must adhere to the following legal requirements for the transportation of herbicides, as per the IPMR:

- Ensure that the herbicide is properly secured during transport to prevent accidental discharge or unauthorized removal, and to prevent contamination of food or drink intended for animal or human consumption, household furnishings, toiletries, clothing, bedding, or similar items transported with the herbicide.
- Keep herbicides in their original containers and with original packaging and labelling affixed, or in appropriate containers with trade name, name of active ingredient, concentration of active ingredient, and pesticide registration number affixed.

In addition to the IPMR, BC Hydro requires personnel to:

- Follow all applicable federal and provincial transport requirements set out in the *Transportation of Dangerous Goods Act*, including requirements for

documentation, labels, markings, and placards. Spray equipment containing more than 5,000 liters cannot be taken onto public roads.

- Persons transporting dangerous goods must hold a valid TDG Certificate of Training or be under the direct supervision of someone who is trained and certified.
- Read and understand the product label and Safety Data Sheet outlining the transportation requirements for each regulated product used by BC Hydro.
- Keep in the vehicle a first aid kit, fire extinguisher, spill contingency plan, and spill contingency kit (with WorkSafe BC regulated contents). Vehicle operators must be trained to handle spills.
- Inspect containers for defects prior to transport. Transfer any defective packages to empty pesticide containers of the same type or secure any defective containers into secondary containment vessels for transportation.

Herbicide Storage, Section 58(3)(a)(ii)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(a) a description of the methods of handling, preparing, mixing, applying and otherwise using pesticides that will be employed under the plan including a description of the following procedures:

(ii) procedures for safely storing pesticides;

Storage facilities may be permanent, temporary, or mobile. Building materials must be fire-resistant wherever possible and facilities must be clean and well-marked.

Personnel follow these instructions to store herbicides as per the IPMR requirements:

- Keep herbicides in their original containers and with original packaging, or in appropriate containers with trade name, name of active ingredient, concentration of active ingredient, and pesticide registration number affixed.
- Store herbicides separately from food intended for human consumption.
- Keep herbicides in storage facilities that are locked when unattended, not used for storage of food intended for human or animal consumption, ventilated to the outside, and accessible only to authorized persons.
- Mark storage facility in block letters: "WARNING: CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY" so signs are visible to persons approaching each door providing access to the facility.
- Store fumigants and other pesticides that release vapours or bear a poison symbol on the label in a storage facility that is not attached to or within a building used for living accommodations
- Within 60 days after starting to store an herbicide at a location, provide notice of the storage location to the fire department closest to that location.

In addition to the IPMR, BC Hydro requires personnel to:

- Keep storage facilities separate from work and living areas, and away from flammable materials, and bodies of water.
- Keep a herbicide inventory log book, current product labels, Safety Data Sheets, and a copy of WorkSafe BC's *Occupational Health & Safety Regulation* at the storage facility.
- Keep at the storage facility a first aid kit, fire extinguisher, Spill Response Contingency Plan, and a spill kit with WorkSafe BC regulated contents. Persons storing herbicides must be trained to handle spills.

Mixing/Loading & Applying Herbicides, Section 58(3)(a)(iii)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(a) A description of the methods of handling, preparing, mixing, applying and otherwise using pesticides that will be employed under the plan including a description of the following procedures:

(iii) procedures for safely mixing, loading and applying pesticides;

Mixing and Loading Herbicides

Personnel will follow these instructions to mix and load herbicides as per the IPMR requirements:

- Do not wash or submerge in a body of water any container used to prepare, mix, or apply herbicides.
- When drawing water from a body of water or an irrigation system into a container for herbicide use, maintain a gap between the herbicide and the equipment to prevent herbicide from entering the body of water or irrigation system.

In addition to the IPMR, BC Hydro requires personnel to:

- Before mixing, read the product label and Safety Data Sheet, and follow all safety precautions
- Ensure that persons mixing or loading herbicides are Certified Pesticide Applicators, and will use proper protective equipment and clothing as recommended on the label
- Ensure that emergency wash facilities, first aid equipment, spill kits, spill response plans, and emergency phone numbers are close at hand.
- Use clean water free of any suspended particles. Use appropriate procedures to prevent backflow of herbicides into the water source.
- Conduct mixing and loading in areas selected to prevent any spilled herbicides from entering the PFZs for bodies of water, wells, and water intakes.

- Mix herbicides in well-ventilated areas outdoors, under low wind conditions. Ensure there is adequate light and stand upwind to avoid contaminating yourself.
- Keep containers well below eye level to prevent splashing or spilling herbicides in the face or eyes.

Applying Herbicides

As required by the IPMR during work, personnel must:

- Not exceed the area of treatment areas specified on the Notice of Intent to Treat.
- Take precautions to ensure that domestic water sources, agricultural water sources, and soil used for agricultural crop production are protected for their intended use.
- Take precautions to prevent unprotected human exposure to herbicides.
- Take precautions to avoid applying herbicides over vertebrate wildlife or domestic animals that are visible to the user.

In addition to the IPMR, BC Hydro requires personnel to:

- Follow directions and restrictions on product labels and Safety data sheets.
- Record and/or map any changes to the original treatment plan.
- Use the most practical, suitable, target-specific application techniques, such as low-volume, low-pressure backpack or hand-held sprayers and wick applicators.
- Whenever possible, apply herbicides when target species are at their most susceptible stage.
- Have in their possession the treatment area map clearly showing treatment boundaries and pesticide free zones
- Refer complaints to the BC Hydro representative

Herbicide Disposal, Section 58(3)(a)(iv)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(a) A description of the methods of handling, preparing, mixing, applying and otherwise using pesticides that will be employed under the plan including a description of the following procedures:

(iv) procedures for the safe disposal of empty pesticide containers and unused pesticides;

The disposal of herbicide waste is governed in British Columbia by the *Environmental Management Act* and *Hazardous Waste Regulation*.

Personnel will follow these instructions to dispose of herbicides:

- Plan all applications carefully to minimize excess and waste. Any leftover herbicide mix should be saved for future use or disposed of in an appropriate manner.
- Triple-rinse empty metal, glass, or plastic containers before disposal. Rinse sprayers and containers well away from any body of water or well.
- Puncture or break any non-recyclable containers so that they cannot be reused, then discard at an approved sanitary landfill.

Spill Response Plan, Section 58(3)(a)(v)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(a) A description of the methods of handling, preparing, mixing, applying and otherwise using pesticides that will be employed under the plan including a description of the following procedures:

(v) procedures for responding to pesticide spills;

Personnel must ensure that an appropriate spill containment kit and spill contingency plan is at the application site. If an herbicide spill occurs, personnel will follow these instructions:

- Ensure the safety of workers and public by limiting access to the area, protecting people from exposure, and ensuring wash facilities are nearby.
- Put on protective equipment before cleaning up the spill, including protective clothing, respirators, and eye protection.
- Contain the spill.
- Report spills to the Provincial Emergency Program (PEP) as per the *Spill Reporting Regulation*. Also follow reporting protocols to BC Hydro.
- Clean up the site.

Pre-treatment Inspection Procedures, Section 58(3)(b)(iv)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(b) a description of the environmental protection strategies and procedures that will be followed under the plan, including a description of the following strategies and procedures:

(iv) pre-treatment inspection procedures for identifying treatment area boundaries;

Before vegetation management is conducted at a specific site, a pre-treatment inspection is completed to protect environmentally sensitive areas. At this stage, the work method is confirmed to ensure it is appropriate for the site, and specific environmental concerns are identified and reviewed with vegetation contractors prior to beginning work. Before work begins, environmentally sensitive areas are

marked in the field. On transmission corridors, the active ROW boundary is also flagged.

Before Work Starts

When treating areas of Crown land with herbicide, BC Hydro will seek input from parties who may be significantly impacted. On private land or First Nations treaty lands or reserves, BC Hydro will obtain permission from the owner or manager of the land before treating with herbicides.

Personnel must ensure that the work area is properly defined and inspected before work begins as required by the IPMR:

- Check the Notice of Intent to Treat to ensure that the proposed treatment locations, the proposed treatment (including the herbicide and its method of application), and the total area of the treatment areas are correct.
- Ensure that the herbicide used is registered for the intended use as described on the herbicide label.
- Keep onsite the detailed map showing the proposed treatment areas and PFZs in the work area.
- If work is being conducted in an area where biological control agents have been released to control noxious weeds, make reasonable efforts to identify these sites and prevent harm to these organisms.

Before herbicide applications begin, personnel must ensure that each individual who will be using the herbicide is informed of:

- Boundaries of the treatment area
- Requirements for personal protection, including Safety Data Sheets
- Herbicide use procedures required to protect human health and the environment
- Target species to be controlled, the desirable species to be protected during treatments, and how to identify these plants/trees

Signs

The IPMR requires that notification signs be posted on land being treated with herbicides. Signs must be clearly visible and legible from each approach to the treatment area used by the public. All approaches from highways are posted. Signs may not be removed for at least 14 days after the herbicides have been applied. Records are kept on how public notification was given and where notices were posted.

The signs must include information on the trade name or active ingredient of the herbicide used, date and time of application, precautions to be taken to prevent harm to people entering the treatment area, the IVMP confirmation number, and contact information.

Equipment Maintenance & Calibration, Section 58(3)(b)(v)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(b) a description of the environmental protection strategies and procedures that will be followed under the plan, including a description of the following strategies and procedures:

(v) procedures for maintaining and calibrating pesticide application equipment;

Equipment Maintenance

The IPMR requires applicators to ensure that all equipment is in good working order and if required is calibrated to conform to the application rates on the herbicide label.

In addition to the IPMR, BC Hydro requires that:

- Equipment must meet all regulatory requirements.
- Equipment must be safe, clean, in good repair, and compatible and appropriate for the herbicide being used.
- Nozzles must be working properly or be replaced, and hose connections must not be leaking.
- Tools and equipment must be in good working order and properly cared for and stored.
- Tools that are prone to failure must be replaced, and spares must be available onsite.
- A regular maintenance schedule must be implemented for each piece of equipment.

Equipment Calibration

Application equipment must be properly calibrated to conform with the application rates on the herbicide label.

As a minimum, all sprayers should be calibrated once per year prior to use, and at regular intervals throughout the season when changing pesticide products and when nozzle output begins to vary. The frequency of calibration is dictated by factors such as the formulation of herbicides used. For example, abrasive formulations will result in greater nozzle wear and will require more frequent calibrations.

In general, equipment should be calibrated:

- For each individual applicator using hand-held or backpack equipment
- At the beginning of each season
- At the start of each treatment job
- More frequently with abrasive formulations (such as wettable powders)

- If application rates are questionable
- Any time the application equipment type is changed, such as a change in size or type of nozzle
- Any time the pesticide or formulation of a pesticide is changed

It is not necessary to calibrate every backpack, provided each backpack has the same set up with nozzles etc.

Calibration Records

As per the IPMR requirements, personnel must keep a record for each piece of application equipment that requires calibration, when the equipment was calibrated, and the data upon which the calibration was based.

Weather Monitoring, Section 58(3)(b)(vi)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(b) a description of the environmental protection strategies and procedures that will be followed under the plan, including a description of the following strategies and procedures:

(vi) procedures for monitoring weather conditions and strategies for modifying pesticide application methods for different weather conditions;

Personnel will monitor weather and weather forecasts immediately prior to treatment and on a daily basis wherever herbicides are applied. Information is collected from Environment Canada and other official sources.

The prevailing meteorological conditions including temperature, precipitation, and velocity and direction of wind, are recorded for each treatment location and each day of use on the Daily Operations Record (DOR).

Stop Work Conditions

Herbicide applications must be stopped when any of the following conditions exist in the contract area. When herbicide label restrictions are more limiting, they will take precedence over the conditions below:

- Temperatures exceeding label requirements
- Raining steadily (water running consistently down the lateral stems)
- Ground wind speed exceeds 8km an hour (for foliar applications), i.e., gentle breeze, leaves, and twigs in constant motion
- Foliage is covered by ice or frost, or water is flowing on the foliage
- Overall conditions that favor herbicide drift

Residual pesticides must not be used on water-saturated soil, during heavy rainfall, or if heavy rainfall is imminent.

Herbicides must be applied only between 30 minutes before sunrise and 30 minutes after sunset.

Herbicides Used and Application Methods, Section 58(3)(c)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(c) identification of each pesticide that will be used under the plan, the manner of its application and the type of equipment required for each manner of application.

Chemical control involves the use of herbicides to inhibit growth of vegetation on or adjacent to BC Hydro power line corridors. Herbicides are an important tool in integrated vegetation management.

As per the definitions in the IPMR:

Pesticide – means a micro-organism or material that is represented, sold, used or intended to be used to prevent, destroy, repel or mitigate a pest, and includes:

- A plant growth regulator, plant defoliator, or plant desiccant
- A control product as defined in the *Pest Control Products Act (Canada)*
- A substance that is classified as a pesticide by regulation, but does not include micro-organisms, materials, substances, or control products excluded from this definition by regulation

The following active ingredients are used according to the methods and application equipment in Table 4. (Some of the herbicide products containing these active ingredients are described in more detail below, and application methods are described further in the next section.)

- aminocyclopyrachlor
- aminopyralid
- clopyralid
- *Chondrostereum purpureum*
- dicamba
- diflufenzopyr
- florpyrauxifen-benzyl
- fluroxypyr
- glyphosate
- imazapyr
- metsulfuron-methyl
- picloram

- triclopyr
- 2,4-D

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.

Types of herbicide application equipment that may be used include:

- **Backpack** – A backpack is a portable, manually operated, pressurized container with a nozzle for spraying herbicides. It operates under low pressure, thus minimizing the possibility of drift. Backpack sprayers may be used for selective herbicide applications or for spraying individual trees or plants. Backpack sprayers are not effective for large, continuous areas requiring vegetation control due to problems with effective patterns and overspray or underspray. Directed spray from a backpack unit will selectively control targeted vegetation. Backpack spray is effective on established, low-density species, tree seedlings, and noxious weeds. Within this IVMP, backpack sprayers may be used for herbicides proposed for use by foliar, cut stump and/or basal application.
- **Mechanized foliar** – Boom and wick sprayers are widely available commercially for ATV and agricultural tractor equipment. They use a solution tank and spray apparatus similar to a powerhose sprayer, except that solution is delivered to nozzles/wicks mounted at designated intervals along the boom length.
- **Powerhose** – A hand-held spray gun and hose attached to a portable tank with a motorized pump system filled with herbicide will selectively control a variety of vegetation with directed spray. Its use, effectiveness, and disadvantages are similar to the backpack, except that a spray gun is not as mobile or as convenient to use. However, spray guns are efficient for larger scale applications and are generally operate at high pressures. This equipment can be used for the application of all herbicide liquid mixtures.
- **Wick** – Wick applicators are used to selectively apply herbicide by wiping it directly onto plants. Wicks are made of rope, sponge or absorbent pads. The wick applicators are available in many sizes, from hand-operated to vehicle mounted. Only small amounts of herbicide are applied, so the need for pumps, control devices, and spray tanks is eliminated. Applications using this technique are very labour-intensive. Wipe-on wick application is ideal for areas where no spray drift can be tolerated.
- **Squirt bottle** – A squirt bottle refers to a hand-held, non-pressurized container, usually plastic. It may have a trigger pump sprayer. It is used to spray a solution of low-toxicity herbicides directly onto foliage or tree stumps
- **Injection tools** – Battery-powered drill or automatic lance used to inject capsules of herbicide into stems or stump of a target tree. This can also include a syringe type applicator where allowed on herbicide product label.
- **Brush bar with herbicide** – A brush saw or chainsaw with an attachment that deposits the herbicide on the spinning blade or chain, and automatically applies the herbicide onto the stump when cutting the stem

- **Granular applicator** – Granular applicators are used to apply dry (granular) formulations of herbicide to the targeted area in a uniform and controlled manner. Types range from "shaker containers" sold with or as part of the product container, to small hand-held broadcast granular spreaders (commonly used for spreading lawn fertilizer), to larger tractor-mounted broadcasters.

Table 4: Herbicide Method and Equipment

Manner of Application	Active Ingredient	Equipment Required
Foliar	aminocyclopyrachlor	• Backpack sprayer • Boom sprayer • Powerhose • Wick
	aminopyralid	
	clopyralid	
	dicamba	
	diflufenzopyr	
	florpyrauxifen-benzyl	
	fluroxypyr	
	glyphosate	
	imazapyr	
	metsulfuron-methyl	
	picloram	
	triclopyr	
	2,4-D	
Cut stump	*Chondrostereum purpureum*	Backpack sprayer Spray bottle Squirt bottle Modified brush saw
	glyphosate	
	imazapyr	
	picloram	
	triclopyr	
	2,4-D	
Basal bark	glyphosate	Backpack sprayer Spray bottle
	triclopyr	
Injection	glyphosate	Injection lance
	triclopyr	
	imazapyr	
Frilling/hack-and-squirt	glyphosate	Backpack sprayer Spray bottle Squirt bottle

Aminocyclopyrachlor and Metsulfuron–methyl - Navius or equivalent

This is a selective herbicide that provides pre- and post-emergent control of broadleaved weeds, woody species, vines, and grasses on several non-food use sites, such as rights-of-way, wildlife management areas, recreational areas, turf/lawns, golf courses, and sod farms. The chemical is a systemic herbicide and acts by disrupting gene expression. This causes undifferentiated cell division and elongation. The herbicide can cause damage to specific conifer species such as spruce and pines. Classed as very low toxicity by Worksafe BC and PMRA.

Aminopyralid – Milestone or Equivalent

This herbicide is a selective, post-emergent herbicide that controls a wide spectrum of broadleaf weeds, including Canada thistle, knapweeds, oxeye daisy, scentless chamomile, and many others. This herbicide is mildly residual and uses reduced application rates to minimize herbicide load on the environment. Classed as very low toxicity by Worksafe BC and PMRA.

Aminopyralid and Metsulfuron-methyl – ClearView or Equivalent

ClearView combines two active ingredients (aminopyralid and metsulfuron methyl) to produce a selective, post-emergent herbicide that controls a broad spectrum of broadleaf annual and perennial weeds, including Canada thistle, knapweeds, oxeye daisy, scentless chamomile, and many others. This herbicide can be applied for 12-24 months of good control and uses reduced application rates. Classed as very low toxicity by Worksafe BC and PMRA.

Aminopyralid, Metsulfuron-methyl and Fluroxypyr – Sightline or Equivalent

The combination of three active ingredients allow this herbicide to effectively control broadleaf weeds, invasive plants, and shrubs on rangeland, pasture, non-crop areas, industrial sites and rights-of-way. Difficult to control invasive species such as kochia, including glyphosate-resistant biotypes, are successfully managed with this combination of active ingredients. Classed as very low toxicity by Worksafe BC and PMRA.

Aminopyralid, Metsulfuron-methyl and Triclopyr – ClearView Brush or Equivalent

ClearView Brush combines the above listed active ingredients (from Clearview) with triclopyr (from Garlon), which results in broad-spectrum control of hard to control woody species, shrubs, and broadleaf and invasive species. This product is relatively new and represents the move to reduced risk chemistries that offer a safe profile for environment, wildlife, and adjacent vegetation when used as per the label. Classed as very low toxicity by Worksafe BC and PMRA.

Chondrostereum purpureum – Chontrol or Equivalent

This product is a fungal organism that slows or stops the re-growth or suckering of targeted plants. It is best applied during September/October and provides best results in areas with a high concentration of alder and other deciduous woody species that it is labelled for. Classed as very low toxicity by Worksafe BC and PMRA.

Clopyralid – Lontrel, Transline, or Equivalent

This herbicide is useful for spot-treatment control of broadleaf noxious weed species. It is preferred over picloram for the control of some noxious weeds such as Canada thistle, perennial sow-thistle, and scentless chamomile. It is effective only on actively growing plants in areas where high-residual herbicides should not be used. For perennial weeds, clopyralid will control the initial top growth and inhibit regrowth during the season of application. Clopyralid is not used as a soil-applied residual herbicide and will not be used in areas of high rainfall. Classed as very low toxicity by Worksafe BC and PMRA.

Diflufenzopyr and Dicamba – Distinct, Overdrive, or Equivalent

This herbicide is the first active ingredient from a chemical class called semicarbazones. Based on available data, diflufenzopyr has low toxicity to humans, birds, aquatic organisms, mammals, and bees. It has low residual properties. Diflufenzopyr causes hormones in plants to become concentrated in the growth regions. These products generally target broadleaved weeds. Classed as slightly toxic by Worksafe BC and PMRA.

Florpyrauxifen-benzyl – Rinskor active

Rinskor active is a new formulation that is currently being evaluated by Health Canada for registration in Canada. The active ingredient is from a new class of synthetic auxin herbicides. This product has a broad spectrum of activity on grasses and broadleaf weeds and has a very favorable environmental and toxicological profile. Classed as very low toxicity by Worksafe BC and PMRA. Note: this product will not be used until PMRA registration is granted.

Glyphosate –Vantage, Vision, or Equivalent

This herbicide is effective for controlling re-sprouts of most deciduous tree species. It is applied to the cut stump surface of the woody vegetation immediately after brushing or injected/squirted into the cut frill of a tree as a liquid formulation. It can also be used in a broadcast application. Glyphosate is non-selective and has no or very little residual activity in the soil. It binds tightly to all types of soils independent of the levels of organic matter, silt, clay, and soil pH. Classed as very low toxicity by Worksafe BC and PMRA.

Imazapyr – Arsenal Powerline or Equivalent

This herbicide is used to control brush species, most broadleaf weeds and annual and perennial grasses. It is applied as a low volume foliar or cut stump application. This herbicide is translocated throughout the plant and plant growth stops almost immediately after application. It is moderately residual and can

usually provide season-long control on many perennial plants. Classed as very low toxicity by Worksafe BC and PMRA.

Metsulfuron-methyl – Escort or Equivalent

The active ingredient (metsulfuron-methyl) is used as a selective herbicide to control various species of broadleaf weeds, trees, and brush and some annual grasses. It stops cell division in the shoots and roots of the plant, causing plants to die. It is applied pre-and post-emergence (before and after growth begins). The herbicide has very low toxicity to humans and animals. Best results are obtained when this product is applied to actively growing weeds during late spring to autumn. Classed as very low toxicity by Worksafe BC and PMRA.

Picloram and 2-4,D – Aspect or Equivalent

The combination of Picloram and 2,4-D results in the targeted control of woody plants as well as broadleaf weeds, while still being safe for grasses. Picloram is a selective, residual herbicide that can remain in the soil for several years providing long-term control against susceptible broadleaf invasive plants. Since picloram may persist in the soil, care is taken to avoid applying this herbicide to areas where soil may be moved or where there is shallow aquifers or domestic water intakes and wells. Classed as very low toxicity by Worksafe BC and PMRA.

Triclopyr – Garlon Products or Equivalent

The active ingredient triclopyr is effective for control of deciduous trees and brush. It provides an effective alternative to glyphosate for control of certain tree species, such as aspen poplar and trembling aspen. Triclopyr is a selective herbicide, has very little soil residual activity, and rapidly degrades in soil microorganisms and sunlight. It generally takes 10-46 days to break down in soil depending on soil type, moisture, and temperature. Although the herbicide does not bind to soil as tightly as glyphosate, once triclopyr moves into the soil, there is generally little movement. The herbicide tends to stay in the upper 30 cm of the surface soil layers following rainfall where it undergoes degradation. Garlon products can be applied as cut stump, basal, or foliar applications. Classed as very low toxicity by Worksafe BC and PMRA.

2-4,D – LV 700 or Equivalent

2,4-D compounds are hormone mimic chemicals that are selective depending upon rate and species. It is formulated to rapidly penetrate the waxy covering of plants. The most common application is foliar, and for best results should be applied when plants have rapid growth, likely May/June and September. 2,4-D herbicides have a short soil persistence period. Products with LD_{50} of >1000 are classed as slightly toxic by Worksafe BC and PMRA.

Chapter 4, Environmental Protection

This chapter covers the following, as per Section 58 of the IPMR (information required for Pest Management Plans):

- Protecting community watersheds and water sources – Section 58(3)(b)(i)
- Protecting fish, wildlife, and habitat – Section 58(3)(b)(ii)
- Preventing contamination of food – Section 58(3)(b)(iii)

Protecting Watersheds and Water Sources, Section 58(3)(b)(i)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(b) a description of the environmental protection strategies and procedures that will be followed under the plan, including a description of the following strategies and procedures:

(i) strategies to protect community watersheds and other domestic and agricultural water sources from adverse effects of pesticide use;

Pesticide free zones (PFZs) are maintained around community watershed intakes, as well as other water intakes and wells used for domestic and agricultural purposes. The locations of these water sources are noted and all PFZs are flagged before any herbicide treatment takes place. See Table 5, Water Protection Table

Pesticide free zone (PFZ) – is an area of land that must not be treated with pesticides and must be protected from pesticides moving onto it. PFZs usually are a strip of land adjacent to water bodies to protect riparian habitat. Required PFZ widths are specified in the herbicide product label or by provincial regulation and are usually a minimum of 10 m in width as measured by the horizontal distance from the high-water mark. PFZs are marked in the field before starting any herbicide treatment.

Measures to Protect Community Watersheds

Many communities have designated watersheds where surface water is managed as the water source for the community. The location of **community watersheds** to be protected is verified by checking the Community Watershed website of the BC Ministry of Environment and/or BC Hydro's geographic information system (GIS).

Community watershed — a water source from a stream where the water is used for human consumption; the stream is licensed under the provincial *Water Act* for a waterworks purpose or a domestic purpose controlled by a water user's community, and the drainage area is not more than 500 square kilometres.

By regulation, no herbicides are mixed, loaded, or applied within:

- 10 metres of bodies of water within community watersheds
- 30 metres of community watershed intakes Herbicides are not stored within the boundaries of community watersheds.

These PFZs are measured and flagged in the field prior to treatment.

Measures to Protect Wells and Water Intakes

In many BC communities, homeowners use private groundwater or surface water sources for domestic water, instead of a watershed. BC Hydro is restricted from applying herbicides within defined PFZs and **No Treatment Zones** (NTZs) set out in Table 5: Water Protection Table (below). PFZs and NTZs are used to protect water supply intakes or wells used for domestic and agricultural purposes that are located on or adjacent to power line corridors. Locations of registered wells and intakes are verified by searching applicable government websites.

No treatment zone (NTZ) – an area of land that must not be treated with pesticides.

Attempts to identify and located unregistered wells and water intakes are made by:

- Identifying potential water users, such as private property owners or lessees, and asking them about intake and well locations.
- Looking onsite for domestic or agricultural water use

Protecting Fish and Wildlife, Riparian Areas, and Wildlife Habitat,
Section 58(3)(b)(ii)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(b) a description of the environmental protection strategies and procedures that will be followed under the plan, including a description of the following strategies and procedures:

(ii) strategies to protect fish and wildlife, riparian areas and wildlife habitat from adverse effects of pesticide use;

Bodies of water are provided protection through the IPMA and IPMR. BC Hydro ensures that herbicides will not be applied within established NTZs and will respect PFZs and special requirements set out in buffer zones.

Body of water – Any natural body of water, including lakes and streams, etc. It does not include a human-made, self-contained body or structure for water.

Buffer zone – A strip of land between a PFZ and the pesticide treatment area where pesticides are not applied directly in order to prevent spray drift, runoff, or leachate into the PFZ. The width of the buffer zone is variable and up to the discretion of the applicator, taking into consideration the application equipment used and site factors such as terrain, soil conditions, and weather conditions.

In addition to the PFZs specified earlier for bodies of water, BC Hydro will exercise caution when working with herbicides adjacent to and within sensitive ecosystems including riparian habitat.

Riparian habitat – The area of land adjacent to a body of water that contains vegetation that is distinctly different from the vegetation of adjacent upland areas due to the presence of water. Riparian vegetation has several important ecological functions including providing shading or cover, water temperature regulation, food for fish and wildlife (small organic debris), bank stability, or stream structure (large organic debris).

Work in riparian areas is carefully planned in advance through an inventory and prescription process. Fish and riparian habitat is protected as follows:

- Identifying and mapping bodies of water through applicable sources of government data
- Documenting bodies of water identified during field assessments in BC Hydro's mapping system
- Classifying bodies of water as fish-bearing or non-fish-bearing (bodies of water that cannot be confirmed as fish-bearing are managed as fish-bearing)
- Managing fish-bearing bodies of water with appropriate PFZs and NTZs as per Table 5

Measures to Protect Fish and Riparian Areas

These general precautions are followed when working around bodies of water:

- Applicators will adhere to the PFZs in Table 5.
- Treatment methods are directed only to target vegetation. As much vegetation as possible is retained around bodies of water.
- Herbicide use will not remove vegetation that is needed to:
  - Prevent erosion of a stream bank
  - Prevent debris that would cause an unreasonable adverse impact from entering the stream

  - Maintain slope stability in areas where landslides have occurred
- Trees are directionally felled away from stream banks and shorelines to minimize disturbance to the riparian area.
- No deleterious substances are allowed to enter the watercourse, including fuels, debris, sawdust, herbicide products, or sediment.
- Where required, machine-free zones are established around riparian areas.
- Equipment or vehicles will not be washed at a stream or along the shores of any body of water.
- No power equipment or vehicles are serviced or refueled any closer than 15m from a body of water. (Note: This distance may need to be greater depending on site-specific conditions.)
- Watercourses will not be diverted, blocked, or restricted, except temporarily to correct hazardous situations, or in an emergency.
- Machinery should only cross streams over a bridge or culvert. If there is no bridge or culvert available, only one crossing point is selected and used, at a location where adverse effects can be minimized and mitigated.

Water Protection Table (Table 5)

The following distances for NTZs and PFZs are prescribed by the IPMR. Section numbers are listed in the first column.

In order to maintain PFZs as pesticide-free, an adequate buffer zone must be implemented around the PFZ. This zone must account for sloped topography, weather at the time of treatment, or any other site factor that could cause the spread of the pesticides.

To establish NTZs and PFZ's, BC Hydro measures the distance between the point of application of herbicide and the water source. This means the horizontal distance from the **high water mark** of the body of water, **stream**, dry stream, or classified **wetland**. If the high water mark cannot be reliably identified (as in the case of puddles or small pools or water), it is measured from the level of the water.

Stream – A watercourse that contains water on a perennial or seasonal basis, is scoured by water, or contains observable deposits of mineral alluvium, and which has a continuous channel bed that is 100m or more in length, or flows directly into a fish stream or a fish-bearing lake or wetland, or a licensed waterworks.

Wetland – A swamp, marsh, bog, or other similar area that supports natural vegetation, and which is distinct from adjacent upland areas.

High water mark – The highest area of land frequently wetted during a season of high water, i.e., the edge of the body of water at its highest wet point, usually marked by a break in terrestrial vegetation

Table 5: Water Protection Table

Section of IVMP Reg.	Permitted Application	NTZ/PFZ	Notes
All Herbicide Applications			
71(3) Reg.	Domestic and agricultural wells and water intakes, including all methods and pesticides.	30m NTZ	NTZ may be reduced if reasonably satisfied that a smaller NTZ will ensure no pesticide enters well or intake (70(4) Reg.)
Glyphosate Applications			
74(1)(a)(ii)	Along or around a body of water or classified wetland that: • is fish-bearing, or • that drains directly into a fish-bearing body of water, or • is along or around a dry stream that when wet is fish bearing or • drains directly into a fish bearing body of water	2m PFZ	Glyphosate must be applied using **selective application methods**.*
74(1)(c) Reg.	Along or around a body of water if the body of water is: • not fish-bearing at any time of the year • does not drain directly into a fish-bearing body of water	2m NTZ	
74(1)(b) Reg.	Along or around a body of water or a classified wetland that is: • fish-bearing, or • that drains directly into a fish-bearing body of water, or • along or around a dry stream that when wet is fish-bearing or drains directly into a fish-bearing body of water	5m PFZ	For glyphosate applications other than those applied using selective application methods or within industrial sites that must be kept free of vegetation.
Glyphosate Applications (con't)			
74(2) Reg.	Up to the high-water mark of a temporary free-standing body of water and dry stream, that is: • not fish-bearing at any time of the year • does not drain directly into a fish-bearing body of water	0m NTZ	

Section of IVMP Reg.	Permitted Application	NTZ/PFZ	Notes
75(4) Reg. 75(5),(6),(7) Reg.	No PFZ is required if the body of water is: • a temporary free-standing body of water • not a classified wetland or wildlife habitat feature and • not fish bearing and does not drain into a fish bearing body of water within 100 m. Glyphosate may be applied to a body of water if above three criteria met and body of water is less than 25m2 or not a wetland, or a dry stream bed if the dry stream is not wildlife habitat and not fish bearing when wet.	0m PFZ	No glyphosate applications allowed below the high water mark except as per 75 (5),(6),(7) Reg.
Non-glyphosate Applications			
73(1) Reg.	Around or along a body of water or dry stream and classified wetland using any pesticide except glyphosate, subject to label restrictions and including all application methods.	10m PFZ	Except for glyphosate applications.
Noxious Weed and Invasive Plant Management			
77(2) Reg.	Targeted application of glyphosate to noxious weeds and invasive plants if the application is used between 1m and 10m above the high water mark	1m PFZ	

***Selective application** – The application of a pesticide to individual plants so that the vegetation between individual plants is not treated. For the purposes of BC Hydro's Pest Management Plan this includes cut surface, basal bark, directed foliar, and injection treatments.

Wildlife and Wildlife Habitat

Information is collected from the Conservation Data Centre on locations of rare and endangered species. Areas of known critical **wildlife habitat** are identified within the BC Hydro geographic information system. The provincial *Wildlife Act* and the federal *Species at Risk Act* must be adhered to. Where critical habitat has been mapped and a recovery plan is in place, there is communication with the recovery team to ensure activities meet the strategy requirements. In cases where treatment areas potentially intersect with protected habitats, required protection measures are prescribed.

Wildlife habitat – Any natural environment in which a species or group of species lives; those of particular concern are areas managed or protected by provincial or federal legislation.

Herbicides used in the vegetation management program have no known unreasonable adverse effects on fish and wildlife when applied according to the product label.

When power line corridors are converted to a stable low-growing plant community, it provides potential habitat for wildlife including ungulates and nesting birds. However, removal of tall-growing vegetation may result in the loss of habitat for some species that require mature forested areas.

Wildlife and habitat are protected as follows:

- Identify and protect wildlife trees.
- Leave a diversity of low-growing shrubs and plants that can be browsed by wildlife or used for habitat, including along the edges of ROWs.
- Do not use herbicides in or around known mineral licks.
- Ensure that herbicide use is directed only at target vegetation.
- Keep animal trails open and clear of cut brush.
- Do not disturb inhabited raptor and heron nests.
- Minimize soil erosion caused by vegetation management activities to reduce impact on desirable plants or wildlife.
- Control noxious weeds (as designated under the *Weed Control Act).*
- Take precautions to avoid the use of herbicides over vertebrate wildlife or domestic animals that are visible to the applicator.

Protecting Pollinators

- In general, herbicides are *NOT* harmful to honeybees and other pollinating insects when applied according to label instructions. BC Hydro does not use any neonicotinoid pesticides in its vegetation management activities.
- Herbicides are often applied to vegetation that is not a forage source of honeybees, wild bees, and pollinators and/or spraying is taking place outside the blooming period.
- Most tree species controlled by BC Hydro are wind pollinated (e.g. alder, aspen, birch, cottonwood, willow), not insect pollinated (e.g. arbutus, cherry, some maple species).
- In cases where bee forage plants are sprayed, the herbicide(s) most often have a repellency effect on foraging bees.
- Within a short time after spraying, the plants will be affected, and wilting and discoloration will quickly deter foraging bees to visit.
- Most herbicides are liquid sprays that will cause rapid absorption and evaporation. Wettable Powders (WP) may pose a risk when bees are tempted to collect the powdery residue of the pesticides left on the foliage and flowers, but these formulations are not commonly used by BC Hydro.

Preventing Contamination of Food, Section 58(3)(b)(iii)

58 (3) A pest management plan prepared for the purpose of section 7 (1) (a) of the Act must include the following operational information:

(b) a description of the environmental protection strategies and procedures that will be followed under the plan, including a description of the following strategies and procedures:

(iii) strategies to prevent pesticide contamination of food intended for human consumption;

In general, food plants and medicinal plants are low-growing shrubs and herbaceous plants that are compatible with power line safety and reliability. The establishment of these species is encouraged, and they are not actively controlled. However, tall-growing species and other vegetation that might interfere with power lines must be controlled regardless of their use by people.

Public notification of herbicide treatments is posted at the treatment area according to the IPMR, Section 64. BC Hydro will also notify landowners or users who have previously requested such notification. These measures help ensure that people can recognize an area that has recently been treated and can avoid inadvertently gathering food in the vicinity until the appropriate wait time noted on the posting has passed.

Areas used to collect food and medicinal plants are mapped where BC Hydro is notified of their ongoing use, and these interests are considered when planning vegetation management work.

BC Hydro may apply herbicides to areas used for agricultural crop production.

In the vicinity of certified organic farms, the grower is responsible for maintaining an 8m buffer zone between their organic crops and adjacent non-organic crops or as recommended by the Certified Organic Associations of British Columbia, CAN/CGSB-32.310-2020 5.2. During the pre-treatment planning, identified organic farms are contacted to ensure they are aware of required buffer zones.