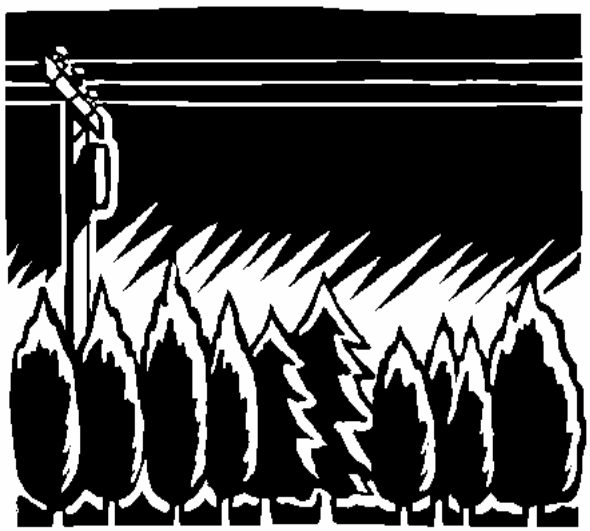
# Integrated Vegetation Management Plan

## For Control of Vegetation within Transmission Rights-of-way

# 797-0004-2005/2010



British Columbia Transmission CORPORATION™

**Issued: July 2005**
**Revised: April 2008**

BC Transmission Corporation
Vegetation Management Department
POB 49260, 4 Bentall Centre
Suite 1100, 1055 Dunsmuir Street
Vancouver, BC
V7X 1V5

**Acknowledgements / Signing Authority:**

This document was produced and reviewed by the
**BCTC Vegetation Management Department:**

Gwen Shrimpton (chair) _____
Telephone: 604-699-7409 *signature*

Tom Wells _____
*signature*

Kevin Dalgarno _____
*signature*

Ray Read _____
*signature*

Michael Verschoor _____
*signature*

Mike Guite _____
*signature*

**Technical writer:**
Joyce Arthur, Duncan Kent & Associates Ltd., Vancouver

# Table of Contents

British Columbia Transmission CORPORATION™

# Chapter 1, Introduction

## About BCTC

This document is an **Integrated Vegetation Management Plan** for the management of vegetation on transmission line rights-of-way (ROWs) operated by the British Columbia Transmission Corporation (BCTC). It has been prepared in accordance with Section 58 of the Ministry of Environment's *Integrated Pest Management Regulation.*

BCTC is a Crown corporation that began operations in August 2003. It is an independent electric transmission company and is accountable for the operations, maintenance, and planning of BC Hydro's high-voltage electric transmission system. BC Hydro continues to own the transmission assets, while BCTC manages these assets on behalf of BC Hydro. These assets include:

- all transmission lines 60kV and up
- all structures, equipment, switching facilities, substation facilities, and telecommunications facilities used in connection with this transmission
- right-of-way permits, licenses, and agreements relating to any of these assets

## Integrated Vegetation Management

This *Integrated Vegetation Management Plan for Transmission Rights-of-way* (IVMP) is a **Pest Management Plan** that describes:

- the program for controlling vegetation along transmission rights-of-way (ROWs), using the principles of integrated resource management and 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 IVMP is intended to be used by BCTC and its agents and contractors to carry out vegetation management work on all transmission ROWs managed by BCTC.

British Columbia Transmission CORPORATION™

## *Definitions*

**Integrated pest management (IPM)** means a process for managing pest populations that includes the following elements:

(a) planning and managing ecosystems to prevent organisms from becoming pests

(b) identifying pest problems and potential pest problems

(c) monitoring populations of pests and beneficial organisms, damage caused by pests and environmental conditions

(d) using injury thresholds in making treatment decisions

(e) suppressing pest populations to acceptable levels using strategies based on considerations of:

(i) biological, physical, cultural, mechanical, behavioural and chemical controls in appropriate combinations

(ii) environmental and human health protection

(f) evaluating the effectiveness of pest management treatments

**Integrated resource management** (IRM) is a land management technique that identifies and takes into account all resource values (i.e., wildlife, fisheries, environmental) along with social, cultural, economic, and safety needs. The purpose is to maintain biodiversity, a sustainable environment, and a diversified resource base, while still undertaking effective vegetation management.

A **Pest** is any undesirable organism that must be controlled to ensure the safety and integrity of operating systems. For BCTC transmission rights-of-way, this means primarily tall-growing trees that would grow past safe clearance limits or hazard trees that could fall onto the transmission lines from the edges of the right-of-way.

A **hazard tree** is a tree that is defective, has an imminent potential to fail, and is likely to hit or damage a person or target (BCTC line or electrical equipment) when it falls. A **danger** tree is a tree close to powerlines, which is tall enough, or will be tall enough within five years, that it could pose a danger to the lines if it fails.

A **noxious weed** is a plant that negatively interferes with management objectives for particular areas of land at particular times, for example, weeds that pose a threat to farm crops or animals. Noxious weeds in BC are designated as such under the *Weed Control Regulation*.

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

## *Goals of Vegetation Management*

BCTC controls tall-growing vegetation because of a zero tolerance policy for outages caused by trees growing into lines. BCTC's policy is to effectively and safely manage the risk of such outages. BCTC also works to minimize the risk of outages caused by hazard and danger trees falling onto the lines.

The specific goals of vegetation management on transmission ROWs are to:

- minimize public and worker safety hazards
- reduce the number of outages due to vegetation sources
- reduce the risk of fires caused by trees contacting the lines
- allow access and lines of sight for maintenance

The program also strives to:

- encourage a stable, low-growing plant community
- use leading edge techniques and practices
- respect agreements with the public, landowners, and other stakeholders
- ensure First Nations' traditional rights are respected
- comply with all government regulations and corporate policies
- selectively control only undesirable (target) species
- encourage other compatible uses of ROWs such as agriculture
- enhance biodiversity

## *Site Objectives*

The overall objective of managing vegetation is to replace a tall-growing plant community with a low-growing one that will not contact the powerlines. There are four main ways of managing the ROW to achieve this goal:

**Low-growing stable plant community** — Wherever possible, control methods will target only tall-growing vegetation and encourage or introduce desirable low-growing species, particularly shrubs and indigenous plants that are naturally present on the site, in order to suppress tall-growing species.

**Compatible use** — ROWs are used for activities that will not conflict with transmission lines and that control or prevent the growth of tall trees, such as recreational or agricultural uses.

**No clearing required** — Areas not cleared are 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 to transmission lines.

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

## Identifying Information, Section 58(1)

This IVMP applies to all BCTC-managed transmission lines in BC. A transmission line carries high-voltage electricity (69kV to 500kV) over long distances from generating plants (mostly hydroelectric dams) and delivers it to substations, where the voltage is reduced for delivery to customers over distribution lines.

For operational purposes, BCTC divides the province into four regions: Lower Mainland, Vancouver Island, Southern Interior, and Northern Interior. Each of these regions has differing characteristics and needs.

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

The person responsible for administering the IVMP is Gwen Shrimpton, Manager Vegetation/Pest Management, who is the principal contact for information relating to the plan.

**Contacts**

| | | |
|---|---|---|
| Provincial | Gwen Shrimpton | 604-699-7409 |
| Provincial | Tom Wells | 604-699-7406 |
| Lower Mainland | Mike Guite | 604-699-7413 |
| Vancouver Island | Ray Read | 250-755-4741 |
| North | Michael Verschoor | 250-963-5739 |
| Interior | Kevin Dalgarno | 250-549-8549 |

## *Geographic Boundaries, Section 58(1)(a)*

BCTC manages about 75,000 hectares of land throughout BC, upon which run over 18,000 kilometres of transmission lines. The legal widths of transmission rights-of-way vary from 10 metres to about 300 metres. Individual transmission lines vary in length from 1 metre to 500 kilometres.

British Columbia Transmission CORPORATION™

### Areas Covered By This Plan

This IVMP covers vegetation management, including the use of herbicides, within the boundaries of legal rights-of-way (ROWs).

It also covers facilities associated with the ROWs, such as:

- helicopter landing pads
- the base of towers and other electrical structures
- equipment storage sheds
- access roads leading to the ROW or other facilities that BCTC manages
- highway easements
- the base of woodpole structures

It also covers areas outside rights-of-way where:

- BC Hydro transmission structures and equipment are located
- BCTC is allowed to manage as per Section 20 of the *BC Hydro & Power Authority Act*
- BCTC is allowed to manage as per right-of-way agreements with BC Hydro

This IVMP also covers the treatment of noxious weeds and invasive plants on all ROWs and areas listed above.

This plan does **not** cover herbicide use at sites managed by BC Hydro's Generation or Distribution lines of business. These areas of responsibility have their own PMPs.

See this provincial map of the BCTC-managed transmission system.

British Columbia Transmission CORPORATION™

# Chapter 2, Elements of Integrated Pest Management

This chapter describes BCTC's Integrated Vegetation Management Program, as per Section 58 of the provincial *Integrated Pest Management Act* (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)
- injury thresholds — Section 58(2)(d)
- pest treatment options — Section 58(2)(e)
- evaluation program — Section 58(2)(f)

## Prevention, Section 58(2)(a)

Prevention means stopping target vegetation from becoming established, as opposed to treating existing vegetation. Target vegetation is any plant capable of falling or growing into the conductors, causing a power outage.

BCTC's vegetation management program is preventive in nature because the main goal is to establish a stable, low-growing plant community, which will outcompete tall-growing trees.

Preventive measures that BCTC uses on ROWs include:

- natural controls, primarily the establishment of a stable, low-growing plant community that out-competes taller growing species
- good site preparation in the design stage, such as seeding programs to reduce germination of target vegetation
- compatible uses, such as agricultural crops, golf courses, or industrial uses
- non-vegetation techniques to provide more clearance, such as physical re-contouring of the land, and raising conductor heights to avoid contact with vegetation

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

The primary target vegetation to be controlled on transmission ROWs is deciduous and coniferous trees that have the potential to reach or exceed the limits of approach to the line (see page 11 for information on limits of approach). Most other vegetation can remain to improve ROW biodiversity and to out-compete target vegetation.

### *Primary Target Vegetation*

Target vegetation includes any tree that may reach or exceed the limits of approach to transmission line conductors. A physical and/or chemical treatment method will be used to control such trees, but herbicides are used primarily on deciduous tree species and invasive weed species.

The following species represent the majority of target trees growing along the BCTC-managed transmission system. Species will vary by region.

**Table 1: Target Species Along Transmission Lines**

| 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.* |
| Larch | *Larix spp.* |
| **Deciduous** | |
| Alder | *Alnus spp.* |
| Birch | *Betula spp.* |
| Aspen | *Populus tremuloides* |
| Poplar | *Populus spp.* |
| Maple | *Acer spp.* |
| Cherry | *Prunus spp.* |
| Willow | *Salix spp.* |
| Arbutus | *Arbutus menziesii* |

BCTC also controls noxious or invasive plant species as part of the corporate commitment to the Provincial Invasive Plant Strategy, and to meet the requirements of regional weed control committees and the *Weed Control Act*. In addition, thorny bushes, vines, and any other plant will be controlled that could interfere with access to and maintenance of transmission towers and structures.

## Monitoring Program, Section 58(2)(c)

BCTC has established a biophysical inventory project to collect, record, analyze, and monitor the current state of the ROW vegetation. This information will be used to monitor the effectiveness of vegetation management. 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.

Information identified and collected during the biophysical inventory will include:

- Administrative Management Units
- streams and other bodies of water, and their characteristics
- vegetation communities — biogeoclimactic zone, species density, percent coverage, growth rates, species composition, presence of noxious weeds, presence of threatened or endangered plants
- conductor to ground clearances, including unusual terrain features
- amount of slash (vegetative debris) present that might pose a fire risk
- access information — bridges, culverts, fords, helipads, gates, roads
- heritage information — archaeological sites, First Nations traditional uses
- secondary use — agriculture, rangeland, recreation, berry picking, buildings and structures, underground features
- wildlife habitat

All data collected will be entered into a comprehensive database called Powergrid, which contains information related to vegetation management on rights-of-way, including treatment history, patrol and inventory information, site maps, prescriptions, environmental and consultation issues, landowner agreements, contracts, and so on.

### *Monitoring Method, Section 58(2)(c)(i)*

The main monitoring method consists of aerial or ground patrols. Right-of-way patrols gather information within each Administrative Management Unit on a transmission line. (An **Administrative Management Unit** is a defined area within a right-of-way that has relatively uniform characteristics and can be managed with the same long-term site objectives. This allows BCTC to follow the vegetation inventory, control method costs, and evaluate the efficacy of treatments on each specific AMU over the long term.)

Once patrol information is collected, it is used to identify deficiencies, verify the need for treatment, and verify the location and timing of treatments.

### *Frequency of Patrols, Section 58(2)(c)(ii)*

BCTC has designated patrol frequencies for every circuit in BC, and works with field personnel to schedule patrols.

The frequency and timing of patrols depends on the type of management site, e.g., for low-clearance, high-growth sites requiring intensive vegetation

control, frequent patrols over a calendar year may be required to monitor the presence and development stage of target vegetation. In contrast, for high clearance or recently managed areas, one spring patrol a year may be sufficient. Any outages or knowledge of poor conditions may also require additional patrols to identify and mitigate risk.

### Line Security Rating

Frequency of patrols also depends on the transmission line security rating, which ranges from "low" to "very high." The "very high" rating in Table 2 includes lines rated at 500kV or more, which require several patrols per year because outages cannot be tolerated. The "low" rating denotes a line where there is a potential but non-urgent issue.

**Table 2: Circuit Security Ratings for Vegetation Management**

| Line Security Rating | N — Very High | A — High | B — Medium | C — Low |
|---|---|---|---|---|
| **Outages Tolerated** | None | Momentary (Recloses) | < Four hours | > Four hours |
| **Vegetation Management Strategy** | No grow-ins.<br>No trees capable of falling within flashover distance. | No grow-ins.<br>Falling tree could brush against line.<br>Momentary outage acceptable, with no line damage. | No grow-ins.<br>Falling tree remains on line.<br>Switching allows restoration within four hours. | No grow-ins.<br>Falling tree remains on line.<br>Switching cannot be undertaken within four hours. |
| **Comments** | Requires creation of danger tree strip where all trees are removed. | Selected danger tree removal needed to maintain A rating. | No difference between B & C; it's a function of restoration (switching) time. | No difference between B & C, it's a function of restoration (switching) time. |

In addition to regular patrols, special patrols will be done whenever there is a transmission circuit outage. Patrols may be conducted by air or ground.

### Spring Patrols

The spring patrol occurs between March and June each year. The purpose is to verify and collect information to plan the coming year's vegetation management programs, and to refine work plans.

### Fall Patrols

The fall patrol, if needed, occurs between September and December each year. It provides an update of site conditions after the summer's vegetation management program. It is also used to develop the annual plan for the upcoming year.

***Patrol Information Collected,***
***Section 58(2)(c)(iii)***

Types of information that should be recorded on patrols:

- verification that previous identified work has been completed
- evidence of vegetation contacting conductors (burn marks on trees or conductor)
- tree heights and proximity to limits of approach
- out-of-compliance clearances (according to limits of approach)
- imminent threats, i.e., dead, dying, and leaning trees, and root rot pockets (on the ROW and along the edge)
- condition of off-ROW danger tree strip
- narrowing of ROW edge, if any
- the estimated current density of target trees, expressed in percentage cover of the site
- relative densities of target versus compatible species in order to determine the appropriate work method
- unusual terrain features, such as topographical features, eroded or erosion-prone areas, bare-ground areas, and terrain hazards such as large rocks and stumps
- special conditions, such as compatible land use issues, property encroachments, and other concerns
- the environmental conditions and features of the treatment area, such as riparian issues, wildlife issues, and other environmental concerns
- damage to structures and lines
- road access conditions, including gates, locks, road surface, culvert conditions, etc.

---

## Injury Thresholds,
**Section 58(2)(d)**

An injury threshold (also called an action threshold or hazard level) is the point at which vegetation control becomes necessary, in order to minimize the risk of outages and optimize safety.

Tall-growing trees that have the potential to reach or exceed the limits of approach to the line will be controlled.

***How Injury Thresholds are Chosen,***
***Section 58(2)(d)(i)***

**Clearance Requirements**

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

- limits of approach
- maximum conductor sag
- mature vegetation height
- unusual terrain features that may result in a low conductor to ground clearance

- maximum conductor swing

### Limits of Approach

For vegetation management on ROWs, the limits of approach are the primary determinant of the injury threshold. This refers to the distance a person, machine, or conductive material (such as a tree) can be in relation to the energized conductors based on the circuit rating, flashover distance (when an arc of electricity jumps from a conductor to a nearby tree), and other attributes, such as conductor sag (where the line sags closer to the ground due to increased heat.)

Table 3 shows the limits of approach for tree clearing on transmission lines.

### Table 3: Limits of Approach

| | Limits of Approach | | | | | |
|---|---|---|---|---|---|---|
| **Nominal Voltage** | **69kV** | **138kV** | **230kV** | **287kV** | **345kV** | **500kV** |
| Absolute clearance requirements, minimum conductor to vegetation clearance | 3.0m | 4.5m | 4.5m | 6.0m | 6.0m | 6.0m |

***How Injury Thresholds are Applied,***
***Section 58(2)(d)(ii)***

The limits of approach are the primary consideration for vegetation management work on the right-of-way. However, work must also be practical, efficient, cost-effective, safe, and have minimal impact on the environment.

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

### Vegetation Management Cycles

Vegetation management is conducted on a cyclical schedule. Maintenance cycles are determined for each area to be treated under a contract, and optimized within the Administrative Management Units (AMUs) to ensure appropriate and timely treatment.

In a cyclic control program, the total area is divided into yearly allotments, i.e., blocks, or contracts that are identified with AMUs on Powergrid (a database application that records detailed information on BCTC's transmission lines and vegetation management program). BCTC calculates vegetation management cycles for AMUs and field personnel implement them.

Control cycles are determined using vegetation growth rates, person-hours required, and related costs. 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.

**Timing of Treatment**

A number of factors will help determine the timing of the treatment for optimal control, including:

- stem height
- stem diameter at breast height (DBH)
- number of stems
- growth rate
- cost of treatment
- whether stems are merchantable or non-merchantable timber
- hazard rating of specific trees
- fuel loading rating
- temperature

### *Other Threshold Criteria*

BCTC will control any invasive weed or vegetation that could interfere with its other objectives for ROW vegetation management, primarily public or worker safety, prevention of fires, and access to the lines and structures for maintenance.

Within 300m of forested and grassland areas, Section 10 of the provincial *Wildfire Regulation* requires BCTC to maintain ROWs in a manner that prevents any fire from spreading.

In urban areas, aesthetics is also a major objective and might preclude the presence of any vegetation except grass, shrubs, and low-growing ornamental species.

Weeds and trees also need to be controlled along access roads and helicopter landing pads adjacent to remote transmission lines, to ensure safe access and driving. Tree limbs must not hang down into the access road or landing pad, and all debris around roads and landing pads will be removed. Vegetation around the base of woodpole structures will be controlled to minimize the risk of fire.

## Pest Treatment Options, Section 58(2)(e)

This section describes the various manual and mechanical vegetation management techniques that BCTC uses on transmission ROWs. It covers:

- description of the technique
- selection criteria for techniques
- benefits and limitations of the technique

- decision-making process for all treatment methods, including flowchart

BCTC will use the following manual and mechanical methods for this IVMP:

- slashing
- mowing
- girdling
- grooming
- pruning

### *Slashing*

Slashing (also called brushing) is the removal by hand tools of individual stems that will eventually grow into transmission lines. Tall-growing tree species are cut down within a few inches of the ground line.

Slashing is the most commonly used manual vegetation management technique on transmission lines, and is sometimes combined with the herbicide cut-surface method. Tools used include chainsaws or circular brush saws.

Generally, slashing is carried out at the specific time of year when the target vegetation is more likely to die after being cut. Slashing is usually directed only to target species, preserving the maximum amount of low-growing species. In addition, a tall slash/girdle method may be used, which involves cutting taller trees at a higher height, then girdling the stem to prevent resprouting.

#### Selection Criteria for Slashing

Slashing is the preferred method in the following situations:

- in areas with a well-established low-growing plant community
- in combination with mowing
- in difficult terrain with limited machine access, e.g., around guy wires, steep slopes, and riparian areas
- when environmental concerns have a high priority

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

Slashing is **not** preferred in the following circumstances:

- for densities between 5,000 and 10,000 conifer stems and 10,000 to 20,000 deciduous stems per hectare
- stands of target trees over 4m in height because of unacceptable levels of debris

- areas where mowing is a suitable alternative
- areas with high aesthetic concerns
- areas with a high fire risk
- areas where slashing would leave debris levels that violate BCTC's fuel management standard or the *Wildfire Act*

**Benefits of Slashing**

- Slashing allows the immediate removal of target vegetation, with complete retention of low-growing compatible species.
- Conifer trees cut below the lowest branch are permanently controlled.
- Slashing allows spot treatment with herbicides to prevent stumps from resprouting.
- Slashing 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.
- Slashing is beneficial in areas where target vegetation is widely scattered.

**Limitations of Slashing**

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

### *Mowing*

Mowing is the cutting of target vegetation with wheel or track-mounted heavy-duty rotary or flail cutters. A heavy-duty tractor or excavator is equipped with the cutting head and driven over the ROW to cut target vegetation. This method is primarily used for transmission lines in conifer-prone areas and to reduce high-density deciduous areas.

### Selection Criteria for Mowing

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

- with a density over 20,000 deciduous stems per hectare
- with a density over 10,000 coniferous stems per hectare
- with target trees over 4m in height (to reduce slashing debris)
- where other techniques would leave debris levels that violate BCTC's fuel management standard or the *Wildfire Act*
- identified as high-use feeding areas for ungulates such as moose and elk (cutting blades are 0.6–1m from the ground to increase forage height)

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

- on target trees with a DBH over 20cm (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 a dense understory of low-growing compatible species and high stem densities of target vegetation (an excavator machine should be used)
- in areas with rocks that can cause excessive damage to cutting heads (unless an excavator with an articulating mower is used)
- in areas that are developed or have high public use because of the risk of flying debris
- in areas with stumps that create accessibility problems
- in boggy areas where the machine will not operate properly
- on slopes that create a worker hazard
- in riparian areas

### Benefits of Mowing

- Mowing mulches the vegetation into smaller pieces that readily biodegrade, which reduces fuel loading fire hazards.

- Mowing is seasonally effective, inhibiting growth from spring through late summer. This is important in areas where herbicide follow-up treatment is not possible.

- In areas where fast-regenerating ground covers are plentiful, resprouting of unwanted vegetation is suppressed.

- In non-selective mowing (Hydro-axe or Kershaw), all vegetation is cut to ground, leaving a level ROW and facilitating future herbicide applications that use mechanical delivery systems.

- In mowing directed only towards target vegetation (hydraulic excavator, rotary disc, or flail), the ROW retains biodiversity and existing low ground cover.
- Target vegetation can be removed faster and more economically than other methods.
- Work progress and workmanship are clearly visible.
- Using heavy equipment is generally less hazardous to the operator than using hand-held equipment.

**Limitations of Mowing**

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

### *Girdling*

Girdling (also called frilling) involves cutting one or more strips of bark from around the entire tree trunk with a special girdling tool or other hand tool. The bark strips are removed along with other tissue down to the sapwood. This procedure is usually limited to single-stemmed, deciduous trees on transmission lines, 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.

**Selection Criteria for Girdling**

- Girdling is most often used in riparian areas or other environmentally-sensitive sites.
- Girdling is generally only used on trees with a DBH over 5cm. Trees of lesser diameter may break at the girdle, causing the tree to resprout.
- Girdling is not acceptable in areas where the target vegetation will reach limits of approach within two growing seasons, unless the tall slashing and girdling technique is used.
- Girdling should not be used for stem densities of over 15,000 stems per hectare because it is not practical, effective, or cost-effective. Also, the amount of standing dead stems may create a fire hazard.
- Girdling is not acceptable in situations where tree failure could lead to worker or public injury or property damage. In these cases, girdling may only be done via the tall slashing and girdling method.
- Conifers are never girdled unless they are part of a riparian prescription.
- Girdling is effective on alder, birch, and willow species. Girdling is not as effective on northern black cottonwood and aspen poplar under 15cm DBH because of prolific resprouting.
- On maple species, girdling is not used on coppices of more than five stems, or where the root collar is over half a metre in size.

**Benefits of Girdling**

- Girdling promotes retention of vegetation cover and increased site stability due to root structure retention.
- Girdling has greater public acceptance than herbicide use.
- Girdling is not limited by difficult terrain.
- Girdling is flexible, because individual stems and species can be removed or left on a tree-by-tree basis.
- 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 coniferous and other 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 will be required to remove the branches.
- The dead trees remain standing for 2–3 years, which may be objectionable in highly visible areas.
- The use of hand tools may be hazardous to workers.
- Blowdown of dead trees may pose a safety problem alongside well-travelled areas, or to workers re-entering the area.
- Workers must be experienced girdlers, since poor girdling results in resprouts or premature blowdown with resprouts.

### *Grooming*

Grooming is the mechanical grubbing and grading of the transmission ROW 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.

Grooming uses a combination of the following techniques:

- mowing
- machine-raking or brush-blading
- ploughing or discing
- rough grading / harrowing
- seeding and fertilizing

**Selection Criteria for Grooming**

Grooming is an acceptable method in the following situations:

- to clear land for economically viable and sustainable grazing or agriculture

- to recontour ROWs 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 municipal government agencies or private property owners
- to maintain road access

**Benefits of Grooming**

- Grooming clears the site completely of vegetation, 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 benefits the property owner by providing a better use of the land base, such as for pastureland.

- BCTC benefits because of the reduced ongoing maintenance required under the transmission lines.

- 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 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.

- Root-suckering species and resprouting species are not totally removed by bulldozing, thereby increasing multi-stemmed regeneration of unwanted species.

- Grooming leaves the area temporarily exposed to the elements, resulting in possible erosion.

***Pruning***

Pruning is the removal of branches or limbs in order to direct and control tree growth away from transmission 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 back to a stub, bud, or a lateral branch.

Pruning is the approved vegetation management method for areas where tree removal is not a readily acceptable option.

### Selection Criteria for Pruning

BCTC does not support pruning trees on transmission lines. Trees should be removed at ground level. However, pruning may be the best management technique in the following circumstances:

- where it is cost-effective compared to tree removal
- where there is significant public opposition to tree removal, and there is no legal right-of-way agreement
- where the main stem is not on the ROW, but branches encroach on the ROW
- where trees are required for wildlife habitat or to protect riparian areas
- where written agreements exist that require pruning on private land
- as a temporary measure until a written long-term agreement is in place

In general, 69kV and 138kV circuits are the only areas where the ROW is narrow enough that edge trees would require pruning to maintain clearances.

Tree removal or engineering changes to the overhead conductors will be carried out if pruning operations cannot provide both adequate clearance and healthy, aesthetically acceptable trees.

### Benefits of Pruning

- Pruning methods lengthen the control cycle and optimize desirable tree form.
- 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 and retains aesthetics, as opposed to a removed tree.

### Limitations of Pruning

- Pruning is usually costlier than removal because trees may need to be pruned repeatedly.
- Pruning requires a skilled, experienced operator. 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 transmission lines and have hazard potential, while removed trees do not.

- There is a risk of injury to workers from hand tools and from falling when pruning the tops of trees.

## Herbicide Methods

This section describes the various herbicide techniques that BCTC uses on transmission rights-of-way to control vegetation. It covers:

- description of the technique
- selection criteria for techniques
- benefits and limitations of the technique
- decision-making process for all treatment methods, including flowchart

BCTC will use the following herbicide methods for this IVMP:

- cut surface
- basal bark
- backpack foliar
- mechanized foliar
- injection
- aerial spot treatment

Types of herbicide application equipment that may be used include:

- backpack — hand-operated tank with pump worn on the back, with a hose attached to a spray wand, and a positive shut-off system
- mechanized foliar — boom, directed nozzle or wick sprayer mounted on an all-terrain vehicle
- helicopter — rotary wing aircraft
- powerhose — truck-mounted tank with hose and high-pressure nozzle and handgun
- wick / wipe-on tools — sponge or long-handled applicator stick containing herbicide
- squirt bottle — hand-held, non-pressurized container, may have a trigger pump sprayer
- injection tools — battery-powered drill or automatic lance used to inject capsules of herbicide into stems
- 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

The following herbicides will be used, according to the methods and application equipment in Table 4.

- clopyralid (C)
- dicamba (D)

- glyphosate (G)
- imazapyr (I)
- diuron (Du)
- chondostereum purpureum (Ch)
- picloram (P)
- triclopyr (T)
- 2,4-D (2)

2,4-D will only be used when formulated with picloram as 'Tordon 101' for control of noxious weeds.

**Table 4: Herbicide Method and Equipment**

| Equipment | Application Method | | | | |
|---|---|---|---|---|---|
| | Cut Surface | Basal | Foliar | Injection | Aerial |
| Backpack (high pressure) | | | **C D Du G P T 2** | | |
| Backpack (low pressure) | **D G I Ch T** | **T** | | | |
| Mechanized | | | **C D Du G P T 2** | | |
| Helicopter | | | | | **G** |
| Powerhose | | | **C D Du G P T 2** | | |
| Wick / wipe-on | **D G T** | | **G D** | | |
| Squirt bottle | **D G Ch** | | | | |
| Injection tools | | | | **G** | |
| Brush bar with herbicide | **D G I T** | | | | |

### *Reasons for Herbicide Use*

The careful, limited use of herbicides is an important part of vegetation management on BCTC rights-of-way (ROWs). Herbicides are often the only effective means of control within ROWs, for safety reasons and to prevent power outages.

An integrated vegetation management program that combines physical techniques with site-specific follow-up use of herbicides is often the most effective way to establish a stable, low-growing plant community. Herbicides are used primarily on deciduous trees, because they are fast-growing and quick to resprout, compared to conifers. When conifers are cut below the lowest branch, they will die.

Physical techniques used alone do not effectively control deciduous vegetation over the long-term. Trees such as alder, birch, aspen, and maple resprout from cut stumps, resulting in dense stands of tall-growing trees after repeated mowing or slashing. Follow-up use of herbicides prevents this resprouting, and effectively helps achieve the site objective of a stable, low-growing, biologically-diverse plant community. Once this site conversion is complete, it requires minimal maintenance, which reduces disruption to the natural environment over the long term, and helps reduce herbicide use over time.

Other reasons for using herbicides include:

- Most herbicide applications on ROWs are very target-specific and completed with hand-held sprayers, while physical techniques often use heavy machinery that is more likely to damage non-target vegetation.
- The risk of accident and injury among workers is far greater when using physical means of controlling vegetation than when applying herbicides.
- Some physical techniques such as mowing facilitate soil erosion, as well as removal of more non-target vegetation than herbicides. Soil erosion negatively impacts fish-bearing bodies of water.
- Studies indicate that herbicide-managed sites can have a greater volume of wildlife forage compared to mowed sites. Herbicide use reduces aesthetic concerns and fire hazards caused by slash build-up.

### *Cut Surface*

This method (also called cut-and-treat) is used in conjunction with slashing 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 resprouting.

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

The herbicide of choice is triclopyr. Glyphosate is preferred in environmentally-sensitive areas, and imazapyr on dense clumps of hard-to-control species such as bigleaf maple.

**Selection Criteria for Cut Surface Treatment**

- The cut surface treatment is used in areas where basal bark treatment is not optimal, such as where the tree must be removed for aesthetic reasons (e.g., alongside roadways), in low conductor-to-ground situations, or where standing dead trees are not desirable. It may not be suitable for urban areas.

- It is a very labour-intensive method and is not cost-effective for dense stands.
- 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.
- It is highly targeted to allow desirable plant species to inhibit the recurrence of target vegetation by competing for water, light, and nutrients.
- There is minimal risk of herbicide exposure to workers or the public due to the directed nature of the treatment.
- Herbicide is limited to the stump surface, resulting in minimal impact on fish, wildlife, or the environment.
- It removes the canopy, but increases low-growing forage for wildlife.

**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.

### *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 resprouting. 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 deciduous trees between 0.5m and 4.0m in height, and less than 15cm DBH.
- Basal treatment is best used on tree densities of 6,000 to 10,000 stems per hectare, where most stems are at least 5cm DBH.

- At stem densities of over 15,000 stems per the 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 slashing 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.
- It is species-specific so 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.

**Limitations of Basal Bark**

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

***Backpack Foliar***

Backpack foliar treatment sprays herbicides onto the foliage of individual trees or small clusters of trees, 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.
- If target vegetation is below 1.5m in height, it allows for better coverage, and will reduce the potential for operators to overreach.
- It is often used to treat resprouts 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 resprouts of high-density target vegetation.
- It targets specific vegetation, with adjustable application rates and dosages.

**Limitations of Backpack Foliar**

- Buffer zones may be required to protect pesticide-free zones (see page 40), depending on wind direction and topography.
- The recommended spray height is 1.5m.
- Caution must be exercised to avoid spraying 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 or 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. This method often uses a Radiarc nozzle.

**Selection Criteria for Mechanized Foliar Treatment**

- This method is optimally used on areas that have been previously mowed or hand-slashed to reduce resprouts.
- It is often used to treat resprouts one to two years after the area has been mowed or slashed.
- 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 resprouts of high-density target vegetation.
- It targets specific vegetation, with adjustable application rates and dosages.

- The Radiarc nozzle reduces the amount of herbicide used because well-defined droplets are produced, producing 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 pesticide-free zones (see page 40), depending on wind direction and topography.
- Caution must be exercised to avoid spraying 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.

### *Injection Treatment*

In this technique, a small capsule containing glyphosate is injected into the stem of the target tree or stump by means of a battery-powered drill or automatic loading lance. The herbicide is slowly released into the sapwood.

**Selection Criteria for Injection Treatment**

- Injection should be used when the cut surface method cannot be done immediately and there is no risk to line security.
- It is effective on resprouting stumps, provided the capsules are applied to live tissue.
- It is ideal along fence lines and in other tight quarters, and may also be a good choice around riparian areas.
- Trees greater than 20cm DBH are not effectively controlled by injection.

- 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 Treatment**

- Injection is highly targeted and effective on certain species, such as red alder.
- It is not limited by terrain.
- Injection 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.
- Injection virtually eliminates the possibility of environmental contamination because it is so directed (although shell casings may be left onsite).
- It removes the canopy, but increases low-growing forage for wildlife.

**Limitations of Injection Treatment**

- In highly visible areas, dead foliage of standing trees may be objectionable.
- Capsules are not bio-degradable.
- 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.
- Treatment results in reduced forage and cover in the short term.

### *Aerial Spot Treatment*

No aerial herbicide treatments will be carried out under this IVMP without written authorization from the Deputy Administrator of the *Integrated Pest Management Act* (Ministry of Environment).

Only glyphosate may be used for aerial treatments.

Equipment includes spray booms mounted on helicopters. Applications are generally made at heights of 3–10m above the tops of target vegetation, at 30–60km/h.

The pilot and a project supervisor will conduct a pre-treatment aerial inspection of the treatment site to ensure the pilot's familiarity with the target area and its boundaries. An experienced ground crew will be present during treatment to monitor drift and to inform the pilot of changing conditions or excess drift.

### When to Choose Aerial Spot Treatment

Aerial spraying may be done by BCTC on a very limited and targeted spot basis in remote areas where other methods are not practical. For example, aerial spraying may be the only effective and practical treatment method for a dense grove of trees along a transmission corridor in a wilderness area with no road access.

Aerial spraying will not be done on ROWs that are within 100m of any body of water.

### Benefits of Aerial Spot Treatment

- Efficacy of aerial spot treatments is generally high, but depends on species, timing, dosage, and density.
- A single aerial spot treatment can ensure effective vegetation management for 2–4 years.
- Target stands can be selectively treated in a short period of time, with minimal worker exposure to herbicides.
- It is the only cost-effective vegetation management method in remote areas with no road access.

### Limitations of Aerial Spot Treatment

- It is technically demanding, with stringent application constraints.
- Intensive preparation and follow-up is required.
- Aircraft safety and maneuverability are the main hazards.
- There is a risk of spray drift.

## Method Selection, Section 58(2)(e)(iv)

A decision-making process for choosing treatment methods ensures that the most suitable, effective, and cost-effective method or combination of methods is selected for an area to be treated, taking into account various assessment criteria.

Using these criteria, personnel will evaluate, select, and combine the methods that best suit the vegetation management site, whether manual and mechanical, herbicides, or both.

The overall objective for a site and the prescription will guide the choices (see page 3, *Site Objectives*). The best methods are those that will meet the ROW's long-term site objective. Treatments will be optimally timed for maximum efficacy, with consideration given to seasonal growing conditions, weather, and presence of animals or people.

### *Assessment Criteria*

The techniques chosen will be justified and evaluated against the following assessment criteria:

**Effectiveness and Timing**

- consequences of not treating or delaying treatment
- benefits vs. limitations of each method
- efficacy
- short vs. long term impacts
- urgency
- limits of approach, line security rating, and conductor sag
- timing
- potential fuel loading on ground (i.e., fire risk)

**Suitability for Site**

- site objective
- density of target stems
- stem height and DBH
- species (conifer/deciduous)
- terrain (slope, aspect, access)
- compatible and other land use
- condition of the target area and target vegetation

**Other**

- public and First Nations considerations
- safety and environmental considerations
- availability of tools and contractors
- scope of the work

- aesthetics
- cost

There are additional assessment criteria for herbicides. The most suitable herbicide for the job will be selected. For the application technique and equipment, the combination will be chosen that will least affect desirable vegetation in the treatment area, and which will minimize the amount of herbicide used.

### *External Communications*

When treating areas of Crown land with herbicide, BCTC will seek input from parties who may be significantly impacted, such as neighbours and government agencies. On private land and Indian Reserves, BCTC will obtain permission from the owner or manager of the land before treating with herbicides.

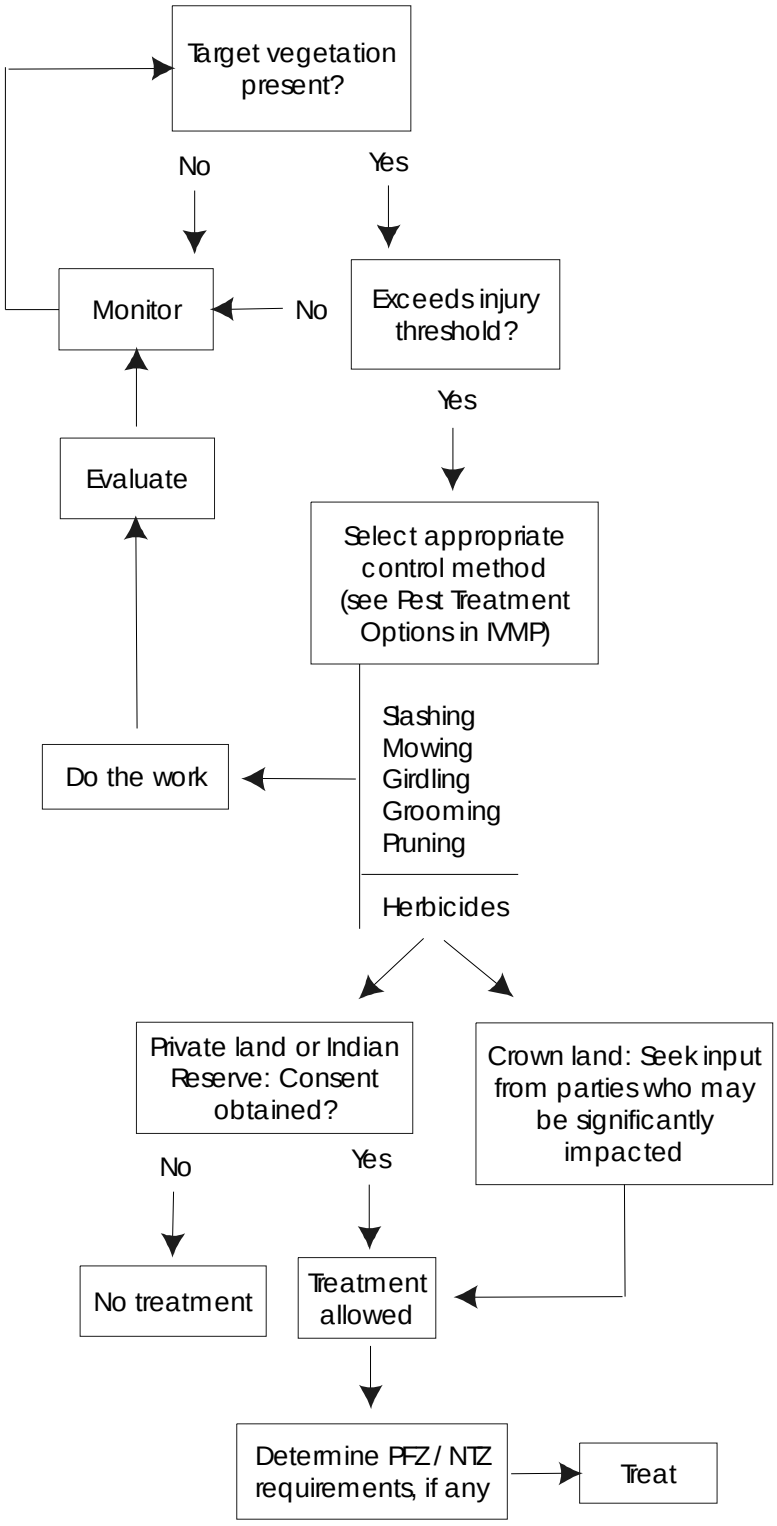
BCTC also generally notifies private landowners, parks boards, and other utilities when undertaking herbicide treatment on or adjacent to their land. Whenever notification is deemed necessary or prudent, it will be done before treatment begins, and will be in the form of personal letters or phone calls.

As per Section 64 of the *Integrated Pest Management Regulation*, notification signs will be posted on land being treated with herbicides. Signs will be clearly visible and legible from each approach to the treatment area used by the public. All approaches from highways must be posted. Signs may not be removed for at least 14 days after the herbicides have been applied. Records will be kept on how public notification was given and where notices were posted.

### *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 Tall-growing Species



## Evaluation of Herbicide Applications, Section 58(2)(f)

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

The purpose of evaluating vegetation management work is to:

- achieve site objectives
- evaluate and adjust work plans accordingly
- determine the success of treatment techniques
- ensure no negative environmental impacts occurred
- take corrective action where necessary

Evaluation of the site also adheres to Section 35(2) of the *Integrated Pest Management Regulation*, which requires that records of treatment results, effectiveness, and impacts be kept.

### *Evaluation Methods*

Visual evaluations are 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 will be evaluated, but not 100% of each treatment area.

Within two days of the application, the site will be inspected for accuracy of application, as follows:

- Cut surface – Look for marker dye on stumps.
- Basal – Look at the stem to ensure a proper wrap was made.
- Foliar – Check for coverage by looking for marker dye on foliage.
- Aerial – Check for coverage by looking for marker dye on foliage.
- Injection – Check the number and placement of capsules, drills, and plugs.

About 14 days after application, the site will be inspected to ensure that:

- Target vegetation was effectively controlled.
- Non-target vegetation was not affected.
- Herbicide treatment did not take place within pesticide-free zones (see page 40).

Within a year after application, the site will be evaluated for target mortality to ensure that program objectives were met.

### ***Data Collected***

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

# Chapter 3, Herbicide Use and Handling

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

- transportation — Section 58(3)(a)(i)
- storage — Section 58(3)(a)(ii)
- mixing and loading — Section 58(3)(a)(iii)
- application — Section 58(3)(a)(iii)
- disposal — Section 58(3)(a)(iv)
- spill response plan — Section 58(3)(a)(v)
- application equipment — Section 58(3)(b)(v)

## Responsibilities

To apply herbicides, personnel must possess a current BC Pest Control Service License. Applications will be performed or supervised by a Certified Pesticide Applicator as per the *Integrated Pest Management Regulation* (Section 46). The Certified Pesticide Applicator must:

- be in continuous attendance at the site while herbicides are being applied
- have proof of certification on hand
- supervise no more than four uncertified assistants at one time
- maintain continuous contact, auditory and/or visual, with the uncertified assistants
- be within 500m of persons being supervised
- have a detailed map or diagram showing the proposed treatment areas and areas that require a pesticide-free zone (Section 42(1) of the Regulation)
- comply with the standards set out in Division 7 of the Regulation, *Records and Reporting Requirements*

Certified applicators must also:

- inform personnel under their supervision of boundaries of the proposed treatment area, personal protection requirements, and procedures required to protect human health and the environment
- ensure that application equipment is in good working order and properly calibrated
- inspect the treatment area to ensure that regulatory requirements and standards can be met

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

Personnel will follow these instructions to transport herbicides:

- Follow all applicable provincial transport requirements set out in the *Transport of Dangerous Goods Act*.
- Ensure that the herbicide is properly secured during transport so that accidental discharge or unauthorized removal is prevented, and also to prevent contamination of anything transported with the herbicides that is intended for animal or human consumption
- Read and understand the product label and Material Safety Data Sheet outlining the transportation requirements for each regulated product used by BCTC.
- Keep in the vehicle a first aid kit, fire extinguisher, spill contingency plan, and spill contingency kit. Vehicle operators will be trained to handle spills.
- Inspect containers for defects prior to transport and fasten them securely in the vehicle.
- Adhere to the standards contained in BCTC's Pesticide Use Standards, which cover the safe use and handling of herbicides.
- Follow *Transport of Dangerous Goods Act* requirements for documentation, labels and markings, and placards.
- Follow *Integrated Pest Management Regulation* requirements (Sections 33(2) and 65).

---

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

Personnel will follow these instructions to store herbicides:

- 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.
- Keep herbicides in storage facilities that are locked when unattended, accessible only to authorized persons. Facilities must be clean, well-marked, and ventilated to the outside.
- Storage facilities may be permanent, temporary, or mobile. Building materials will be fire-resistant wherever possible.

- 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.
- Keep storage facilities separate from work and living areas, and away from anything intended for human or animal consumption, flammable materials, and bodies of water.
- Provide notice of the storage location to the fire department closest to that location.
- Keep a herbicide inventory log book, current product labels, Material Safety Data Sheets, and a copy of WCB's Occupational Health & Safety Regulation at the storage 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.
- Follow *Integrated Pest Management Regulation* requirements (Sections 33(1) and 66).

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

Personnel will follow these instructions to mix and load herbicides:

- Ensure that persons mixing or loading herbicides are Certified Pesticide Applicators, and will use proper protective equipment and clothing.
- Before mixing, read the product label and Material Safety Data Sheet, and follow all safety precautions.
- Ensure that emergency wash facilities, first aid equipment, spill kits, 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 pesticide-free zones for bodies of water, wells, and water intakes.
- When drawing water fram a waterbody or an irrigation system, maintain a gap between the herbicide and the equipment to prevent backflow.
- Do not wash or submerge in a body of water any container used to prepare, mix, or apply herbicides.

## Application Procedures, Section 58(3)(b)(iii)

Personnel will follow these instructions to apply herbicides:

- Use the most practical, suitable, target-specific application techniques, such as low-volume, low-pressure backpack or hand-held sprayers and wick applicators.
- State the herbicides to be used, application rates, timing, quantities, treatment area, and species to be controlled on the Daily Operations Records, and closely follow all specifications.
- Do not use foliar applications if the wind speed exceeds 8km/hr.
- Do not apply herbicides from a distance of more than 1.5m from a targeted plant. Apply selectively to specific targets only.
- Follow directions and restrictions on product labels and *Material Safety Data Sheets* for all herbicides.
- Do not spray herbicides if it is raining.
- Do not apply any herbicide within a pesticide-free zone, no treatment zone, or buffer zone (see page 40).
- Do not spray herbicides on foliage covered by ice or frost.

### *Personal Protective Equipment and Clothing*

Workers handling or applying herbicides will wear adequate personal protective clothing and use proper protective equipment.

Specific safety requirements will vary depending on the type of herbicide used and the method of application. Personnel will read the product label and *Material Safety Data Sheet* for the manufacturer's recommendations on protective equipment and clothing to be worn when using their product.

### *Re-entry Requirements*

To avoid contact with herbicides, personnel will respect the recommended restricted entry interval time before entering any sprayed area. These limits do **not** apply if personal protective equipment is worn.

In high-use areas where significant contact with treated areas is possible, users of the area must wait 48 hours before re-entering, unless there is precipitation. If there is precipitation, 24 hours is sufficient.

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

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 sprayed onto the treatment area.
- 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 containers so that they cannot be reused, then discard at an approved sanitary landfill.

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

If a 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*.

Clean up the site.

## Equipment Maintenance, Section 58(3)(b)(v)

Personnel will follow these instructions:

- Ensure that equipment used meets with the approval of BCTC and meets all applicable regulatory requirements.
- Calibrate application equipment at the beginning of the treatment contract to conform with the application rates on the pesticide label.
- Repeat calibrations after 25 hours of use with abrasive formulations (such as wettable powders), when another product is used, or if application rates are questionable.
- Keep a record for each piece of calibrated application equipment showing when it was calibrated and the supporting data.

- Ensure that tools and equipment are in good working order and are properly cared for and stored.
- Replace tools that are prone to failure, and carry spares.
- Implement a regular maintenance schedule on each piece of equipment.

# Chapter 4, Environmental Protection

This chapter covers the following, as per Section 58 of the *Integrated Pest Management Regulation* (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)
- boundary marking procedures — Section 58(3)(b)(iv)
- weather monitoring — Section 58(3)(b)(vi)

## Riparian Definitions

**Pesticide free zone (PFZ)** – an area of land that must not be treated with pesticides, and must be protected from pesticides moving onto it. PFZs are measured by the horizontal distance from the high water mark. PFZs will be flagged before starting any herbicide treatment.

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

**Body of water** – any watercourse or body of water, such as a stream, river, wetland, or lake, but not including a human-made, self-contained body or structure of 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.

**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.

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

Pesticide-free zones (PFZs) will be 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 will be noted and all PFZs will be flagged before any herbicide treatment takes place. See Table 5, Water Protection Table, on the next page.

### *Measures to Protect Community Watersheds*

The location of watersheds to be protected will be verified by checking the Community Watershed website of the Ministry of Sustainable Resource Management.

No herbicides will be mixed, loaded, or applied within:

- 10 metres of bodies of water within community watersheds
- 30 metres downslope of community watershed intakes
- 100 metres upslope of community watershed intakes

These pesticide-free zones will be measured and flagged in the field prior to treatment.

### *Measures to Protect Wells and Water Intakes*

The PFZs and NTZs set out in Table 5: Water Protection Table will be used to protect water supply intakes or wells used for domestic and agricultural purposes that are located on or adjacent to ROWs or corridors. Locations of registered wells and intakes will be verified by searching applicable government websites. Attempts to identify and located unregistered wells and water intakes will be made by:

- advertising in community newspapers
- identifying potential water users, such as private property owners or lessees, and asking them about intake and well locations (if occupant cannot be contacted, a pamphlet will be left)
- looking onsite for domestic or agricultural water use

BCTC will update information on the locations of both registered and unregistered wells and intakes when this IVMP is renewed in five years.

**Table 5: Water Protection Table**

| Section | Permitted Application | NTZ/PFZ | Exception |
|---|---|---|---|
| **Glyphosate 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) |
| 74(1)(c) Reg | Along or around a body of water if the body of water is:<br>• not fish-bearing at any time of the year<br>• 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:<br>• fish-bearing, or<br>• that drains directly into a fish-bearing body of water, or<br>• along or around a dry stream that when wet is fish-bearing or drains directly into a fish-bearing body of water | 5m PFZ | |
| 74(2) Reg | Up to the high water mark of a temporary free-standing body of water and dry stream, that is:<br>• not fish-bearing at any time of the year<br>• does not drain directly into a fish-bearing body of water | 0m NTZ | |
| **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 | 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 | |

## Protecting Fish, Wildlife, Habitat,
### Section 58(3)(b)(ii)

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

- identifying and mapping bodies of water through applicable sources of government data
- documenting bodies of water identified during field assessments in BCTC's mapping system
- classifying bodies of water as fish-bearing or non-fish-bearing (bodies of water that cannot be confirmed as fish-bearing will be managed as fish-bearing)
- managing fish-bearing bodies of water with appropriate pesticide-free zones and no treatment zones (see Table 5 above)

### *Measures to Protect Riparian Areas*

These general precautions will be followed when working around bodies of water:

- Applicators will adhere to the pesticide-free zones in Table 5 above.
- Treatment methods will be directed only to target vegetation. As much vegetation as possible will be retained around bodies of water.
- Low-growing shrub or grass species will only be removed to protect safe working clearances from transmission lines.
- Herbicide use will not remove vegetation that is needed to:
  - prevent erosion of a streambank
  - prevent debris that would cause an unreasonable adverse impact from entering the stream
  - maintain slope stability in areas where landslides have occurred
- Trees will be directionally felled away from stream banks and shorelines to maintain safe working clearances from transmission lines.
- No deleterious substances will be allowed to enter the watercourse, including fuels, debris, sawdust, or sediment.
- Tracks or tires from heavy equipment will not enter the riparian area unless provided for in the prescription.
- Equipment or vehicles will not be washed at a stream or along the shores of any body of water.
- No power equipment or vehicles will be 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 will be selected and used, at a location where adverse effects can be minimized and mitigated.

### *Wildlife and Habitat*

Information will be collected from the Conservation Data Centre on locations of rare and endangered species. Inventories of ROWs will be completed to identify areas of critical wildlife habitat. The provincial *Wildlife Act* and the federal *Species at Risk Act* will be adhered to.

Transmission ROWs are converted to a low-growing successional stage, which creates habitat for ungulates, ground-nesting birds, and other species.

However, removal of tall-growing species means the loss of habitat for some species.

Wildlife and habitat will be protected as follows:

- Control noxious weeds (as designated under the *Weed Control Act).*
- Identify and protect certified wildlife trees.
- Leave to grow a diversity of low-growing shrubs and plants 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.
- Do not aerial spray over visible vertebrate wildlife or domestic animals.
- 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.
- Identify sites where biological weed control organisms have been released, and prevent harm to those organisms.

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

In general, food plants and medicinal plants are low-growing shrubs and herbaceous plants that are compatible with transmission 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 transmission lines must be controlled regardless of their use by people.

Persons using the ROW to collect wild food or medicinal plants must notify BCTC. Areas with food and medicinal plants will be mapped, and these interests will be considered when planning vegetation management work.

Public notification of herbicide treatments will be posted at the treatment area according to the *Integrated Pest Management Regulation*, Section 64. BCTC will also notify landowners or users who have previously requested such notification. A Notice of Intent to treat will be sent to all First Nations communities near the treatment area. These measures will ensure that people understand the area has been treated and will not inadvertently gather food.

Herbicides will not be sprayed on areas used for agricultural crop production.

It is the responsibility of organic farmers to ensure an adequate buffer zone between their farm and an existing ROW.

## Boundary Marking Procedures, Section 58(3)(b)(iv)

To ensure that herbicide treatments do not stray to non-target areas, the boundaries of the treatment area will be visibly flagged before treatment begins. Personnel will be properly trained and have basic compassing and mapping skills.

Certain areas will be accurately delineated on the ground and clearly flagged or painted, including:

- boundaries of the full statutory ROW width, edge to edge
- the area to be treated (if different from above)
- riparian management areas
- pesticide-free zones
- hazard trees
- other sensitive areas, such as heritage sites

Personnel will follow these instructions:

- Measure and clearly mark the edges of the ROW with coloured flagging tape.
- Mark treatment boundaries within the ROW, and the boundaries of pesticide-free zones, no treatment zones, and buffer zones, using a different colour flagging tape for each if feasible.
- Ensure that flagging and paint is clearly visible **before**, **during**, and **after** completion of the vegetation management work.
- Leave boundary markers in place for 14 days after treatment.

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

Personnel will check the product label for guidelines for applying herbicides under various weather conditions.

Before applying herbicides, personnel will forecast and consider the effects of the following:

- precipitation
- wind (both speed and direction)
- air stability
- temperature
- ice or frost on foliage

### *Frequency of Monitoring*

Weather and weather forecasts will be carefully monitored at the beginning and on a daily basis throughout the treatment program. Information will be collected from Environment Canada and other official sources.

In addition, relevant information on typical weather conditions for the site will be gathered during vegetation inventories and included in the prescription.

### *Stop Work Conditions*

Herbicide treatments will be stopped (or not started) when any of the following conditions exist in the treatment area:

- ground wind velocity over 8km/h when undertaking broadcast or foliar applications
- temperatures over 30°C
- steady rain
- ice and frost
- overall conditions favour herbicide drift

When herbicide label restrictions are more limiting than the above conditions, the labels will take precedence.

### *Drift Monitoring Procedures*

Three factors contribute to drift: application techniques, weather conditions, and applicator error. The possibility of drift will be reduced through appropriate training and certification of workers, and by not conducting foliar applications in ground winds over 8km/h. Also, thickeners can be added to the herbicide to increase droplet size.

Spray drift will be monitored during aerial and foliar applications of herbicide using test cards or moisture-sensitive tape to help ensure the accuracy of buffer zone establishment, and the integrity of PFZs. Sufficient cards or tape will be used to ensure early detection of spray drift near bodies of water.