Integrated Pest Management Plan 2017-2022

For Forest Vegetation Management

British Columbia Timber Sales (BCTS)
Chinook Business Area
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This document is an updated version of BCTS Chinook Business Area's Pest Management Plan 2012-2017 prepared by Chris Nunn, RPF and Jim Jenson, RFT, with some sections being rewritten and other section, being kept intact.

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1. INTRODUCTION

1.1 BC Timber Sales and its Mandate

BC Timber Sales (BCTS) was founded in 2003 with a mandate to provide the cost and price benchmarks for timber harvested from public land in British Columbia. Through 12 Business Areas and an operational presence in 33 locations, BCTS manages some 20 percent of the provincial Crown allowable annual cut. The Chinook Business Area geographically encompasses the Chilliwack, Haida Gwaii, Sea to Sky and Sunshine Coast Natural Resources Districts.

BCTS is committed to the safety of all people affected by its operations – employees, contractors, licensees and the public as demonstrated by achievement of SAFE Company certification in August 2008. BCTS requires SAFE Company certification for all parties employing workers on Timber Sales Licences or bidding on contracts with BCTS.

BCTS is committed to sound forest management. This commitment to forest management excellence includes maintaining certification of an Environmental Management System in all Business Areas under the International Organization for Standardization (ISO 14001) and Sustainable Forest Management (SFM) certification over 100% of its operating areas. Under the BCTS Provincial Sustainable Forest Management Plan, BCTS commit to reforest blocks as soon as possible following harvest, which eliminates most of the vegetation management treatment needs for successful forest regeneration.

1.2 Pest Management Plan Legislation

The Integrated Pest Management Act (IPMA) and the Integrated Pest Management Regulation (IPMR) require pesticides to be used pursuant to the principles of Integrated Pest Management (IPM), which requires the development of a Pest Management Plan (PMP) and the use of pesticides in accordance with the terms and conditions of the PMP. Section 7 of the IPMA requires that certain vegetation management practices may be conducted under a comprehensive PMP.

For the purposes of Section 7(1)(a) of the IPMA, a PMP is a document that is prepared in accordance with Section 58 of the IPMR. It aims at promoting the use of Integrated Pest Management in the selection and use of pest control methods and preventing unreasonable adverse effects to human health and the environment from the use of pesticides.

1.3 Role of the BCTS Pest Management Plan

BCTS Chinook Business Area's PMP describes the integrated vegetation management process used by the Business Area in helping to achieve its basic silviculture obligation to re-establish a free growing stand of commercially valuable tree species following timber harvesting, while minimizing risks to people and the environment.

This PMP includes the following:

- Legal accountability with the provisions of the IPMA as well as all applicable federal, provincial and regional legislation;
- Adherence to higher level plans;
- Conformance with the requirements of Environmental Management (EMS) System and Sustainable Forestry Initiative (SFI) certification;
- The incorporation and use of the principles of IPM;
- Public awareness of BCTS Chinook Business Area vegetation management program; and
- The practices and approaches for vegetation management are planned and carried out in a manner that minimizes risks to the environment and human health.

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1.4 Term of the Pest Management Plan

The term of the plan is for 5 years from the date the Pesticide Use Notice is confirmed by the BC Ministry of Environment (MoE).

1.5 Responsibility for Vegetation Management

The principal contact for information relating to this PMP on behalf the BCTS Chinook Business Area is:

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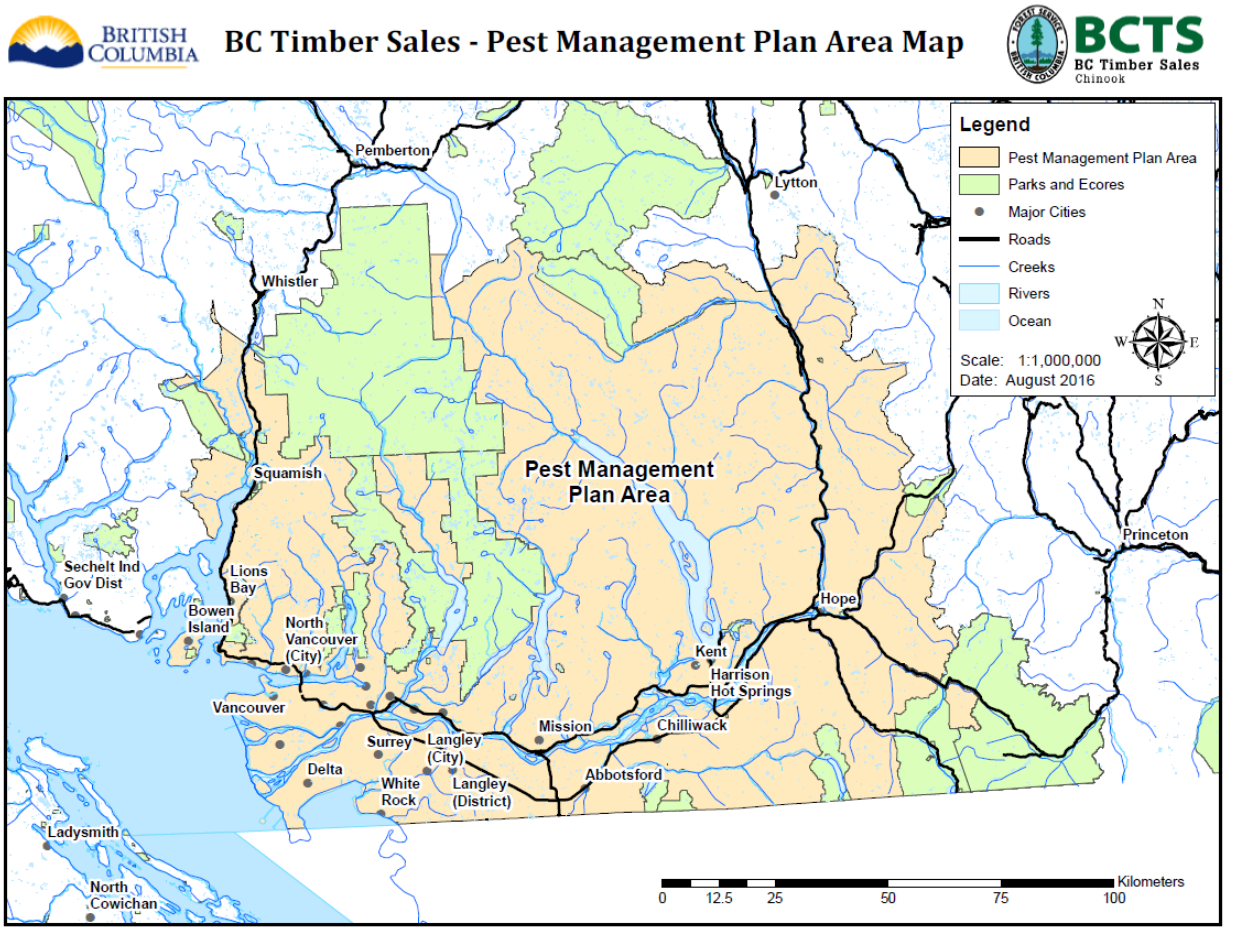
1.6 Geographic Boundaries

This PMP applies to all licences sold and managed under the BCTS program in the Chilliwack and Sea to Sky Natural Resources Districts. Map 1.1 below shows the boundaries of the two Districts.

Map 1.1



2. INTEGRATED PEST MANAGEMENT PROGRAM

For the purpose of this plan, the term Integrated Vegetation Management (IVM) will be used to describe vegetation management using the principles of IPM. Vegetation refers to all plant forms including grasses, sedges, forbs, vines, ferns, herbaceous brush, deciduous trees and coniferous trees.

2.1 Objectives of Integrated Pest Management

In forestry, the main objectives of an IVM approach are:

1. to ensure efficient and effective vegetation management to prevent competing vegetation from causing basic silviculture obligations not being met;
2. to ensure that herbicides may be used in forest vegetation management when the use of herbicides will be the most appropriate option for the situation after carefully weighing environmental, social, ecological and economic factors.

The decision for any such herbicides application will be biologically and environmentally sound and based on strategies formulated through scientific principles and site specific knowledge.

The IVM approach will also ensure that all activities carried out under this PMP conform to BCTS' EMS and SFI certification requirements. Both programs are based on a commitment to carry out forest management in an environmentally sound manner and to strive for continuous improvement. Both seek to balance long term production of timber values with the protection of other forest values including wildlife, native vegetation, soil microbes and water quality.

2.2 Integrated Vegetation Management Principles

As required under Section 58(2) of the IPMR, a PMP must include the following six integrated pest management elements:

- Pest Prevention;
- Pest Identification;
- Pest Monitoring;
- Injury Thresholds;
- Pest Treatment Options; and
- Evaluating Effectiveness and Impacts of Pesticide Use

Each of above-listed elements forms an integral part of BCTS-Chinook's vegetation management program.

2.2.1 Pest Prevention

Pest prevention is essential to conducting an efficient vegetation management program. Most brushing problems in the Chilliwack and Sea to Sky Districts can be avoided through effective pest prevention strategies. The following strategies are used to prevent vegetation competition from becoming a problem to establishing commercially valuable crop tree stands:

- *Early Identification of Sites with high brush hazard;*

Biogeoclimatic Ecosystem Classification zones and site series with high brush hazard are identified during site planning stage before timber harvesting. This ensures an effective treatment regime will be scheduled.

- *Reforestation treatment timing*

BCTS will plant brush-prone sites within one year following timber harvest completion so that seedlings can become established before competing vegetation species fully establish onsite. Sites with high likelihood of drought induced mortality will be planted as early in the spring as possible to prevent plantation failure due to drought.

- *Use of improved Seed*

Seed with the highest genetic worth has been shown to grow faster than seed from wild stands. This increased growth provides the seedlings the ability to compete with encroaching vegetation more effectively.

- *Selection of Appropriate Species*

Species to be grown on a site must be ecologically suited to the site in order to maximize seedling performance and thus, minimizing potential brushing treatments. Ecological site classification at both pre-harvest and post-harvest stages will provide guidelines for species selection. Special attention will be paid to selecting suitable species for brush prone microsites.

- *Selection of Appropriate Stock Types*

Appropriate seedling stock size will be selected for a site based on its brush hazard rating. Generally larger stock types are capable of competing with vegetation more effectively than small stock types.

- *Planting density, fertilization, and browse guarding*

Planting density is determined by seedling mortality and planned objectives for the site. Higher mortality rates suggest higher planting densities. At the time of planting, fertilizer tablets or "teabags" may be used to promote seedling root development and height growth on nutrient poor sites. The installation of cages or cones over seedlings will be considered when it is necessary to prevents browse damage from small and large animals such as pikas, rabbits and deer

- *Site Preparation*

When planting cannot occur in a timely manner on sites where brush hazard is high, the site conditions will be altered through a mechanical site preparation treatment to create a more favourable growing environment for planted seedlings by disruption or removal of a pre-existing vegetation layer before planting treatments occur.

2.2.2 Pest Identification

The key to effective vegetation management is to identify what and where deleterious brush species are likely to occur at the pre-harvest stage. The ecological characteristics of a site are classified, allowing accurate prediction of main competing vegetation species for the site and the severity of vegetation competition. Table 2.1 below shows vegetation complexes and expected competition levels.

Table 2.1 Brush Hazard Ratings by Biogeoclimatic Zone, subzone and Site series

Site Series	*BEC Zone and Subzone*									
	CDF mm	*CWH dm*	*CWH ds1*	*CWH ms1*	*CWH vm1*	*CWH vm2*	*ESSF mw*	*IDF ww*	*MH mm1*	*MH mm2*
1	M/4	M/4	L	L	M/4	L	M/6	M/7	M/6	M6
2	L	L	L	L	L	L	L	L	L	L
3	L	L	L	L	M/4	M/4	L	L	M/6	M/6
4	M/4,2	L	M/7	M-H/3	M/3	L	L	H/7	M/6	M/6
5	L	M-H/2,3	M-H/3,2	L	H/3	M/3	L	H/5	M/6	M/6
6	M-H/2,3	L	L	VH/3	M/4	L	VH/8	H/5	M/6	M/6
7	VH/1	VH/2,3	VH/3,2	VH/1	VH/3	H/3	VH/8	H/5	M/8	M/8
8	VH/1	VH/1	VH/1	VH/1			VH/3		L	L
9	VH/1	VH/1	VH/1	VH/1	VH/1	L			L	L
10	L	VH/1	VH/1	L	VH/1	L				
11	VH/3	L	L	VH/3	VH/1	H/3				
12	VH/1	VH/3	VH/3		L					
13	VH/1	VH/1			VH/3					
14	VH/1	VH/1								
15		VH/1								

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L = tree growth is not or is slightly impacted from competing vegetation;
M = tree growth impacted but not survival rate from competing vegetation; and
H, VH =tree growth and survival rate is significantly impacted by competing vegetation. Italicized ratings indicate significant water influences including floodplain and high water tables

Brush Complex Codes

1- Cottonwood /Alder- i.e. Cottonwood, Red alder, Salmonberry, Red elderberry, and Devil's club;
2- Bigleaf Maple- Bigleaf maple;
3- Red Alder /Shrub- i.e. Red alder, Vine maple, Thimbleberry, Salmonberry, and Red elderberry;
4- Salal;
5- Mixed Shrub- i.e. Thimbleberry, Red raspberry, Douglas maple, False azalea, Fireweed, Bracken fern;
6- Ericaceous Shrub- White-flowered rhododendron, False azalea, Huckleberry, Blueberry;
7- Dry Shrub - i.e. Saskatoon, Ceanothus, Ocean-spray, Beaked hazelnut; and
8- Subalpine Herb - i.e. Fireweed, Sitka valerian, Indian hellebore

Above information has been taken from "A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region, Land Management Handbook No. 28" by R.N. Green and K. Klinka, 1994.

2.2.3 Pest Monitoring

Monitoring surveys are completed periodically throughout the life of a stand from establishment to free growing. BCTS Chilliwack and Squamish field staff monitor and assess seedling and vegetation performance using a combination of methods described in the table below. Frequency of walkthrough monitoring surveys for a block area is determined via a block specific risk rating and supplemented with data gathered in the field.

Table 2.2 Monitoring Surveys in Chilliwack and Sea to Sky District

Survey Type	*Timing*	*Information Gathered*	
		Crop Tree	*Vegetation*
Site Plan	Pre-Harvest	Advance regeneration - sph, height, vigour	Species, cover, height
Planting Prescription	Following Harvest and before planting	Advance regeneration - species, sph, height, vigour	Species, cover, height
Survival/Stocking – to verify survival and stocking status using one 50m^2 plot per hectare	2 -6 months following planting	Planted tree - species, height, vigour, root collar diameter	Species, cover, height, individual stem diameter and stem density of vegetation (if necessary)
Walkthrough –to verify Regeneration Performance and identify potential brushing treatment areas	One -three years following planting treatment (may be more than one survey depending on risk rating of a site)	Total tree- species composition, height, vigour, sph, crop tree - species, vigour, wsph, and height	Species, cover, height, individual stem diameter and stem density of vegetation (if necessary)
Brushing- to conduct detailed site assessment for identified brushing areas	Whenever a brushing treatment need is identified.	Total tree - species composition, height, vigour, sph Crop tree - species, vigour, wsph, height, dbh	Species, cover, height, individual stem diameter and stem density of vegetation (if necessary)
Brushing Assessment / Efficacy	One growing season following treatment	Total and crop tree – vigour and evidence of chemical/mechanical damage.	Target species, non-target species - cover, height, % control of treatment
Pre-free growing Walkthrough –to confirm whether a stand will have any issue meeting free growing requirements	5-10 years after planting	Crop tree species, stocking level, and height in relation to competing brush species.	Species, cover, height, individual stem diameter and stem density of vegetation

Free Growing	One year prior to free growing late due date or whenever FG requirements are clearly met	Total tree - species, composition, height, vigour, sph Crop tree - species, vigour, wsph, height, dbh	Species, cover, height, individual stem diameter and stem density of vegetation

2.2.4 Injury Thresholds

An injury threshold in vegetation management is when the growth and spread of a given plant or plant population reaches levels that will cause some unacceptable environmental and economic damages to managed or natural ecosystems. Injury thresholds are used in making decisions on whether or not action should be taken. Once an injury threshold is determined, a treatment threshold can be defined that ensures the injury threshold is not reached.

With respect to meeting legal obligations in silviculture two injury thresholds are identified. First is when vegetation competition threatens crop tree survival, preventing regen delay requirements from being met. Second, when competing vegetation prevents crop tree stands from meeting approved free growing stocking standards.

Corresponding treatment thresholds for the two injury thresholds identified above will be determined using information gathered on the site in combination with applying criteria to determine its impact on a desired outcome. When it's determined that at least one brushing treatment will be necessary to prevent plantation failure or undesirable stand conditions from occurring, a brushing treatment will be prescribed. However, there is not a single method that best describes the decision making process as treatment thresholds vary with the crop tree species, vegetation complex, geographic area, site conditions and specific stages of stand development.

Within BCTS' operating areas in the Chilliwack and Sea to Sky Districts, any brushing treatment decisions made during the early plantation development period (1-4 years after planting) are carried out to promote crop tree establishment and meet regen delay obligations. Through assessment of early growth performance, if it is revealed there is no likelihood for crop tree species, particularly shade intolerant species, to survive on the site due to being overtopped by dense competing vegetation, then a brushing treatment will be prescribed. Evidences of crop tree survival problem include crop trees exhibiting poor height and diameter growth performance, and poor vigour due to stress from light, moisture or nutrient competition.

The brushing treatment threshold for later stages of plantation development prior to free growing declaration can be difficult to determine as the treatment objective is often to release crop trees from deciduous competition. Therefore, treatment thresholds for determining whether or not to treat will be based on measuring the impact of brush competition against approved free growing stocking requirements for a site. If a site is found to have a well expressed deciduous competition component, and, that component will reduce the total free growing stems per hectare to below the minimum required level, then a brushing treatment will be prescribed. A crop tree can only be considered free growing when it reaches a certain percentage above the height of competition stems within one meter of its radius, usually prescribed at 150 percent crop tree to brush height ratio.

In relation to treatment timing, a preventative treatment can be more selective and effective than a release treatment. It is preferred to prescribe brushing treatments in the first few years than to wait until overtopping occurs on brushy sites. Predictive models such as Green and Klinka's (1994) brush hazard rating system are consulted to assist with predicting potential stand establishment issues.

Treatment areas will be stratified down to one hectare brushing assessments, although smaller areas may be treated depending on block size and brush hazard. Thresholds for prescribing brushing treatments will rely on quantifiable data as much as possible. Nevertheless, determining thresholds in the complex plantation environment is still accomplished, to a large extent, by local knowledge and experience. The final decision to treat will not be made unless a qualified BCTS' representative has verified treatment recommendations in the field.

2.2.5 Pest Treatment Options and Selection Criteria

Treatment options consist of both chemical and non-chemical methods. Each method has its benefits and limitations. Treatment methods for a specific site will be selected based on a number of factors including safety concerns, timing, treatment efficacy, cost, biophysical constraints, legal constraints, political constraints and concerns from other users and stakeholders.

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It is important that the chosen method is effective in treating the target vegetation in a safe and cost effective manner. Pre-planning and recognizing that brush could be a concern in an area is important to be proactive in treating any competition. Early recognition and intervention will minimize the use of herbicides and reduce costs accordingly.

Due to the complexity of issues that may influence a treatment decision, this PMP does not attempt to create an all-encompassing treatment decision matrix. If efficacy, cost and operational constraints were the leading indicators in a treatment decision matrix, herbicide methods would likely be the leading treatment choice, however, employing principles of IPM minimizes the need to treat problem vegetation. The IPM strategy starts prior to harvest, is carried through the site preparation and planting stages and is acted upon through monitoring and the utilization of a range of vegetation management strategies.

The following tables outline the vegetation management options including pesticide and non-pesticide treatment methods, based on location, existing brush characteristics and Green and Klinka's brush hazard rating system

Table 2.3 Treatment Options Based on Target Species, Constraints, and Severity of Competition

Target Species	*Constraint*	*Target Species Characteristics*	*Vegetation Competition Severity Rating*	*Recommended Treatment Option*
All shrubs & herbaceous	Potential traditional uses and Critical wildlife habitat;	All	L-VH	Manual cutting & powersaw/brushsaw
	PFZs, Special management Areas, High fisheries value buffers	All	M-VH	Manual cutting & powersaw/brushsaw
Bigleaf Maple		All	L	Manual cutting
		>15 cm dbh	M-VH	Powersaw
		<15 cm dbh	M-VH	Basal bark treatment
		<2m ht	M-VH	Backpack selective
Red Alder		All	L	Manual cutting &
	High density roadside	<5 cm dbh	M-VH	powersaw/brushsaw
	High density roadside	>5 cm dbh	M-VH	Powersaw/brushsaw
	Retain specific stems	>3m ht	H-VH	Manual girdle
	> 1 0 ha, < 3 streams, good access, low wildlife values	<3m ht	H-VH	Basal bark treatment Powerhose
	Few watercourses, low wildlife	<2m ht	H -VH	
	values	<2m ht	H -VH	Backpack broadcast
	Frequent watercourses			Backpack selective
Herbaceous &		>3m ht	M -VH	Powersaw/brushsaw
Shrubs	Poor access, infrequent watercourses, low wildlife and fisheries values	All	M-VH	Aerial
	> 10 ha, few streams, good access, low wildlife values	<3m ht	H-VH	Powerhose
	Infrequent watercourses, >10ha, low wildlife values	<2m ht	H - VH	Backpack broadcast
	Frequent watercourses, high wildlife or fisheries values in adjacent area	All	H-VH	Backpack selective

Table 2.4 Attributes of Chemical Methods used in the Chilliwack and Sea to Sky Natural Resource Districts

Method / *Factors*	*Aerial – Rotary Wing, broadcast treatment (glyphosate)*	*Ground Foliar-Backpack Sprayer, broadcast or spot treatment (glyphosate)*	*Ground Spot Foliar-Backpack and Cone, spot treatment (glyphosate)*	*Stem Injection -Hack and Squirt, Cut Stump (glyphosate, 2,4-D)*	*Basal Bark-individual stem treatment (triclopyr)*
Scale of Treatment/ Limitations	Larger openings with even boundaries, requires large PFZ *I* buffer on water sources, most economical with large program. Also on isolated blocks or difficult terrain.	Ability to treat individual pockets or larger applications, smaller PFZ than aerial	Ability to treat small pockets during growing season (cone protect seedlings)- longer treatment window, requires smaller PFZ than aerial	Treats individual stems- very selective, smallest PFZ, option when deciduous diameters are large (> 7 cm dbh) or densities arc high	Treats individual stems - very selective, smallest PFZ, more effective when target stems are 1 to 7 cm dbh.
Target Vegetation	Herbaceous, woody stems and trees	Herbaceous, woody stems and trees < 2m	Herbaceous, woody stem cover, and trees < lm	Trees	Trees
Efficacy	2-4 years	2-4 years	2-4 years	4 years	4 years
Equipment Required	Helicopter with boom sprayer	Backpack sprayer -	Backpack sprayer with cone attachment for protecting seedlings	Hand tools and spray bottle, specially equipped chainsaw	Backpack sprayer
Technique	Herbicide applied as fine spray	Herbicide applied as fine spray as worker walks through treatment area	Herbicide applied as fine spray as worker walks through treatment area. Cone protects young seedling from spray	Workers make cuts in bark and apply herbicide using spray bottles, or inject chemical – apply chemical to exposed cambium layer.	Worker applies herbicide directly on bark of selected target trees.
Worker Safety	Limited contact with chemical, ground access not required on difficult terrain.	Exposure to spray if improper procedures or clothing used. Workers must be on the ground.	Exposure to spray if improper procedures or clothing used. Workers must be on the ground.	Exposure to spray if improper procedures or clothing used. Workers must be on the ground.	Exposure to spray if improper procedures or clothing used. Workers must be on the ground.
Effect on Fish	No impact if PFZ and buffer used	No impact if PFZ and buffer used	No impact if PFZ and buffer used	No impact if PFZ and buffer used	No impact if PFZ and buffer used
Effect on Wildlife	Reduced forage availability in short term, reduced cover in short term	Reduced forage availability in short term, reduced cover in short term	Reduced forage availability in short term, reduced cover in short tem	Reduced cover in short term, limited effect on forage	Reduced cover in short term, limited effect on forage
Measures of Reducing Hazard	Worker – ensure proper chemical and equipment handling techniques are followed.	Worker – ensure proper chemical and equipment handling techniques arc followed. Treat overhead hazards before entering work	Worker – ensure proper chemical and equipment handling techniques are followed. Treat overhead hazards before entering work	Worker- ensure proper chemical and equipment handling techniques are followed. Treat overhead hazards before entering work	Worker- ensure proper chemical and equipment handling techniques are followed. Treat overhead hazards before entering work
Public Concerns	Use signage to notify public of project on site, ensure public is clear before application	Use signage to notify public of project on site, ensure public is clear before application	Use signage to notify public of project on site, ensure public is clear before application	Use signage to notify public of project on site, limited opportunity for public exposure due to individual stem treatment	Use signage to notify public of project on site, limited opportunity for public exposure due to individual stem treatment
Cost Ranking	1	2	3	4	5

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Table 2.5 Attributes of Mechanical/Manual Methods used in the Chilliwack and Sea to Sky Districts

Method / *Factors*	*Broadcast Burn*	***Mechanical Site Preparation (machinery)***	***Mechanical Cutting (hand power tools)***	***Manual Cutting (hand tools)***	***Manual Girdling (hand tools)***
Scale of Treatment /Limitations	Treat large areas (broadcast treatment), requires nearby water source for control, requires proper weather and slash conditions	Treat any area, slope < 40% for machine access, terrain relatively even, robust soils or use puncheon to avoid compaction and rutting, avoid when soils are susceptible to damage, treatment size limitation based on equipment used,	Treat all areas, requires skilled labour force, physically demanding, terrain and slope will affect worker safety, ability to treat spot areas	Treat all areas, physically demanding, ability to treat spot areas, ability to work in difficult terrain	Treat all areas, physically demanding, ability to treat spot areas, ability to work in difficult terrain
Target Vegetation	All vegetation	All vegetation	Generally woody stems and trees	Generally woody stems and trees	Trees
Efficacy	2-3 years	2 years	Herbaceous < 1 yr Woody stems and trees - 2-5 years	Herbaceous < I yr Woody stems and trees - 2-5 years	4 years
Equipment Required	Appropriate firefighting equipment, helicopter for aerial ignition, some skilled labour	Appropriate machinery, skilled operator	Power tools, skilled labour force	Hand tools, unskilled labour force	Hand tools, unskilled labour force
Technique	Ignite ground fire to burn slash accumulations	Machine moves /disturbed ground to create plantable spots	Cut larger vegetation to create areas for planting.	Cut larger vegetation to create areas for planting.	Girdle deciduous trees to reduce overhead competition
Worker Safety	Potential exposure to flammable liquids, burning slash. Workers must be on the ground.	Worker protected in cab of machinery. Workers must be on the ground.	Use of dangerous power tools, repeated motions physically demanding, terrain and slope will affect worker safety	Use of tools, repeated motions physically demanding. Workers must be on the ground.	Use of tools, repeated motions physically demanding. Workers must be on the ground.
Effect on Fish &Wildlife	*Fish* -Minimal if planned and carried out under proper conditions; *Mammal* - loss of habitat for small mammals and birds, loss of forage- short term.	*Fish* - no impact, machine restricted from fish sensitive zones; *Wildlife* - loss of forage - short term, alteration of habitat	*Fish* - no impact if proper buffers maintained; *Wildlife* - debris may limit access in short term	*Fish* - debris in watercourses may increase oxygen demand - maintain proper buffers and limit introduction of debris; *Wildlife* – debris may reduce access in short term	*Fish* - debris in watercourses may increase oxygen demand; maintain proper buffers and limit introduction of debris; *Wildlife* - stems may break at girdle limiting access
Measures of Reducing Hazard	*Worker*- ensure workers are aware of plan and follow safe work procedures; *Public*- public sensitive to smoke - manage for smoke pollution, post signage to inform public to clear out of area before starting	*Worker*-inform operator of difficult areas and obstacles; *Public*- general acceptance of method	*Worker*- ensure workers have training and follow safe work procedures; *Public* - may limit access, post signage, general acceptance of method.	*Worker* – ensure workers follow safe work procedures; *Public*- may limit access, post signage, general acceptance of method.	*Worker* – ensure workers follow safe work procedures; *Public*- may limit access, post signage, general acceptance of method.
Cost Ranking	4	4	5	5	3

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Note: Cost Ranking is relative as is shown for comparison purposes.

2.2.6 Evaluating Effectiveness and Impacts of Pesticide Use

All brushing projects are evaluated following treatment to determine efficacy, including both chemical and non-chemical methods. The evaluation usually happens within one growing season after treatment and follow-up visits may occur up to several years later if results are not immediately evident. Untreated portions may be left within blocks to compare conifer performance between treated and untreated areas. This evaluation will also look at the effects of the treatment on non-target vegetation and the effectiveness of the pesticide free zones and buffers. The effectiveness of brushing treatments will be monitored through these ongoing studies, which will provide feedback in the decision making process for future treatments on similar stands.

Monitoring and feedback is required under the IPMR and is critical for BCTS to strive for continual improvement in its performance of resource management activities and practices. Performance reviews and continuous improvement are critical elements of the BCTS EMS and SFI certifications.

3 ENVIRONMENTAL PROTECTION STRATEGIES AND PROCEDURES

3.1 Strategies to Protect Community Watersheds

Under this plan, any herbicide applications proposed to occur within 100 meters of a community watershed boundary will be carried out according to the following strategies and procedures:

- The location of community watersheds to be protected will be verified by accessing the Community Watershed Dataset (WHSE_WATER_MANAGEMENT.WLS_COMMUNITY_WS_PUB_SVW), located in BC Geographical Data Warehouse (BCGW);
- Herbicides shall not be stored within a community watershed for more than 24 hours prior to their use, and shall be removed from the community watershed within 7 days of use, unless they are stored in a permanent structure;
- A 10 meter pesticide free zone (PFZ) shall be maintained from the point of herbicide application and all bodies of water;
- A 30 meter PFZ shall be maintained down slope from the point of herbicide application and all licensed water intakes;
- A 100 meter PFZ shall be maintained upslope from the point of herbicide application and all licensed water intakes;
- All PFZs shall be measured and marked/flagged prior to herbicide use; and
- Herbicide use shall be discontinued if herbicide residues or breakdown products are detected at a community watershed water intake, and further use shall not be undertaken until a medical health officer of the Ministry of Health has been satisfied that all required measures have been implemented to preserve water quality.

3.2 Strategies to Protect Domestic and Agricultural Water Sources

To ensure that water users are identified prior to herbicide application, the following two spatial dataset in BCGW will be used to verify locations of all water intakes and water wells respectively:
WHSE_WATER_MANAGEMENT.WLS_POD_LICENCE_SVW; and
WHSE_WATER_MANAGEMENT.GW_WATER_WELLS

All identified water intakes outside of a community watershed will have a minimum 30-meter no-treatment zone for herbicides established around their points of diversion or well sites. This applies for both domestic and agriculture use. Water users with surface water intakes within 100m of areas of pesticide use shall be notified in advance of pesticide use in adjacent areas.

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3.3 Strategies for Protecting Fish and Wildlife, Riparian Areas and Wildlife Habitat

Fish streams, riparian areas, wildlife habitat features, and wildlife habitat areas are all defined in the *Forest Planning and Practices Regulation* (FPPR) and these resource values are pre-identified through Forest Stewardship plan and Site Plans or approved Silviculture Prescriptions. Any proposed herbicide use will be consistent with requirements specified in FPPR or prescribed in operational plans for protecting these resource values.

3.3.1 Fish and Riparian Area

BCTS recognise the importance of preserving riparian values during forestry operations and will conduct vegetation management activities accordingly. Standard provisions for preserving riparian values during herbicide use include:

- Identify and map all streams, lakes and wetlands;
- Establish an appropriate PFZ and associated buffer zones around all flowing streams, lakes, wetlands and identify them in the field with flagging tape or other markers.
- Use Kromocote cards during aerial spraying operations to detect drift into buffer zones and to ensure that PFZs remain pesticide free; and
- Restrict treatments in Riparian Reserve and Management Zones.

Buffer zones are strips of land between PFZs and the treatment area. They are designed to protect the integrity of the PFZ. The width of the buffer zones will vary with the application technique, the pesticide used, the topography, weather conditions and soil factors.

Table 3.1 describes the required pesticide free zones around water features.

Table 3.1 Minimum Pesticide Free Zone and Buffer Widths

Area of Concern	*Application Method*	*PFZ Width (m)*	*Buffer Width (m)*	*No Treatment Zone Width (m)*
Classified S1,S2,S3,S4 *Streams*, L1,L2,L3,L4 *Lakes* and W1,W2,W3 *Wetlands*	Aerial (low *drift delivery system)*	10	5	
	Backpack (Broadcast)			
	Backpack (Directed Foliar)	10	5	
	Backpack (Cone)	10	5	
	Hack and Squirt	10	5	
	Cut Stump	10	5	
		10	5	
	Backpack (Basal)			
		10	2	
Wet S5,S6, NCD's *(and does not drain into a fish bearing waterbody within 100m)*	Aerial (low drift delivery system)	10	5	
	Backpack (Broadcast)	[1] 10	5	
	Backpack (Directed Foliar)	[2] 2	3	
	Backpack (Cone)	[2] 2	3	
	Hack and Squirt	[2] 2	3	
	Cut Stump	[2] 2	3	
	Backpack (Basal)	10	2	
Dry S5, S6, NCD's, Temporary free standing body of water <25m^2	Aerial (low drift delivery system)	N/A		
	Backpack (Broadcast)	N/A	N/A	
	Backpack (Directed Foliar)			
(above do not drain into a fish bearing waterbody within 100m)	Backpack (Cone)	N/A		
	Hack and Squirt	N/A		
	Cut Stump	10		
	Backpack (Basal)		2	

Area of Concern	*Application Method*	*PFZ Width (m)*	*Buffer Width (m)*	*No Treatment Zone Width (m)*
Temporary free standing body of water >25m^2 *(not fish bearing and does not drain into a fish bearing waterbody)*	All application methods	High Water Mark	[3]N/A	
Domestic water intake	Any			30
Active beaver lodge/ pond/dam (slope less than 10%)	Aerial (rotary)	-	-	50
Active beaver dam (slope greater than 10%)	Aerial (rotary)	-	-	90
Raptor nest	All (except manual)	-	-	100

1) *or aerial and ground (broadcast and discretionary) applications- A 10m PFZ will be maintained for dry* S5,S6 *and NCD's that drain directly (within 1OOm) into* a *fish bearing waterbody;*
2) *A 2m PFZ will be maintained for dry* S5,S6 *and NCD's that drain directly (within 1OOm) into* a *fish bearing waterbody. Selective applications can take place from 2m-10m from the high water mark;*
3) *For Temporary free standing bodies of water >25m^2 an appropriate buffer will be established as required.*

N.B. It is assumed that all application methods will use glyphosate except for basal bark which uses triclopyr. While herbicides are unlikely to cause any direct toxic effects to wildlife, they can, however, impact wildlife habitat, particularly forage values if applied inappropriately.

3.3.2 Wildlife and Wildlife Habitat

At the time of the preparation of this document, many important wildlife habitat areas (WHA) and ungulate winter ranges (UWR) within the Chilliwack and Sea to Sky Natural Resource Districts have been set aside for conservation or protection through legal orders. BCTS will identify any designated or proposed WHAs and UWRs that are adjacent to proposed herbicide brushing treatment areas. Spatial boundaries of all WHAs and UWRs can be verified through the following datasets:

WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE_HABITAT_AREA_POLY
WHSE_WILDLIFE_MANAGEMENT.WCP_WHA_PROPOSED_SP
WHSE_WILDLIFE_MANAGEMENT.WCP_UNGULATE_WINTER_RANGE_SP
WHSE_WILDLIFE_MANAGEMENT.WCP_UNG_WNTR_RNG_PROPOSED_SP

Legal orders for each established WHA and UWR can be accessed through the following two websites:
http://www.env.gov.bc.ca/wld/frpa/iwms/wha.html
http://www.env.gov.bc.ca/wld/frpa/uwr/approved_uwr.html

BCTS will also identify and retain some components of deciduous and shrub species to promote stand level biodiversity. For example, shrub species that produce berries for small birds will be pre-identified and left standing during brush treatments.

3.3.3 Species at Risk

BCTS Chinook has a Species at Risk process that is ongoing throughout the management of a specified area. Assessment for species at risk initially occurs at the block planning stage and reoccurs at each major event in the life of the block, including the proposal of silvicultural treatments. Staff and contractors/consultants are required to follow the species at risk assessment process and document all findings. A ledger detailing all of the findings is maintained for each block and any proposed activity would be reviewed while considering any species at risk findings. Best management practices for many species at risk are established and employed. Where no best management practice is available, a qualified professional may be consulted.

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A list of the current species at risk can be found at:
http://www.speciesatrisk.bc.ca/
http://www.env.gov.bc.ca/atrisk/

3.4 Strategies to Prevent Herbicide Contamination of Food Intended for Human Consumption

Berry picking and medicinal plants gathering are common throughout both districts. Efforts will continue through formal and informal consultation to determine the locations of these activities. Measures will be taken to accommodate such resource use wherever possible. Precautions to avoid contamination of food plants include:

- implement increased buffer zones around identified patches;
- delay the timing of applications until after the food harvesting is completed;
- use non-chemical methods to treat the brush, and
- signs will be posted at all entrances to chemical treatment sites as per Section 64(1) of the *Integrated Pest Management Regulation.*

Mushrooms are also collected extensively. Mushrooms collected in clearcut openings (morels) ripen during spring months when herbicide application is unlikely. Herbicide treatment is normally carried out during the early summer months. Other mushroom species that are found in standing timber face no herbicide treatment risk.

3.5 Pre-Treatment Inspection Procedures for Identifying Treatment Area Boundaries

All areas scheduled for herbicide application shall be subject to a pre-treatment ground layout in order to locate and mark all treatment boundaries, PFZ, No Treatment Zones and associated buffers. Boundary and treatment area layout shall be verified prior to treatment by the supervisor. Boundaries shall be marked in a manner clearly visible to the applicator.

3.5.1 Layout for Aerial Applications

For aerial applications, coloured bags shall be utilized with distinct colours for treatment or no treatment boundaries, PFZ's and its associated buffers.

- All distances for PFZs, buffers, etc., shall be measured. Measurement will normally be conducted by the use of a hip chain;
- To ensure persistence of marker bags until time of treatment, bags attached to live vegetation shall be punctured; and
- Prior to treatment, all aerial bag layouts shall be flown by the site supervisor ensuring that the applicator (pilot) is familiar with all onsite layouts.

3.5.2 Layout for Ground Applications

- For ground based applications (backpack, basal, hack and squirt and cut stump), treatment boundaries shall be located with highly visible ribbon;
- PFZ's shall be clearly marked with durable and persistent flagging tape; and
- The supervisor shall verify all ground application layout.

3.5.3 Layout Mapping

Layout maps will include:

- Unit number;
- All streams and waterbodies;
- Treatment boundaries;
- Treatment areas listing size, method and application rate for each;
- Areas of No Treatment (NTZs) and PFZs;

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- Treatment areas;
- Buffer zones (if any);
- Wildlife tree patches (WTPs);
- Waterbodies;
- Bag or ribbon lines with applicable colours;
- A colour legend; and
- Any special condition pertaining to the treatment area.

3.6 Procedures for Maintaining and Calibrating Herbicide Application Equipment

All equipment used for the application of herbicides shall be maintained on a daily basis and shall be calibrated at the start of each new project.

3.6.1 Aerial Equipment

All equipment shall be calibrated prior to commencement of treatment operations. Proof of calibration for aerial (both rotary and fixed wing) applications and the Swath Kit Analysis or a recognised calibration system approved by the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) shall be provided by the applicator to BCTS at the beginning of each spray season. If the operator has attended a FLNRO calibration clinic, a copy of the results will be provided to the proponent. If the applicator has not attended a clinic, a calibration process will be carried out prior to operations. The "Aerial Sprayer System Calibration Checklist" found in the Herbicide Field Handbook 006 (revised) will be required to be completed. Operators may have already completed a calibration for another Business Area in which case, documentation will be required and a minimum flow check will be conducted before operations begin. For application equipment specifications, please refer to the BCTS Vegetation Management Aerial Herbicide Contract, which outlines standards for equipment used for aerial applications. The contractor shall have qualified personnel on each spray site who will ensure the equipment conforms, at all times, to the manufacturer's standards.

3.6.2 Ground Equipment

Equipment used for backpack applications shall be calibrated, at the start of each season and prior to commencing spray operations on new areas or with new herbicides, ensuring that each individual is familiar with appropriate target delivery rate and equipment functions. All backpack spray equipment shall:

- Have a positive shut-offhand control;
- Be a sealed non-leaking container;
- Have an extension wand for nozzle; and
- Have a pressure limiting valve.

Several factors can affect equipment calibration including vegetation height and density, nozzle type and pressure and ground conditions. The most accurate method of calibration is to actually spray an area of known size and measure the amount of solution used over this known area. Applicators will be referred to the Herbicide Field Handbook 006 (revised) for further information.

3.7 Procedures for Monitoring Weather Conditions and Strategies for Modifying Herbicide Application Methods for Different Weather Conditions

Measurements will be made to record weather conditions prior to treatment, at the end of treatment and between treatments if there has been a change in site or weather conditions. The following items will be recorded for foliar treatment methods:

- Wind speed and direction;
- Relative Humidity;
- Presence of frost or dew;
- Precipitation;
- Temperature; and
- Sky conditions (clear, overcast, cloudy, and partly cloudy).

Strategies for modifying applications according to changing weather conditions are described in the table below.

Table 3.6. Treatment Weather Conditions

	Temperature	*Thick Dew or Frost on Leaves*	*Wind Speed (kph)*	*Relative Humidity (%)*	*Rain, Inversion or Fog*	*Freezing Conditions*
Aerial Foliar (glyphosate)	>26.5°C No spray	No spray	>8 No spray	<40 No spray	No spray	No spray
Backpack Foliar/ Injection (glyphosate)	>26.5°C No spray	No spray	>10 No spray	<40 No spray	No spray	No spray
Basal Bark< (triclopyr)	Only limited to when snow and water prevent spraying of treatment zone on bark.					
Cut Stump/Injection (2,4-D)	Only limited to when snow and water prevent spraying of treatment zone on bark.					

4.0 OPERATIONAL REQUIREMENTS

4.1 Safe Handling Practices

All handing of pesticides must comply with the provisions of the *Environmental Management Act.*

4.1.1 Pesticide Transport

Minimum standards for pesticide transport are stipulated in *The Transportation of Dangerous Goods Act,* and the *Integrated Pest Management Act* and Regulations. The following requirements shall be followed:

- Transport shall be limited to undamaged containers;
- All pesticides shall be secured during transport;
- Spill cleanup equipment along with a spill contingency plan and a first aid kit shall accompany transported pesticides. Spill contingency and spill cleanup kit requirements are outlined in the BCTS EMS;
- Transport of pesticides shall occur in a lockable compartment, separate from the passenger section of the vehicle;
- All pesticides shall be kept locked when the vehicle is left unattended;
- All drivers of vehicles transporting pesticides shall be trained and aware of the spill contingency plan;
- Pesticides shall not be transported with food, feed, seeds, drugs, drinking water or clothing in the same compartment;
- Herbicide mixture shall not be transported in mixing vessels. Mixture shall be transported only in labelled herbicide containers, marked "mixture" and include the mix ratio. Total mixture transported cannot exceed the single load capacity of the aircraft working from any mix site for aerial application or the capacity for one refill for ground-based equipment in use;
- Personal protection equipment and personal first aid equipment shall be carried in a closed compartment separate from the pesticide containers;
- When transporting herbicides, required documentation includes Material Safety Data Sheets (MSDS) and Product labels.

4.1.2 Pesticide Storage

The *Integrated Pest Management Regulation* stipulates that all herbicides, when not in use, shall be stored:

- In a locked shed (not used for the storage of food intended for human or animal consumption;
- Have clearly posted warning signs (WARNING: CHEMICAL STORAGE -AUTHORIZED PERSONS ONLY) at each entrance;
- Have proper ventilation to the outside; and
- Be accessible to authorized personnel only.

Temporary storage in the back of a locked vehicle (5 ton van) is permissible when all conditions for herbicide storage are met. The locked vehicle must be parked in a location such that no product could flow into a waterbody should a leak occur while unattended.

4.1.3 Mixing and Loading of Pesticides

All pesticides used under this PMP shall be mixed at designated mixing and filling stations. Requirements and procedures to be followed during the mixing and loading of pesticides are specified as follows:

- Wherever possible, the mixing/loading station will be located in the treatment area. The mixing site shall be selected so that it is on level ground, and situated so that if a spill does occur, contamination of waterbodies will not occur;
- As a minimum, the *Integrated Pest Management Regulation* will be complied with and a supervisor who holds a valid Pesticide Application Certificate of the appropriate category shall supervise each crew of up to 4 workers;
- A minimum crew size for mixing and loading will be one (1) dedicated person. Functional crew numbers will be dependent upon the number of pieces of spray equipment required in the operation;
- Mixers and Loaders of pesticides shall have an emergency spill kit on site and be familiar with BCTS' Spill Contingency Plan. Mixers and Loaders shall ensure that all equipment is in good operating condition;
- The appropriate protective clothing and personal protection equipment shall be worn;
- Ensure that the system used to fill the application equipment has an appropriate backflow device;
- Equipment shall not be left unattended during filling;
- First aid equipment and an eye wash station shall be located in close proximity of the filling station;
- Ensure that clean water is available for rinsing;
- Ensure that empty containers are triple-rinsed and slashed;
- Ensure that approved rates are not exceeded;
- Understand the exact inventory of product on site prior to starting any mix block;
- Perform all mixing outdoors. If mixing in the back of a vehicle, ensure adequate lighting and ventilation is available; and
- Load water into delivery system last in order to rinse lines of residual herbicide.

4.1.4 Aerial Operations

Minimum spray volumes will be 50 litres per hectare for conventional delivery system and 100-150 litres per hectare for low drift delivery system unless otherwise directed by the contract administrator.

Other requirements for aerial operations are specified as follows:

- With each load, Mixer and Loader should be in radio communication with the pilot in order to ensure that the mix ratio is correct for the treatment unit;
- Each load must be recorded immediately after loading into the spray system. The record shall include:
    - PMP number;
    - Contractor name and Pesticide User Service Number;
    - Herbicide name;
    - PCP Number and concentration;
    - Volume of product used in litres broken down by application method;
    - Volume of carrier used in litres broken down by application method;
    - Aircraft type;
    - Date and time;
    - Cut block or opening number;
    - Pilot name and certification number;
    - Mixer name and certification number;
    - Loader name and ce1tification number;
    - Project Supervisor name and certification number; and
    - Summary of treatment information including total volume of product and carrier applied.

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- Ensure that the loading area is clear of people, equipment and loose items whenever the aircraft approaches;
- Erect caution signs along roads where necessary;
- Know the exact volume of mixture to be loaded;
- Ensure hose end and aircraft loading connections are clean and drip free;
- Check spray system for leaks and drips;
- Ensure loading system is shut off when the correct volume is loaded; and
- Ensure aircraft is disconnected from the load hose prior to take off.

4.1.5 Ground Operations

- Wherever possible, the mixing/loading station shall be located in the treatment area;
- Mix system for backpack, backpack basal, cut stump (using brush saw applicator) and hack and squirt to be located in a waterproof tub or vat in order to ensure the containment of any overflow or spill; and
- Each backpack mix and each hack and squirt mix shall be recorded once loaded into the backpack or spray bottles. The record shall include:
  - PMP number;
  - Contractor name and Pesticide User Service Number;
  - Date and time;
  - Herbicide name, PCP Number and concentration;
  - Mixer name and certification number;
  - Volume of herbicide in litres;
  - Volume of carrier in litres;
  - Name of applicator and certification number (where applicable);
  - Project supervisor name and certification number; and
  - Cut block or opening number.

4.1.6 Container and Unused Pesticide Disposal

All 115 litre empty pesticide containers (shuttles) are to be returned to the manufacturer for re-use. If the containers should become damaged, they shall be triple-rinsed and returned for recycling. All 10- litre containers shall be triple-rinsed, punctured and disposed of in a landfill that is under the control of the Regional District and has been approved for pesticide container disposal. All rinse volume shall be applied to the treatment area.

Applicators must ensure that they have no more than five hundred litres of empty pesticide containers on any site at any given time. In order to exceed this limit, the applicator or PMP holder will require a Generator Registration Number, pursuant to the Hazardous Waste Regulation, Schedule 6.

The following precautions shall be taken to mitigate hazards to the environment:
- When triple rinsing containers on site, rinse volume shall be drained into the spray tanks for application onto the treatment area;
- Once triple-rinsed, 10 litre containers shall be punctured to prevent reuse; and
- Empty containers shall be delivered to an approved landfill or container collection site in a timely manner.

4.1.7 Spill Response

The spill plan currently in use by BCTS shall be followed when carrying out herbicide operations. Spill treatment equipment shall be at or near storage, mixing and loading sites and it shall include at least the following:
- Personal protective equipment;
- Absorbent material such as sawdust, sand, activated charcoal, vermiculite, dry coarse clay or commercial absorbent;
- Neutralizing material such as lime, chlorine bleach or washing soda; and

- Long handled broom, shovel and waste receiving container with lid.

All contractors engaged in herbicide operation activities shall be familiar with BCTS Spill Contingency Plan and shall post this plan at all mixing and loading stations as well as in the vehicles involved in the transportation or storage of herbicides. If contractors that work under this PMP operate under their spill response plan, it shall meet or exceed the provisions as described in the BCTS Spill Contingency Plan. Their plan must state at a minimum:

- All personnel shall be protected from herbicide exposure by wearing appropriate protective clothing and safety gear;
- Any person exposed to a herbicide shall be moved away from the place of the spill;
- First aid should be administered, if required;
- The source of the spill should be stopped;
- The spilled material should be stopped from spreading by creating a dam or ridge;
- The project supervisor will cease operations until the spill is contained and the source is repaired;
- Absorbent material shall be spread over the spill if applicable to absorb any liquid;
- The absorbent material shall be collected in garbage bags or containers with the contents clearly marked;
- Contaminated soil or other material will be removed from the spill site and placed in garbage bags or containers;
- The person responsible for the project will contact an approved representative of BCTS for shipping instructions and disposal requirements;
- When more than five kilograms of product of herbicide is spilled on land, or any amount in a waterbody, the person responsible for the project will immediately report it to Emergency Management BC by phoning 1-800-663-3456 or, where that is impractical, to the local police or nearest detachment of the RCMP and an approved representative of BCTS will be notified of the details related to the spill as soon as is practical by the project supervisor.

4.2 Implementation Procedures

4.2.1 Minimum Qualification of Project Supervisor and Monitors

All herbicide treatments carried out under this PMP will be conducted under the direct supervision of a designated site supervisor.

- The Supervisor must have training and/or experience in supervising and monitoring an aerial/ground application program;
- The Monitor must have training and/or experience in on-site monitoring of similar operations;
- Supervisors and Monitors must possess a Pesticide Applicator Certificate in the Forestry General category.

The BCTS will maintain on file the names and certificate numbers, Pesticide User Service Number, and the experience/training summaries of the Project Supervisor and Monitor.

4.2.2 Applicator Qualifications

All herbicide treatments will be conducted or directed by an individual who holds a valid Pesticide Applicator Certificate in the appropriate category. For aerial treatments, the pilot and Mixers will hold a certificate in the Forestry General category. The ratio of non-certified applicators to certified applicators shall not exceed 4:1. Certified applicators shall maintain continuous non-assisted auditory or visual contact with uncertified applicators at all times during pesticide treatments. All certificate information shall be retained on file.

4.2.3 Aerial Applications

During all aerial applications, the chosen application contractor shall adhere to the following standard operating procedures:

A pre-work meeting will be held with the BCTS Contract Administrator, site supervisor and the chosen application contractor. The following will be reviewed during the pre-work meeting:

- Familiarity with emergency procedures;
- Spill contingency plan;
- Monitoring procedures;
- Communication protocols;
- Application parameters;
- All aircraft and boom systems will have undergone an approved calibration analysis; and
- Certificate numbers shall be recorded and an aircraft safety briefing shall be conducted.

Field pre-works will be held with staff and will include the following:

- Prior to individual block treatment, Mixers and Loaders will be made aware of the exact amounts of chemical and carrier to be applied;
- Prior to treatment, blocks shall be flown with the site supervisor in order to ensure pilot's familiarity with the treatment area, PFZ's, buffers, no-treatment areas and to ensure that the area is clear of people and large animals;
- The site supervisor will ensure there is at least one Monitor present per helicopter. The Monitor shall record one weather check (temperature, relative humidity, wind speed and direction) per load, ensure the integrity of any PFZ's, monitor droplet size and verify coverage possibly through the placement of kromekote cards;
- The site supervisor or Monitor shall also be in constant communication with the pilot throughout application operations.
- Regular spray equipment checks shall include:
    - Nozzle orientation;
    - Nozzle size;
    - Spray On /Off button operational;
    - Inline filter functional;
    - Tanks are clean;
    - Backflow check valves are installed;
    - Load valves are dribble free;
    - Spill kit is readily available;
    - First Aid kit is readily available;
    - Spill Contingency Plan is posted; and
    - Clean water is available for rinsing.

All pesticide use shall be recorded in the Herbicide Operations Records by the Mixer or Loader and shall be provided to BCTS and retained on file by the applicator for a period of three (3) years.

4.2.4 Aerial Application Techniques

Flight techniques when spraying adjacent to buffers and sensitive areas using a low drift delivery system are as follows:

- All "spray on" shall be in straight lines;
- All flights shall be on an even plane (level);
- Flight airspeed, when climbing or descending, shall remain constant. Deviation shall be no more than 15% from the calibration speed;
- An adequate number of spray swaths parallel to the low drift area will be treated to form an additional buffer for right angle spray swaths;
- Flights along the buffer will be uphill, whenever possible, eliminating the extra number of fine droplets produced when spraying downhill;
- Headlands will be treated with a minimum of two spray swaths parallel to the block edges;
- "Spray on" will not be initiated during descents into the treatment area over tree lines or other obstacles on a spray run; and

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- "Spray off" will be initiated prior to beginning the climb over tree lines or other obstacles on a spray run. The headland spraying will cover the distance required for these descents and climbs.

Conventional spray will be conducted at a height of 3 - 5 meters above the target, when safe to do so. This is the height for optimum spray deposit. Low Drift spray delivery will normally be conducted at a height of 15 - 25 meters above the target. This height ensures the flight can be on a level plane for the length of the spray run. Deposit is not a factor as large droplets are produced by this system.

4.2.5 Ground Applications

During ground spraying or single stem treatment operations, the supervisor will ensure the chosen application contractor adheres to the following contractual stipulations:

- A pre-work meeting will be held to ensure that the chosen application contractor is familiar with emergency procedures, spill contingency plan, application parameters and site-specific concerns on an individual block-by-block basis. Names and certification numbers of all certified applicators shall be recorded;
- The supervisor shall ensure he/she is familiar with the layout prior to commencing treatment.
- Prior to commencing treatment workers shall be briefed on treatment parameters and block layout/configuration;
- Prior to commencing treatment the Contractor shall ensure the area is clear of people and large animals;
- The application contractor will supply one supervisor and one Crew leader/Monitor who shall ensure the integrity of any PFZs or sensitive areas and verify acceptable levels of coverage (Section 3.5 outlines Monitor's duties). The Monitor should be in constant radio contact with the supervisor; and
- All pesticide use shall be recorded by the Mixer or supervisor in the Herbicide Operations Records, which will be provided to BCTS and retained on file by the application contractor for a period of three years.

4.3 FORESTRY HERBICIDES PROPOSED FOR USE UNDER THIS PMP

Herbicides proposed for use within the scope of this PMP are registered for forestry use under the Pesticide Control Products Act. They have been deemed safe when applied in accordance with the instructions outlined on their labels. Table 4.1 below indicates the herbicides proposed for use within the context of this PMP for vegetation control.

Table 4.1 Herbicides Included Within the PMP

Herbicide Trade Name	*Active Ingredient*	*Application*			*PCP#*
		Usage	*Aerial*	*Ground*	
Vision Silviculture Vision Max Silv. Forza Silviculture Weed-Master Vantage Forestry	Glyphosate	Common	Yes	Yes	19899 27736 26401 29009 26884
Release Silviculture Release XRT Release MSO Garton RTU Garton XRT	Triclopyr	Common	No	Yes	22093 28941 28431 29334 28945
Formula 40F	2,4-D	Rare	No	Yes	28295

The most common herbicide used in forestry is glyphosate. It is selected for its low toxicity and high efficacy rates in treating competing vegetation. When applied at relatively low rates, it effectively manages competing forest vegetation species without significant damage to coniferous trees.

Triclopyr is only applied as a basal bark treatment to selected deciduous trees. It is effective in controlling target vegetation but its use is limited to controlling large woody stems.

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