

**Pest Management Plan 2010-2015
794-XXX-10/15**

For Forest Vegetation Management

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Summary

This Integrated Pest Management Plan (PMP) has been developed to guide in the control of vegetation competition in conifer stands. It covers forested land within the Sunshine Coast Timber Supply Area, specifically lands managed by Fraser Timber Supply Area Cooperative Association (FTSACA). The concept of integrated pest management is a systematic approach to pest management that relies on a wide spectrum of techniques to manage pests. These techniques may be in the form of direct controls on the pest, such as vegetation management - the reduction or removal of deciduous plants competing for light or other resources with crop trees or they may be in the form of indirect controls that are aimed at avoiding the pest problem, such as tree planting. These strategies are used to ensure that coniferous crop trees reach free growing and that FTSACA meets their legal silviculture obligations.

The plan contains information on FTSACA's obligations and commitments, treatment methods, environmental considerations, and operational standards. **It describes the vegetation management strategies used by FTSACA and the circumstances under which specific treatments are applied. It summarizes the steps the FTSACA takes in its forest management program to minimize vegetative competition and hence the needs for direct treatments.**

All activities conducted under this plan will comply with the Integrated Pest Management Act and Regulations.

Table of Contents

SUMMARY	II
TABLE OF CONTENTS	III
LIST OF MAPS	V
LIST OF TABLES	V
LIST OF APPENDICES	VI
1.0 INTRODUCTION	1
1.1 INTEGRATED PEST MANAGEMENT	1
1.2 SCOPE OF THE PEST MANAGEMENT PLAN	1
1.3 TERM OF THE PEST MANAGEMENT PLAN	1
1.4 PROPONENTS TO THE PLAN	1
1.5 PESTICIDES USED	1
2.0 INTEGRATED PEST MANAGEMENT PROGRAM.....	3
2.1 PREVENTION.....	3
2.1.1. Mapping - Ecosystems and Pre-existing Brush.....	3
2.1.2. Site Preparation.....	6
2.1.3. Planting	6
2.1.4. Fertilization	6
2.1.5. Browse Guarding.....	6
2.2 MONITORING	7
2.2.1. Competing Vegetation	7
2.2.2. Surveys.....	7
2.3 TREATMENT	8
2.3.1. Treatment Thresholds.....	8
2.3.2. Treatment Selection	8
2.3.3. Herbicide Application Rates.....	11
2.4 EVALUATION	11
3.0 ENVIRONMENTAL PROTECTION.....	12
3.1 COMMUNITY WATERSHEDS	12
3.2 FISHERIES RESOURCES AND RIPARIAN AREAS	12
3.3 WILDLIFE VALUES	12
3.4 DOMESTIC WATER INTAKES.....	13
3.5 FOOD PLANTS.....	13
4.0 OPERATIONAL REQUIREMENTS	14
4.1 SAFE HANDLING PRACTICES	14
4.1.1. Pesticide Transport	14
4.1.2. Pesticide Storage.....	14
4.1.3. Mixing and Loading of Pesticides	14
4.1.4. Container and Unused Pesticide Disposal.....	15
4.1.5. Spill Response.....	15
4.2 IMPLEMENTATION PROCEDURES	16
4.2.1. Boundary Layout Procedures.....	16
4.2.2. Project Supervisor and Monitors Minimum Qualifications	16
4.2.3. Applicator Qualifications	16
4.2.4. Aerial Applications	17
4.2.5. Ground Applications	17
4.3 EQUIPMENT MAINTENANCE AND CALIBRATION	18
4.3.1. Aerial Equipment.....	18

4.3.2.	<i>Ground Equipment</i>	18
4.3.3.	<i>Calibration</i>	18
4.4	PESTICIDE TREATMENT SIGNS.....	18
4.5	SITE MONITORING PROCEDURES.....	19

List of Maps

Map No.	Title	Pg
Map 1.1	Chilliwack Forest District	4

List of Tables

Table No.	Title	Pg
Table 1.1	Herbicides Used in This Plan	3
Table 2.1	Brush Hazard Ratings by BEC Subzone –Chilliwack Forest District	7
Table 2.2	Monitoring Surveys of the Chilliwack Forest District	11
Table 2.3	Attributes of Chemical Methods Used in the Chilliwack Forest District	13
Table 2.4	Attributes of Mechanical / Manual Methods Used in the Chilliwack Forest District	14
Table 2.5	Application Rate Ranges and Optimal Treatment Season for Vision® and Release®	15

List of Appendices

<i>Appendix 1</i>	<i>Pesticide Information</i>
<i>Appendix 2</i>	<i>Treatment Thresholds</i>
<i>Appendix 3</i>	<i>Contact Information</i>
<i>Appendix 4</i>	<i>Water Resources in the Chilliwack Forest District</i>

Communication Summary (separate cover)

- First Nations
- Government Agencies
- Public

1.0 INTRODUCTION

1.1 Integrated Pest Management

The concept of integrated pest management is a systematic approach to pest management that relies on a wide spectrum of techniques to manage pests. Integrated Pest Management is defined in the *Integrated Pest Management Act* to mean “a process for managing pest populations that includes the following elements:

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

Fraser Timber Supply Area Cooperative Association. (FTSACA) is committed to using these principles in managing their forest obligations.

1.2 Scope of the Pest Management Plan

This pest management plan includes all Crown forest land within the Chilliwack Forest District.

1.3 Term of the Pest Management Plan

The term of the plan is for 5 years from 2010 to 2015.

1.4 Proponents to the Plan

The Fraser Timber Supply Area Cooperative Association is a group of forest licencees with timber rights under a variety of licences in the Fraser Timber Supply Area. Any member of this association may propose the use of herbicides under this plan.

1.5 Pesticides Used

FTSACA uses the federally registered products Vision®, VisionMax® and Vantage®* (containing the active ingredient glyphosate) and Release® (containing the active ingredient triclopyr) in its vegetation control programs. Vision®, VisionMax® and Vantage® are used as a foliar spray and a *stem injection* product while Release® is used as a basal bark treatment on various deciduous trees.

* Vision® and Vantage® are trade names for glyphosate formulations distributed by two different manufacturers. Since these are the same product, they may be interchanged for glyphosate treatments. Vision Max® is also a glyphosate based product whose formulation is able to enter the vegetation faster. It enables treatments to continue when precipitation is expected.

Table 1.1 Herbicides Used in This Plan

Product	Active Ingredient	PCP Number
Vision®	Glyphosate	19899
Vantage®	Glyphosate	26884
Vision Max®	Glyphosate	27736
Release®	Triclopyr	22093
Sylgard 309®	Siloxyated Polyether	23078

Additional information on these products can be found in Appendix 1.

2.0 INTEGRATED PEST MANAGEMENT PROGRAM

Integrated Pest Management is the key to the pest management program and incorporates the following concepts:

- Prevention - managing ecosystems to prevent organisms from becoming pests;
- Monitoring - ongoing monitoring of pest populations;
- Treatment - establishment of treatment thresholds and control of pests through direct intervention; and
- Evaluation - formal evaluations of treatment success.

It uses all available, practical techniques to directly deal with pest problems, including biological, physical, and cultural controls, as well as chemical treatments. All activities are done in a coordinated manner such that the total costs are minimized while still achieving the final goal. FTSACA is committed to the principals and practice of Integrated Pest Management and will use the techniques listed below in an integrated program to manage competing vegetation. FTSACA will minimize the use of herbicides where operationally feasible.

Vegetation management under the Integrated Pest Management program involves the following components:

Prevention, Monitoring, Treatment, and Evaluation

2.1 Prevention

Prevention is the key to the Integrated Pest Management program. The ideal situation would be to have the crop trees growing at their full site potential. Competing brush slows tree growth and is costly to treat. Further, because these treatments are necessary, it means that the conifers are not growing to their full potential. A reforestation program that quickly establishes a new crop and keeps the trees growing at or near their potential is obviously the preferred scenario. Costs to new crop establishment are minimized and the use of herbicides is limited.

The objective is to design the reforestation programs to maximize tree growth while minimizing vegetation control.

2.1.1. Mapping - Ecosystems and Pre-existing Brush

The identification of the ecosystem is very important. Each ecosystem has an associated vegetation complex. The identification of those ecosystems with problem vegetation species or complexes at an early stage will help determine a regime of activities designed to control the competing vegetation in the most suitable manner.

Ecosystem mapping is done primarily to determine the correct tree species to re-stock the area. Each species is adapted to certain ecosystems but perform poorly on others. Species selection follows those recommended in the "Establishment to Free Growing Guidebook" for the Vancouver Forest Region and has been fine tuned by FTSACA personnel in the current Forest Development Plan or Forest Stewardship Plan. The type of ecosystem is also useful for estimating, among other things, the potential for brush following the harvest. This information is gathered prior to harvest and summarized in the silviculture prescription or site plan and delineated on its map. This type of mapping is a good method of identifying potential brush concerns based on the ecosystem. The Ministry of Forest's "A Field Guide to Site Identification and Interpretation for the Vancouver Forest Region" (Green and Klinka 1994) ranks forest sites for competing vegetation potential (defined as "the potential of a site to produce post-logging vegetation communities that may affect crop tree establishment and growth") and list competing vegetation complexes that are relevant for the Vancouver Forest Region. Brush is often a problem as a "complex" or a number of vegetation species that grow in similar conditions. There are eight vegetation complexes that have the potential to compete adversely with conifers. The authors of

the guide also developed a rating system based on competition severity. The four hazard ratings are used:

- low – low vigour brush species – no vegetation management anticipated
- moderate – moderate vigour brush species – some vegetation management anticipated
- high – vigorous brush species – some vegetation management anticipated – possible multiple treatments
- very high – very vigorous brush species or pre-existing vigorous brush species – some vegetation management anticipated – possible site preparation required – possible multiple treatments.

Table 2.1 lists the brush hazard ratings for the areas within the Chilliwack Forest District where brush will probably be a concern. Those site series ranked Moderate to Very High have brush concerns and will have the potential to significantly decrease growth and survival of conifers.

Reforestation strategies are developed using many years of observations on similar sites. A generalized regime can be used for the similar ecosystems and is altered based on site conditions. A list of these regimes is discussed in more detail within the Treatment Thresholds section (Section 2.3.1) below and in Appendix 2. An assessment of site characteristics and brush hazard early in the block's history is the key for vegetation management. A regime of silviculture activities is based on these observations. This early assessment will help determine the regeneration method, the species and stock type of trees that are used in planting, the frequency of site visits to monitor seedling growth and brush development and even the type of brushing that may be required to help the block reach free growing.

Low brush hazard areas may be left for naturals but are usually planted with small stock types at low densities (313B, 410B container stock). Since there is little concern for competing vegetation slowing tree growth, the number of site visits is minimized with the confidence that the trees will reach free growing with little help.

High brush hazard sites require more maintenance. Planting using larger stock types (415B, 415D, 615A container stock), higher planting densities, and possibly shade tolerant species where these are ecologically required is done soon after harvesting. Monitoring of seedling performance and brush competition is frequent (every 1-2 years as necessary). Brushing treatments are scheduled early in the plantation history. Multiple treatments are often necessary. Prompt establishment of crop trees on these sites will minimize the number of brushing treatments and subsequently herbicide use.

Historically most of the brushing occurs on the zonal sites (Site Series 01) in the drier ecosystems since these are the areas where harvesting has been concentrated in the recent past. Brush hazard ratings in these areas are considered moderate in the table. As harvesting transitions from the older forests on the mid to upper slopes into the second growth stands on the lower slopes where brush hazards are higher, more vegetation management will be required.

**Table 2.1
Brush Hazard Ratings by BEC Subzone - Chilliwack Forest District**

Site Series	BEC Ecosystem									
	CDF mm	CWH dm	CWH ds1	CWH ms1	CWH vm1	CWH vm2	ESSF mw	IDF ww	MHmm1	MHmm2
01	M/4	M/4	L	L	M/4	L	M/6	M/7	M/6	M6
02	L	L	L	L	L	L	L	L	L	L
03	L	L	L	L	M/4	M/4	L	L	M/6	M/6
04	M/4,2	L	M/7	M-H/3	M/3	L	L	H/7	M/6	M/6
05	L	M-H/2,3	M-H/3,2	L	H/3	M/3	L	H/5	M/6	M/6
06	M-H/2,3	L	L	VH/3	M/4	L	VH/8	H/5	M/6	M/6
07	VH/1	VH/2,3	VH/3,2	VH/1	VH/3	H/3	VH/8	H/5	M/8	M/8
08	VH/1	VH/1	VH/1	VH/1			VH/3		L	L
09	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								

L = tree growth is not or is slightly impacted from competing vegetation

M = tree growth impacted but not survival rate from competing vegetation

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, devil's club

² - Bigleaf Maple - bigleaf maple

³ - Red Alder / Shrub - i.e. red alder, vine maple, thimbleberry, salmonberry, 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

⁸ - Subalpine Herb - i.e. fireweed, Sitka valerian, Indian hellebore

Information 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.

2.1.2. Site Preparation

Site preparation is an activity that prepares the block for regeneration. Site conditions that warrant site preparation include heavy pre-existing brush levels, heavy slash loading or compacted soils from vehicle access. The kinds of site preparation that may be utilized are:

- Roadside slash piling or piling and burning (piles less than 50 m² in ground surface area may be left unburned)
- Off road slash piling or piling and burning
- Ground or aerial foliar spray of pre-existing brush following the harvest but prior to planting
- Ground foliar spray of pre-existing brush along existing roadways prior to harvesting
- Chainsaw cutting of openings in thick brush prior to planting
- Broadcast burning

2.1.3. Planting

Planting can have a large impact on future brush problems. Prompt, successful planting of healthy seedlings of the appropriate species and stock types can result in rapid growth of the seedlings and can result in the plantation outgrowing much of the competing brush. **FTSACA is committed to prompt reforestation with appropriate size planting stock.** The various aspects of planting which are important are:

- Timing
- Planting prescription – species and stock type, size and age

Fertilization and browse guarding are most commonly implemented at the same time as planting but are discussed separately.

Timing. On high brush hazard sites it is critical to plant as soon as possible after harvesting, ideally before the first growing season begins following harvesting. On low to moderate brush hazard sites prompt planting is less critical and may even be delayed to allow slash to settle on steep slopes and surrounding trees to seed in the block.

Planting prescription. The reforestation plan is described in the silviculture prescription or site plan. Based on past experience and anticipated site conditions, the plan outlines the need for planting, the tree species to be used and the estimated density to be planted. The plan is based on the ecology and brush hazard of the site, and there is a different plan for each ecosystem or group of ecosystems (standards units) in the block. A detailed planting prescription may be completed to fine tune the plan. FTSACA intends to plant trees on every cutblock, unless a silviculture survey indicates it is not required.

2.1.4. Fertilization

Time-of-planting fertilization has been used for several years. The best results have been on poor nutrient sites. On rich sites, it is unclear whether fertilization is helpful. Since soil conditions differ throughout an area, the application of fertilizer will ensure that an adequate nutrient supply is available. FTSACA may continue to use time-of-planting fertilizer on a limited basis.

2.1.5. Browse Guarding

Mammal browsing of red cedar and Douglas-fir is common throughout the plan area. Deer are the most common culprit but pikas also are capable of destroying plantations. Browsing is avoided through a number of methods.

- Tree protectors will be installed over the tree at time of planting. These protectors allow light and moisture to reach the trees but provide a physical deterrent to the deer. The protectors are removed once the trees outgrow them.
- Trees may be treated with repellents to keep deer away. The pesticide Plantskydd®, a deer repellent made from pigs' blood, may be applied to the seedlings either in the nursery or in the

field; this treatment prevents browsing for 3 to 6 months based on our current experience. Re-treatments are necessary to maintain the protective effect of Plantskydd®.

2.2 Monitoring

The monitoring phase of the integrated pest management program is crucial since it provides the information needed to make decisions about treatment type and timing.

There are two main tactics used to identify brush problems. The first is to predict where brush problems will occur by using ecosystem information (discussed in Section 2.1 - Prevention). The second method is information gathering during regularly scheduled field surveys. It is important during surveys to be able to identify potential pests and to predict future impact on the crop trees.

2.2.1. Competing Vegetation

The principal plants that are treated as pests in this plan are:

Primary Competitors

- Red Alder
- Bracken fern
- Bitter cherry
- Big-leaf maple
- Douglas maple
- Thimbleberry
- Salmonberry
- Fireweed
- Paper birch

Secondary Competitors

- Slide / Sitka alder
- Elderberry
- Willow species

Species other than those listed may be identified as a pest species on a site-specific basis.

2.2.2. Surveys

Data collected during regularly scheduled surveys is the main method used in evaluating brush competition. The following is a list of monitoring surveys that may occur throughout the establishment of the stand.

Table 2.2 Monitoring Surveys in the Chilliwack Forest District

Survey	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 -	Year following planting	Planted tree - species, height, vigour, root collar diameter	Species, cover, height, individual stem diameter and stem density of vegetation (if necessary)
Regeneration -	Two to three years following harvest	Species composition, height, vigour, sph	Species, cover, height, individual stem diameter and stem density of vegetation (if necessary)
Brushing	Two to five years following regeneration survey	Species composition, height, vigour, sph	Species, cover, height, individual stem diameter and stem density of vegetation (if necessary)
Free Growing	Crop Trees meet minimum height requirements - often 7-10 years post harvest	Species composition, height, vigour, sph	Species, cover, height, individual stem diameter and stem density of vegetation (if necessary)

If an emerging brush problem is identified, then more frequent surveys can be scheduled to monitor brush development.

2.3 Treatment

2.3.1. Treatment Thresholds

The *Treatment Threshold* is the point where the vegetation begins to limit the growth potential of the tree and vegetation management treatments should be done to ensure the tree grows at or near its maximum capacity.

Brushing will be prescribed when:

- a) Crop tree survival will be threatened.
- b) Competing vegetation is preventing conifer crop trees from reaching free-growing status.
- c) Vegetation is not currently competing with conifer crop trees, but where forest site, conifer stocking, target species and other information strongly indicate that competition will prevent an adequate number of potential crop trees from reaching free-growing status.

There are a number of ways in determining the treatment threshold. Appendix 2 describes a number of systems used in determining treatment thresholds.

The decision to treat vegetation will be based on using these methods as well as employing local experience. The final decision to treat will be at the discretion of the brushing program manager or qualified forest professional.

2.3.2. Treatment Selection

Treatment selection is based on the treatment thresholds discussed above.

Treatment Options

This plan has identified two treatment options to manage competing vegetation: Chemical, Manual / Mechanical.

2.3.2.1. Treatment Options - Chemical

Using the vegetation competition values described above, the forest manager can then determine which method of brush control is the most appropriate. Considerations in selecting a method include:

- Type of vegetation requiring control
- Access
- Worker Safety
- Presence and Location of PFZ
- Cost of treatment

Table 2.3 Attributes of Chemical Methods used in the Chilliwack Forest District

Method	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)	Basal Bark - individual stem treatment (triclopyr)
Factors					
Scale of Treatment / Limitations	Larger openings with even boundaries, requires large PFZ / 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 are high	Treats individual stems - very selective, smallest PFZ, more effective when target stems are <7 cm dbh
Target Vegetation	Herbaceous, woody stems and trees	Herbaceous, woody stems and trees < 2m	Herbaceous, woody stem cover, and trees < 1m	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	Hand tools and spray bottle, specially equipped powered saw	Backpack sprayer
Worker Safety	Limited contact with chemical	Exposure to spray if improper procedures or clothing used	Exposure to spray if improper procedures or clothing used	Exposure to spray if improper procedures or clothing used	Exposure to spray if improper procedures or clothing used
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 term	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 are followed. Treat danger snags before entering work area.	Worker - ensure proper chemical and equipment handling techniques are followed. Treat danger snags before entering work area.	Worker - ensure proper chemical and equipment handling techniques are followed. Treat danger snags before entering work area.	Worker - ensure proper chemical and equipment handling techniques are followed. Treat danger snags before entering work area.
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 per Treatment	\$300 - 500 / ha	\$400 - 800 / ha	\$400 - 800 / ha	\$500 - 1000 / ha	\$600 - 4000 / ha

2.3.2.2. Treatment Options – Manual/Mechanical

1. Girdling – cut through the bark and completely sever the cambium layer around the main stem of the target vegetation, usually deciduous trees.
2. Powersaw, brush saw – cut target vegetation using powered hand tools.
3. Manual cutting - cut target vegetation using hand tools such as axes
4. Stem bending – bend over target vegetation, primarily to prevent vegetation press.

Table 2.4 Attributes of Mechanical / Manual Methods used in the Chilliwack Forest District

Method	Broadcast Burn	Mechanical Site Preparation (machinery)	Mechanical Cutting (hand power tools)	Manual Cutting (hand tools)	Manual Girdling (hand tools)
Factors					
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, 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 < 1 yr Woody stems and trees - 2-5 years	4 years
Equipment Required	Appropriate fire fighting 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
Worker Safety	Potential exposure to flammable liquids, burning slash	Worker protected in cab of machinery	Use of dangerous power tools, repeated motions physically demanding, terrain and slope will affect worker safety	Use of tools, repeated motions physically demanding	Use of tools, repeated motions physically demanding
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, ensure public clear 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

2.3.3. Herbicide Application Rates

Application rates are derived from the manufacturers' specifications and operational experience and shall not exceed the manufacturers' specifications. Application rates and typical treatment timing for glyphosate and triclopyr are shown in Table 2.5.

Table 2.5 Application Rate Ranges and Typical Treatment Seasons for Glyphosate and Triclopyr

Application Method	Main Target Vegetation	Application Rate (kg a.i. ¹ /ha)	Typical Season for Treatment
Site preparation-foliar-glyphosate *	Salmonberry-thimbleberry-elderberry-red alder	0.9-2.1	August-September
Foliar-glyphosate *	Red alder	1.5-1.8	August-September
"	Bitter cherry	1.3-1.8	August-September
"	Salmonberry & thimbleberry	0.9-1.8	August-September
"	Elderberry	1.5-1.8	August-September
"	Bracken	1.3-1.8	August-September
"	Fireweed	1.5-1.8	August-September
Hack & squirt *	Red alder/bitter cherry/paper birch	0.5-1.8	All year
Basal spray-triclopyr	Elderberry	1.0-7.2	April-November
"	Bitter cherry	1.0-7.2	"
"	Red alder	1.0-7.2	"

* - Amount of herbicide used is based on a ground cover percentage estimate of target vegetation.

2.4 Evaluation

Each herbicide brushing project is evaluated following treatment to examine efficacy. The evaluation may not occur for up to several years if results are not immediately evident. Untreated portions may be left within blocks to compare conifer performance between treated and untreated areas. These ongoing studies will allow for examination of the effectiveness of brushing treatments. This feedback is incorporated into the decision making process for future treatments on similar stands.

¹ "a.i." stands for active ingredient

3.0 ENVIRONMENTAL PROTECTION

3.1 Community Watersheds

There are a number of Community Watersheds and various water license holders in the plan area. There is the potential that community watersheds will have herbicide treatments scheduled within their boundaries. Any treatments shall be done following restrictions regarding herbicide use within community watershed as outlined in the FPC Community Watershed Guidebook – 1996. Also see Section 3.4, Domestic Water Intakes.

3.2 Fisheries Resources and Riparian Areas

Under the *Forest Planning and Practices Regulations (FPPR)* of FRPA, forest streams have been classified into six main categories based upon their size and presence or absence of fish (see the “Riparian Management Guidebook”). Prior to harvesting all streams in a new block are mapped, assessed for fish, and classified. The only features associated with water that are not classified and mapped are “non-classified drainages”; these do not have continuous channels or alluvial deposits and are therefore not streams. These are usually small and *ephemeral*. The assessment and classification is done by FTSACA staff and consulting biologists. Lakes and wetlands are also classified and mapped.

Blocks that pre-date the FPC have most of the waterbodies accurately mapped as well. **Known but unmapped streams and wetlands are added to operational maps prior to treatment.**

The *FPPR* restricts certain activities in riparian areas. For example, adjacent to most lakes and all S1 to S3 streams, a 10-meter or greater riparian reserve zone is established. These are no harvest areas.

The value of preserving, or in some cases enhancing, riparian values is recognized and the vegetation management program is conducted accordingly. Standard provisions for herbicide use include:

- Identifying and mapping all streams, lakes and wetlands
- Establishing an appropriate “pesticide free zone - PFZ” and associated buffer zones around all flowing streams, lakes, wetlands and identifying them in the field with flagging tape or other markers (see Section 4).
- Using kromocote cards during aerial spraying operations to detect drift into buffer zones and to ensure that PFZs remain pesticide free.
- Restricting treatments in Riparian Reserve and Management Zones.

Appendix 4 describes the required pesticide free zones around water features.

The term PFZ denotes a strip of land, up to 10 meters in width, adjacent to a stream or water body, and measured horizontally from the *high water mark*. Pesticides may not be directly applied to or allowed to reach the PFZ via drift, runoff or *leachate*. 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. No pesticides are used in no-treatment zones, but applications may be made up to the edge of these zones – no buffer zones are required.

3.3 Wildlife Values

While herbicides are unlikely to cause any direct toxic effects to wildlife, if applied inappropriately they can impact wildlife habitat, particularly forage values. Potential deer winter ranges have been identified throughout the district. Communication with local Ministry of Environment staff aids in the management of wildlife species in proposed treatment areas.

Approved WHAs - <http://www.env.gov.bc.ca/wld/frpa/iwms/wha.html>

3.4 Domestic Water Intakes

All domestic water intakes that have Water Licenses (issued by MoE) have been mapped. All these water intakes will have a minimum 30-meter no-treatment zone for herbicides established around their diversion points or well sites.

To ensure that water users are identified prior to herbicide application, a procedure has been developed and is detailed in Appendix 4.

Community watershed locations can be checked at: http://www.env.gov.bc.ca/wsd/plan_protect_sustain/comm_watersheds/index.html

Well locations can be checked at: <http://aardvark.gov.bc.ca/apps/wells/>

Water licences can be checked at: http://www.elp.gov.bc.ca:8000/pls/wtrwhse/water_licences.input.

On site observations will help identify and locate unlicensed water intakes. Active water intakes will have no-treatment zones established, similar those that are licenced.

3.5 Food Plants

Berry picking is common throughout the district. Efforts will continue through formal and informal consultation to determine the locations of these activities. Measures will be made to assess the resource and accommodate wherever possible. Some measures could include delay of treatment or alteration of treatment boundaries.

4.0 Operational Requirements

4.1 Safe Handling Practices

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 procedures will be followed while transporting herbicides for application under this PMP.

- Pesticide containers will be secured during transit and placed in locked compartments when vehicles are left unattended
- Pesticides will be carried separately from food, safety gear, and people – i.e., in the back of a pickup truck and not in cars or station wagons
- Pesticide containers will be inspected prior to departure for damage or leakage
- Pesticide will be transported in metal truck boxes or, if the truck has a wooden deck, on a heavy tarpaulin
- Pesticides will be transported with a spill kit (shovel, absorbent pads) and the driver will be trained in emergency spill procedures
- Provided the volume of pesticide is less than 5000 litres no placards or documentation is required during transport

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 and;
 - Having clearly posted warning signs (“**WARNING: CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY**”) at each entrance,
 - Proper ventilation to the outside,
 - 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 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 4 workers.

- The minimum crew size for mixing and loading will be one (1) dedicated person, and other than that, crew size will dependent upon the number of pieces of spray equipment in use in the operation.
- Mixers and Loaders of pesticides shall have an emergency spill kit on site and be familiar with FTSACA 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 an appropriate backflow device is used within the system used to fill the application equipment.
- Equipment shall not be left unattended during filling.
- First aid equipment and 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.
- Know 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.
- Load water into delivery system last in order to rinse lines free of residual herbicide.

4.1.4. 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 500 (five hundred) litres worth 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 *Special 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.
- Empty containers shall be delivered to an approved landfill or container collection site in a timely manner.

4.1.5. Spill Response

A pesticide spill kit and contingency plan will be maintained at mixing and loading sites. The pesticide spill kits shall contain at least the following materials:

- Personal protective equipment.
- Absorbent material such as kitty litter, sawdust or commercial absorbent.
- Neutralizing material such as lime or washing soda.
- Long handled broom, shovel, waste bags, waste container with locking lid.

A FTSACA representative must approve both the spill kits and contingency plans prior to project commencement.

All personnel working on the herbicide project shall be familiar with the contents of the spill kit and the procedures to be followed when responding to a spill.

All spills shall be reported immediately to a designated FTSACA official.

4.2 Implementation Procedures

4.2.1. Boundary Layout Procedures

All areas scheduled for herbicide application shall be subject to a pre-treatment ground layout in order to locate and mark all treatment boundaries, Pesticide Free Zone's, No Treatment Zones and associated buffers. Boundary and treatment area layout shall be verified prior to treatment by the supervisor given that prevailing weather conditions may have changed some site conditions. Boundaries shall be marked in a manner clearly visible to the applicator.

4.2.1.1. Layout for Aerial Applications

For aerial applications, coloured bags shall be utilised, with distinct and different colours for PFZ's and associated buffers, and no treatment versus treatment boundaries.

- All distances for PFZ's, 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.
- Prior to treatment, all aerial bag layouts shall be flown by the site supervisor ensuring that the applicator (pilot) is familiar with all onsite layout.

4.2.1.2. Layout for Ground Applications

- For ground based applications (backpack, basal, hack and squirt and cut stump), undistinguishable treatment boundaries shall be located in highly visible ribbon.
- PFZ's shall be clearly marked in durable and persistent flagging tape.
- Refer to Section 4.2 and Figure 7.0 for a detailed enumeration of required operational Pesticide Free Zones and buffer widths.
- The supervisor shall verify all ground application layout.

4.2.2. Project Supervisor and Monitors Minimum Qualifications

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's Certificate in the Forestry General category.

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

4.2.3. Applicator Qualifications

All herbicide treatments will be conducted or directed by an individual who holds a valid Pesticide Applicator Certificate. 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.

4.2.4. Aerial Applications

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

- A pre-work conference will be held with the FTSACA Contract Administrator, site supervisor and the chosen application contractor. The following will be reviewed during the pre-work conference:
 - Familiarity with emergency procedures;
 - Spill contingency plan,
 - Monitoring procedures,
 - Communication protocols
 - Application parameters

Certificate numbers shall be recorded and an aircraft safety briefing shall be conducted.

- 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 shall ensure that there is at least one (1) 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 Monitors 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
 - 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 FTSACA and retained on file by the applicator for a period of three (3) years.

4.2.5. Ground Applications

During ground spraying or single stem treatment operations, the supervisor shall ensure the chosen Application Contractor adhere to the following contractual stipulations:

- A pre-work conference will be held with FTSACA and the chosen Application Contractor and shall ensure familiarity 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 Contractor's Supervisor shall ensure he/she is familiar with 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.
- Workers shall wear appropriate protective clothing.
- The Contractor shall supply one supervisor and one Crewleader/Monitor who shall ensure the integrity of any PFZ's 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.
- All pesticide use shall be recorded by the Mixer or Contract Supervisor in the Herbicide Operations Records, which shall be provided to FTSACA and retained on file by the applicator for a period of three (3) years.

4.3 Equipment Maintenance and Calibration

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.

4.3.1. Aerial Equipment

All equipment shall be calibrated prior to commencing operations for FTSACA.

4.3.2. Ground Equipment

Equipment used for backpack applications shall be calibrated prior to commencing spray operations, ensuring that each individual is familiar with appropriate target delivery rate and equipment functioning. All backpack spray equipment shall:

- Have a positive shut-off hand control
- Be a sealed non-leaking container
- Have an extension wand for nozzle
- Have a pressure limiting valve

4.3.3. Calibration

Calibration is measured by checking the distance travelled and the swath width for a known volume of spray. These calibration checks shall be performed at the beginning of each spray contract for FTSACA and shall be the responsibility of the Application Contractor's Supervisor.

Equipment used for basal bark, hack and squirt and cut stump procedures will also be calibrated, however this calibration is less stringent given that the amount of chemical shall be distributed over the area according to a known number of target stems found on site. Calibration is an ongoing process and the Contractor's Supervisor should be aware of target vegetation density and applications volumes as determined by the manufactures label.

4.4 Pesticide Treatment Signs

Signs containing site specific information with regards to treatment of each site shall be posted at all road or trail accessible points to the treatment area. Signs will be posted prior to treatment and will remain posted for a minimum of fourteen (14) days following treatment at which time a FTSACA representative may remove them. All Pesticide Treatment Signs will:

- Be of a minimum size of 550 cm²
- Be water resistant
- Display the title “**Notice of Pesticide Use**” in bold block letters that are clearly legible to a person approaching the treatment area. Substitution of “pesticide” with “herbicide” or another category of pesticide is permissible.
- Contain the following:
 - Date of Application
 - Confirmation Number
 - Pesticide Trade Name
 - Pesticide Common Name
 - PCP Number
 - Purpose of Treatment
 - Method of application
 - FTSACA, Address, Contact Name and Phone Number

4.5 Site Monitoring Procedures

Site condition and weather monitoring is an integral part of a herbicide program. During herbicide operations, temperature, relative humidity and wind speed shall be recorded at intervals of once each hour, or for each application load in the case of aerial application.

The Supervisor or Contract Administrator, reserves the right to cease herbicide operations using Glyphosate in the event of inclement weather or adverse site conditions. Aerial and backpack herbicide operations shall be stopped when parameters are exceeded according to the manufacturer’s label.

Hack and squirt, cut stump and basal bark applications using Vision® (Glyphosate) and Release® (Triclopyr) shall be stopped by the contractor’s supervisor in periods of rain or snow when conditions prevent product from being applied effectively according to the manufacturer’s label.

Detailed site assessments or surveys for each anticipated treatment site will be completed within 18months of the proposed treatment.