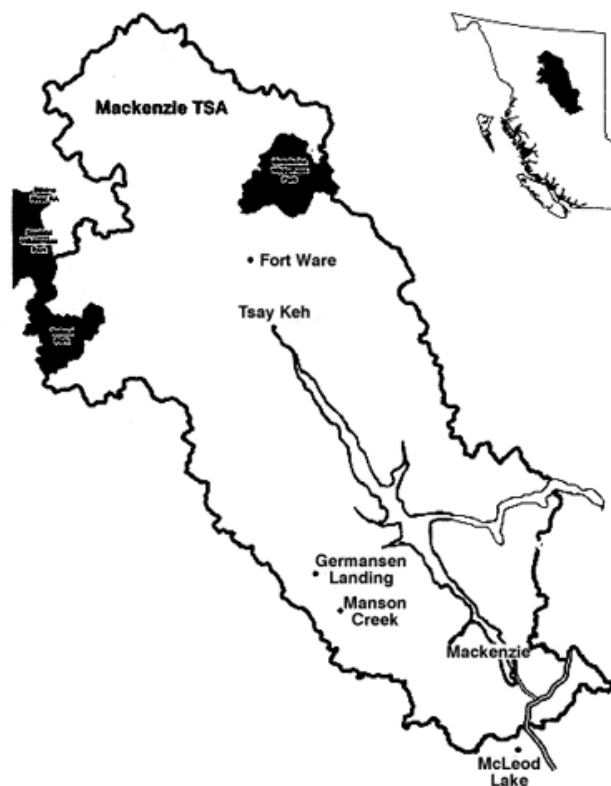




BCTS
BC Timber Sales
Prince George Business Area

BC TIMBER SALES PEST MANAGEMENT PLAN



PRINCE GEORGE BUSINESS AREA

**FOREST VEGETATION MANAGEMENT WITHIN THE MACKENZIE
TIMBER SUPPLY AREA.**

January 3, 2019 – January 2, 2024

BCTS-MK-PMP 19/24

TABLE OF CONTENTS

BC TIMBER SALES PEST MANAGEMENT PLAN	1
EXECUTIVE SUMMARY	5
1. INTRODUCTION	8
1.1. PURPOSE	9
1.2. OBJECTIVES GUIDING THIS PMP ARE AS FOLLOW:	9
2. PLAN HOLDER AND DESCRIPTION OF THE PMP AREA	11
2.1. PLAN HOLDER	11
2.2. TERM OF PLAN	11
2.3. CONTACTS UNDER THIS PLAN	11
2.4. GEOGRAPHICAL BOUNDARIES	12
2.5. USE OF THIS PLAN ON CROWN LAND	12
2.6. PUBLIC USE WITHIN THE PLAN AREA	12
3. VEGETATION AND PEST MANAGEMENT	13
3.1. VEGETATION MANAGEMENT OBJECTIVES	14
4. THE INTEGRATED PEST MANAGEMENT PROGRAM	15
4.1. PREVENTION	17
4.1.1. PREDICTION AND PLANNING	17
4.1.2. STOCKING STANDARDS	18
4.1.3. SITE PREPARATION	18
4.1.4. PLANTING AND FERTILIZATION	19
4.1.5. SPECIES SELECTION	19
4.1.6. STOCK TYPE	20
4.1.7. MICROSITE SELECTION	20
4.2. TIMING AND SCHEDULING	21
4.2.1. PLANTING	21
4.2.2. BRUSHING	21
4.3. IDENTIFICATION	22
4.4. MONITORING AND ESTABLISHING PRIORITIES	24
4.4.1. MONITORING	24
4.4.2. ESTABLISHING PRIORITIES	25
4.4.3. INJURY AND ACTION THRESHOLD DECISION	26
4.4.4. TREATMENT OPTIONS AND SELECTION	27
4.4.5. TREATMENT OPTIONS	27
4.4.6. INFLUENCING FACTORS	33
4.4.7. POST TREATMENT EVALUATION	36
5. SAFE HANDLING PRACTICES	36
5.1. PESTICIDE TRANSPORT	37
5.2. SAFE STORAGE OF HERBICIDES	38

5.3.	MIXING AND LOADING AND APPLYING OF PESTICIDES	39
6.	BCTS EMERGENCY MANAGEMENT SYSTEM PROCEDURES.....	40
6.1.	MIXING AND LOADING	40
6.2.	DISPOSAL OF EMPTY HERBICIDE CONTAINERS AND UNUSED HERBICIDES	42
6.3.	SPILLS	43
6.4.	SPILL RESPONSE.....	43
6.5.	INITIAL SPILL RESPONSE ACTIVITY.....	43
6.5.1.	DISCOVERY AND ASSESSMENT	44
6.5.2.	CONTAINMENT AND RECOVERY.....	44
6.5.3.	SPILLS TO LANDS	44
6.5.4.	SPILLS TO WATER.....	45
6.5.6.	FOR SPILLS LESS THAN 25 LITRES	45
6.5.7.	NOTIFICATION AND DOCUMENTATION	45
6.6.	REPORTABLE LEVELS OF HAZARDOUS MATERIALS SPILLS.....	46
6.7.	SPILL ROLES AND RESPONSIBILITIES	46
6.8.	SPILL KITS INSPECTION AND MAINTANCE	47
7.	PESTICIDE TREATMENT SIGNS.....	48
8.	HERBICIDE APPLICATION EQUIPMENT CALIBRATION.....	48
8.6.	AERIAL	49
8.7.	GROUND.....	49
9.	WEATHER CONDITIONS AND APPLICATION OF HERBICIDE	50
9.6.	AERIAL BROADCAST.....	50
9.7.	GROUND BROADCAST	51
9.8.	GROUND – CUT STUMP AND BASAL BARK APPLICATIONS	51
10.	ENVIRONMENTAL PROTECTION.....	52
10.6.	STRATEGIES TO PROTECT WATERSHEDS.....	52
10.7.	STRATEGIES TO PROTECT FISH AND RIPARIAN AREAS	53
10.8.	STRATEGIES TO PROTECT WILDLIFE AND WILDLIFE HABITAT	54
10.9.	STRATEGIES TO PREVENT PESTICIDE CONTAMINATION OF FOOD INTENDED FOR HUMAN CONSUMPTION	55
10.10.	PRE-TREATMENT INSPECTIONS PROCEDURES FOR IDENTIFYING TREATMENT AREA BOUNDARIES.....	55
10.10.1.	TREATMENT AREA LAYOUT	56
10.10.2.	FINAL PRE-TREATMENT BLOCK RECONNAISSANCE.....	57
11.	HERBICIDE USED FOR VEGETATION CONTROL	58
12.	REPORTING, NOTIFICATION, ONGOING ENGAGEMENT AND PLAN AMENDMENTS .	60
12.1.	REPORTING.....	60
12.2.	CONFIRMATION HOLDER USE RECORDS.....	60

APPENDIX.....	62
APPENDIX 1: MAP OF PEST MANAGEMENT BOUNDARY AREA.....	61
APPENDIX 2: GLOSSARY AND TERMS.....	63
APPENDIX 3: MACKENZIE FIELD TEAM SILVICULTURE REGIME.....	67
APPENDIX 4: ADVANTAGES AND DISADVANTAGES OF SILVICULTURE TREATMENTS...	68
APPENDIX 4: EFFECTIVNESS OF HERBICIDETREATMENTS.....	72
APPENDIX 5: EFFECTIVENESS OF MANUAL TREATMENTS	76
APPENDIX 6 – EMS INCIDENT REPORTING AND INVESTIGATION FORM	79
APPENDIX 7 – HERBICIDE OPERATION RECORD	80
13. BIBLIOGRAPHY	82
14. REFERENCES.....	84

Figure 1. IPM STEPS FOR AN EFFECTIVE INVASIVE PLANT MANAGEMENT PROGRAM.....	16
Figure 2 INITIAL SPILL RESPONSE PROCESS.....	44

TABLES

TABLE 1 OBJECTIVES OF SITE PREPARATION.....	19
TABLE 2 VEGETATION TREATMENT OPTIONS	28
TABLE 3 HERBICIDE AND BIOLOGICAL HERBICIDE METHODS	29
TABLE 4 MECHANICAL, MANUAL, AND BIOLOGICAL METHODS.....	31
TABLE 5 REPORTABLE LEVELS OF HAZARDOUS MATERIALS	46

EXECUTIVE SUMMARY

The forests of B.C contain some of the most ecologically diverse plant and animal communities. One way to help maintain a healthy forest is through careful management of the various tree diseases, insects, plants and animals that can damage a forest resource.

When “Pests” affect forest health, there can be huge losses in timber production. Therefore,

Management of vegetation is an important part of successfully re-establishing healthy crop trees after a forest has been logged. Management objectives are to suppress competing vegetation enough to allow establishment of crop trees and to maximize their survival and growth while minimizing damage to non-target organisms.

It is neither desirable nor possible to remove all vegetation that could compete with crop trees. Instead, an Integrated Vegetation (pest) Management approach is used to achieve desired results. Typically, a combination of control measures need to be considered and long-term strategies developed to minimize impact on people and the environment. Vegetation control options will be outlined in this Pest Management Plan document.

BC Timber Sales defines “pests” as competing vegetation that is infringing on crop tree establishment and survival. BC Timber sales will use proactive and preventative approaches to reduce reliance on herbicide and ultimately reduce its use. However, the use of herbicide can be a beneficial tool in aiding in the management of vegetation. Therefore, BC Timber Sales will emphasize (explore) proactive and preventative management approaches utilizing key elements of the *IPM Act*;

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

Although, all of these key elements are important. For this reason, planning and evaluating management approaches will be critical in BC Timbers Sales ability to sustain forestry resources while protecting Indigenous rights, fish and wildlife habitat and providing opportunities for recreational users and more. For the reason that, good planning will lead to better forest management and if the use of this PMP is needed then evaluation of treatments is essential to improving forest management decisions to ensure a reduction in herbicide use.

All Integrated Pest Management activities conducted under this PMP will comply with all applicable legislation, including (but is not limited to) the [Integrated Pest Management Act and Regulations](#), [Forest and Range Practices Act](#) (FRPA) and the [Forest Planning and Practices Regulation](#) (FPPR).

This plan applies to specific areas in the [Mackenzie Timber Supply Area \(TSA\)](#). For all blocks harvested under Timber Sale Licences (TSL's), BCTS is obligated, through legislation, to achieve free growing¹ status within the time frame specified in the Silviculture Prescription² or Site Plan³ (SP). BCTS carries out vegetation management activities in meeting these legal obligations.

Additionally, BCTS holds road maintenance obligations on some Forest Service Roads. These responsibilities include safety and environmental aspects including maintaining rural residence access, high value recreation site access, roadside and road prism water flow and drainage to minimize negative impacts on road integrity, and sight lines to enhance safety. Herbicide may be used as a road maintenance tool to manage vegetation on roadsides to satisfy this requirement.

The BC Timber Sales (BCTS) Prince George Business Area – Mackenzie Field Team submits the following integrated Pest Management Plan (PMP) for the management of competing vegetation for the period of January 3rd, 2019 to December 31st, 2024.

This PMP describes: public consultation; annual Notice of Intent to Treat (NIT); use of Integrated Pest Management (IPM); Pesticide storage; prevention of water contamination; protection of wildlife, riparian areas and wildlife habitat; preparation of herbicide use; prevention of human exposure; and recording keeping and annual reporting.

1. INTRODUCTION

Section 24(2)(g) of the Integrated Pest Management Regulation ([IPMR](#)) requires the preparation of a Pest Management Plan (PMP) for herbicide use for the management of noxious weeds and invasive plants on more than 50 hectares a year of public land (e.g. provincial Crown land).

This PMP is a plan that describes:

- A program for managing pest populations or reducing damage caused by pests based on integrated pest management; and,
- The methods of handling, preparing, mixing, applying, and otherwise using pesticides within the program.

The mandate of this PMP is to implement a proactive program that identifies, prevents and monitors pests (herbs, shrubs and deciduous (broadleaf) trees) to ensure sound silviculture practices are carried out. The objective is to ensure that BC Timber Sales silviculture obligations are fulfilled in a meaningful proactive way while minimizing any adverse effects associated with vegetation management. This Integrated Pest Management (IPM) framework will allow plantations to achieve free growing status within the time frame required and reduce potential volume losses as a result of mortality and/or suppressed growing conditions.

This plan is intended to describe and provide guidance for an Integrated Pest Management (IPM) approach for control of vegetation on Crown land; it is not meant to be an operational plan and it does not mean BC Timber Sales will solely rely on herbicide applications to manage their silviculture obligations.

1.1. PURPOSE

This plan is intended to describe and provide guidance for an Integrated Pest Management (IPM) approach for integrated vegetation management (IVM) on Crown land. The primary purpose in developing this PMP is to provide a single document that described a multi-agency approach and planning process, using the principles of IPM that will both ensure the effective management of “pest vegetation” and effective management of forested crown lands within northern BC while also protecting environmental and human values. Where appropriate, government ministries will work collaboratively with regional invasive species committees or other partnering agencies to design operational treatment plans within the PMP area.

This PMP is designed to replace the existing PMP (Confirmation # 738-0022-14/19)

1.2. OBJECTIVES GUIDING THIS PMP ARE AS FOLLOW:

- Legal accountability with the provisions of the Integrated Pest Management Act and Regulations ([IPMA](#) and [IMPMR](#));
- The responsible use of herbicides;
- To incorporation and use of the principles of IPM;
- Public and First Nations awareness of, and input into, vegetation management at the landscape level;
- To establish free growing crop trees on a disturbed area in a cost effective manner with full consideration of human safety and social, environmental, and cultural values;
- To control competing vegetation or brush encroachment of young tree seedlings;
- To establish a clear decision making process that sets standards for timely and effective treatments;
- To promote the use of integrated vegetation management that minimizes vegetation pest problems and reduces the need for the use of herbicides;
- To promote reforestation of well-stocked stands and valuable tree species that support the Timber Supply Analysis;

- To provide an open forum for public and First Nations participation concerning PMP development and content;

The focus of treatments will generally be on helping BC Timber Sales meet legal silviculture obligations by using the objectives mentioned above.

DRAFT

2. PLAN HOLDER AND DESCRIPTION OF THE PMP AREA

2.1. PLAN HOLDER

The PMP holder will be *BC Timber Sales – Prince George Business Area - Mackenzie Field Team*.

2.2. TERM OF PLAN

This plan shall be in effect for a five-year period from January 3, 2019 to January 2, 2024.

2.3. CONTACTS UNDER THIS PLAN

Len Stratton, RPF (Responsible for managing pests on behalf of BC Timber Sales-PGBA)

Timber Sales Manager

BC Timber Sales – Prince George Business Area

Telephone: (250) 614-7400

Ray Jacob, RFT (Primary Contact)

Woodlands Supervisor

BC Timber Sales – Mackenzie Field Team

Telephone: (250)-997-2240

Raymond.Jacob@gov.bc.ca

Mailing Address:

BC Timber Sales

Po Box 2260, 1 Cicada Road

Mackenzie, BC V0J 2C0

2.4. GEOGRAPHICAL BOUNDARIES

This Pest Management Plan is specified to provincial Crown land within the Mackenzie Natural Resource District, which forms part of the BCTS Prince George Business Area. The Mackenzie Natural Resource District is located north of Prince George surrounding Williston Lake and includes the community of Mackenzie. This PMP boundary includes BCTS operating area and any other legacy blocks in the Mackenzie Resource District (see [Appendix 1](#)).

2.5. USE OF THIS PLAN ON CROWN LAND

This PMP provides the guidance for integrated pest management on Crown land; it informs and guides BCTS silviculture operations on vegetation management to meet and manage silviculture obligations.

Agencies or non-government organizations working in partnership with the Province of British Columbia may be authorized to use this PMP for IPM activities on Crown lands, provided that the following are adhered to in a signed letter of agreement:

- Compliance with the contents of, and commitments made in, the PMP; and,
- Compliance with the requirements contained in the *IPMA*, *IPMR*, and other applicable legislation (e.g. the *Park Act* and the *Ecological Reserve Act*).

2.6. PUBLIC USE WITHIN THE PLAN AREA

The principle land uses within the PMP area are: forestry, agriculture, mining, gas and oil development, recreation, hunting, fishing, medicinal and food plant gather. Substantial timber harvest levels support numerous sawmills and pulp mills. The area is also well known for its land and water based recreational activities. There are also many high use Provincial Parks and Protected Areas including conservation areas,

conservancies, recreation areas and sites and resort tenures that are popular tourism destinations. Hunting, fishing and non-consumptive activities like hiking, nature photography, boating, and research activities are also popular. Provincial Crown land is also used for harvesting of medicinal and food plants and fur bearing animals.

3. VEGETATION AND PEST MANAGEMENT

Vegetation management in the context of this plan will include the following:

- Vegetation that is interfering with silviculture obligations
- Vegetation that is considered pest vegetation,
- Noxious weeds and invasive plants

Pest management in the context of this plan will include the following:

- Vegetation that inhibits plantation establishment;
- Vegetation that hinders optimal growth and development of crop trees;
- Vegetation that prevents a stand from achieving free growing;
- Vegetation that affects an established plantation's overall health; or,
- Vegetation when combined with snow causes damage to crop trees by snow press.

For the purposes of this PMP, the following definitions apply:

Crop Species – will be defined as desirable conifer species stated in each cut-block Site Plan.

Vegetation – all plant life including, without limitations, grasses, sedges, forbs, vines, ferns, brush, deciduous trees, and coniferous trees.

Pest Vegetation* or Pest – which, primarily, is likely to outcompete or damage crop species

Vegetation Management – any pest vegetation compromising legal and silviculture obligations

Invasive plants - species that are non-native or alien to the ecosystem under consideration. Their introduction causes, or is likely to cause, economic or

environmental damage, or harm to human health. In B.C. the term invasive plant is synonymous with invasive alien plant.

Noxious weed – invasive plant species designated by regulation to be noxious under the *BC Weed Control Act* (WCA), administered by FLNRORD.

*Additional definitions and a glossary of Acronyms may be found in [Appendix 2](#).

3.1. VEGETATION MANAGEMENT OBJECTIVES

BC Timber Sale's vegetation management objectives are centered on sound decision making processes when managing forest ecosystems to ensure a healthy and sustainable environment for all to prosper and enjoy. Legislative requirements will also help guide and establish vegetation management objectives.

BCTS vegetation management objectives are to meet all legal silviculture obligations while minimizing negative impacts on the land base. BCTS vegetation management objectives are to:

- Ensure vegetation management practices and procedures are safe, environmentally sound, practical, efficient and cost-effective;
- Maintain a healthy and vigorous plantation;
- Prevent competing pest vegetation from causing injury or death, or having negative impact on plantations;
- Utilize appropriate technologies;
- Ensure public awareness;
- Pursue partnership opportunities with various resource experts;
- Ensure use of herbicides in a biological and ecologically appropriate manner, with treatment strategies based on sound science;
- Identify and quantify vegetation management requirements;
- Consider compatible alternative uses for vegetation management to balance social, economic, and environmental values.

All vegetation management under this plan will adhere to IPMA, IPM, MOE, and other applicable federal, provincial and regional legislation.

4. THE INTEGRATED PEST MANAGEMENT PROGRAM

In the context of this document, the term Integrated Vegetation Management (IVM) will be used to describe vegetation management using the principles of Integrated Pest Management. Vegetation refers to all plant life including, without limitation, grasses, sedges, forbs, vines, ferns, brush, deciduous trees, and coniferous trees.

This PMP aims to achieve effective, long-term vegetation control and management compatible with both the legislated mandate(s) for invasive plant control, and the needs of humans, animals, plants, and environmental resources at and beyond the treatment site. No single tactic can solve a current vegetation problem or prevent future damage; therefore it is often necessary to combine several control methods into an IPM program.

IPM is a decision making process for determining what actions will be taken when vegetation problems occur. In IPM programs, all available information is considered in order to manage pest populations effectively in an environmentally sound manner. Preventing organisms from becoming pests, by keeping them at some acceptable level (i.e. below a level that causes damage), is generally the first step in an IPM program. When applied appropriately, this process will result in improved management, lower costs, ease of maintenance, and lower environmental impacts from control activities.

Successful implementation of an IPM program requires:

- Strategic, monitoring-based, prevention-oriented management;
- Extensive communication and cooperation among federal and provincial agencies, First Nations, local governments, private industry, landowners, and the general public;
- Public education and awareness programs in cooperation with regional invasive plant committees; and,
- Continuous improvement and innovation.

Government recognizes that within the larger plan area, there are localized areas with unique social and cultural values whose residents may wish to have further input and discussion on the operational delivery of vegetation management under this PMP. The plan holder will respond to these requests while developing annual operating plans

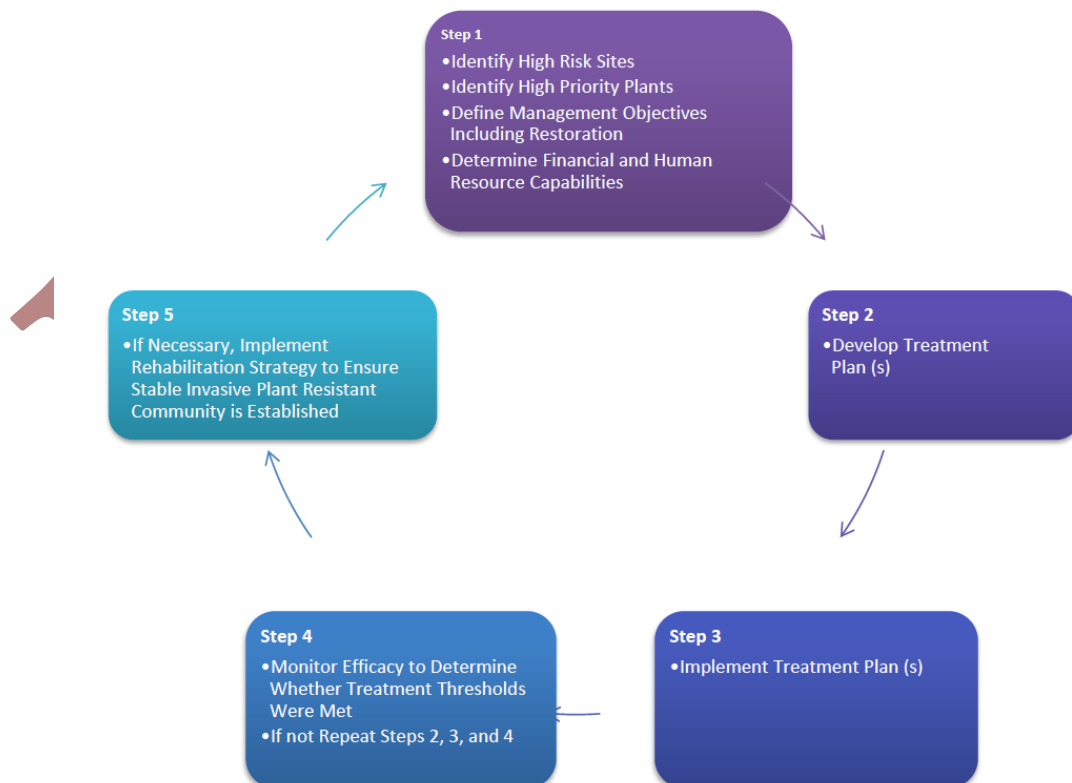
through best available means, such as open house gatherings, email notifications, website postings, etc.

The elements of an IPM program for this PMP are:

- Prevention;
- Identification;
- Surveys, Inventories and Data Management;
- Establishing Priorities and Management Strategies;
- Selecting Treatment Options and Methods and,
- Monitoring and Evaluation.

Government and other agencies or non-government organizations authorized to conduct activities under this PMP are committed to the principles and practice of IPM, and to the implementation of IPM steps as outlined in Figure 1.

Figure 1. IPM STEPS FOR AN EFFECTIVE INVASIVE PLANT MANAGEMENT PROGRAM



4.1. PREVENTION

Integrated Pest Management (IPM) is a strategy focusing on long term prevention of pest or their resultant damage using experts and best available science. Techniques such as manual brushing, chemical and/or biological controls may be implemented. Herbicides are used only after monitoring indicates they are needed according to established guidelines. Pest control methods are selected and applied in an effective and economical manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.

Preventing vegetation from becoming a pest is an essential component of this PMP. Rather than relying on treatments to address pest issues, reducing pest problems through preventive steps makes any pest treatments more effective if they are required. Preventing in the initial establishment of competing crop tree vegetation before it becomes a pest is the most effective method of crop tree establishment. Therefore, BC Timber Sales will explore innovative treatments such as fertilization and site preparation to closely mimic natural processes to prevent vegetation problems from existing to ensure successful seedling establishment.

The PMP will help guide crop tree establishment using the following strategy. The following defines the existing management strategies and commitments of BC Timber Sales silviculture program for preventing vegetation from becoming a pest by establishing crop trees. Prevention is the preferred management option; the key to prevention is good planning.

4.4.1. PREDICTION AND PLANNING

The Forest and Range Practices Act stipulates that a Site Plan (SP) be prepared for each cut-block to be harvested. Similar plans known as Silviculture Prescriptions were developed under pre-existing legislation. A Site Plan defines management strategies for all aspects of forest operations including harvest plan information, site assessment, maximum soil disturbance, results and strategies, retention requirements, and other critical factors.

Blocks are generally stratified using the [Biogeoclimatic Ecological Classification system](#) during the development of the SP. Site specific data (vegetation and species

distribution, expected brush hazard, and moisture and nutrient status) coupled with knowledge of how vegetation responds to harvest on a given ecotype is used to predict a potential pest problem and prescribe mitigating measures. Preventative measures include site preparation, fertilization, species selection, stock type selection, harvest timing, planting timing, and variations of stocking standards.

4.4.2. STOCKING STANDARDS

Stocking standards ensure reforestation programs meet objectives over time. Key components of stocking standards are density and species selection. They ensure suitable species selection and stocking levels that achieve prompt and effective establishment. Stocking standards will influence stand structure, forest biodiversity, stand economics, future utilization, forest health, and rotation lengths.

Stocking standards currently utilized by BC Timber Sales are approved under a Forest Stewardship Plan or a Forest Development Plan. Approved variations from these standards may be applied for standard units having site limiting factors. These variations provide BC Timber Sales with greater flexibility to assign and alter different stocking standards that are more suitable to that management unit and landscape priorities.

4.4.3. SITE PREPARATION

The intent of site preparation is to reduce the impacts of growth limiting factor(s) that might inhibit seedling establishment or growth potential and/or to encourage the natural regeneration of trees by creating favourable growing areas. The need for site preparation is usually identified at the prediction stage of the SP and verified during a post-harvest assessment. Well-planned and appropriate site preparation can make site conditions optimal for seedling establishment and growth. It can also reduce vegetation competition often allowing trees to achieve free-growing without additional vegetation treatments.

Table 1 describes the limiting factors, and the preventive site preparation methods that may be utilized to help mitigate negative impacts on reforestation objectives.

Table 1 OBJECTIVES OF SITE PREPARATION

Site Preparation Method	Limiting Factor
Mechanical, Manual, Chemical, Prescribed Burning	Reduce established vegetative competition
Mechanical, Prescribed Burning	Improve soil temperature
Mechanical	Improve soil moisture and aeration
Mechanical, Prescribed Burning	Reduce slash loading/increase # of plant-able spots
Mechanical	Improve drainage
Mechanical, Prescribed Burning	Encourage natural regeneration of trees

4.4.4. PLANTING AND FERTILIZATION

BC Timber Sales will reforest stands promptly to ensure successful seedling establishment after harvest to prevent vegetation management problems. BC Timber Sales will continue to plant high quality and improved stock. This will ultimately increase the success of reforestation programs by improving stock handling and microsite selection – choosing the best possible spot for each seedling planted. Also, the use of high genetic worth stock for reforestation operations will ensure better survival and performance of planted seedlings. The use of individual tree fertilization may be utilized to improve reforestation efforts and reduce reliance on vegetation management by encouraging seedling establishment and growth. This will help seedlings out compete surrounding vegetation and also ensure strong vigorous growth to help combat damage associated with vegetation press and suppression.

4.4.5. SPECIES SELECTION

Species selection will be made based on the ecological suitability of a species to the specific site conditions present on an area and best available science. Ecologically suitable species are coniferous or broadleaf tree species that are well-adapted to a site's

environmental condition, including variability in these conditions that may occur over time. Additional considerations include immediate and long-term forest health factors, climate change adaptation, future products, volume and value, biodiversity and consistency with Timber Supply Analysis.

4.4.6. STOCK TYPE

Stock type selection has its greatest influence on the establishment and early growth phases of a plantation. Choice of stock type can significantly impact the length of time to achieve free-grow obligations. Therefore, successful seedling establishment requires the appropriate choice of stock type. BC Timber Sales will evaluate sites and select appropriate stock type on the basis of competitive species, distribution and ability of seedlings to compete with present and potential competing vegetation, and the ability of seedling to establish on the soil type found on-site.

4.4.7. MICROSITE SELECTION

Optimum crop tree growth is achieved through the selection of appropriate microsites. Traditionally, planting carried out by BC Timber Sales has involved planting in mineral soil and on raised microsites. Where duff and humus is shallow, planting without screening¹ may be carried out to enable seedlings to use nutrients that are available in the organic-rich soils layers. Where there are no appropriate microsites, site preparation may accompany planting activities to create microsites where none are available, this is typically done when site conditions do not line up with the silvics of the crop tree species and usually has a negative impact on crop trees.

4.2. TIMING AND SCHEDULING

In order to ensure maximum seedling survival, establishment, development and the ability to compete with associated vegetation, timing of reforestation activities on sites having high to very high brush hazard is critical. This may also preclude the need to carry out a brushing treatment. Careful monitoring of sites will determine timing and scheduling of Silviculture activities.

4.4.1. PLANTING

Successful reforestation is achieved by immediately planting sites as soon as possible. BC Timber Sales attempts to plant blocks immediately, usually within two growing seasons of completed harvesting activities. This is dependent on the following but not limited to; site constraints; stock availability; slash loading; plantability, and other logistics constraints.

4.4.2. BRUSHING

BC Timber Sales, Mackenzie Field Team typically assesses vegetation competition 5-8 years after planting activities. This assessment is initially done through surveys and confirmed in the field. However, this assessment is also done at the post-harvest assessment stage to determine the risk of vegetation competition on seedling survival and establishment. Often, high risk blocks are identified and monitored frequently to ensure brushing treatments are selected efficiently and done in a timely matter. Timing and scheduling of brushing treatments are crucial elements in maintaining cut-blocks to acceptable government standards; ultimately to ensure free-grow standards are met while minimizing unnecessary treatments/modifications to the forest landscape.

4.3. IDENTIFICATION

Accurate identification of “pests” and recognition of the threat posed by the “pest” to stands are a fundamental requirement for successful pest management and forest management.

The Integrated Pest Management Act defines “pest” as an injurious, noxious or troublesome living organism, but does not include a virus, bacteria, fungus or internal parasite that exists on or in humans or animals. For the purposes of vegetation management activities under this Pest Management Plan, the term “pest vegetation or pest” refers to herbaceous, shrub and broadleaf (deciduous) complexes or communities that:

- Inhibit plantation establishment;
- Hinder optimal growth and development of crop trees;
- Prevent a stand from achieving free growing;
- Affect an established plantation’s overall health; or,
- When combined with snow, causes damage to crop trees by snow press.

For the purpose of this PMP, vegetation is divided into three possible competing vegetation communities: herbaceous; shrubs, and broadleaf.

HERBACEOUS PLANTS: VEGETATION COMMUNITY A

Herbaceous species predominately compete with newly planted seedlings for light and commonly contribute to vegetation and snow press. Species found in areas within this PMP include, but are not limited to: fireweed (*Epilobium angustifolium*), grass (*Calamagrostis* spp.), wood fern and lady fern (*Dryopteris* spp.).

SHRUBS: VEGETATION COMMUNITY B

Shrubs can be divided into two categories: low and high. Low shrubs are woody plants that typically grow to be less than 1.5 metres in height, whereas high shrubs tend to typically grow to heights taller than 1.5 metres.

Low shrubs: Include, but are not limited to: thimbleberry (*Rubus parviflorus*), black twinberry (*Lonicera involucrata*), white flowering rhododendron (*Rhododendron albiflorum*), prickly rose (*Rosa acicularis*), red elderberry (*Sambucus racemosa*), and red raspberry (*Rubus idaeus*).

High shrubs: These include, but are not limited to: alder (*Alnus* spp.) and willow (*Salix* spp.). Alder is commonly found in many mature stands within the PMP area. After harvest, alder can potentially be a significant competitive species depending on the ecology, distribution and density throughout the site, and may negatively impact seedling establishment and development.

BROADLEAF TREES: VEGETATION COMMUNITY C

Species include, but are not limited to: Trembling Aspen (*Populus tremuloides*), Cottonwood (*Populus balsamifera*) and Paper Birch (*Betula papyrifera*). Many forest stands have a minor component of mature aspen. A moderate to very high brush hazard from aspen may occur after harvest of stands with a component of aspen due to root suckering. Plantations with greater than 1000 stems per hectare (SPH) of evenly distributed aspen, cottonwood, birch are considered to have a potential brush hazard. Lower densities can be a brush hazard if their presence impacts seedling development.

The chief reference for identification of these species and other plants commonly found within the PMP area is Plants of Northern British Columbia, (Mackinnon, Pojar, Coupé, 1999).

4.4. MONITORING AND ESTABLISHING PRIORITIES

BCTS has a standard silviculture regime (see [Appendix 3.](#)) that outlines activities within the lifetime of a cut-block. These activities include regular inspections (formal surveys) along with other silviculture activities. The regimes are adjusted on a block by block basis as new information is provided through the monitoring program. Common adjustments made are typically changes to the activity dates or adding/removing activities to either better manage the land base and [or] to identify any concerns. Once a block has been identified with pest concerns, through monitoring activities, a priority of treatment options will be determined and the risk associated with each of those treatments weighed before a decision is made. The following section will explain in detail how BC Timber Sales monitors and establishes priorities.

4.4.1. MONITORING

Harvested blocks and plantations are evaluated on a regular basis. Each block, stratum and microsite presents a unique environment for brush ingress. Properly timed and thorough surveys are essential in identifying and addressing problems which may affect the survival, and or growth of crop trees or restrict the achievement of a free growing plantation.

Surveys and walkthroughs are scheduled throughout the plantations' development in order to ensure that stocking and brush levels are acceptable and that free growing parameters will be achieved within the appropriate time frame. The data and information collected during the surveys includes, but is not limited to the following: density of the vegetation, height of the crop trees, height of the brush species, type of brush species, and the affect the brush is having on the crop trees.

THE NORMAL MONITORING REGIME IS:

- **Pre-harvest stage:** Pre harvest brush assessments are performed while reviewing Site Plans. Evaluation and recommendation for pre-harvest vegetation management is initially assessed at this stage.
- **Year 0:** Post-harvest assessments to determine the plantability of an area, the necessity of site preparation, stock type selection, verification of the brush hazard of an area, and to verify the Site Plan.
- **Years 1-4:** A regeneration delay survey is completed at the time of planting to ensure that regen delay has been met. A survival survey is completed one to two years after planting to evaluate survival and crop tree performance. Both surveys include an assessment of brush.
- **Years 5-8:** Regeneration surveys/walkthroughs and/or brush assessments (detailed site assessments) to determine the level of stocking and the need for brushing treatments.
- **Years 9-20:** Free growing surveys to determine whether free growing requirements have been met.

4.4.2. ESTABLISHING PRIORITIES

A pest species may be designated a threat to the plantation either through legislation, a survey assessment, or through monitoring, or risk assessments conducted in the field. The area covered under this PMP has a very diverse ecology, climate and level of pest infestation. To prioritize the threats, BC Timber Sales uses the general criteria below:

- Risk to plantation survival and success
- Legal designation to control (e.g. stocking standards, caribou management, and other legislative or regulatory mandate)

- Level of pest abundance and risk of impact on plantation
- Potential to cause social, economic or environmental damage
- Safety concerns and access constraints
- Likelihood of success, which depends on a combination of the control methods/tools available for utilization on specific sites. Appropriate treatment methods greatly dictate the success of the treatment.

Priorities mentioned above are not static but rather dynamic to ensure priorities and objectives match current legislation relevant to this PMP.

4.4.3. INJURY AND ACTION THRESHOLD DECISION

Injury threshold decisions use the priorities established in the above Section 4.3 to ensure the most effective treatment selection while minimizing negative impacts associated with those treatments. Action threshold decisions use the same priorities but are proactive treatments done to avoid future treatments and to ensure a successful start from the beginning of the cut-blocks life.

DECISION THRESHOLDS - HERBACEOUS AND SHRUB:

The decision to treat will be based on whether competing vegetation meets the criteria as outlined in Section 4.3. Each block that is considered for vegetative management will have a brush assessment completed, and stocking levels and performance assessed. These assessments will be reviewed and approved by a qualified forest professional.

DECISION THRESHOLDS – BROADLEAF

Conifer release from broadleaf trees may be required to reduce suppression or increase growth rates to meet free growing requirements. Specific thresholds with respect to treatment of deciduous are difficult to quantify. The following thresholds provide

guidance:

- Distribution of deciduous species in an area > 1.0 hectare that results or may result in less than the minimum number of required free growing stems.
- Deciduous species encroaching upon the effective growing space of crop trees, where without treatment, free growing obligations may not be met.
- Deciduous species encroaching upon the effective growing space of crop trees where distribution and/or densities may result in mortality or the suppression of crop trees.

4.4.4. TREATMENT OPTIONS AND SELECTION

Treatment selection is directly linked to the recommendations from a silviculture survey or detailed site assessment⁵ (DSA). The selection process includes a determination of limiting factors and the necessity for treatment through the use of decision thresholds and priorities. If a treatment is required, information including treatment objective, target species description, and site limiting factors will be incorporated into the treatment selection process. In addition, BC Timber Sales will consult with and collaborate with stakeholders impacted by the treatment selected to ensure a balance of social, economic and environmental values.

4.4.5. TREATMENT OPTIONS

Pest control methods are selected and applied in an effective and economical manner to minimize risks to human health, beneficial and non-target organisms, and the environment. There are currently 15 options that could be utilized for treating vegetation complexes with different advantages and disadvantages (see [appendix 4](#)). One or a combination of the following methods in table 2 may be utilized during the term of this PMP:

Table 2 Vegetation treatment options

Manual and Biological Methods:

- Girdling
- Snap / Hinge
- Mechanical Brushing and Weeding (Saw)
- Manual Brushing and Weeding (Hand)
- Brush Mats
- Sheep Grazing
- Prescribed Burning
- Cut Stump with a Bioherbicide
- Mechanical Site Preparation

Chemical Methods:

- Aerial (Broadcast and/or Discretion)
- Backpack (Broadcast)
- Backpack (Directed Foliar)
- Basal Bark
- Cut Stump with a Herbicide
- Chemical Site Preparation

Table 3 and **4** represent the primary treatments and influencing factors governing those treatments to be used by BC Timber Sales in its vegetation management activities under this PMP. Efficacy of each treatment is outlined in greater detail in **appendix 4** and **5** respectively.

Table 3 Herbicide and biological herbicide methods

Herbicide Application Methods					
	Aerial Broad Cast and/or Pilot Discretion (glyphosate)	Backpack and Broadcast and Directed Foliar (glyphosate)	Basal Bark (triclopyr)	Cut Stump	Cut Stump (biological herbicide)
Target Vegetation	Herbaceous; shrubs, deciduous	Herbaceous; shrubs, deciduous	Deciduous	Shrubs & deciduous	Shrubs & deciduous
Efficacy	2-4 years	2-4 years	4+ years	4+ years	Moderate reduction of re-sprouting and regrowth on shrubs. Poor efficacy on deciduous
Application method	Using an aerial boom mounted on a helicopter, small droplets of herbicide are applied to the leaves of target vegetation.	Using backpack sprayer, workers on the ground apply herbicide to the leaves of target vegetation	Using a backpack sprayer, workers on the ground apply herbicide to the lower part of the stem to form a band approximately 5 cm in width	Workers on the ground cut down the target vegetation. Then using a backpack sprayer squeeze bottle, or nozzle mounted to the saw, herbicide is applied to the stump.	Workers on the ground cut down the target vegetation. Then using a squeeze bottle, biological herbicide is applied to the stump.

Workers safety*	Minimal exposure to herbicide application.	Exposure to herbicide.	Exposure to herbicide.	Exposure to herbicide and use of dangerous tools and saws.	Exposure to herbicide.
Effects on Mammals	Short-term reduction in cover. Limited effect on food supply.	Short-term reduction in cover. Limited effect on food supply.	Short-term reduction in cover. Limited effect on food supply.	Short-term reduction in cover. Limited effect on food supply.	No reports of adverse effects on mammals.
Effects on Birds	Reduced cover for nests.	Reduced cover for nests.	Reduced cover for nests.	Reduced cover for nests.	No reports of adverse effects on birds.
Effects on Fish	Adequate PFZ required.	Adequate PFZ required.	Adequate PFZ required.	Adequate PFZ required.	Adequate PFZ required.
Measures for reducing hazards**	PFZ and NWZ required.	PFZ, NWZ and Danger Trees fallen prior to entering area required.	PFZ, NWZ and Danger Trees fallen prior to entering area required.	PFZ, NWZ and Danger Trees fallen prior to entering area required.	PFZ, NWZ and Danger Trees fallen prior to entering area required.
Public Concerns	Posting of signs and notification to reduce herbicide exposure to the public.	Posting of signs and notification to reduce herbicide exposure to the public.	Posting of signs and notification to reduce herbicide exposure to the public.	Posting of signs and notification to reduce herbicide exposure to the public.	No known mammalian toxins.
*	All application methods require workers to wear proper safety gear outlined in MSDS.				
**	PFZ (pesticide free zone) and NWZ (no work zone)				

Table 4 Mechanical, manual, and biological methods

Non-chemical Methods						
	Manual Brushing and Weeding	Mechanical Brushing and Weeding	Mechanical Site Preparation	Prescribed Burning	Girdling, Snap and Hinge	Sheep or Goat Grazing
Target Vegetation	Herbaceous; shrubs, deciduous	Herbaceous; shrubs, deciduous	Herbaceous; shrubs, deciduous	Herbaceous; shrubs, deciduous	Deciduous	Herbaceous
Efficacy	< 1 year	< year for herbaceous and +/- 2 years for deciduous	3 -5 years	3 – 5 years (if appropriate intensity achieved)	+/- 3 years setback for deciduous if successful	1 – 2 years or longer if treatment repeated.
Application method	Spot treatment around crop tree using handheld cutters.	Spot treatment around crop trees using brush saws or chainsaws.	Raised microsites created by excavator	Use of fire by ground crews and/or helicopter to apply a controlled burn.	Girdling by removing a strip of bark to form a band around the lower part of the stem. Snap/hinge by partially breaking smaller stems by hand.	Using a flock of sheep/goat to graze competing vegetation.
Workers safety*	Repetitive movement, hard and physical labour.	Use of dangerous tools and saws. High risk of injury and exposure to fumes.	Use of dangerous machinery.	Use of dangerous tools and machinery. Exposure to smoke and fire.	Repetitive movement.	Generally safe for workers.

Effects on Mammals	Reduced mobility and access. Also, may reduce browse and hiding cover in the short-term.	Reduced mobility and access. Also, may reduce browse and hiding cover in the short-term.	Reduced mobility and access. Also, may reduce browse and hiding cover in the short-term.	Reduced mobility and access. Also, may reduce browse and hiding cover in the short-term.	Reduced mobility and access. Also, may reduce browse and hiding cover in the short-term.	Reduction of local food for native ungulates. Potential for negative interactions with predators such as cougars and bears.
Effects on Birds	Reduced cover for nests.	Reduced cover for nests.	Reduced cover for nests.	Reduced cover for nests.	Reduced cover for nests.	Low/no impacts.
Effects on Fish	Adequate buffer required to keep debris out of water course and maintain stream shading.	Adequate buffer required to keep debris out of water course and maintain stream shading.	Adequate buffer required to keep debris out of water course and maintain stream shading.	Adequate buffer required to keep debris out of water course and maintain stream shading.	Adequate buffer to maintain stream shading.	Adequate buffer to maintain stream shading. Corrals not to be constructed in riparian management areas.
Measures for reducing hazards**	PFZ, NWZ and Danger Trees fallen prior to entering area	PFZ, NWZ and Danger Trees fallen prior to entering area	PFZ, NWZ and Danger Trees fallen prior to entering	PFZ, NWZ and Danger Trees fallen prior to entering area	PFZ, NWZ and Danger Trees fallen prior to entering area required.	PFZ, NWZ and Danger Trees fallen prior to entering area

	required.	required.	area required.	required.		required.
Public Concerns	General acceptance of method.	General acceptance of method.	General acceptance of method.	General acceptance of method. Concerns of smoke do exist.	General acceptance of method.	General acceptance of method.
*	All application methods require workers to wear proper safety gear.					

4.4.6. INFLUENCING FACTORS

Target Species Height – Backpack foliar treatments are typically not appropriate once the height of the target brush species approaches approximately 2 metres in height – worker exposure increases with height increase. Sheep grazing will similarly be constrained by the ability of sheep to reach the foliage.

Target Species Diameter – While virtually any deciduous tree stem can be girdled, there are upper and lower diameter limits beyond which treatment becomes impractical. These will vary somewhat depending on the species of tree and the type of girdling tool being used. In general, diameters less than approximately 3 cm, or greater than 20 cm, are not suitable for treatment. Manual treatments will have an upper practical limit as diameters approach 10 cm. Manual treatments for target species with a diameter greater than 10 cm is considered “felling” and increases worker exposure to hazards reducing the practicality of manually treating target species with larger diameters due to safety concerns (*Work Safe BC section 26.1*).

Target Species Distribution – Broadcast foliar treatments are not appropriate if the target brush is distributed only in discrete clumps. Discretionary treatments are not

generally appropriate if the target brush is uniformly distributed over the treatment unit.

Physical Impediments to Treatment – Large numbers of overhead obstacles such as residual trees can preclude aerial treatments. Steep slopes and heavy slash loading can make ground-based treatments such as backpack, manual, mechanical and sheep grazing impractical.

Degree of Constraint of Treatment Due to Required Buffering etc. – Blocks with many features that require buffering may be impractical to treat chemically. Pesticide free zones, no treatment zones, and buffers may be required for water bodies, wetlands, roads, etc. Some highly constrained units may have little area left treatable once the chemical buffers are in place.

Target Species-Crop Tree Protection Conflict – Some brush species such as Cow Parsnip may no longer be susceptible to chemical treatment by the time the crop trees have hardened off sufficiently to avoid chemical damage. This incompatibility may be consistent every year, or it may only apply in certain years when a wet summer has slowed conifer hardening off or when early frosts cause succulent target species to wilt.

Vulnerable Plant Species – Vulnerable plant species are defined as those plants whose numbers are either limited or are important for browse or forage. The status and distribution of rare plant communities is available from the Conservation Data Centre on line at: www.env.gov.bc.ca

Special Wildlife Features – Special wildlife features may be identified within some units that will constrain treatment options. Heavy browsing might reduce the need for brushing in an area that had little alternative browse available. Manual and mechanical treatments might be restricted when the slash loads likely to result from the treatment

could obstruct a high use game trail. Sheep grazing is opposed by MOE in higher grizzly bear use areas.

Aboriginal Rights Infringement – When specific information indicates that there is a higher likelihood of treatments infringing on aboriginal rights on a unit, certain treatments may be considered unsuitable, or a buffer/no treatment zone may be implemented. For example, if consultation with a First Nation produced information that a specific site was used for berry-picking, a broadcast chemical treatment would be considered inappropriate.

Potential for Conflict – Certain features of a proposed treatment unit might indicate that chemical treatment could result in an unacceptable risk of creating conflict with members of the general public, First Nations, local residents or stakeholders. For example, proximity to a residence might result in the choice of a less controversial treatment.

Potential Damage to Crop Trees – Certain treatments may expose the crop trees in a unit to unacceptable levels of risk of damage. For example, crop trees that have developed under a thick aspen canopy often become spindly. Treatments that remove the surrounding stems suddenly can result in toppling of the crop trees. Aerial spraying or girdling may be preferred in such cases. Alternately, manual treatments may be inappropriate where heavy slash loading can occur or palatability of target vegetation can be an issue when considering sheep grazing. Another potential risk to a stand is if there are root rot issues within the block, this could cause the potential rapid spread of the root rot if brushing were to occur.

Other factors such as treatment windows, administrative workload, and treatment priority based on risk of crop tree mortality, and efficacy constraints are weighed

separately from the above process, but are also considered when selecting treatment methods.

**Assessments or surveys for each anticipated treatment site will be completed within 18 months of the scheduled treatment date.*

4.4.7. POST TREATMENT EVALUATION

Post-treatment Evaluations shall be completed in the year following treatment when full leaf out has occurred. Aerial flights or an on-block field inspection/assessment will be used to determine treatment evaluation. The assessments shall focus on the previous year's treatments with regards to efficacy of the treatment, coverage, slash loading, degree of release, crop tree damage, and conformance of PFZ's and boundaries. The evaluation will also confirm that there was no unreasonable impact to the environment.

The Post-treatment Evaluation will be implemented in an effort to refine future vegetation management prescriptions and strategies, and it will determine the need for any immediate follow-up treatment (i.e. missed areas).

Future surveys on the areas will also be used to determine long-term efficacy of the treatment and help guide future vegetation management decisions.

5. SAFE HANDLING PRACTICES

Ensuring that correct environmental protection procedures are in place can be further strengthened by ensuring the handling and application of herbicides is conducted in a manner that reduces the risk of accidents caused by human error or equipment malfunction. BC Timber Sales will ensure these requirements are met through contractual agreements, its Environmental Management (EMS) and Safety procedures.

5.1. PESTICIDE TRANSPORT

The [*Transport of Dangerous Goods Act*](#) regulates the handling and transportation of poisonous substances that may include herbicides. The *IPMA* and *IPMR* also specify certain transport requirements/procedures.

The plan holder shall ensure that Ministry personnel, contractors, and other agencies working under this PMP follow these procedures for safely transporting herbicides within the Plan Area:

- Ensure that herbicides are carried in a compartment that is secured against spillage and unauthorized removal. The compartment shall be separate from food and drinking water, safety gear, spill containment equipment and people;
- Ensure that all herbicide containers are inspected for defects prior to transporting. Herbicides shall be kept in their original containers and with original labels. If original labels are not available, the herbicides shall be placed in appropriate containers that have the trade name, active ingredient concentration and pesticide registration number affixed to the outside of the container;
- Ensure that the vehicle is equipped with a first aid kit, fire extinguisher, spill contingency plan and kit, and that the vehicle operator has been trained on how to handle spills;
- Ensure that all documents and placards are carried in, or placed on, transport vehicles if required under the [*Transportation of Dangerous Goods Act*](#), the *IPMA* or the *IPMR*; and,
- Ensure that the vehicle operator reads and understands the herbicide labels and the product Material Safety Data Sheet (MSDS) for all herbicides being transported.

5.2. SAFE STORAGE OF HERBICIDES

The plan holder shall ensure that Ministry personnel, contractors, and other agencies working under this PMP follow these procedures for safely storing herbicides within the Plan Area:

Ensure that herbicides are stored in accordance with the *IPMA*, *IPMR* and the Workers' Compensation Board document [*Standard Practices for Pesticide Applicators*](#):

- Keep herbicides in their original containers and with original packaging. If original packaging is not available, the herbicides shall be placed in appropriate containers that have the trade name, active ingredient concentration and pesticide registration number affixed to the outside of the container;
- Ensure that storage facilities are locked when left unattended, ventilated to the outside atmosphere, are entered only by persons authorized to do so, and that there is a placard affixed and maintained on the outside of each door leading into the storage area bearing, in block letters that are clearly visible, the words :
“WARNING – CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY”;
- Keep storage facilities separate from work and living areas, and away from food, flammable materials, bodies of water and water sources;
- Ensure the storage facility is equipped with necessary spill equipment, first aid kits, and the appropriate Material Safety Data Sheets of herbicides stored;
- Invasive Alien Pest Management Plan for Provincial Crown Lands in Central and Northern British Columbia
- Persons responsible for the herbicide storage shall ensure that all herbicides are stored in a locked canopy or similar arrangement, separate from the driver and personal protective gear.
- **Temporary storage in the back of a locked vehicle (i.e. 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.

5.3. MIXING AND LOADING AND APPLYING OF PESTICIDES

The plan holder shall ensure that Ministry personnel, contractors, and other agencies working under this PMP follow these procedures for safely mixing, loading and applying herbicides within the Plan Area are adhered to:

- Ensure that all mixing, loading and application of herbicides is carried out by, or directly supervised by, a Certified Pesticide Applicator with the appropriate category of certification, and that all manufacturer's recommendations, as specified on the herbicide labels, are adhered to;
- Ensure that all mixing, loading and application of herbicides are undertaken in a safe manner. All mixing and loading shall be undertaken only in areas at least 15 meters from, and selected to prevent any spilled herbicides from entering into pesticide-free zones, no treatment zones, bodies of water, fish or wildlife habitat, water sources, or other environmentally sensitive features (e.g., agricultural production areas);
- Ensure that containers used to mix, prepare or apply herbicides are not washed or submerged in any body of water;
- Ensure that eye wash station(s), protective clothing, safety spill kits, spill response plans, a copy of the PMP, each herbicide product's MSDS, emergency telephone numbers and first aid supplies are present and available at or near each mixing, loading or treatment site.
- Follow all directions and restrictions on herbicide product labels, including adhering to the recommended re-entry times to treated areas unless personal protective equipment is worn; and,

- Ensure that the listed herbicides in this PMP will only be mixed with water as a carrier for herbicide applications. Prior to any water being collected in the field, BC Timber Sales Pest Management Plan for Provincial Crown Lands in Northern British Columbia from a natural source for forestry application, a fresh water permit will be acquired from the MOE.

6. BCTS EMERGENCY MANAGEMENT SYSTEM PROCEDURES

BC Timber Sales is committed to continually improving forest safety and Sustainable Forest Management Standard (SFI). BC Timber Sales requires all clients to have an awareness of the principles and standards of SFI along with an adequate safety program.

The plan holder shall ensure that Ministry personnel, contractors, and other agencies working under this PMP follow these procedures for safely mixing, loading and applying herbicides within the Plan Area are adhered to:

- BC Timber Sales commitment to promoting environmental stewardship and sustainability
- BC Timber Sales commitment to promoting a safe work environment
- BC Timber Sales EMS and Safety policy requirements
- SFI standards
- SAFE Company Certification Standards or any safety certification scheme recognized by the BC Forest Safety Council or BC Timber Sales.

6.1. MIXING AND LOADING

On top of the safety procedures outlined in Section 5 & 6. All pesticides used under this PMP shall be mixed at designated mixing and filling stations following BC Timber Sales Emergency Response Plan. 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.
- The minimum crew size for mixing and loading will be one (1) dedicated person. Crew size will be dependent upon the number of pieces of spray equipment in use for the operation. Certification and/ or training of applicators will meet legislative requirements.
- Mixers and loaders of pesticides shall have an emergency spill kit on site and be familiar with the BC Timber Sales Environmental Emergency Response Plan. Mixers and loaders shall ensure that all equipment is in good operating condition.
- 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 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, unless other arrangements are made.
- Ensure that approved rates are not exceeded.
- Know the exact inventory of product on site prior to starting any mixing.
- 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.

6.2.DISPOSAL OF EMPYTY HERBICIDE CONTAINERS AND UNUSED HERBICIDES

Except where herbicides are applied by plan holder personnel, the responsibility of container disposal will lie with the contractor, or other agencies working under this PMP.

The plan holder shall ensure that Ministry personnel, contractors, and other agencies working under this PMP follow these procedures for the safe disposal of empty herbicide containers and unused herbicides within the Plan Area:

- Ensure that all herbicide waste is disposed of in a manner consistent with relevant laws, and in accordance with the manufacturer's instructions as noted on the product label, as appropriate;
- All 115 litre empty returnable 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. Upon project completion, all 10 litre containers should be triple rinsed, punctured and disposed of in a landfill which is under the control of the Regional District, and has been approved for pesticide container disposal. All rinse volume should 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 Environmental Management Act, Hazardous Waste Regulation (Schedule 6).

6.3. SPILLS

The plan holder shall ensure that Ministry personnel, contractors, and other agencies working under this PMP follow these procedures for responding to herbicide spills within the Plan Area ([see appendix 6](#)). If contractors that work under this PMP have their own spill response plan, they must meet or exceed the following sections.

6.4. SPILL RESPONSE

A spill plan is an integral part of this PMP and a copy must be on-site at all pesticide operations. For spill plan content and responsibilities, refer to the British Columbia Timber Sales, Environmental Management System Emergency Response Plan, sections that cover Hazardous Materials Spills, Spill Preparedness, Spill Preparedness Responsibilities and Spill Action Steps. Refer also to the same section for Reportable Levels of Hazardous Materials Spills (PEP and BC Timber Sales reportable levels) and for Minimum Spill Kit Requirements.

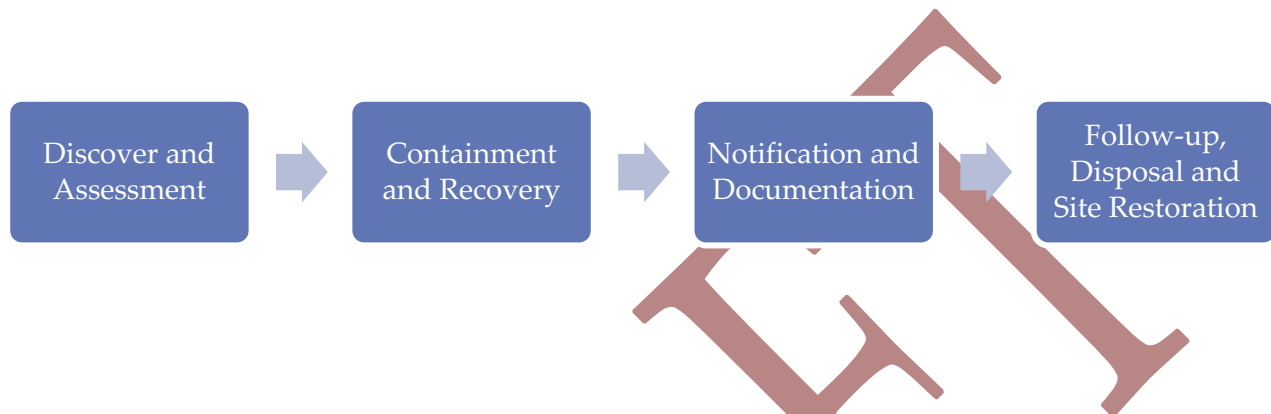
All contractors engaged in herbicide operation activities shall be familiar with the BC Timber Sales Prince George Business Area EMS Emergency Response Plan and shall keep this plan available at all mixing and loading stations as well as in the compartments of vehicles involved in the transportation or storage of herbicides.

6.5. INITIAL SPILL RESPONSE ACTIVITY

Initial response activity is consistent with the BC Timber Sales Environmental Emergency Response Plan. It may be updated as modifications to the BC Timber Sales Environmental Emergency Response Plan occur. The plan holder will ensure that Ministry personnel, contractors, and other agencies working under this PMP follow

these procedures for responding to spills within the plan area. The following is an excerpt from that Response Plan.

Figure 2 INITIAL SPILL RESPONSE PROCESS



6.6.1. DISCOVERY AND ASSESSMENT

- Follow safety procedures and use appropriate personal protective equipment prior to initiating a response plan
- If safe, **STOP THE PRODUCT FLOW!** Halt activities that are causing the spill (i.e. close valves; elevate leaking hoses, shut off pumps, etc.). **Minimize Impact of Spill**
- Complete an incident assessment (Safety, Spill Id/Volume and Environmental)

6.6.2. CONTAINMENT AND RECOVERY

1. Take action within your ability using resources (hand tools, heavy equipment and spill response equipment) at hand to minimize the spread and impact of the spill until additional resources and expertise arrive.
2. Recover and contain any contaminated materials or substances

6.6.3. SPILLS TO LANDS

1. Determine extent of spill. Contain spills away from a water course.
2. Mark the perimeter of the spill. Dig recovery ditches around the perimeter and recovery pits (sumps) within the spill area.
3. Monitor ditches and recovery pits to ensure the collection system is effective.

4. Recover the product from the containment area, treat or dispose of it appropriately.

6.5.4. SPILLS TO WATER

1. In a ditch or stream, contain the spill using whatever surface water containment system possible.
2. Divert and corral the spilled product to the containment system using absorbent booms or other methods.
3. Continue to sweep and corral the spilled product to one corner for recovery

6.5.5. FOR SPILLS LESS THAN 25 LITRES

1. Soak up all free products with absorbent pads, booms, and other materials.
2. Place used absorbent materials in a heavy duty plastic bag or other suitable container for disposal or recycling. Mix stained soil with loose absorbents or commercial bioremediation agents.

6.5.6. NOTIFICATION AND DOCUMENTATION

1. Report spills in accordance with spill reporting criteria listed in “**Table 5**” below.
2. If you feel that the spill is beyond your level of training and experience to handle, it is advisable that you seek assistance from a spill response specialist.

Report all reportable spills to the appropriate agencies and to BC Timber Sales.

Spill Reporting Criteria (see [appendix 6](#) for more details on incident reporting and investigation:

1. All spills that are equal to or greater than the Provincial Emergency Program (PEP) reportable level must be reported to PEP as soon as possible and within 24hrs.
2. Any spills of deleterious substance into a watercourse must be reported to PEP as soon as possible and within 24hrs.
3. All spills that are equal to or greater than the BC Timber Sales reportable level must be reported to BC Timber Sales as soon as possible and within 24hrs.

6.6. REPORTABLE LEVELS OF HAZARDOUS MATERIALS SPILLS

The plan holder will ensure that Ministry personnel, contractors, and other agencies working under this PMP report any reportable levels listed in **table 5**.

Table 5 Reportable levels of hazardous materials

REPORTABLE LEVELS OF HAZARDOUS MATERIALS		
Hazardous Material	PEP Reportable Level ⁽¹⁾	BC Timber Sales Reportable Level ⁽²⁾
Antifreeze	5 kilograms (5 litres)	5 litres
Diesel fuel	100 litres	25 litres
Gasoline (auto & saw)	100 litres	25 litres
Greases	100 litres	25 litres
Hydraulic Oil	100 litres	25 litres
Lubricating Oils	100 litres	25 litres
Pesticides	1 kilogram	1 kilogram
(1) as required by the BC Spill Reporting Regulation		
(2) or a spill of ANY quantity that enters a surface waterbody (i.e.: running ditch, stream, lake)		

6.7. SPILL ROLES AND RESPONSIBILITIES

The plan holder will ensure that Ministry personnel, contractors, and other agencies working under this PMP understand their roles and responsibilities for responding to herbicide spills. If contractors that work under this PMP have their own spill response plan, they must meet or exceed the following:

- Assess risk for potential spills and identify additional preventative and control measures.
- Ensure all workers understand the Emergency Response Plan and it is available on site at all times.

- Ensure all workers are familiar with worksites, spill kit locations and spill kit requirements.
- Ensure workers are trained/ aware in WHMIS, TDG and spill response.
- Have the appropriate MSDS available on site.
- Conduct periodic drills of spill preparedness and response based on employee knowledge and experience, environmental impact, and adjacent values. Where applicable, refer to local procedures. Complete BC Timber Sales CHK-010 Emergency Response Test & Drill Report Form and retain records for BC Timber Sales review.
- Respond to all spills in accordance with the emergency response plan.
- If you are responsible for a spill of hazardous material, you are then responsible to take appropriate action to minimize environmental impact.
- Complete spill kits inspections and maintain spill kits as necessary:

6.8. SPILL KITS INSPECTION AND MAINTANCE

The plan holder will ensure that Ministry personnel, contractors, and other agencies working under this PMP meet or exceed the spill kit inspection and maintenance requirements in this section.

Spill kits must be present in vehicles transporting and dispensing fuels and pesticides. Minimum Spill Kit requirements include:

- 3 - Heavy duty plastic bags or suitable container(s)
- 10 - Absorbent pads (or equivalent absorbent material) appropriate for each type of spill
- 3 – 3"x 48" absorbent booms/ socks
- Commercial bioremediation product
- One shovel
- A container of emergency tank sealant (i.e. Plug-N-Dike, Seal-it or equivalent which are commercial product names for bentonite clay)
- Personal protective safety gear as required for the type of spill

7. 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 they will be removed by a BC Timber Sales representative. All Pesticide Treatment Signs will meet the requirements of the Integrated Pest Management Regulation and will:

- Be 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.
- Display a cautionary symbol.
- Contain the following:
 - Date and time of application
 - Confirmation number
 - Pesticide trade name or active ingredient
 - Precautions to be taken to prevent harm to people
 - Purpose of treatment
 - Method of application
- BC Timber Sales office, address, contact name and phone number

8. HERBICIDE APPLICATION EQUIPMENT CALIBRATION

All herbicide application equipment shall be calibrated to the satisfaction of BC Timber Sales before herbicide application operations commence. This includes verifying that the application equipment is in proper working order and, if required, is calibrated to conform to the application rates on the pesticide label.

Calibration is an ongoing process. Equipment speeds, nozzle sizes, spray pressure and helicopter height are examples of variables that are adjusted during spray operations to achieve optimal herbicide application coverage and rates.

8.1. AERIAL

Equipment calibration and swath kit analysis will be performed by BC Timber Sales staff or an approved external contractor. Proof of calibration and the swath kit analysis shall be submitted to BC Timber Sales and kept for at least 2 years.

Maintenance of the spray equipment is the responsibility of the application contractor. The contractor shall have qualified personnel on each spray site who will ensure the equipment conforms, at all times, to the manufacturer's standards.

8.2. GROUND

The application contractor shall calibrate equipment used for backpack applications. Equipment should be calibrated:

- For each individual applicator using hand-held or backpack equipment;
- At the beginning of each season and the start of each new treatment area;
- Any time the application equipment is changed or repaired;
- For each change in size or type of nozzle; and
- Any time the pesticide or formulation of a pesticide is changed.

A maintenance person, designated by the application contractor, must conduct maintenance and repairs. The maintenance person must be knowledgeable in the operation and repair of the equipment. The equipment operation must conform to the manufacturers' specifications. Records will be kept by contractors for each piece of calibrated equipment for a minimum of 2 years.

9. WEATHER CONDITIONS AND APPLICATION OF HERBICIDE

An anemometer (wind speed) and thermometer will be used to ensure weather conditions are suitable for herbicide application at treatment sites before herbicide treatment occurs and periodically during herbicide application. Wind speed and direction and temperature will be recorded prior to application.

9.1. AERIAL BROADCAST

Aerial broadcast spraying operations shall be stopped when any of the following conditions exist on the Treatment Unit(s):

- Wind velocity exceeds 8 km/h;
- Temperature exceeds 26.5°C;
- Temperature is at or below 0°C for dormant application;
- Relative humidity (R.H.) is less than 50% (R.H. as low as 40% may be accepted when high volume and large droplet-producing nozzles (i.e. D10-46, Acuflo®) are used;
- Snow or ice covers brush;
- When vegetation is too wet (from dew or precipitation);
- When precipitation is predicted within one hour (VisionMax) or two hours (Vision) following herbicide application (exceptions will be discussed at the pre-work conference);
- Inversion or air turbulence (i.e. thermal updrafts) is so great as to seriously affect the normal application pattern;
- Foggy weather; or
- Inadequate daylight for safe application.

(NOTE: Herbicide label restrictions will take precedence over those listed in this paragraph where those label restrictions are more stringent, see for [VisionMax](#) label example)

The Ministry Representative or designated, independent Contract Administrator on site will be responsible for collecting and monitoring weather conditions and will advise the Contractor when conditions are such that broadcast spraying operations cannot commence or are to be stopped. Spraying operations cannot commence or resume until such time as the weather conditions improve as determined by the Ministry Representative on site.

9.2. GROUND BROADCAST

Ground broadcast spraying operations shall be stopped when any of the following conditions exist on the Treatment Unit(s):

- Wind velocity exceeds 8 km/h or when wind is dead calm;
- Temperature is at or below 0°C or exceeds 30°C;
- Relative humidity (R.H.) is less than 25% for Ester formulations, or it is less than 30% for Glyphosate formulations;
- rain, snow or ice covers brush;
- When vegetation is too wet (from dew or precipitation);
- When precipitation is predicted within two hours following herbicide application (exceptions will be discussed at the pre-work conference); or
- Overall conditions favour herbicide drift.

9.3. GROUND – CUT STUMP AND BASAL BARK APPLICATIONS

- Cut Stump and Basal Bark applications shall be stopped when the bole of the target trees is too wet from dew or precipitation.
- Basal Bark operations shall be stopped when the bole of target trees is covered with frost.

10. ENVIRONMENTAL PROTECTION

BC Timber Sales will identify, monitor and control pest vegetation using safe treatment methods to ensure adherence to environmental laws and protection. In order to protect ecosystems, there are circumstances where the use of herbicide is the only effective method for managing pest vegetation. This is particularly true when site goals require extirpation of all target species, or restoration of a site is required because a particular injury threshold has been exceeded. The risk to ecosystem health and function that can result from pest vegetation establishment and spread is far greater than the risk of safe, localized herbicide use.

All pest management activities proposed for use under this PMP will incorporate strategies to ensure the protection of our environment. These procedures require that any person(s) applying or handling herbicides under the authority of this PMP be cognizant of the location of the following:

- All community, domestic and agricultural water sources;
- Riparian areas, wetlands and all bodies of water whether or not they contain fish;
- Wildlife habitat and species at risk; and
- Food plants intended for human consumption, including First Nations traditional medicinal use.

10.1. STRATEGIES TO PROTECT WATERSHEDS

There are various watershed assessments that have been completed or are being conducted within the Prince George Business Area. Where results indicate that vegetation management activities should be restricted in a watershed, the recommendations will be considered prior to treatment of any areas of concern. If any brushing treatments were to take place within a community watershed, the following extra precautions will be taken:

- Pesticides will not be stored for any more time than it takes to complete the brushing treatment;
- There will be a no treatment zone in places where it could directly impact a water source. Any creeks that are within or drain into a community watershed will have a minimum 50 metre no treatment zone;
- There will be a minimum 50 metre no treatment zone placed around any intakes and wells;
- There will be continuous monitoring during any use of pesticides in these areas;
- If pesticides or pesticide residues were to be detected in a community watershed stemming from a BC Timber Sales brushing treatment, all precautions necessary would be undertaken by BC Timber Sales to ensure no further damage was done. These precautions include:
 - Discontinued use of the pesticide in the area;
 - Cleanup work to remove any contaminated soils;
 - Advisement of the situation to the Drinking Water Officers with full cooperation to ensure the clean-up is done properly and effectively.

If during the PMP review and afterwards, there are domestic and agricultural water sources that are brought to our attention, BC Timber Sales will ensure appropriate no treatment zones are put in place to avoid contamination of these water sources.

10.2. STRATEGIES TO PROTECT FISH AND RIPARIAN AREAS

Riparian features are identified pre-harvest and are managed through approved Site Plans, Silviculture Prescriptions, Forest Stewardship Plans, and Forest Development Plans. Riparian features are further assessed through silviculture surveys, detailed site assessments; pre-treatment inspections by BC Timber Sales staff, treatment layout, and the final pre-treatment block reconnaissance.

The area encompassed within this PMP includes many significant fisheries values. In keeping with mandates outlined in all forest plans and relevant legislation, identified

fisheries and riparian habitat shall be protected with a PFZ and an appropriate buffer width as defined in **Figure 5**.

10.3. STRATEGIES TO PROTECT WILDLIFE AND WILDLIFE HABITAT

The Prince George Natural Resource District has many important and diverse habitats for mammals, birds, amphibians and fish species. Wildlife shall be managed according to current and evolving biodiversity guidelines and all standards as stated within legislation will be followed.

For the purpose of this PMP, criteria used for habitat management will be set in the context of biodiversity guidelines. Specific attention will be given to those species and/or habitats that are noted as Species at Risk.

All wildlife values and critical habitats identified in higher level plans, or while conducting fieldwork, or through the consultation/referral process shall be considered prior to carrying out any treatments under this PMP.

Examples of treatment strategies tailored to protect wildlife habitat needs include:

- Pesticide free zones/no treatment zones
- Pesticide application rate thresholds
- Selective treatments
- Manual treatments
- Where feasible, the retention of ungulate browse species such as willow and red osier dogwood
- Preferred best practices

The above strategies are preferred in areas known to hold wildlife and wildlife habitat valued by stakeholders and/or First Nations, such as trap-lines. In those identified

areas, a common concern is herbicides, particularly the application of aerial herbicide. BCTS intends to work with stakeholders and First Nations through a balanced approach and flexible decision making.

10.4. STRATEGIES TO PREVENT PESTICIDE CONTAMINATION OF FOOD INTENDED FOR HUMAN CONSUMPTION

First Nations and stakeholders use berry plants and other plants for food and medicinal purposes and under certain circumstances, cattle and livestock may graze within cut-blocks that fall under this PMP. As part of the PMP public review and consultation process and annual Notification of Intent to Treat (NIT) process, BC Timber Sales will consider berry-picking and medicinal plant harvest areas, range, and grazing areas in the treatment selection process. On sites where proposed treatment areas are identified as containing food, medicinal plants, or within a tenure for cattle and livestock intended for human consumption, BC Timber Sales will attempt to prevent exposure to herbicides by utilizing selective treatments, timing of treatments, using non-herbicide methods, or avoidance of treatment by consulting with First Nations and stakeholders. All blocks treated with herbicides will have signs posted at entrances as required by the IPM regulations.

10.5. PRE-TREATMENT INSPECTIONS PROCEDURES FOR IDENTIFYING TREATMENT AREA BOUNDARIES

Once a block is identified as requiring treatment, BC Timber Sales staff will carry out a spatial exercise to identify proposed treatment areas that are adjacent to and/or overlap various interests including but not limited to First Nations, stakeholders, private property holders, and Species at Risk communities. Potential conflicts are individually explored and strategies identified to mitigate or negate harmful impacts to adjacent interests.

10.6. TREATMENT AREA LAYOUT

With strategies in place as appropriate for each block, trained staff will lay out the treatment areas. Layout activities are carried out with the help of GPS shape files, aerial photos and/or the most recent map as a reference.

Layout consists of an intensive block reconnaissance to identify and mark all treatment boundaries, PFZ's, associated buffers, No Treatment Zones and retention patches identified in the silviculture survey or detailed site assessment, or discovered during the reconnaissance. Additionally the treatment prescriptions are verified to ensure:

1. The most appropriate treatment is prescribed;
2. External and internal treatment boundaries are adequate to ensure pesticide is not applied to adjacent property and sensitive features; and
3. Applicable regulatory requirements and standards can be met while carrying out the brushing treatment.

All boundaries are located and tied in using GPS or compass and hip chain to then be accurately mapped. Treatment area boundaries not already captured on the layout maps are GPS traversed. Riparian areas and PFZ's are GPS traversed as part of layout.

Treatment boundaries are clearly marked with bags or flagging ribbon to ensure they are clearly visible to the herbicide applicators.

Following field layout, the GPS shape file is entered into BC Timber Sales' forest management computer program (LRM) so that the exact treatment area boundary and all internal boundaries such as PFZ's are captured. Using this updated information,

finalized treatment maps are produced which incorporate all treatment boundaries, PFZ's, allocated buffer, No Treatment Zones and retention patches. These maps, along with a GPS shape file, are provided to the pesticide application contractors. This GPS shape file is entered into all field computers including the GPS computer on board any helicopters involved in herbicide application.

10.7. FINAL PRE-TREATMENT BLOCK RECONNAISSANCE

Immediately prior to the application of herbicide, a final block reconnaissance is carried out for each treatment area. For aerial applications this is done by helicopter with the application pilot. The Implementation supervisor is also present on this flight.

During this final reconnaissance, the following are reviewed:

1. Verify that all pesticide applicators, monitors and pilot (if applicable) understand the block layout, permit specifications, application rate, the location of any special resource features that are to be protected and all internal and external boundaries.
2. All boundaries, PFZ's and NTZ's present on the block are verified:
 - a. For aerial applications, the layout map and the pilot's digital map on their onboard computer are compared against what actually exists on the ground.
 - b. Any changes found on the ground that have occurred since layout such as heavy rains resulting in a temporary waterbody or a waterbody having been missed during layout, are identified.
 - c. Any new features are GPS traversed and entered into the aerial applicators onboard GPS computer or added onto layout maps for other application methods.
3. Is the general public, wildlife or livestock present in the treatment area? Treatment does not commence until it is confirmed there is no presence of the general public, and there is no visible wildlife or livestock in the treatment area.

11. HERBICIDE USED FOR VEGETATION CONTROL

BC Timber Sales in the Prince George Business Area commits to using the lowest treatment rates that will provide effective control of competing vegetation. Herbicides and biological herbicides to be used for brush control under this PMP are referenced in **Table 6** below.

Table 6 Herbicides and Biological Herbicides Products

Trade Name: <i>Weed-Master™</i>	Active Ingredient: <i>Glyphosate 35.6%</i>	PCP No.: 29009
Trade Name: <i>Vision MAX®</i>	Active Ingredient: <i>Glyphosate 49.0%</i>	PCP No.: 27736
Trade Name: <i>Garlon™ XRT</i>	Active Ingredient: <i>Triclopyr 75.5%</i>	PCP No.: 28945
Trade Name: <i>Garlon™ RTU</i> No.: 29334	Active Ingredient: <i>Triclopyr 14.4%</i>	PCP
Trade Name: <i>Chontrol Peat Paste</i>	Active Ingredient: <i>Chondrostereum purpureum 0.67%</i>	PCP No.: 29293

Figure 5 Minimum pesticide free zone and buffer width

MINIMUM PESTICIDE FREE ZONE AND BUFFER WIDTH

Areas of Concern	Application Method	PFZ Width (m)	Buffer Width (m)	No Treatment Zone (m)
Classified Streams: S1, S2, S3, S4 & Lakes: L1, L2, L3, L4 & Wetlands: W1, W2, W3	Aerial (Low drift delivery system)	10	5	-
	Backpack (Broadcast)	10	5	-
	Backpack (Directed Foliar)	10	5	-
	Cut Stump	10	5	-
	Basal Bark	10	5	-
Wet: S5, S6, Non-Classified Drainages (NCD)	Aerial (Low drift delivery system)	10	5	-
	Backpack (Broadcast)	10	5	-
	Backpack (Directed Foliar)	10	5	-

	Cut Stump	2	3	-
	Basal Bark	10	5	-
Dry: S5, S6, NCD's, Temporary free standing body of water <25m ²	Aerial (Low drift delivery system)	10	5	-
	Backpack (Broadcast)	10	5	-
	Backpack (Directed Foliar)	10	5	-
	Cut Stump	2	3	-
	Basal Bark	10	5	-
Temporary free standing body of water >25m ² – not fish bearing and does not drain into a fish bearing water body within 100m	All application methods using Glyphosate	High Water Mark	N/A*	-
	Basal Bark	10	5	-
Domestic Water Intake	All	-	-	50
Active Beaver Dam	Aerial	-	-	100
Raptors Nest	All (except manual)	-	-	100
Mineral Lick	All application methods using herbicide			100**
	Manual			50
*	Glyphosate may be applied to a body of water, providing it meets the above criteria and is either smaller than 25 m ² or not a wetland. Glyphosate may be applied to a dry stream bed if the dry stream is not a wildlife habitat feature and is not fish bearing when wet.			
**	If a mineral lick is discovered post-harvest in the Net Area to Reforest, BCTS will protect it from herbicide by establishing a minimum 100 m No Treatment Zone around the mineral lick, including the establishment of a minimum 100m buffered corridor to and from the mineral lick.			

12. REPORTING, NOTIFICATION, ONGOING ENGAGEMENT AND PLAN AMENDMENTS

The plan holder, partnering organizations, and each contracting firm that applies herbicides under this PMP are committed to the following IPMR when managing pest vegetation. The plan holder will maintain a high standard of communication, record keeping and professionalism when developing and consulting on this PMP and any future amendments that may arise. Specific activities in these areas, as well as requirements under the IPMA are outlined in this section.

12.1. REPORTING

Accurate record keeping allows both plan holder and the Administrator of the *IPMA*, to:

- Monitor the quantity of herbicides used;
- Ensure compliance with the IPMR;
- Ensure compliance with the commitments made in this PMP; and,
- Ensure compliance with the contents of the Pesticide Use Notice.

The plan holder will ensure that each of the required records described below are maintained.

12.2. CONFIRMATION HOLDER USE RECORDS

The plan holder, partnering organizations and each contracting firm that applies herbicides under this PMP must maintain daily records of herbicide use.

Section 37(1) of the IPMR describes the requirements for these records. The following records must be kept for each treatment location and day of use:

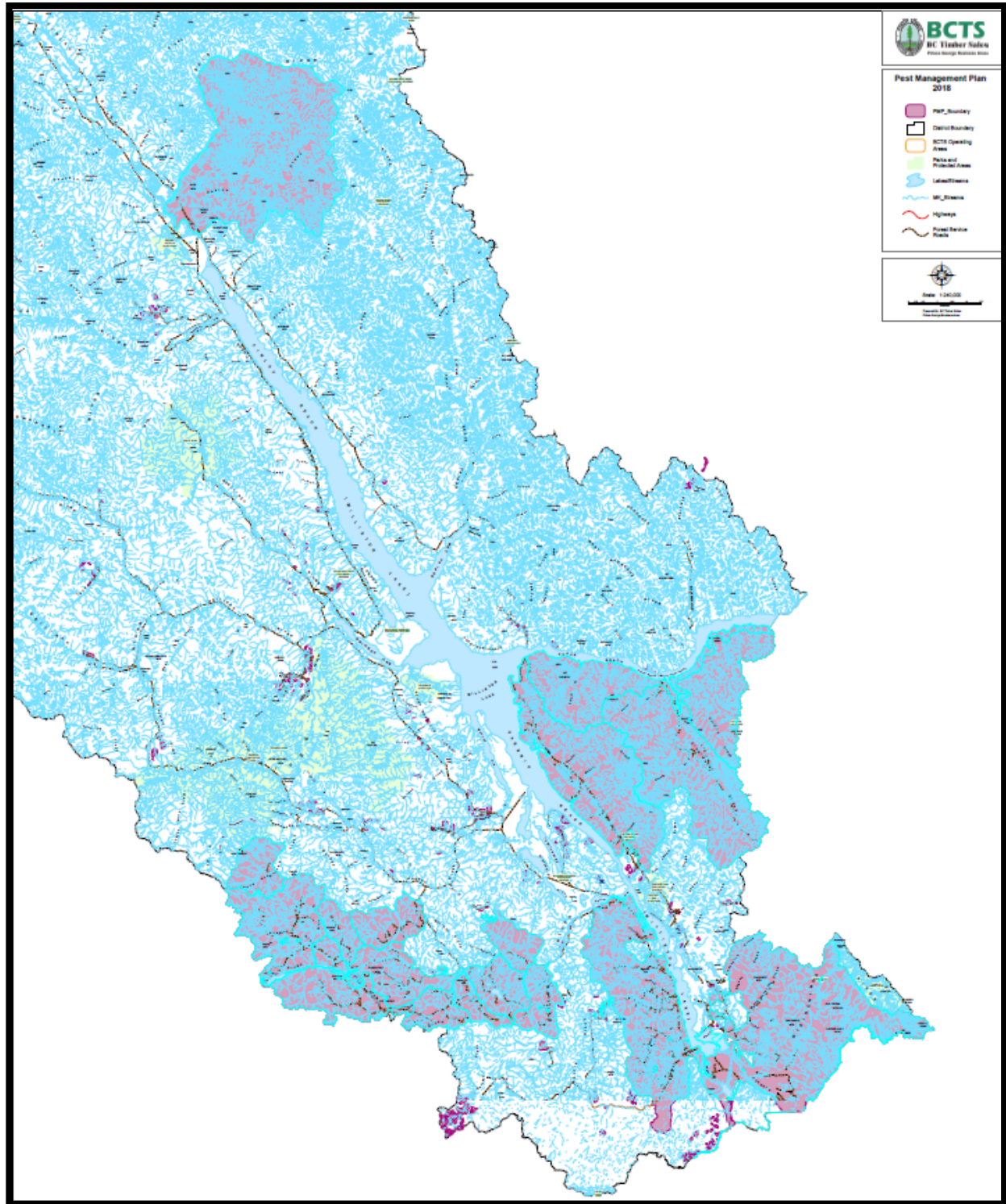
- Date and time of the herbicide use;
- PMP confirmation number;
- Names of all applicators and certification number of certified applicators;
- Name(s) of the invasive plant(s) targeted for treatment;

- Trade name of each herbicide used and its registration number under the federal *Pest Control Products (PCP) Act*;
- For each herbicide used, the method and rate of application and the total quantity used;
- Prevailing meteorological conditions including temperature, precipitation and velocity and direction of the wind, these conditions should be measured at the beginning of each day before starting treatment, re-measured if obvious changes in environmental conditions occur throughout the day, and re-measured at the end of any treatment day;
- A record for each piece of the holder's herbicide application equipment that requires calibration, showing when the equipment was calibrated and the date upon which its calibration was based.

Users of the PMP will maintain daily records of herbicide use, and all site assessment, treatment and monitoring records (see [appendix 7](#) for example).

APPENDIX

APPENDIX 1: MAP OF PEST MANAGEMENT BOUNDARY AREA



APPENDIX 2: GLOSSARY AND TERMS

1. **Artificial regeneration** - “Establishing a new forest by planting seedlings or by direct seeding (as opposed to natural regeneration)”, (B.C Ministry of Forests and Range Glossary, 2008).
2. **Bio herbicide** - “A naturally occurring substance or organism that kills or controls undesirable vegetation. Preferred over synthetic chemicals because of reduced toxic effect on the environment.” (B.C Ministry of Forests and Range Glossary, 2008).
3. **Biogeoclimatic classification system** - A multi-scaled, ecosystem-based classification system that groups ecologically similar sites based on climate, soils, and vegetation; widely used as a framework for resource management and scientific research in British Columbia, (B.C Ministry of Forests and Range Glossary, 2008).
4. **Biogeoclimatic unit** - Part of the biogeoclimatic ecosystem classification system. The recognized units are a synthesis of climate, vegetation, and soil data and defined as classes of geographically related ecosystems that are distributed within a vegetationally inferred climate space, (B.C Ministry of Forests and Range Glossary, 2008).
5. **Biogeoclimatic variant** - A subdivision of a biogeoclimatic subzone. Variants reflect further differences in regional climate and are generally recognized for areas slightly drier, wetter, snowier, warmer, or colder than other areas in the subzone, (B.C Ministry of Forests and Range Glossary, 2008).
6. **Biogeoclimatic zone** - A geographic area having similar patterns of energy flow, vegetation, and soils as a result of a broadly homogeneous macroclimate, (B.C Ministry of Forests and Range Glossary, 2008).
7. **Biological control** - “The use of biotic agents such as insects, nematodes, fungi, and viruses for the control of weeds and other forest pests.” (B.C Ministry of Forests and Range Glossary, 2008).
8. **buffer zone** - “A strip of land where disturbances are not allowed, or are closely monitored, to preserve aesthetic and other qualities adjacent to roads, trails, waterways, and recreation sites, (B.C Ministry of Forests and Range Glossary, 2008).

9. **Cambium** - "A single layer of cells between the woody part of the tree and the bark. Division of these cells results in diameter growth of the tree through formation of wood cells (xylem) and inner bark (phloem)", (B.C Ministry of Forests and Range Glossary, 2008).
10. **Certified pesticide applicator** - An individual certified (through examination) by the Ministry of Environment's Integrated Pest Management Program to use or supervise the use of pesticides in a specific management category, (B.C Ministry of Forests and Range Glossary, 2008).
11. **Competing vegetation** - Vegetation that uses the common resources (space, light, water, and nutrients) of a forest site needed by preferred trees for survival and growth, (B.C Ministry of Forests and Range Glossary, 2008).
12. **Conifer release** - "To 'release' established coniferous trees from a situation in which they have been suppressed by thinning out undesirable trees and shrubs which have overtopped them. Carried out to improve the growth of the coniferous trees released", (B.C Ministry of Forests and Range Glossary, 2008).
13. **Crop tree** - "A healthy tree of a species that is ecologically suitable for the site and commercially valuable", (B.C Ministry of Forests and Range Glossary, 2008).
14. **Fill Planting** - "Planting required to supplement poorly stocked natural regeneration or to replace seedlings that have died on previously planted sites", (B.C Ministry of Forests and Range Glossary, 2008).
15. **Forest health** - "The vigour or physiological condition of a forest". (B.C Ministry of Forests and Range Glossary, 2008).
16. **Forest health factors** - "Biotic and abiotic influences on a forest that have an adverse effect on the health of trees and other plants." "Biotic influences include fungi, insects, plants, animals, bacteria, and nematodes. Abiotic influences include frost, snow, fire, wind, sun, drought, nutrients, and human-caused injury", (B.C Ministry of Forests and Range Glossary, 2008).
17. **Free-growing** - "An established seedling of an acceptable commercial species that is free from growth-inhibiting brush, weed, and excessive tree competition; or young trees that are as high as or higher than competing brush, with 1 m of free-growing space around their tops" , (B.C Ministry of Forests and Range Glossary, 2008).

18. **Improved stock** - "Trees selected from the natural population with better than average characteristics such as growth rates", (B.C Ministry of Forests and Range Glossary, 2008).
19. **Natural Processes** - A **process** existing in or produced by nature (rather than by the intent of human beings). For example, volcanic activity and tidal activities (Deinitions.net, 2019).
20. **Riparian habitat** - "The stream bank and flood plain area adjacent to streams or water bodies" , , (B.C Ministry of Forests and Range Glossary, 2008).
21. **Riparian management area (RMA)** - "An area consisting of a riparian management zone and a riparian reserve zone" , (B.C Ministry of Forests and Range Glossary, 2008).
22. **riparian management zone (RMZ)** - A portion of the riparian management area established to conserve the fish, wildlife habitat, biodiversity, and the water values of the riparian management zone, and to protect the riparian reserve zone, if any, within the riparian management area, (B.C Ministry of Forests and Range Glossary, 2008).
23. **Riparian reserve zone** - A portion of a riparian management area established to protect fish, wildlife habitat, biodiversity, and water values,(B.C Ministry of Forests and Range Glossary, 2008).
24. **Riparian zone** - "A strip of land of variable width adjacent to and influenced by a body of fresh water", (B.C Ministry of Forests and Range Glossary, 2008).
25. **Seedlot** - Seeds that are collected and assembled as a lot for the purposes of registration under Part 5 of the Chief Forester's Standards for Seed Use, (B.C Ministry of Forests and Range Glossary, 2008).
26. **Slash** - "The tree residue left on the ground as a result of forest and other vegetation being altered by forest practices or other land use activities. Slash includes material such as logs, splinters or chips, tree branches and tops, uprooted stumps, and broken or uprooted trees and shrubs", (B.C Ministry of Forests and Range Glossary, 2008).
27. **Screefing** - "The removal of herbaceous vegetation and duff to expose a weed-free soil surface for planting. A type of site preparation that may be carried out by mechanical or chemical means", (B.C Ministry of Forests and Range Glossary, 2008).

28. **Silvicultural treatments** - “Activities that ensure the regeneration of young forests on harvested areas, enhance tree growth, or improve wood quality in selected stands. Activities include: site rehabilitation and preparation, planting, spacing, fertilization, and pruning”, (B.C Ministry of Forests and Range Glossary, 2008).
29. **Silviculture Prescription** - To describe management objectives, measures, and conditions that must be met to accommodate forest resources, resource features and known non-timber resources, and to ensure that the inherent productivity of the site is maintained and that a free growing stand is produced. *Forest Practice Code Act and the Operational Planning Regulation*. A silviculture prescription (SP) is an operational plan that describes forest management objectives for an area:
- a. Was harvested, damaged, or destroyed before October 1, 1987 (back log prescription).
 - b. In which a silviculture treatment is proposed for an area in which timber
 - c. In which timber has been damaged or destroyed by natural causes
 - d. For which harvesting is proposed, or in which unauthorized harvesting has occurred, (B.C Ministry of Forests and Range Glossary, 2008).
30. **Silviculture regime** - “A series of site-specific silviculture treatments planned over time”, (B.C Ministry of Forests and Range Glossary, 2008).
31. **Site Plan** – To describe resource plans at a site-specific level
32. **Stocking standard** - The range of healthy, well-spaced, acceptable trees required to establish a free-growing stand or to meet the residual stand requirements following an intermediate cutting or the harvesting of special forest products, (B.C Ministry of Forests and Range Glossary, 2008).
33. **Sustainable forest management** - “Management that maintains and enhances the long-term health of forest ecosystems for the benefit of all living things while providing environmental, economic, social, and cultural opportunities for present and future generations”, (B.C Ministry of Forests and Range Glossary, 2008).
34. **Tree Fertilization** - The addition of fertilizer to promote tree growth on sites deficient in one or more soil nutrients. Also used to improve the vigour of crop trees following juvenile spacing or commercial thinning.” (B.C Ministry of Forests and Range Glossary, 2008).

APPENDIX 3: MACKENZIE FIELD TEAM SILVICULTURE REGIME

BC Timber Sales Mackenzie Field Team GENUS Silviculture Regime for Silviculture Liability

Artificial Regeneration

Example:

SU-PL-RX-MK 2005 – Planting Prescription (vegetation treatment scheduling should be updated at this time if concerns noted on site)

PL-PL-CTAIN-MK 2006 – Planting Activity

*SU-PL-PLOT-MK 2006 (RG Declaration survey with **only** 5 plots/SU or stratum)

PL-FP-CTAIN-MK 2007 – This activity covers off planting any rehab'd access and burn piles. Enter 5% of the applicable NAR (ie. block or SU), we are not spatially tracking the burn piles and rehab'd access. **If <0.1 ha, don't enter this activity.**

SU-SU-PLOT-MK 2008 (Objective is to check survival of planted stock, confirm SR by SU and identify brushing needs.)

SU-RG-PLOT-MK 2011 (Objective is to confirm SR status by SU and identify brushing needs.)

BR-MA-MANCT-MK 2013

SU-RA-PLOT-MK 2014 (This is a due diligence survey with the objective to make sure the block is on track to FG and accurately predict the year.)

SU-FG-PLOT-MK 2017

* If regen delay is not declared based on the SU-PL-PLOT-MK survey then we will replace the SU-SU-PLOT-MK survey with a SU-RG-PLOT-MK survey. This will increase the sample intensity to make sure we have met regen delay and identify any potential NSR as early as possible.

Natural Regeneration (Conifer)

Example:

SU-PL-RX-MK 2005(field season after logging completed) – Planting Prescription

SP-ME-CHAIN-MK 2005(field season after logging completed)

SU-RG-PLOT-MK 2010 – schedule 5 years post treatment (regen delay milestone survey)

PL-FP-CTAIN-MK 2011

SU-RA-PLOT-MK 2013- (This is a due diligence survey with the objective to make sure the block is on track to FG and accurately predict the year.)

BR-MA-MANCT-MK 2015 -

SU-RA-PLOT-MK 2016

SU-FG-PLOT-MK 2019

DRAFT

APPENDIX 4: ADVANTAGES AND DISADVANTAGES OF SILVICULTURE TREATMENTS

Advantages and disadvantages – Advantages and disadvantages may differ and dependent on site variables. The points outlined below are generalized characterizations of treatment results which is helpful in the decision making process.

Manual Methods:	Manual methods include methods such as hand pulling, hand cutting, brush mats, and girdling. Hand-held powered and non-powered cutting tools may be used. Manual methods can be used for site preparation, brushing, conifer release and pre-commercial thinning. Often the only feasible method for vegetation control near streams and lakes.	
	Advantages	Disadvantages
Girdling	<ul style="list-style-type: none">• Can be target specific• Can be used in sensitive areas• No site degradation• Maintains wildlife habitat by being target, stem and species specific• More socially acceptable than some other methods• Low environmental constraints	<ul style="list-style-type: none">• Regrowth may occur• Relatively slow and labour intensive• Can be dangerous for the operator (cuts, exposure to equipment exhaust fumes)• Costly, especially if more than one treatment is required• High risk of injury to crop trees• Temporary increase in fire hazard• Potential for crop trees to be buried by slash or cut/damaged
Snap / Hinge		
Mechanical Brushing and Weeding (Saw)		
Manual Brushing and Weeding (Hand)		
Brush Mats		
Prescribed Burning	Controlled burning has only been used for site preparation.	
	Advantages	Disadvantages

	<ul style="list-style-type: none"> • Quick results • Reduced fire hazard later • Lowers planting costs 	<ul style="list-style-type: none"> • No selective • Roots not always killed • Some loss of organic layer • Risk of fire spreading to adjacent areas • Can contribute to poor air quality
Sheep Grazing	These methods include the use of sheep or goat for grazing purposes and release of insects that attack target vegetation. It also includes biological herbicides.	
Cut Stump with a Bio-herbicide	Advantages	Disadvantages
	<ul style="list-style-type: none"> • Grazing reduces fire hazard (through loss of fuels) • Grazing animals create free fertilizer • Can be used in sensitive areas • Minimal site degradation • More socially acceptable • Low environmental constraints 	<ul style="list-style-type: none"> • Grazing animals can damage seedlings • Grazing animals require fenced corrals at night and on-site supervision • Grazing animals attract predators • Often more expensive than other methods
	<ul style="list-style-type: none"> • Grazing reduces fire hazard (through loss of fuels) • Grazing animals create free fertilizer • Can be used in sensitive areas • Minimal site degradation • More socially acceptable • Low environmental constraints 	<ul style="list-style-type: none"> • Grazing animals can damage seedlings • Grazing animals require fenced corrals at night and on-site supervision • Grazing animals attract predators • Often more expensive than other methods
Mechanical Site Preparation	Involves the use of heavy machinery such as tractors equipped with blades or mowing attachments, crushing and chipping equipment or brush cutters. Mechanical methods are usually limited to site preparation but can also be used in conifer release and thinning operations.	
	Advantages	Disadvantages
	<ul style="list-style-type: none"> • Fast • Relatively inexpensive • Good when brush is very dense and resistant to 	<ul style="list-style-type: none"> • Potential for rapid re-sprouting • May be limited by terrain and fine soil

	<p>herbicide</p> <ul style="list-style-type: none"> • Provides good access for planting • Wildlife can move through treated areas easily 	<p>textures</p> <ul style="list-style-type: none"> • Can potentially cause soil compaction and erosion problems • No protection for planted seedlings if used as a post-establishment treatment
--	--	---

Source: *Forestry Applicator Certification Manual – Ministry of Environment, 2013*

DRAFT

APPENDIX 4: EFFECTIVENESS OF HERBICIDE TREATMENTS

Note some of the herbicides listed below are not used by BC Timber Sales. Along with some of the target species that are not native to Mackenzie Forest District and therefore are not targeted. Refer to [Section 11](#) for herbicides used. Refer to Section 4.3 for common pest vegetation found in the Mackenzie Forest District. The tables presented in this appendix highlight the efficacy (injury) of treatments based on type of herbicides used, treatment method, and target species, (Boateng, 2002, pp. 13-18)

HERBICIDE TREATMENT INJURY: CONIFERS IN B.C.														
<i>Injury: 0=no visible injury; 1=<25% (light); 2=25-60% (moderate); 3=60-90% (severe); 4=90-100% (very severe); blank=unknown</i>														
<i>Treatment Period (TP): BB=Bud break: new leaves; LF=Late Foliar, leaves fully expanded; EF: Early foliar: leaves 1/3 mature size; LS=Late summer, leaves fully mature + terminal growth completed; D=Dormant, winter before bud break or no deciduous leaves; AS= All Season</i>														
			Amabilis fir	Grand fir	Sub-alpine fir	Western redcedar	Douglas-fir	Western hemlock	Lodgepole pine	Ponderosa pine	Western white pine	Engelmann spruce	Sitka spruce	White spruce
Herbicide	Rate	TP												
Foliar applications														
2,4-D ester	2-3 kg ae/ha	EF		2			1	1		4			0	1
		LF		2		2	3	1		3	2		2	0
		LS	1	2-3			2-3	3	0	1-2	1-2		0	0
		D					0	0					0	0
Glyphosate	1.5-2.1 kg ae/ha	LF		3			1	2		3	3	1		0
		LS		2		2	1		0	0	2-3	0	0	0
		D		0						0	1	1		0
Hexazinone	1-2 kg ai/ha	EF					1		0		1			1
	2-4 kg ai/ha	EF or LF		1		2-3	2	0	0	1	2	2		1-2
		D		0			2		0	0				0
	4-8 kg ai/ha	EF or LF				3	2	1	1					2
Triclopyr ester	1-2 kg ae/ha	EF		1			2	1		4	3		1	
		LF		3			3			3	2			1
		LS - D		1			1	1		3			1	1
	2-4 kg ae/ha	LS - D					2-3	3		3			2	1-2
Soil applications														
Hexazinone	1-2 kg ai/ha	AS		1	0		1	0	0			0		1
	2-4 kg ai/ha	AS			2		2-3	0	1-2	0	1	1		1
	4-8 kg ai/ha	AS			2			0	2			2		2
Cut-stump applications														
2-4,D amine	30-100%	AS		4	4				4	4	4			4
Glyphosate	30-100%	AS		4	4	4	3	4	4	4	4	4	4	4
Triclopyr ester	20-30%	AS		4	4	3	3	4	4	4	4	4	4	4
Stem injection														
Glyphosate	1 Cap/5 cm dbh	AS	4	4	4	4	3	4	3	4	4	4	4	4
Basal Bark Treatment														
Triclopyr ester	3-5%	AS	4	4	4	4	3	3	4	4	4	4	4	4

HERBICIDE TREATMENT EFFECTIVENESS: HARDWOODS IN B.C.

Injury: 0=no visible injury; 1=<25% (light); 2=25-60% (moderate); 3=60-90% (severe); 4=90-100% (very severe); blank=unknown

Treatment Period (TP): BB=Bud break: new leaves; LF=Late Foliar, leaves fully expanded; EF: Early foliar: leaves 1/3 mature size; LS=Late summer, leaves fully mature + terminal growth completed; D=Dormant, winter before bud break or no deciduous leaves; AS= All Season

Herbicide	Rate	TP	Red alder	Trembling aspen	Paper birch	Black cottonwood	Bigleaf maple	Balsam poplar
Foliar applications								
2,4-D ester	1-2 kg ae/ha	EF or LF	4	2	2	0	1	0
	2-3 kg ae/ha	EF or LF	4	3	3	1	2	1
Glyphosate	1.5-2.1 kg ai/ha	LS	2	2-3	3	3	2-3	2-3
Hexazinone	1-2 kg ai/ha	EF		1	1		1	2-3
	2-4 kg ai/ha	EF or LF		2-3	2	2	1	2-3
	4-8 kg ai/ha	EF		3-4	3	3		3-4
Triclopyr ester	1-2 kg ae/ha	EF - LS	3	2				
	2-3 kg ae/ha	EF - LS	3-4	3-4	2-3	2-3	2-3	1-3
	4-5 kg ae/ha	EF - LS	4	4	4		3	
Soil applications								
Hexazinone	1-2 kg ai/ha	AS		0	1			
	2-4 kg ai/ha	AS	1	3	2-3		1	4
	4-8 kg ai/ha	AS		4	3			4
Cut-stump applications								
2,4-D amine	30-100%	AS	4	4	4	3	2	3
Glyphosate	30-100%	AS	4	3	3	4	3-4	
Triclopyr ester	20-30%	AS	4			4	4	
Stem injection								
2,4-D amine	1ml/5 cm dbh	AS	4	4		3		
Glyphosate	1 Cap/5 cm dbh	AS	4	4	4			4
Hack and squirt								
2,4-D amine	1ml/5 cm dbh	LF	4	2		3		
Glyphosate	1ml/5 cm dbh	EF or LS	4	3-4	4			4
Bark Treatment								
2,4-DP ester	100%	AS					1-2	
2,4-DP ester + 2,4-D ester	100%	AS					1	
Triclopyr ester	1-2%	AS	3				1	
	3-5%	AS	4			4	3	
	10-30%	AS	4	4	4		4	
	100%	AS	4				4	

A-14

Herbicide Prescription for Forest Vegetation Management

HERBICIDE TREATMENT EFFECTIVENESS: SHRUBS, GRASSES, FERNS, AND FORBS IN B.C.(CONT.)

Injury: 0=no visible injury; 1=<25% (light); 2=25-60% (moderate); 3=60-90% (severe); 4=90-100% (very severe); blank=unknown

Treatment Period (TP): AS= All Season

Herbicide	Rate	TP	Mountain alder	Sitka/green alder	False azalea	Scotch broom	Bitter cherry	Highbush cranberry	Stink currant	Devil's club	Red-osier dogwood	Elderberry	Dull Oregon grape	Hardhack	Black huckleberry	Red huckleberry	Red raspberry	Salmonberry	Snowberry	Thimbleberry	Black twinberry
Soil applications																					
Hexazinone	1.0-2.0 kg ai/ha	AS	0	0				0	0						2					0	
	2.0-4.0 kg ai/ha	AS	1	1	2			0	1		1	2		4	2		4	3	4	1	
	4.0-8.0 kg ai/ha	AS	1	2-3	3			1	2		3			4			4	4		2	
Cut-stump applications																					
2-4.D amine	30-100%	AS	2-3	3			4														
Glyphosate	25-50%	AS	2-3	2-3			4														
Triclopyr ester	20-30%	AS	2-3	3			4														
Stem injection																					
Glyphosate	1 Cap/5 cm dbh	AS	4	4																	
Bark Treatment																					
Triclopyr ester	2-3%	AS	3	3			4										3	2		2	
	20-30%	AS	4	4			4														

A-16 Herbicide Prescription for Forest Vegetation Management

HERBICIDE TREATMENT EFFECTIVENESS: SHRUBS, GRASSES, FERNS, AND FORBS IN B.C.

Injury: 0=no visible injury; 1=<25% (light); 2=25-60% (moderate); 3=60-90% (severe); 4=90-100% (very severe); blank=unknown

Treatment Period (TP): BB=Bud break; new leaves; LF=Late Follar, leaves fully expanded; EF: Early follar; leaves 1/3 mature size; LS=Late summer, leaves fully mature + terminal growth completed; D=Dormant, winter before bud break or no deciduous leaves

Herbicide	Rate	TP	Mountain alder	Sitka/green alder	False azalea	Scotch broom	Bitter cherry	Highbush cranberry	Stink currant	Devil's club	Red-osier dogwood	Elderberry	Dull Oregon grape	Hardhack	Black huckleberry	Red huckleberry	Red raspberry	Salmonberry	Snowberry	Thimbleberry	Black twinberry
Foliar applications																					
2,4-D ester	2.0-3.0 kg ae/ha	EF/LF	3	3		3			3		1	3					1	2	4	2	
	2.0-3.0 kg ae/ha	LS	3			2			3		1	3						2		2	
	2.0-3.0 kg ae/ha	D		1		1		2	2		0	2						1	2	1	
Glyphosate	1.5-2.1 kg ae/ha	EF/LF	4	3	3				3		3	3	3		2	2	3	3-4	4	3	4
	1.5-2.1 kg ae/ha	LS	2-3	3	4	0			1	3	1	3			3		3	4	3	3	3
Hexazinone	1.0-2.0 kg ai/ha	BB - EF		0		0			1			2									2
	2.0-4.0 kg ai/ha	BB - LF		2		0		1	2		1										
		BB - EF										3	3					2-3			3
	4.0-8.0 kg ai/ha	BB - EF						2	3			3			2		2	3		3	3
Triclopyr ester	1.0-2.0 kg ae/ha	EF - LS		2		3			3			3			2	2	3	3	3	2	3
	1.0-2.0 kg ae/ha	D		1					3			2			2	2	3	2	0	2	
	2.0-3.0 kg ae/ha	LF - LS		3		3			4			3			3		3	3		2	3
	3.0-4.0 kg ae/ha	EF				3			3			3							3		3
	3.0-4.0 kg ae/ha	D				3			4									3			

A-15 Herbicide Prescription for Forest Vegetation Management

HERBICIDE TREATMENT EFFECTIVENESS: SHRUBS, GRASSES, FERNS, AND FORBS IN B.C.(CONT.)

Injury: 0=no visible injury; 1=<25% (light); 2=25-60% (moderate); 3=60-90% (severe); 4=90-100% (very severe); blank=unknown

Treatment Period (TP): AS= All Season

			Douglas maple	Vine maple	Wht. rhododendron	Roses	Salal	Saskatoon	Sitka mt. ash	Soopolallie	Willow	Bluejoint	Bracken	Cowparsnip	Deer fern	Lady fern	Sword fern	Stinging nettle	Fireweed	Forbs	Annual grasses	Perennial grasses
Herbicide	Rate	TP																				
Soil applications																						
Hexazinone	1.0-2.0 kg ai/ha	AS	0			0	0		0		3	2							0	1		
	2.0-4.0 kg ai/ha	AS	1	1		2	2	4	2	3	3	3					2		3	3		3
	4.0-8.0 kg ai/ha	AS	2			3		4	3		3											
Cut-stump applications																						
2-4-D amine	30-100%	AS		3						3												
Glyphosate	25-50%	AS		3						4												
Triclopyr ester	20-30%	AS		4						4												
Stem injection																						
Glyphosate	1 Cap/5 cm dbh	AS								3												
Basal bark applications																						
Triclopyr ester	2-3%	AS		4						4												
	20-30%	AS		4						4												

Source for Pages A11 to A18: Biring, B.S., P.G. Comeau and J.O. Boateng (1996). Effectiveness of Forest Vegetation Control Methods in British Columbia. B.C. Min. For., Victoria, B.C. FRDA Handbook 011.

A-18 Herbicide Prescription for Forest Vegetation Management

HERBICIDE TREATMENT EFFECTIVENESS: SHRUBS, GRASSES, FERNS, AND FORBS IN B.C.(CONT.)

Injury: 0=no visible injury; 1=<25% (light); 2=25-60% (moderate); 3=60-90% (severe); 4=90-100% (very severe); blank=unknown

Treatment Period (TP): BB=Bud break; new leaves; LF=Late Foliar; leaves fully expanded; EF: Early foliar; leaves 1/3 mature size; LS=Late summer; leaves fully mature + terminal growth completed; D=Dormant, winter before bud break or no deciduous leaves; AS= All Season

			Douglas maple	Vine maple	Wht. rhododendron	Roses	Salal	Saskatoon	Sitka mt. ash	Soopolallie	Willow	Bluejoint	Bracken	Cowparsnip	Deer fern	Lady fern	Sword fern	Stinging nettle	Fireweed	Forbs	Annual grasses	Perennial grasses
Herbicide	Rate	TP																				
Foliar applications																						
2,4-D ester	2.0-3.0 kg ae/ha	EF or LF		2	1		1				2-3	0	1				0		2	4	0	0
	2.0-3.0 kg ae/ha	LS		2	1						2										0	0
	2.0-3.0 kg ae/ha	D		2			1				1	0	1				0				0	0
Glyphosate	1.5-2.1 kg ae/ha	EF or LF		3		4		3	3		1-2	3	4			4	3		2	3	4	4
	1.5-2.1 kg ae/ha	LS		3	3		1				2-3	2	3-4	2	2	2-3	2-3		3	3	4	4
	1.5-2.1 kg ae/ha	D																	1	4	3	
Hexazinone	1.0-2.0 kg ai/ha	BB - EF			0	1	0	1			1	3							2	3-4		3
	2.0-4.0 kg ai/ha	BB - LF		1	1	0	3	0	2-3		2-3										4	1
	4.0-8.0 kg ai/ha	BB - LF		2		3-4					3-4											
Triclopyr ester	1.0-2.0 kg ae/ha	EF - LS		2	3		2															
	1.0-2.0 kg ae/ha	D		3	2	1-2	2															
	1.0-2.0 kg ae/ha	AS										0	1				2			3		
	2.0-3.0 kg ae/ha	LF - LS		2-3		2-3	3				1											
	3.0-4.0 kg ae/ha	EF		3			2				3											
	3.0-4.0 kg ae/ha	D		3			3															

A-17 Herbicide Prescription for Forest Vegetation Management

APPENDIX 5: EFFECTIVENESS OF MANUAL TREATMENTS

The tables presented in this appendix highlight the effectiveness of treatments based on manual treatments used and target species.

Source: *Manual Brushing for Forest Vegetation Management in British Columbia: A review of Current Knowledge and Information Needs*, (Comeau, 1992, pp. 2-7).

2.1 Manual Cutting of Hardwoods

Manual cutting of most hardwoods (e.g., cottonwood, bigleaf maple, aspen and birch) is generally not effective (Table 2). Following cutting, most hardwoods sprout rapidly and the number of shoots per stump increases greatly.

TABLE 2. Effectiveness of manual brushing treatments for controlling selected hardwoods

Species	Effectiveness of manual cutting (single treatment only)	Most effective time to cut	Comments
Cottonwood	<ul style="list-style-type: none"> –sprouts may grow 1.5–3 m in height in one growing season –stems may increase 25× in number 	–mid-June to mid-August (?)	<ul style="list-style-type: none"> –considered a crop species in some areas –may be used as a nurse crop to reduce weevil damage –basal sprouts provide forage for snowshoe hares and may help reduce hare feeding damage on conifer seedlings
Bigleaf maple	<ul style="list-style-type: none"> –sprouts may grow between 2 and 3 m in two growing seasons –stems may increase up to 50× in number –forms multi-stem clumps which cover large areas 	–cutting in mid- to late summer may slightly reduce sprouting	<ul style="list-style-type: none"> –pre-harvest treatments may be more effective than post-harvest treatments –double-bagging and stapling dark plastic over stumps to eliminate light has been tested, although problems with tears in the bags have limited success to date
Aspen	<ul style="list-style-type: none"> –sprouts and suckers grow 1.5-3 m in one growing season –5× increase in sprouts after cutting 	–reports range from summer to dormant season	–moisture status of the site may affect sprouting ability
Birch	<ul style="list-style-type: none"> –sprouts vigorously –can regrow to 40–70% of pre-treatment height in one growing season 	–unknown	–manual cutting used to produce coppices in Salmon Arm area
Red alder	<ul style="list-style-type: none"> –effective if: alder >5 years old; cut at height of <20 cm; cut during prescribed window –vigorous sprouter –1.5–3 m in one growing season 	–window starting 8–10 weeks after bud break and ending 8 weeks later (July to early September on south coast of B.C.)	–moisture status may affect sprouting ability; may be more effective on drier sites

TABLE 4. Effectiveness of manual brushing treatments for controlling selected shrubs

Species	Effectiveness of manual cutting (single treatment only)	Most effective time to cut	Comments
Sitka alder	<ul style="list-style-type: none"> –can effectively reduce cover and height to 4 or 5 years on dry (pinegrass) sites –can return to pre-treatment levels within one growing season –observations show that on wet sites it may sprout throughout the growing season 		<ul style="list-style-type: none"> –moisture status of site affects sprouting ability –a clumpy growth habit and small diameter stems make girdling this species difficult
Willow	<ul style="list-style-type: none"> –sprouts up to 1.5 m in height in one growing season –3–5× increase in number of stems 	–late summer (?)	<ul style="list-style-type: none"> –a clumpy growth habit and small diameter stems make girdling this species difficult and ineffective –important species for moose forage –basal sprouts provide forage for snowshoe hares and may help reduce hare feeding damage on conifer seedlings –reductions in willow cover may not be enough to benefit conifer seedlings
Thimbleberry	<ul style="list-style-type: none"> –can regrow to 90% of pre-treatment height (60–100 cm in 1 year –cutting can result in increased numbers of shoots and increased cover of thimbleberry 	<ul style="list-style-type: none"> –may be slight reduction in sprouting if cut in mid-July –mid-summer (July) cutting will provide control only until the following spring 	
Salmonberry	<ul style="list-style-type: none"> –can regrow to 60–90% of pre-treatment height (up to 1 m) in 1 year –cutting twice in one season may be effective –preliminary results show cutting 2 years before harvest may help reduce sprouting 		<ul style="list-style-type: none"> –site factors may influence sprouting ability –may be a good candidate for pre-harvest control
Salal	<ul style="list-style-type: none"> –expected to be a significant sprouter as a result of extensive root system 		<ul style="list-style-type: none"> –manual pulling may be effective but likely is not practical
White-flowered rhododendron	<ul style="list-style-type: none"> –effective –can increase up to 6× number of stems but sprouts grow slowly 		<ul style="list-style-type: none"> –mechanical site preparation and prompt planting may effectively control this species
False azalea	<ul style="list-style-type: none"> –effective –slow-growing species 		<ul style="list-style-type: none"> –mechanical site preparation and prompt planting may effectively control this species
<i>Vaccinium</i> spp.	<ul style="list-style-type: none"> –effective –slow-growing species 		<ul style="list-style-type: none"> –mechanical site preparation and prompt planting may effectively control this species

TABLE 3. Effectiveness of girdling for controlling selected hardwoods

Species	Effectiveness of girdling	Most effective time to girdle	Comments
Cottonwood	–preliminary results show it may be effective		–see Table 2
Bigleaf maple	–post-harvest girdling not effective because of large numbers of stems requiring treatment		–pre-harvest treatments may be more effective than post-harvest treatments
Aspen	–can be effective –suckers far less compared to cutting	–preliminary results indicate June may be the most effective time	–both pre- and post-harvest girdling show promise –moisture status of the site may affect suckering ability –aspen takes 1–3 years to die following girdling
Birch	–significant sprouting occurs when girdled at breast height –difficult to girdle because stems often are not round		
Red alder	–reports mixed –may be effective on larger stems (>5 cm)	–some reports suggest bridging may be a problem if girdled during active sap flow (May–July)	–moisture status may affect sprouting ability; treatment appears to be more effective on drier sites –alder takes 1–3 years to die following girdling

TABLE 5. Effectiveness of manual brushing for controlling selected grasses, ferns and herbs

Species	Effectiveness of manual cutting (single treatment only)	Most effective time to cut	Comments
Pinegrass	–resprouts vigorously		–clipping may not significantly benefit conifer seedlings –repeated clipping will control this species
Bluejoint reedgrass	–resprouts vigorously		–repeated cuttings have reduced the vigour of this species
Lady fern	–resprouts vigorously	–mid-summer (July) cutting will provide control only until the following spring	–cutting in June results in regrowth to untreated heights by the end of July –repeated cutting over successive years will reduce vigour
Bracken	–resprouts vigorously	–mid-summer (July) cutting will provide control only until the following spring –for cutting twice in one growing season, the first cut should be made before the frond is fully expanded and the second cut should be made 6 weeks later	–repeated cuttings over successive years have not appeared to reduce vigour –repeated cutting within a growing season may be necessary
Fireweed	–resprouts vigorously	–a cutting during full leaf-out (from late July through August in the southern Interior) provides control only until the following spring	–a major contributor to vegetation press problem –hockey sticks have been used to bend rather than sever stems, reducing the need for retreatment within the same growing season; retreatment will be necessary in the subsequent years –repeated mid-summer cutting over 3 years can reduce height and cover

APPENDIX 6 – EMS INCIDENT REPORTING AND INVESTIGATION FORM

BC Timber Sales will provide and ensure those working under this plan adhere to all requirements under this plan. BC Timber Sales will ensure reporting and investigations of any significant environmental damage using the following form or equivalent:

		BC Timber Sales Environmental Management System ENVIRONMENTAL OPERATING PROCEDURE EMS Incident Reporting and Investigation																																								
Revised: April 1, 2018		EOP - 04																																								
SCOPE/PURPOSE: The scope of this environmental operating procedure (EOP) applies to significant environmental events associated with activities/operations within the scope of BCTS EMS including; harvesting, silviculture, access and planning. The purpose of this EOP is to outline BCTS staff procedures and responsibilities for EMS incident reporting and investigation.																																										
EMS INCIDENT REPORTING REQUIREMENTS: <ol style="list-style-type: none"> Emergency Response Incidents: <ul style="list-style-type: none"> Fire: Any uncontrolled fire related to BCTS activities Spills: Any spill exceeding BCTS reportable levels or any amount spilled into or immediately adjacent to a stream, lake or running water. Erosion/Landslide Events: Any emergency or potential emergency situation, including: abnormal soil movement or sedimentation creating a significant risk to the environment or public safety, movement or an imminent risk of movement of a volume of material greater than 250 m³, or disturbance through erosion processes of a land area greater than 0.25 ha. Potential Non-Compliance: <ul style="list-style-type: none"> In the opinion of the person reporting, legislation and regulation has been violated and there may be an agency investigation to determine fact and possible enforcement action. Significant Non-conformance: <ul style="list-style-type: none"> An occurrence or event that has or will likely result in a negative environmental impact and cannot be immediately rectified. When the EMS program has been severely compromised and/or a "Notice to Comply" has been issued at the discretion of local management. This includes repeated non-conformances that may become significant. 		<table border="1"> <thead> <tr> <th colspan="3">Reportable Levels</th> </tr> <tr> <th>Substances</th> <th>BCTS</th> <th>EMBC</th> </tr> </thead> <tbody> <tr> <td>Antifreeze</td> <td>25 litres</td> <td>25 litres</td> </tr> <tr> <td>Diesel fuel</td> <td>25 litres</td> <td>100 litres</td> </tr> <tr> <td>Gasoline (auto & saw)</td> <td>25 litres</td> <td>100 litres</td> </tr> <tr> <td>Greases</td> <td>25 litres</td> <td>100 litres</td> </tr> <tr> <td>Hydraulic Oil</td> <td>25 litres</td> <td>100 litres</td> </tr> <tr> <td>Lubricating Oils</td> <td>25 litres</td> <td>100 litres</td> </tr> <tr> <td>Methyl Hydrate</td> <td>5 litres</td> <td>5 litres</td> </tr> <tr> <td>Paints & Paint Thinners</td> <td>25 litres</td> <td>100 litres</td> </tr> <tr> <td>Solvents</td> <td>25 litres</td> <td>100 litres</td> </tr> <tr> <td>Pesticides</td> <td>1 kg or 1 litre</td> <td>1 kg or 1 litre</td> </tr> <tr> <td>Explosives</td> <td>Any</td> <td>Any</td> </tr> </tbody> </table>		Reportable Levels			Substances	BCTS	EMBC	Antifreeze	25 litres	25 litres	Diesel fuel	25 litres	100 litres	Gasoline (auto & saw)	25 litres	100 litres	Greases	25 litres	100 litres	Hydraulic Oil	25 litres	100 litres	Lubricating Oils	25 litres	100 litres	Methyl Hydrate	5 litres	5 litres	Paints & Paint Thinners	25 litres	100 litres	Solvents	25 litres	100 litres	Pesticides	1 kg or 1 litre	1 kg or 1 litre	Explosives	Any	Any
Reportable Levels																																										
Substances	BCTS	EMBC																																								
Antifreeze	25 litres	25 litres																																								
Diesel fuel	25 litres	100 litres																																								
Gasoline (auto & saw)	25 litres	100 litres																																								
Greases	25 litres	100 litres																																								
Hydraulic Oil	25 litres	100 litres																																								
Lubricating Oils	25 litres	100 litres																																								
Methyl Hydrate	5 litres	5 litres																																								
Paints & Paint Thinners	25 litres	100 litres																																								
Solvents	25 litres	100 litres																																								
Pesticides	1 kg or 1 litre	1 kg or 1 litre																																								
Explosives	Any	Any																																								
PROCEDURE:		RESPONSIBILITY																																								
Reporting	Review and follow-up any reported or identified EMS incidents as defined above.																																									
	Field Tech receives spill report and reports incident to their supervisor as soon as possible. Complete Part A CHK-009 and/or enter incident into EMS Issue Tracking System (ITS). Refer to the Certification Module Supplementary User Guide for additional information.																																									
Investigation	If Emergency Response Incident, ensure appropriate agencies have been notified and ensure the reporting Licensee / Permittee / Contractor or BCTS staff member has followed the requirements of the eERP such as: initial response action, agency reporting and follow-up.																																									
	Determine if further investigation is necessary from reported information. If a decision is made not to conduct an incident investigation, provide rationale on EMS Incident Report Form CHK-009 or in ITS. Rationale must be supported by supervisor or CSO. Incidents that don't have a significant impact on the environment, (i.e. Timber Transport and Marking) or incidents that can be immediately rectified (i.e. industrial waste left on site or a blocked cross drain culvert) don't require root cause investigation but one may be initiated if it is a repeat or chronic issue.																																									
	Determine who should conduct the investigation based on severity of event, risk and consequence. <ul style="list-style-type: none"> Level 1: Includes most reported EMS incidents, investigation usually conducted by BCTS staff that are administering and/or supervising the applicable project. Level 2: This type of investigation is more complex requiring additional time, experienced personnel, knowledge, or resources to complete, and may involve BCTS staff and/or external experts. Usually associated with incidents when there is a significant impact to environment, social and economic values. 																																									
	Conduct Incident Investigation to determine root cause and assess: <ul style="list-style-type: none"> Immediate actions undertaken and proposed to be undertaken to address impacts. Details of the incident including a timeline, contributing factors and root cause(s). Adequacy of response measures, including training, equipment capabilities, procedures, etc. Licensee, Permittee, Contractor, and company conformance to procedures or instructions. Control of impact, including timeliness of response. 																																									
	Develop recommendations for corrections and corrective actions and appropriate action plans identifying: <ul style="list-style-type: none"> Immediate actions to be undertaken to address impacts. Additional actions required to address root cause(s). Responsibilities, timelines, and verification of completion of actions. 																																									
	Ensure details of investigation are documented in the EMS Issue Tracking System (ITS) and/or complete Part B of the Incident Report Form CHK-009 and file appropriately. Refer to the Certification Module Supplementary User Guide for additional information.																																									
	Obtain Timber Sales Manager or designate approval, document on CHK-009 or in ITS.																																									
	Implement corrections and corrective actions, follow-up, update and close ITS and action plans.																																									

APPENDIX 7 – HERBICIDE OPERATION RECORD



Ministry of
Forests, Lands and
Natural Resource Operations

HERBICIDE OPERATION RECORD

THIS FORM MUST BE COMPLETED FOR HERBICIDE PROJECTS. PART I IS TO BE COMPLETED BY THE MINISTRY PROJECT MANAGER AND PART II BY THE CONTRACTOR. THE CONTRACTOR CAN ALSO USE THIS FORM, WHEN COMPLETED, TO MEET REQUIREMENT OF THE INTEGRATED PEST MANAGEMENT PROGRAM OR OPT TO COMPLETE THE STANDARD IPMP OPERATIONS RECORD FORM.

PART I — MINISTRY PROJECT MANAGER'S RESPONSIBILITY																																						
ADMINISTRATION	PROJECT NO.			PESTICIDE USE PERMIT NO.			SERVICE LICENCE NO. (Ministry)																															
	LOCATION						MAPSHEET		OPENING NO.																													
	HERBICIDE (Trade Name, a.i. and Percent)						P.C.P. NO.																															
	CONTRACTOR				SERVICE LICENCE NO. (Contractor)			PILOT'S NAME																														
	MINISTRY PROJECT MANAGER					DATE(S) OF OPERATIONS																																
SITE INFORMATION	TARGET VEGETATION																																					
	CONDITION (drought stress, fall colours, insect or disease damage)																																					
	CROP TREES																																					
	CONDITION (drought stress, fall colours, insect or disease damage)																																					
	SOIL CONDITIONS (for soil-active herbicides)																																					
MOISTURE CONDITIONS: ☐ Wet ☐ Moist ☐ Dry ☐ Very Dry ☐ _____ SOIL TEMPERATURE: _____ °C at 10 cm depth																																						
RAINFALL: <u>One Week Before</u> <u>First Week After Application</u> <table border="1"> <thead> <tr> <th>Date</th> <th>Rainfall</th> <th>Date</th> <th>Rainfall</th> <th>Date</th> <th>Rainfall</th> <th>Date</th> <th>Rainfall</th> <th>Date</th> <th>Rainfall</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>									Date	Rainfall	Date	Rainfall	Date	Rainfall	Date	Rainfall	Date	Rainfall	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Date	Rainfall	Date	Rainfall	Date	Rainfall	Date	Rainfall	Date	Rainfall																													
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____																													
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____																													
COMMENTS																																						
COMMENTS	PROJECT MANAGER'S COMMENTS ON THE OPERATION																																					
PART II — CONTRACTOR'S RESPONSIBILITY																																						
METHODS	TREATMENT METHOD																																					
	1. ☐ Aerial ☐ Ground																																					
	2. ☐ Broadcast ☐ Spot ☐ Stump ☐ Stem Injection ☐ _____																																					
	TYPE AND MODEL OF EQUIPMENT (TOOL) USED																																					
	AERIAL SPRAYING (and ground spraying where applicable)																																					
	NOZZLES			Number			Type and Size		Orientation																													
	BOOM TYPE																																					
	APPLICATION			Flying Height			Speed		Pressure																													
				m			km/hr		kPa																													
				Delivery Rate (output)			Swath Width																															
			L/min			m																																
Stem Injection Spacing, Ground Spot Spacing																																						

FS 705 H/P 10/14 PART 1 OF 2

PART II — CONTRACTOR'S RESPONSIBILITY (cont.)

WEATHER RECORDS	WEATHER PROBLEMS									
	DEW CONDITIONS ☐ None ☐ Light ☐ Moderate ☐ Heavy Dry by _____ ☐ a.m./ ☐ p.m.									
	SNOW CONDITIONS ☐ None ☐ Light ☐ Moderate ☐ Heavy									
	FROST (time period)									
	RECORDING TIME	OPERATIONS Start Finish		TEMP. (°C)	PRECIP. (cm)	RH (%)	SKY CONDITION (% cover)	WIND (km/h + direction)	FOG CONDITION	COMMENTS
WEATHER CONDITIONS SHOULD BE TAKEN AT THE START OF THE PROJECT, FOLLOWED BY RECORDING AT 15-MINUTE INTERVALS FOR AERIAL SPRAYING, AND 3-HOUR INTERVALS FOR GROUND TREATMENTS.										
MIXING & APPLICATION	<div style="display: flex; justify-content: space-between;"> MIXING APPLICATION </div>									
	BATCH NO.	HERBICIDE*	ADDITIVE*	CARRIER*	TOTAL MIX (L)	UNIT NO.	ha TREATED	SPRAY MIX USED (L)	RATE	
									kg a.i./ha	% Product**
*PROVIDE NAME AND QUANTITY FOR HERBICIDE, ADDITIVE AND CARRIER.						**FOR INDIVIDUAL TREE OR SPOT TREATMENTS.				
OTHER COMMENTS (eg, condition and source of water supply)										
OTHER	RECORD OF CHEMICAL USED Total Received (L or kg) Total Used (L or kg)									
	EMPTY CONTAINERS DISPOSED		Number		Method		Location			
	CHEMICAL SPILLS		Date		Location		Amount			
	ACCIDENT(S) AND FIRST AID									
	EQUIPMENT MALFUNCTION OR BREAKDOWN							CREW SIZE	TIME REQUIRED FOR TREATMENT	
								_____ man hours		
	ADDITIONAL COMMENTS									
I CERTIFY THAT THE ABOVE SUMMARY IN PART II IS ACCURATE AND TRUE.										

13. BIBLIOGRAPHY

Adams, Robert W. (ed.) 1995. Handbook for pesticide applicators and dispensers; fifth edition. British Columbia. Ministry of Environment. British Columbia Pesticide Control Branch.

Balfour, Patty M. 1989. Effects of forest herbicides on some important wildlife forage species. FRDA report 020. Province of British Columbia.

B.C. Ministry of Forests. [19??]. Glossary of forestry terms (1990's edition). Victoria, B.C. <<http://www.for.gov.bc.ca/hfd/library/documents/glossary/1990s/>> Accessed October 2006.

Canadian Forest Service. 1993. Glossary of forestry terms. Forestry Canada, Pacific and Yukon Region, Pacific Forestry Centre, Victoria, B.C. <<http://warehouse.pfc.forestry.ca/pfc/2919.pdf>> Accessed November 2006.

Comeau, P.G.. 1993. Competition indices and decision making. Proceedings : NIVMA AGM, 1993.

Comeau, P.G., Braumandl, T.F. and Xie, C-Y. 1993. Effects of overtopping vegetation on light availability and growth of Engelmann spruce (*Picea engelmannii*) seedlings. Can. J. For. Res. 23: 2044-2048.

Davis, Ingrid. 1998. Non-crop vegetation, detrimental or not?: redefining free growing. Forest Practices Branch, Ministry of Forests, March 31, 1998.

Dunster, Julian A. and Katherine. 1996. Dictionary of natural resource management. UBC Press. Vancouver, BC.

Forestry Undergraduate Society. 1983. Forestry handbook for British Columbia fourth edition. D.W. Friesen & Sons Ltd. Cloverdale, BC.

Hamilton, Evelyn. 1990. Vegetation management: an integrated approach proceeding of the fourth annual vegetation management workshop. FRDA report 109. Province of British Columbia.

Hamilton, Evelyn, H. and Yearsley, H. Karen. 1988. Vegetation development after clearcutting and site preparation in the SBS zone. FRDA report 018. Province of British Columbia.

Hamilton, Evelyn and Watts, Susan. 1988. Vegetation competition and responses: proceedings of the third annual vegetation management workshop. FRDA report 026. Province of British Columbia.

Harper, George, et. al. 1999. A Provincial Correlation of Regional Forest Vegetation Potential and Brush Hazard Interpretations. Res.Br., B.C Ministry of forests, Victoria, B.C. Working Paper No. 41/1999

Kidd, Frank A. and Mihajlovich, Milo. 1998. Triclopyr herbicide: a bibliography of technical references of non-target field and laboratory reports. Province of British Columbia.

Krajina, V.J. 1969. Ecology of forest trees in British Columbia. Ecol. West. N. Am. 2(1): 1-146

Lavender, D.P., et al. 1994. Regenerating British Columbia's forests. UBC Press. Vancouver, BC.

MOF. (1). 1995. Establishment to free growing guidebook Prince George forest region. Province of British Columbia.

MOF (2). 1995. Public consultation guidebook. Province of British Columbia.

MOF (3). 1995. Silvicultural systems guidebook. Province of British Columbia.

MOF (1). 1997. Prince George forest district standard operating procedure: Pre-1987 Free Growing Guidelines. British Columbia Ministry of Forests.

MOF (2). 1997. Stand level biodiversity management guidelines for silviculture treatments of pre-1987 blocks Prince George forest district. British Columbia Ministry of Forests.

MOF (1). 1998. Draft vegetation competition guidelines in the Prince George forest region. British Columbia Ministry of Forests

MOF (2). 1998. Prince George region standard operating procedures for declaring openings free growing. Silviculture manual chapter 4, section 4.4. British Columbia Ministry of Forests.

Otchere-Boateng, Jacob. 1998. Herbicide field handbook. British Columbia Ministry of Forests. Victoria, BC

Pojar, Jim and Meidinger, Del. February 1991. Ecosystems of British Columbia. British Columbia Ministry of Forests. Crown Publications Inc., Vancouver, BC.

Sullivan, Thomas P. 1988. Non-target impacts of the herbicide Glyphosate: a compendium of references and abstracts. FRDA report 013. Province of British Columbia.

14. REFERENCES

Doliner, L.H. and Borden, J.H. 1986. PesTerms: a glossary of forest pest management terms. Simon Fraser University. Burnaby, BC.

Douglas, George W., et al. 1998. Rare Native Vascular Plants of British Columbia. Province of British Columbia. Victoria, BC

MacKinnon, Andy, et al. 1999. Plants of Northern British Columbia. Lone Pine Publishing. Edmonton, Alberta.

Otchere-Boateng, Jacob. 1998. Herbicide field handbook. British Columbia Ministry of Forests. Victoria, BC