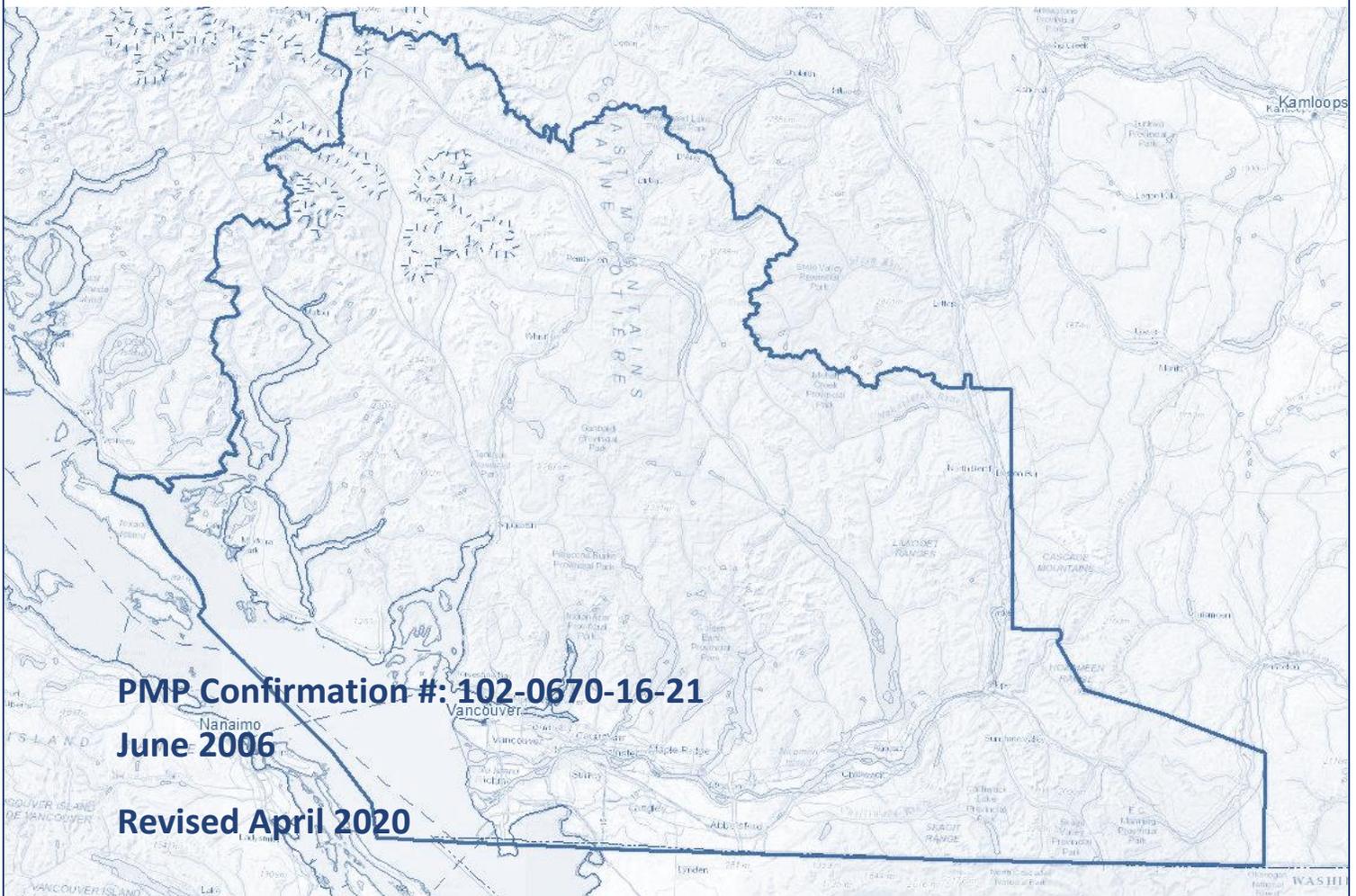




# Invasive Alien Plants Pest Management Plan for Provincial Crown Lands in the South Coastal Mainland Region of British Columbia

Ministry of Transportation and Infrastructure  
Ministry of Environment (BC Parks and Protected Areas)  
Ministry of Forests, Lands, and Natural Resource Operations



<b>REVISIONS</b>		
<b>Revision #</b>	<b>Date</b>	<b>Description</b>
1	April 2020	<ul style="list-style-type: none"> <li>• Added Revisions table and revised date on front page.</li> <li>• Updated principal contact information.</li> <li>• requirements and due diligence required when working around wells and water license intakes.</li> <li>• Included cultural values to the list of values impacted by Invasive Plants</li> <li>• Updated Section 9.6.3 Biological Control</li> <li>• Expanded Section 11 to clarify expectations and</li> <li>• Fixed broken hyperlinks</li> <li>• Removed Appendix 2 (Protocol to establish invasive plant containment lines in IAPP) as it is no longer relevant.</li> <li>• Added Appendix 3 (Environmental, Toxicological and other Parameters of Herbicides) - for information</li> <li>• Added Section 12.3.2 Ongoing Engagement - for clarity</li> </ul>

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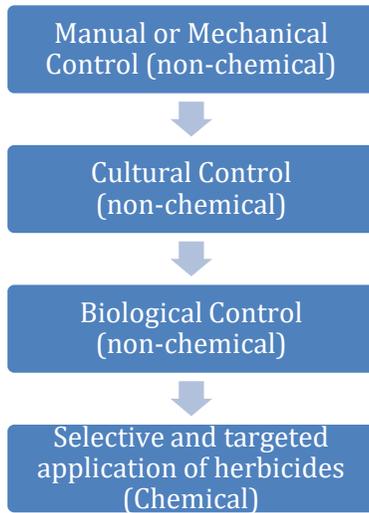
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## Executive Summary

An invasive alien plant is any plant species, not native to British Columbia (BC) that has the potential to cause undesirable or detrimental impacts to the economy, cultural values, as well as to human, animal and ecosystem health. The threat posed by invasive plant species that currently exist in BC or have the potential to spread to BC in the future is significant and growing. These introduced species have no natural predators or pathogens and, once introduced and established, can proliferate and aggressively out-compete native plants that sustain our natural ecosystems. In addition to impacts to natural ecosystems, there are significant socio-economic impacts to the province, with recreation, agriculture, wildlife, fisheries, forestry and First Nations cultural, medicinal and food plants also being negatively impacted. Goals to reduce the cumulative impacts caused by invasive alien plants are best achieved through an integrated approach of prevention and control on provincial Crown Land. As such, the provincial ministries having invasive plant management responsibilities in B.C. have partnered to develop a coordinated and integrated approach to invasive alien plant management in B.C. and have worked together to create this Multi -Agency Pest Management Plan (PMP).

The development of this PMP was led by the Environmental Services section of the Ministry of Transportation and Infrastructure (MOTI), with collaboration and assistance from the B.C. Ministries of Forests, Lands and Natural Resource Operations (MFLNRO) and Environment (ENV). It has been developed in accordance with the *Integrated Pest Management Act (IPMA)* and its accompanying regulations. This PMP outlines an integrated pest management (IPM) approach for the control of invasive alien plants and noxious weeds, which includes prevention strategies, biological and cultural controls, manual/mechanical treatment methods and strategically-targeted, selectively applied and judicious use of herbicide on provincial Crown Lands. As with all legislation, in the event of any inconsistencies between this PMP and the IPMA or the Integrated Pest Management Regulation (*IPMR*), the IPMA and IMPR always supersede the PMP.

The following diagram shows the decision making or thought process involved when determining what type of treatment to use. Chemical treatments are only used as a last resort when other methods are not effective or practical. Often, a combination of the following treatment types will be used to treat an infestation.



The PMP Plan Area is restricted to provincial Crown Land within the geographic areas defined by the Metro Vancouver and Fraser Valley Regional Districts, the lower portion of the Sunshine Coast Regional District (Sechelt peninsula) and the southwest half of the Squamish-Lillooet Regional District (inclusive of Squamish but not including Lillooet). The area encompasses a diversity of ecosystems ranging from wetter Coastal Western Hemlock and drier Interior Douglas Fir forests in the valley bottoms and along the coast, to Engelmann Spruce/Subalpine Fir and Mountain Hemlock forests at the higher elevations. The area includes both urban and natural areas and includes both marine and freshwater ecosystems. This area of BC includes the most densely populated regional districts in BC, and is home to over 2.5 million people, numerous community watersheds, and vast timber, agricultural and recreational values. The area is also home to many endangered native species and plant communities and critical wildlife habitats and these are the values that this PMP aims to protect.

In British Columbia, legislation exists that requires land occupiers to control noxious weeds. The *BC Weed Control Act (WCA)* and its Regulation (WCR) requires that all land owners or occupiers control designated noxious weeds on their land in BC. The *BC Forest and Range Practices Act (FRPA)* and accompanying Invasive Plant Regulation also contain a list of invasive species that require management. The Community Charter Regulation outlines requirements concerning invasive plants as well. There are also many species of invasive plants that are not yet listed in legislation but are having detrimental impacts throughout the province. This PMP will target treatment of high priority invasive plants and/or noxious weeds on provincial Crown Land that are known to cause negative impacts if they are not controlled. The principal goal of the PMP is to prevent the introduction of such plants and reduce the spread of existing plant populations to high-risk sites within the plan area.

## 1.0 Introduction

Section 24(2)(g) of the Integrated Pest Management Regulation (*IPMR*) requires the preparation of a pest management plan for herbicide use for the management of noxious weeds or invasive plants on more than 50 hectares a year of public land (e.g. provincial Crown land).

This plan is intended to describe and provide guidance for an Integrated Pest Management (IPM) approach for control of invasive plants on Crown Land; it is not meant to be an operational plan. Where appropriate, government ministries work together or collaboratively with regional invasive species committees and other partnering agencies to design operational treatment plans within the PMP area.

A PMP means 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.

## 2.0 Purpose and Objectives of this PMP

### 2.1 Purpose

The primary purpose in developing this PMP is to provide a single document that describes a multi-agency approach/planning process for the management of invasive plants and noxious weeds, using the principles of Integrated Pest Management. This plan will support the effective management of high priority invasive plants on provincial Crown Lands within the South Coastal Mainland of BC, while protecting environmental and socio-economic values.

This PMP is designed to replace the previous PMP (Confirmation # 102-0669-11/16) that expired on May 11, 2016.

### 2.2 Objectives

The objectives of this PMP are to ensure the following:

- Compliance with the provisions of the *IPMA* and *IPMR*, and other applicable federal and provincial laws and regulations;
- The incorporation and use of the principles of IPM;
- Public and First Nations awareness of, and input into, invasive plant management at the landscape level;

- The responsible use of herbicides;
- The effective use of an IPM program that takes into account environmentally sensitive areas and land uses; and,
- Continued investigation into alternative non-chemical methods of invasive plant management while recognizing that for several species and for some sites, herbicide use may be the only effective means of management or control.

Under this PMP, existing populations of invasive plants may not necessarily be treated, but rather, kept from expanding further (e.g. beyond a defined containment line). The focus of treatments is on new or small infestations of invasive plants where control is likely; on leading edges or gaps between treatment areas; or, on sites from which seed and plant fragment spread is likely to occur. The purpose is to protect sensitive habitats and reduce the risk of further spread into high risk areas.

The following treatments/methods are strictly **excluded** from this PMP:

- Silvicultural treatments (to remove plants that compete for light and resources with tree seedlings);
- Cosmetic treatments (i.e. to control weeds for aesthetic purposes) or treatment of nuisance weeds; and,
- Aerial spraying via helicopter or fixed-wing plane for invasive plant and/or noxious weed control.

## 3.0 Identifying Information

### 3.1 Identification of Plan Holder

The PMP holder will be the BC Ministry of Transportation and Infrastructure (MOTI).

### 3.2 Geographic Boundaries and Description of the PMP Area

The PMP Plan Area is restricted to provincial Crown Land within the geographical areas defined by the Metro Vancouver and Fraser Valley Regional Districts, the lower portion of the Sunshine Coast Regional District (Sechelt peninsula) and the southwest half of the Squamish-Lillooet Regional District (inclusive of Squamish but not including Lillooet).

Appendix 1 contains maps showing the geographic boundaries of the PMP area.

The Plan Area encompasses the following areas/lands under the jurisdiction of the partnering agencies:

- The MOTI Service Areas 4, 6, 7 and part of 5;
- Areas under the jurisdiction of the MOE, Parks and Protected Areas Division, including Conservancies, Recreation Areas, Ecological Reserves, Provincial Parks,

Protected Areas, Wildlife Management Areas, and lands acquired by this division, within the PMP area; and,

- The following BC Natural Resource Districts: Chilliwack, Squamish and the Sechelt side of the Sunshine Coast Natural Resource District.

The Plan Area contains a diverse array of natural areas including forested, alpine, subalpine, riparian and marine/estuarine ecosystems. Within the PMP area, resource uses include, conservation (e.g. wildlife habitat restoration or protection), hunting, trapping, grazing, parks and recreation, tourism, logging, community watershed protection, including aquifer recharge areas, hydroelectric production, utility transmission and transportation. Invasive plants can negatively impact all of these resources. Therefore, having a management plan to address both prevention of spread and treatment of invasive plants is essential to the management of these lands and the protection of natural resources. Much of the provincial Crown Land in this region of the province is located immediately adjacent to private land and therefore coordination with adjacent land managers is integral to the overall success of the program.

## **4.0 Use of This Plan on Provincial Crown Land**

This PMP provides guidance for invasive plant management on Crown Land; it informs and guides development of annual operating plans. It is recognized that people using Crown Land such as transportation and utility corridors, Natural Resource road systems, recreation sites, trails, and parks can serve as vectors of spread of invasive plants. Control of invasive plants in these areas is a critical component of a regional approach to successful invasive plant management. Where appropriate, government ministries work together or collaboratively with regional invasive species committees and other partnering agencies to design operational treatment plans within the PMP area.

In addition to invasive plant surveys and/or treatments by Provincial government on lands under their jurisdiction, this PMP also allows partnering agencies or contractors to conduct (or allow to be conducted), invasive plant survey, treatment or monitoring activities on land over which they have authorization from the Province to operate on, provided that the following requirements are met:

- Compliance with the requirements and commitments made in this 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*).

## **5.0 Term of Plan**

This plan shall be in effect for a five-year period from the date that the Confirmation of a Pesticide Use Notice has been obtained from the Ministry of Environment.

## **6.0 Person Responsible for Managing Invasive Plants**

The person responsible for coordinating the management of invasive plants under this PMP, and the principal contact for information related to this plan is:

Grahame Gielens  
Environmental Roadside Manager  
Ministry of Transportation and Infrastructure  
447 Columbia Street  
Kamloops BC V2C 2T3

## **7.0 Public Use Within the Plan Area**

The principal land uses within the Plan Area include: forestry, agriculture, aquaculture, fishing, mining, recreation, tourism, hunting, fishing and medicinal and food plant gathering. Substantial timber harvest levels support several sawmills and pulp mills. Aquaculture tenures and import/export activities add considerable activity along coastlines and inlets. The area is also well known for its land and water based recreational activities. There are many highly used provincial parks and protected areas including conservancies, recreation areas, resort tenures, and forestry recreation sites that are popular tourism destinations and important areas for the conservation of biodiversity. Hunting, fishing and non-consumptive activities like hiking, nature photography, boating and research activities are also common.

## **8.0 Invasive Plant Definitions and Impacts**

### **8.1 Definition**

A variety of terms are used interchangeably to refer to invasive plants, including “weeds”, “noxious weeds”, “invasive plants”, and “invasive alien plants”. The Invasive Species Council of BC defines an invasive plant as “any invasive alien plant species that has the potential to pose undesirable or detrimental impacts on humans, animals or ecosystems”, where the term alien refers to plants that did not exist in the South Coastal

Mainland of BC prior to European settlement and/or its natural range did not historically include the South Coastal Mainland.

A noxious weed is any invasive plant designated under the BC *WCA* and *WCR*. *FRPA*'s Invasive Plant Regulation also has requirements for invasive plant management but uses the term "prescribed invasive plant" to refer to plants on its designated list. Both of these Acts and their associated regulations are administered by the Ministry of Forests Lands and Natural Resource Operations.

For the purpose of this PMP, the term "invasive plant" is used to include both invasive alien plants and noxious weeds.

## **8.2 Summary of Impacts**

As defined above, invasive plants are non-native plants that have been introduced into BC and have ecological, economic and social consequences for our province. Without the predators or pathogens that naturally control them in their native habitats, these non-native or alien plants may have an advantage over our native plants and can quickly spread out of control. Often, they exhibit aggressive growth habits and out-compete crops and/or native plants. The resulting invasion can impact recreation and agriculture, damage both terrestrial and aquatic native ecosystems, reduce biodiversity, threaten species at risk, and reduce the abundance and availability of forage for wildlife, livestock and medicinal and food plants for people. Some species of invasive plants such as the invasive knotweeds can damage infrastructure, while other species, such as giant hogweed, can be toxic to humans and/or animals.

Problems caused by invasive plants have increased dramatically in recent decades, due in part to growth and spread of human populations. Population growth can lead to greater disturbance of the land, increased demand for food and fiber, overuse of public land for recreation and commercial production, increased international travel, and globalization of world trade. All of these can advance the introduction, establishment, and spread of invasive plant species.

## **8.3 How Invasive Plants Are Spread**

Although wind, water, domestic and wild animals can disperse invasive plant seeds, human activity is often found to be the primary cause of invasive plant introductions and spread. Invasive plants have been shown to be introduced and spread by the following activities:

- Construction and maintenance activities that involve moving and transporting soil and fill on transportation and utility corridors, rail lines, ship yards, highways, pipe lines and power lines;
- Forestry operations (e.g. road/landing/skid trail building and maintenance, machinery movement during harvesting, post-harvest site preparation, log hauling);
- Range activities (e.g. grazing, herding livestock, and building of stock trails, water developments and corrals);
- Mining operations (e.g. road building and maintenance, movement of machinery, creation of permanent openings in the forest canopy cover);
- Gas and oil exploration and development: well drilling and pipeline construction, movement of machinery, creation of temporary and permanent openings in forest canopy cover;
- Use of seed mixes that are contaminated with invasive plant seed;
- Horticultural practices (e.g. importation and planting of plant species that, over time, become invasive, careless disposal of garden refuse, unintentional seed introduction in soil); and
- Recreational activities (e.g. disturbance of soil by all-terrain vehicles and other recreational vehicles and boats and the dumping of aquatic plants into watercourses).

#### **8.4 The Need to Control Invasive Plants**

Hundreds of species of plants have been intentionally or unintentionally introduced to North America since European exploration and settlement began. Many of these invasive plants become nothing more than nuisance weeds to gardens and human-influenced landscapes, however, a small proportion end up as serious threats to natural areas and native ecosystems. These serious threats are those invasive plant species that will be addressed under this PMP.

There are also legislative requirements to control invasive plants. The *Weed Control Act* and Regulations require land occupiers, as defined in the Act, to control species of provincially and regionally listed noxious weeds on both private and public lands.

Invasive plants are able to establish quickly and out-compete native plants, some of which are rare and at risk. Many invasive plants have short life cycles, while others are extremely long-lived (e.g. broom and gorse may live for 50 years or more, and their seed bank (seed buried in the soil) may remain viable for decades. Seed banks allow plants to germinate, grow, and set seed while environmental conditions are favorable. Some invasive plant species further increase their advantage over native species by producing toxins that inhibit the growth or establishment of other plants. Because they are

introduced, these species have few or no natural predators in BC's environments, thus giving them a further advantage over native species.

Invasive plants have varying traits that permit them to rapidly invade new areas and out-compete native plants for light, water, and nutrients. Some of these traits include:

- Fast growth rates;
- Profuse reproduction by seeds and/or vegetative structures;
- Specially adapted seeds to assist their movement by wind, water or animals;
- Prickles, spines, thorns, or sap that can cause physical injury and repel animals;
- Irregular germination ability allowing establishment during non-ideal conditions;
- Ability to alter soil conditions to benefit only the invasive species in question; and,
- Unhindered growth and reproduction resulting from introduction without the predators that impact the plant in its native habitat.

Because of these traits, their ability to outcompete native plants can result in large dense infestations that may cause the following ecological, social and economic problems:

- A decline in plant and animal biodiversity;
- Altered soil nutrient and hydrological cycles;
- Reduced soil productivity by affecting mycorrhizal fungi or changing chemistry (allelopathic chemicals);
- Negative effects to the habitat of rare and endangered species;
- Increased costs to remove vegetation from impacted infrastructure;
- Reduced availability of traditional plants used for food or medicine;
- Reduced quality and quantity of forage for grazing and browsing wildlife and livestock;
- Toxic or injurious effects to animals and humans;
- Decreased quality of water and fish habitat;
- Changed ecological community structure and function;
- Impacts on aesthetics (visual quality, tourism);
- Altered fire regimes; and
- Reduced access to recreation areas.

## **9.0 Integrated Invasive Plant Management**

This PMP aims to achieve effective, long-term invasive plant control and management that is compatible with legislation, societal values, and environmental resources. IPM is a

decision making process for determining what actions will be taken when pest problems occur. In IPM programs, all available information is considered in order to manage pest populations effectively in an environmentally sound manner. Generally, the first step in an IPM program is to prevent organisms from becoming pests by stopping establishment of new pests and keeping established pests at an acceptable level that causes minimal damage. When applied appropriately, this process results in improved management, lower costs, ease of maintenance, and reduced environmental, cultural, societal, and economic impacts.

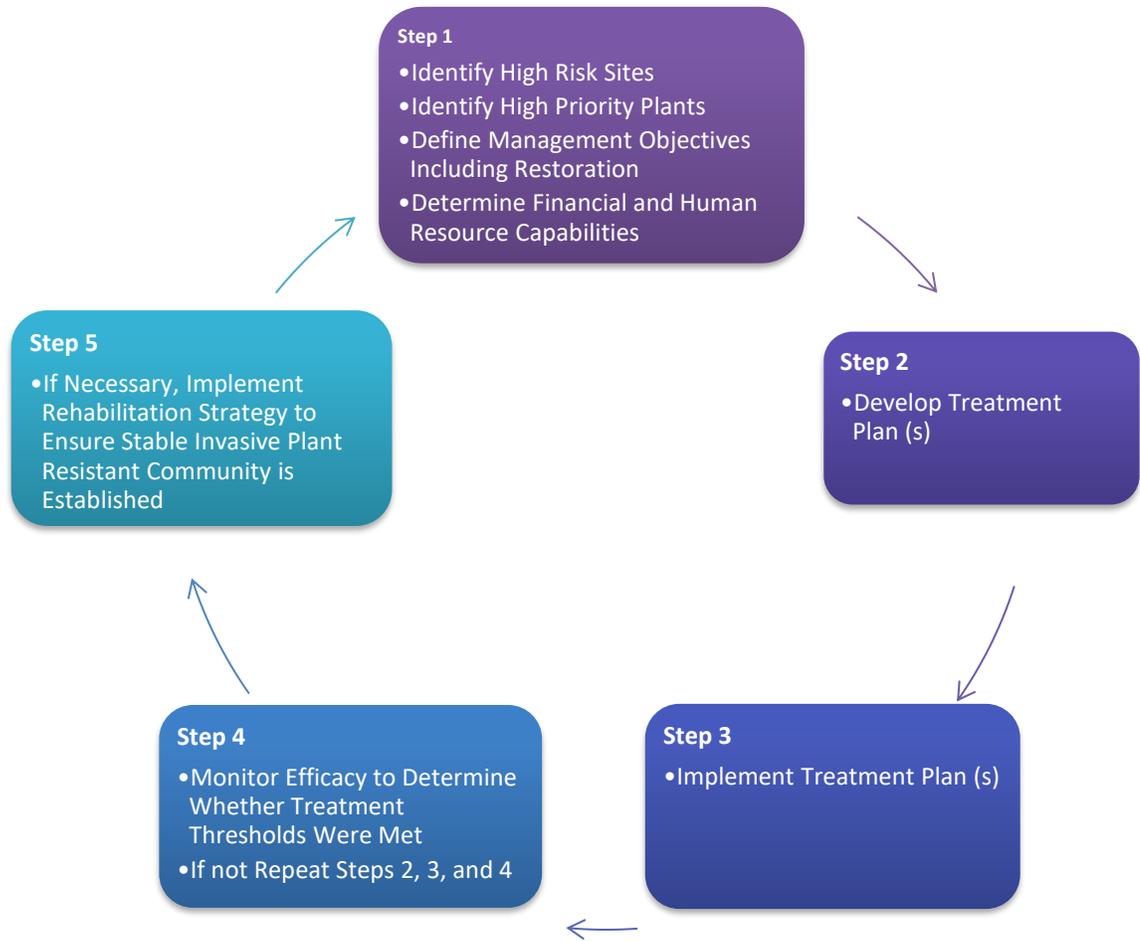
Successful implementation of an IPM program requires the following:

- Strategic, monitoring-based, prevention-oriented management;
- Extensive communication and cooperation among federal and provincial agencies, non-government organizations, First Nations, local governments, private industry, and landowners;
- Public education and awareness programs implemented in cooperation with regional invasive species committees; and
- Continued resourcefulness and innovation by invasive plant managers.

The elements of an IPM program for this PMP are as follows:

- Prevention;
- Identification;
- Surveys, Inventory and Data Management;
- Management Strategies;
- Establishing Priorities;
- Invasive Plant Treatment Options;
- Treatment Method Selection; 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**

The Plan holder 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 invasive plant treatments 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.

## 9.1 Prevention

Preventing the initial establishment and spread of invasive plants is the single most effective method of invasive plant control. Invasive plants will invade those areas that provide suitable habitat for their survival and proliferation. Often this includes areas of soil disturbance such as highway, Natural Resource road and recreational trail developments, right-of-way clearing for fence construction, livestock grazing, and timber

harvesting. Preventing invasive plant seeds or propagules from being deposited on these sites, re-vegetating disturbed areas to ensure vigorous competing vegetation and maintaining healthy, native plant communities through appropriate grazing management practices are important preventative measures. For these reasons it is important to clean equipment, livestock and outer clothing and footwear to prevent the introduction of invasive plant seeds to non-infested areas. Another important method to prevent the introduction of invasive plants is to minimize soil disturbance. Intact or pristine ecosystems in south coastal BC are generally resistant to invasive plants. Most invasive plant species are excluded from mature forests by virtue of the wide, dense canopies that limit the establishment of understory vegetation. Susceptible habitats are created when forest openings occur, typically associated with resource extraction, urbanization, or by natural disturbance (e.g. erosive forces). Prompt seeding of disturbances is an important tool to minimize soil erosion and to prevent the establishment of invasive plants.

Some examples of measures taken to reduce the introduction and spread of invasive plants include:

- Maintain soil, subgrade or surfacing material that is being moved during road construction as free as practicable of invasive plants or seeds;
- Educate staff and contractors to identify priority invasive plant sites that exist or threaten to establish within the plan area;
- Keep equipment yards and storage areas as free of invasive plants as possible using mechanical, cultural or chemical treatments;
- Inspect clothing and vehicle/equipment undercarriages for plant parts or propagules if working in an area known to contain invasive plants;
- Remove (clean and wash) plant seeds or propagules from clothing and/or equipment by dislodging and containing associated water, mud and dirt, either on-site or at designated cleaning stations;
- Keep infestations sufficiently away from areas with a high potential for spread such as roadsides, parking lots, staging areas or recreation sites etc., so that plant parts or seeds are not inadvertently transported by vehicles and equipment;
- Keep equipment and/or livestock out of infested areas where practicable;
- Manage grazing to maintain healthy plant communities that are resistant to invasive plant establishment and invasion;
- Minimize disturbances of desirable vegetation where possible; and
- Re-vegetate disturbed areas adjacent to, or known to be at risk from priority invasive plant establishment using an appropriate combination of scarification and native plantings, or seeding with grass seed that is free of invasive plants by using Common #1 Forage Mixture or better, and checking the Certificates of Seed Analysis

for each species in the seed mixture to ensure no invasive plant contaminants.

## 9.2 Identification

Accurate identification of invasive plant species and recognition of the threat posed by new invaders is a fundamental requirement for successful invasive plant management programs. Several resources are available for accurate identification of invasive plants. Dichotomous keys are useful for ensuring accurate species identification, and E-Flora BC (<http://www.geog.ubc.ca/biodiversity/eflora/>) provides an electronic atlas accessible to anyone with internet access. In addition the Province of BC's Invasive Species Management website contains information about invasive plant identification on the "Resources and Publications" (<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/publications>) and priority invasive plants (<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/priority-species/priority-plants>) pages.

Stewardship and Ecology Specialists within MFLNRO maintain herbaria of native and introduced plant samples collected from BC, and the Royal BC Museum provides species identification services to the Invasive Plant Program. Staff and contractors engaged in managing invasive plants are provided plant identification training and reference materials. Any species found that is a potential new invader to BC is collected, confirmed by taxonomists, and added to the Royal BC Museum herbarium.

## 9.3 Surveys, Inventory and Data Management

Invasive plant surveys are observations made at a single point in time to determine the occurrence of one or many species within a defined landscape. The difference between a survey and an inventory is that an inventory is a cataloguing of all invasive plants of concern within a management area, whereas a survey is an individual observation or a sampling of a representative portion of a larger landscape. In other words, an inventory is the overall picture within the geographic area, which is made up of one or many invasive plants surveys.

Inventories of invasive plant species within the PMP area are required to effectively develop and implement provincial, regional, and local management strategies, and to measure program success. Surveys and inventories are conducted at different intensity levels, or categories, depending upon the individual situation.

Invasive plant surveys focus primarily on priority invasive plant species that are new to an area and pose a high risk of causing negative impacts, including species listed either under *FRPA's Invasive Plant Regulation*, or in the *WCA Regulation*. Surveys may also focus on

recording all invasive plants in a high priority area, which may include areas that pose a high risk of invasive plant spread such as public access points, parking areas, campgrounds etc. Surveys are also an important first step in discovering a new incursion of a species and finding isolated patches of expanding species. The survey(s) confirms invasive plant infestation extent, size, distribution, and density.

Surveys may be conducted by truck, ATV, motorbike, bicycle, boat, or on foot depending on access to the area, the level of detail required, and budget. Efforts are made to choose the method that will have the least impact on the land base.

Areas that are likely to be susceptible to invasion will be examined in detail once the survey boundaries have been determined. Many dry land invasive species tend to invade grasslands and forest openings while riparian or emergent invasive species prefer lakeshores, ponds, sloughs, creeks, river edges, marshes and seepage areas. Experience with biogeoclimatic zones and sub-zones may assist in focusing survey efforts. Areas that have been recently disturbed or that receive disturbance on a regular basis are surveyed because they are generally the preferred habitat for establishment of invasive species. Such areas may include, but are not limited to:

- Roadsides, ditches, pull-outs and landings;
- Recreation sites and campgrounds;
- Openings in the forest canopy;
- Burned areas;
- Air strips;
- Gravel pits;
- Areas where vehicle traffic and loading/unloading is common;
- Areas that are/have been over-grazed, and areas of heavy livestock and/or wildlife use;
- Areas where there has been recent development, or construction sites where machinery has been present; and
- Any other areas where human activity or natural disturbance may increase the likelihood of invasive plant introduction, establishment and spread.

Information recorded at an invasive plant site includes the UTM coordinates (northing, easting and zone), location, date, species, estimated size of the infestation in hectares, distribution, density, and any pertinent site characteristics or additional information, such as soil type and proximity to water bodies and riparian areas. Site photos may also be taken. If the surveyor is unable to correctly identify a particular plant species a sample is taken for identification.

Invasive plant survey and inventory data is housed within the Invasive Alien Plant Program (IAPP) application. This comprehensive database and mapping application allows extraction of relational data, statistics and spatial mapping information and is housed at the following web site: <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species>

The inventory information in IAPP provides the basis for monitoring species, evaluating the effectiveness of treatment prescriptions at the local and landscape scale and for decision making within the program. Extensive effort is made to maintain the inventory at a high standard including documenting, over time, invasive plant locations as they move and change in size, distribution and density. Although the task is large due to the extent of area managed and number of species and infestations, collecting treatment and treatment monitoring data and updating survey data significantly helps to maintain the inventory.

#### **9.4 Management Strategies**

Managing invasive plant populations under an “injury threshold” approach is complex and sometimes confusing. The *IPMR* defines the injury threshold as “the point at which the abundance of pests and the damage they are causing or are likely to cause indicates that pest control is necessary or desirable.” The principle of injury threshold was developed for agricultural systems to manage the economic impacts that pests have on crops. There is an ecological and/or economic threshold associated with a pest density at which action is taken to prevent injury. With invasive plants, ecological, economic, cultural and social impacts are considered when determining the best management strategy for target species. Invasive plants that are determined to be a high risk and do not occur in a region or occur only at very low population levels, are controlled before their populations expand to cause significant injury. It is only when invasive plant species have expanded to a large area and rehabilitation of critical habitats and other values are contemplated that injury thresholds as defined under the *IPMR* are considered. Government’s approach is based on selection of the optimum management strategy for each invasive plant species as presented below.

The selection of which invasive plant management strategy to employ on a landscape is determined by the review and consideration of key factors. These factors include: 1) species distribution across a defined landscape; 2) invasiveness (threat) of the invasive plant species; 3) susceptibility of habitats that are invaded or threatened by the species; and, 4) density of plants at a site, or potential for the species to become very dense.

Upon review of the current inventory data for each species, the distribution of known sites will either be considered localized within a defined area of susceptible habitat or endemic across the majority of susceptible habitat. If an invasive plant species is detected and confirmed to be a new high risk incursion to the province, a provincial response plan is engaged with the objective of eradicating the new invader. This is referred to as **Early Detection Rapid Response (EDRR)**. If a species is determined to be localized to a small area, or a new incursion to the management area or region, the resulting management objective may be to extirpate the species from the infested sites through a regional early detection and rapid response treatment plan. If the localized infestation covers a much larger area and there is no chance of eradicating the population, the resulting management objective is to contain the infestation in order to stop the spread and establishment into un-infested areas. This is referred to as **Containment**. Finally, if a species is determined to be endemic across the majority of a defined area(s) of susceptible habitat behind a containment line, the resulting management action is referred to as **Rehabilitation**. Rehabilitation actions include biological control measures, intensive treatments and re-vegetation. The potential for a species to cause impacts in the future due to high density indicates that rehabilitation may be required. These three strategies are discussed further below.

#### **9.4.1 Early Detection Rapid Response**

The management objective of this strategy is to extirpate all sites with the goal of removing the invasive plant threat. The discovery of a new invader to the province invokes the provincial Early Detection and Rapid Response Plan developed by the Inter-Ministry Invasive Species Working Group which may also involve the federal government if the species is new to Canada. A new incursion of an invasive plant species into a region from another part of the province is also managed to achieve extirpation, provided there is susceptible habitat at risk; this process is known as “regional EDRR”.

#### **9.4.2 Containment**

The management approach of this strategy is to prevent existing established invasive plant populations from spreading into new areas. This is often, but not always, facilitated by delineating a geographic polygon, referred to as a containment line, around the infested area. A containment line is a boundary drawn on a map delineating the main infestation of a species from the area where the species is not yet established. Once a containment line is drawn, intensive management is focused on the smaller outlier or satellite infestations located outside of the main infestation. Management of some sites, such as extensive infestations in pesticide free zones

(PFZ) may focus on increased monitoring rather than treatment. Action taken inside the containment line is referred to as rehabilitation which is explained in section 9.4.3. The containment area may be small or large depending on the distribution of the species. Small containment polygons typically cover one or several drainages or a portion of a valley. These polygons may be uploaded and displayed in the IAPP application for land manager and public viewing and for determining which sites require treatment. Large containment areas may cover significant portions of a region or of the province.

### **9.4.3 Rehabilitation**

The management strategy for rehabilitation is to reduce the current impact(s) of an invasive plant species, or multiple species, to an acceptable level (i.e. below an injury threshold). Once the density of plants is significant enough to impact the ecosystem, the services it provides, or the economic values derived from it, the injury threshold of the site has been reached.

Rehabilitation treatments may be undertaken within a containment area to accelerate the recovery of an ecosystem to a previously existing natural or desired state. Biological control (for species with agents available) is often used behind containment lines either by itself or in combination with other management techniques to weaken the invasive plant population by decreasing its density and ability to reproduce. In summary, the management strategy of rehabilitation is to reduce the potential impacts at a site caused by high invasive plant densities, recognizing that eradication is no longer feasible and that future management of the site must recognize the continued existence of these plants.

## **9.5 Establishing Priorities**

Once a non-native plant species has been designated a threat either through legislation, a formal risk assessment process, or through monitoring and determination by the land managers in an area during joint land management planning meetings, it will be given a priority for control within the defined geographic area. General criteria used to assess the risk of a non-native plant species include the following:

- Risk of spread (based on a combination of available habitat, biological methods of reproduction and the dispersal potential of the plant itself or via anthropogenic vectors of spread);
- Level of “invasiveness” (e.g. competitive ability, mode of reproduction, and behaviour in similar ecosystems in other jurisdictions);
- Potential to cause social, economic or environmental damage;

- Legal designation for control; and
- Likelihood of success, which depends on a combination of the control methods/tools available for the particular species, and its current range or distribution. New infestations and/or species with limited distribution are more likely to be successfully controlled than larger, well established populations.

Prioritizing invasive plants for management activities involves putting invasive plant species into management categories based on consideration of the criteria above.

Priority category names or definitions may vary slightly from region to region within this PMP area, but are generally defined as follows:

***Category 1: Prevent***

- New Species not present in BC or in the Plan Area, but likely to establish if introduced; and
- Management Focus: Early Detection and Rapid Response.

***Category 2: Eradicate***

- Species that are new to the management area (e.g. regional species committee boundary) with limited distribution and low density on infested sites; and/or
- Species invading susceptible habitats, sensitive areas, or sites containing red- or blue-listed species; and
- Management Focus: Eradication or the permanent removal of 100% of an invasive plant species from a selected site or area. This is usually only attainable for small isolated patches/clumps of an invasive plant or noxious weed species and may take many years of repeated treatments to be achieved.

***Category 3: Contain***

- New infestations of established species in the area outside of the main population;
- Can include established infestations along transportation corridors and areas of concentrated activities such as trails, campgrounds, parking lots, garbage dumps, maintenance yards, and gravel pits;
- For some species in this category, where agreement among agencies conducting invasive plant management programs in the area is reached, a containment polygon may be established and mapped in IAPP. Herbicide treatments would generally only occur within the containment boundary if sensitive sites or unique resources were at risk and funding was available. Treatments of that species would be focused first on

sites located outside of the containment line with the goal of containing the species to the area delineated by the containment line boundary;

- Preventing or reducing access to areas with invasive plant infestations is also a strategy employed in containment; and
- *Management Focus:* Containment to the current location and/or distribution.

#### **Category 4: Strategic Control / Rehabilitation**

- Established low-density or high-density infestations that are widely distributed and fairly common throughout the South Coastal Mainland area;
- Eradication or Containment is no longer possible within the management area; and
- *Management Focus:* Treatments will be focused in high value or sensitive areas only, either for environmental, social or economic reasons.

## **9.6 Invasive Plant Treatment Options**

All treatment options are considered after it has been established that a species or a site is designated as a high priority for control. The IPM approach is always considered to ensure that an invasive plant species is receiving the most effective treatment. The following treatment options are considered for use either individually or in combination:

- Mechanical control;
- cultural control;
- Biological control; and
- Selective spot application of herbicides.

### **9.6.1 Mechanical Control**

Mechanical control methods that may be used in an integrated invasive plant management program include the following:

- Covering/Smothering;
- Cutting;
- Digging/Excavating;
- Girdling;
- Hand pulling;
- Mowing;
- Pruning;
- Stabbing;

- Tilling; and
- Spot burning.

Mechanical methods of invasive plant control are often used on small sites or portions of sites because they:

- Involve simple and readily available tools and equipment;
- Are effective and environmentally safe methods if timed correctly and precautions are taken to minimize soil disturbance and native vegetation loss in the treatment area;
- Are sometimes the only available techniques for invasive plant control in areas where herbicides cannot be used, for example, they may be the best option when in close proximity to environmentally sensitive features;
- May be effective at reducing invasive plant density or movement off site; and/or
- Result in minimal or no impact to fish habitat as long as erosion and sedimentation are controlled.

The limitations of mechanical control are as follows:

- Mowing is less effective on low-growing plants, or those that have the ability to re-sprout quickly after disturbance. Mowing may not be the best choice on a site if seed feeding bio-control agents are present;
- Cutting effectiveness is largely dependent on plant species, stem diameter, time of cut, and age of the plant;
- Spot burning can pose safety issues for both workers and the environment;
- Burning and/or mowing exacerbates the growth of some invasive plant species, especially those that reproduce by rhizomes;
- Covering/smothering may be costly and labour intensive because treatment sites require regular monitoring to detect and repair torn materials and may prevent native vegetation from re-establishing on the site;
- Excavating may be costly and labour intensive and may include removal of concrete or fencing as complete removal of all root fragments must be obtained to prevent re-growth in rhizomatous species;
- Digging, excavating and hand-pulling are not suitable treatments for species with adventitious root buds and rhizomes;
- Soil disturbance created by mechanical treatments may facilitate the re-establishment of invasive plants; and,

- Repeated follow-up treatments must be conducted to remove all new germinants for three to five years or longer depending on the length of time the targeted species remains viable.

Proper disposal of invasive plants or invasive plant parts following control is important. Invasive plants, plant parts and seeds should be bagged and disposed of in a landfill or other designated disposal site.

### **9.6.2 Cultural Control**

Targeted grazing, re-vegetation and/or fertilization are examples of cultural control methods. Managing public use of land to reduce or prevent weed infestation is another example of a cultural control.

Targeted grazing involves using cattle, goats, or sheep for invasive plant control and has the following advantages:

- May be economical;
- May retard plant development and seed formation and will gradually deplete root reserves if the tops of young plants are continuously grazed; and,
- May be a viable option for control of certain species of invasive plants in areas where manual or mechanical methods or herbicides cannot be used.

Some of the limitations of targeted grazing include:

- The “non-selective ” nature of grazing may result in removal of desirable vegetation in conjunction with targeted invasive plants;
- Multiple treatments are necessary and their timing is critical;
- May create additional soil disturbance and compaction (wet soils); and,
- Animal husbandry and transportation costs can be prohibitive.

### **9.6.3 Biological Control**

Biological control involves using host-specific organisms to reduce an invasive plant population to an acceptable ecological and economic impact level. Biological control agents are predominantly insects and are introduced from an invasive plant’s country of origin, and are only introduced after many years of research and testing to ensure they will not impact non-target species. They attack and weaken target invasive plant species and reduce plant density over time. Biological control will not eradicate a plant species from the province because the agent and plant exist in a predator-prey

relationship. Biological control will always result in remnant populations of the target invasive plant that ensure agent survival. Therefore, biological control agents are not released at sites where the intent is to eradicate or extirpate the plant. Biological control is often used as a treatment option when rehabilitating infested sites and is often most effective when there is competing vegetation.

A complete list of biological control agents operationally used and of agents under development is available on-line at:

<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/management/plants/biological-control/biological-control-agents-host-plants>

The benefits of using biological control agents include the following:

- Affords long-term control on sites with well-established invasive plant populations;
- Slows the spread of invasive plants into new areas;
- Used in areas where other treatment methods may not be feasible, such as PFZs;
- May reduce invasive plant populations below a level where significant environmental or economic damage may occur; and
- Is the most cost-effective, long-term management option for invasive plant control.

Some limitations to using biological control include the following:

- Research and testing to obtain a biological control agent may take many years prior to the agent being approved for use;
- Some biological control agents may be slow to affect target invasive plant species because they can take up to 10+ years to become established, increase in number, and disperse;
- Some invasive plants have been established in the province for decades, and are either prolific seeders and/or have large soil seed banks; this increases the time it takes for biological control agents to affect target plant species populations;
- Some agents have specific habitat requirements and are not suited for all infested sites; and
- Biological control agents are not available for all invasive plant species.

### 9.6.4 Herbicide Application

All herbicides are applied selectively on a spot treatment basis to suppress invasive plants with the goal of reducing herbicide use on each site over time. Following careful consideration of the use of the IPM treatment options, herbicides are used when no other method of control is practical or effective.

The benefits of spot applications of herbicides include:

- Effective, safe and easy to use IPM tool;
- Treatment costs may be significantly lower than those associated with manual or mechanical methods and therefore more invasive plants can be treated; and
- No soil disturbance.

Some of the limitations of using herbicides include the following:

- Herbicides cannot be used within pesticide free zones near water sources and/or drinking wells etc. (See section 4.7);
- Their usefulness is limited in areas with seasonal water courses and on sites with coarse soils; for example, residual herbicides (those that last for one or more seasons) cannot be used on plants growing on soils containing greater than 70% sand or in areas that drain into creeks even if the watercourse is dry at the time of application. Non-residual herbicides may be applied in these areas provided that the required PFZs, as stated in the IPMR, are adhered to; and
- May need more than one treatment due to seed bank.

## 9.7 Treatment Method Selection

Generally, no method will achieve control in a single treatment. The success of different treatment methods will depend on characteristics of the target invasive plant and on site conditions. The integration of a number of control strategies into an IPM program is often more effective than using a single treatment alone.

General conditions associated with selection and use of treatment options are shown in Table 1.

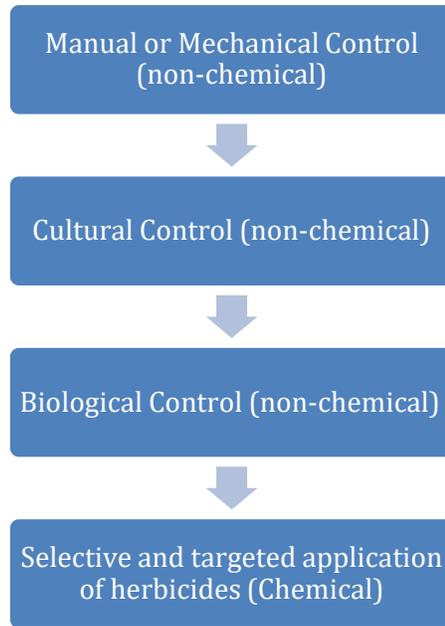
**Table 1: General conditions associated with treatment options.**

Treatment	Conditions for Use
<u>Manual and Mechanical</u> (e.g. covering/smothering,	<ul style="list-style-type: none"> <li>• New, small incursions;</li> </ul>

<p>cutting, digging/excavating, girdling, hand pulling, mowing, pruning, stabbing, tilling, spot burning)</p>	<ul style="list-style-type: none"> <li>• Applicable to most species but aggravate some situations, e.g., rhizomatous hawkweed species or knotweed species;</li> <li>• Sometimes require restoration (to some extent) with grasses and native plant species.</li> </ul>
<p><u>Cultural</u> (i.e. targeted grazing by sheep, cattle, goats, etc.)</p>	<ul style="list-style-type: none"> <li>• Incursion size is variable, otherwise similar to mechanical treatments.</li> <li>• No other options are either available or desirable</li> </ul>
<p><u>Biological</u> (i.e. systematic release of insects and diseases that feed or attack exclusively on targeted invasive plant species)</p>	<ul style="list-style-type: none"> <li>• Older, more established incursions generally with widespread occurrences of target species beyond treatment site;</li> <li>• Currently operationally only available for thistles, knapweeds, toadflax species, tansy ragwort, leafy spurge, hound’s-tongue, and St. John’s wort within the PMP area.</li> </ul>
<p><u>Chemical</u> (i.e. judicious, strategically targeted use of herbicides)</p>	<ul style="list-style-type: none"> <li>• Invasive plant species population size is variable;</li> <li>• Restricted use within close proximity to species at risk, domestic wells or water intakes, water licenses, agricultural food production systems, environmentally sensitive or riparian areas (the area adjacent to streams, lakes and wetlands), PFZs, no treatment zones (NTZ), high public use areas during peak season, or other sensitive areas.</li> </ul>

Other considerations include seasonality, weather conditions, financial and human resources, site accessibility, site conditions, target species composition and percent cover, and the ecological, economic, cultural, and societal consequences of not treating.

Figure 2 shows the decision making process involved when determining what type of treatment to use. Chemical treatments are only used as a last resort when other methods are not effective or practical. Often, a combination of the following treatment types will be used to treat an infestation.



**Figure 2: The decision making or thought process involved when determining the treatment type to be used for a particular invasive plant site**

## **9.8 Monitoring and Evaluation**

Monitoring is repeated over time so changes in invasive plant populations can be followed. It is conducted regularly and is used to detect new invaders, to measure the effect of treatments on the target invasive plant and on non-target vegetation, and to record trends that may be occurring in an invasive plant population. IAPP is an important component of monitoring because it houses long-term inventory, treatment, and monitoring data. Monitoring results are used to guide program direction and provide appropriate feedback for adjustments to ensure the Invasive Plant Program is effectively managing invasive plants. Some specific components of monitoring are described below.

### **9.8.1 Species Monitoring**

Inventory surveys or pre-treatment monitoring are completed visually and are often repeated over time. This provides a record of information about invasive plant occurrence, density, and site characteristics. Government maintains the integrity of the species inventory by routinely monitoring invasive plant sites and updating surveys as resources allow. Many sites are inventoried before receiving an initial treatment through species-specific, and/or geographic-specific survey activities. An exception to this is when a new priority species is encountered during the delivery of

treatment activities. In the years following an initial survey site survey information is updated from treatment information collected in the field.

### **9.8.2 Treatment Monitoring and Evaluation**

A minimum of 10% of chemical and non-chemical treatment sites are monitored annually following treatments to ensure the following:

- Compliance with the commitments made in this PMP;
- Compliance with the IPMA and IPMR and other legislation;
- Correct completion of IAPP treatment records; any errors that may be discovered are returned for correction to the person who conducted the treatment;
- Whether the chosen treatment method was the best method or whether another method should be employed;
- Efficacy of control method used;
- Protection of environmentally sensitive areas;
- Potential or actual impacts to non-target vegetation;
- Re-growth of invasive plants; and,
- Re-treatment requirements, if any.

Biological control treatments are monitored to determine the following:

- Establishment;
- Biological control agent population growth and dispersal;
- Efficacy of agent(s) and level of invasive plant control achieved over time; and,
- Identification of gaps in biological control agent effectiveness due to biological control agent habitat preferences.

Agencies operating under this PMP may also conduct “during treatment” inspections of both herbicide applications and/or manual/mechanical treatments being conducted. These inspections may assess, for example, public and worker safety, environmental concerns, completion schedules and adherence to standards, specifications and the commitments made in this PMP.

## **10.0 Operational Information**

As per Section 58 of the IPMR, the operational information in this section includes:

- Qualifications and responsibilities of persons applying herbicides;
- Procedures for safely transporting herbicides [*IPMR Section 58(3)(a)(i)*];

- Procedures for safely storing herbicides [*IPMR Section 58(3)(a)(ii)*];
- Procedures for safely mixing, loading and applying herbicides [*IPMR Sections 58(3)(a)(ii) and (iii)*];
- Procedures for the safe disposal of empty herbicide containers and unused herbicides [*IPMR Section 58(3)(a)(iv)*];
- Procedures for responding to herbicide spills [*IPMR Section 58(3)(a)(v)*]; and,
- Identification of each pesticide that will be used under the plan, the manner of its application, and the type of equipment required for each manner of application [*IPMR Section 58(3)(c)*].

## 10.1 Qualifications and Responsibilities of Persons Applying Herbicides

The transportation, storage, handling, application and disposal of pesticides are governed by federal and provincial legislation. The partnering ministry personnel and their contractors will follow safe handling practices including workplace requirements for Workplace Hazardous Materials Information System (WHMIS) labelling and worker education. The required practices for pesticide applicators are detailed in:

- BC Ministry of Environment, Canadian Pesticide Education Program Applicator Core Manual; and,
- Work Safe BC (2009) Standard Practices for Pesticide Applicators.

All herbicide applications under this PMP will be conducted by a person who holds a Pesticide Applicator Certificate endorsed for the class of pesticide and the pesticide use required under this PMP.

The responsibilities of the Certified Pesticide Applicator are to:

- Be in continuous attendance at the site with available proof of certification;
- Ensure that applications do not violate this PMP or applicable legislation;
- Maintain continuous contact, auditory and/or visual, with any uncertified assistants;
- Be within 500 meters of persons being supervised; and,
- Comply with the standards contained in Division 7 of the IPMR.

## 10.2 Procedures for Safely Transporting Herbicides

The Transport of Dangerous Goods Act regulates the handling and transportation of poisonous substances that may include herbicides. The IPMA and IPMR also specify transport requirements/procedures.

The plan holder shall ensure that ministry personnel and/or contractors follow these procedures for safely transporting herbicides with 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 to handle spills;
- Ensure that all documents and placards are carried in, or placed on, transport vehicles as 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.

### **10.3 Procedures for Safely Storing Herbicides**

The plan holder shall ensure that ministry personnel and/or contractors follow these procedures for safely storing herbicides within the Plan Area:

- Ensure that herbicides are stored in accordance with the IPMA, IPMR and the Work Safe BC Manual, 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 Labels and MSDS for herbicides stored;
- Ensure that the person responsible for the storage area notifies the appropriate fire department of the presence of herbicides on the premises;
- Ensure that herbicides that release vapours, and bear a "poison" symbol on the label are stored in a storage facility that is not attached to or within a building used for living accommodation; and,
- Persons responsible for the herbicide storage in a vehicle shall ensure that all herbicides are stored in a locked canopy or similar arrangement, separate from the driver and personal protective gear.

#### **10.4 Procedures for Safely Mixing, Loading and Applying Herbicides**

The plan holder will ensure that these procedures for safely mixing, loading and applying herbicides with the Plan Area are followed:

- Ensure that all mixing, loading and application of herbicides is carried out 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, 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 a spill tray is used during all mixing and loading of herbicides to catch and contain any small spills that may occur;
- 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 this PMP, each herbicide product's Label and 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 from a

natural source in invasive plant applications, a fresh water permit will be acquired from the MOE. If equipment is used to draw water from a body of water or an irrigation system into a container used to contain, prepare, mix or apply a pesticide, a gap must be maintained between the pesticide and the equipment so that pesticide is prevented from entering the body of water or irrigation system.

## **10.5 Procedures for Safe Disposal of Empty Herbicide Containers and Unused Herbicides**

Except where herbicides are applied by plan holder personnel, the responsibility of container disposal will lie with the contractor.

The plan holder shall ensure that ministry personnel and/or contractors 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 all relevant laws and in accordance with the manufacturer's instructions as noted on the product label;
- Ensure that empty herbicide containers are returned to the herbicide distributor as part of their recycling program or triple or pressure rinsed, altered so that they cannot be reused, and disposed of in a permitted sanitary landfill or other approved disposal site; and
- Ensure that all leftover herbicide mix is stored for future use in a manner consistent with the requirements specified in Section 4.3 (Procedures for Safely Storing Herbicides).

## **10.6 Procedures for Responding to Herbicide Spills**

The plan holder shall ensure that ministry personnel and/or contractors follow these procedures for responding to herbicide spills within the Plan Area. If contractors that work under this PMP have their own spill response plan, they must meet or exceed the following procedures:

- Ensure that a herbicide spill kit accompanies all vehicles within the Plan Area and contain as a minimum the instructions for spills, emergency telephone numbers, agricultural white lime (5 kg), kitty litter (5 kg), large plastic garbage bags (4), shovels (2), Nutrasol pesticide neutralizing solution (1), an ABC type fire extinguisher, polyethylene or plastic tarp (3m x 3m minimum), dustpan and shop brush, flagging

and rope, a herbicide first aid kit, and personal protective clothing/equipment (rubber gloves, safety glasses); and,

- Ensure that the following spill procedures are followed if a herbicide spill occurs within the Plan Area:
    1. All personnel shall be protected from herbicide contamination by wearing appropriate protective clothing and safety gear;
    2. Any person exposed to a herbicide shall be moved away from the place of the spill;
    3. First aid should be administered if required;
    4. The source of the spill should be stopped;
    5. The spilled material should be stopped from spreading by creating a dam or ridge;
    6. The project supervisor shall ensure operations cease until the spill is contained and the source is repaired;
    7. Absorbent material shall be spread over the spill, if applicable, to absorb any liquid;
    8. The absorbent material shall be collected in garbage bags or containers with the contents clearly marked, removed from the spill site and placed in garbage bags or containers;
    9. If more than 5 kg or 5 L of herbicide\* is spilled, the person responsible for the project will immediately report it to the Provincial Emergency Program by telephoning 1-800-663-3456 or, where that is impractical, to the local police or nearest detachment of the R.C.M.P.; and,
    10. An approved representative of the plan holder(s) will be notified of the details related to the spill as soon as is practical by the contractor project supervisor.
- \* *Environmental Management Act*, Spill Reporting Regulation, Reportable Levels for Pest Control Products

## 10.7 Herbicide Selection and Use

The herbicides intended for use under this PMP are described below in Tables 2 and 3. Herbicide selection is driven first by the conditions of the site and secondly by the target species. Currently, only glyphosate products may be used between 10m and 1m above the high water mark of water bodies if selectively applied for noxious weed or invasive plant control, (and up to the high water mark of temporary, free-standing bodies of water and over dry streams that are not fish bearing or drain directly into fish bearing bodies of water). The remaining herbicides can only be used where the 10 meter PFZ can be maintained by ensuring an adequate buffer zone. However, if a product containing an

active ingredient on the following list is approved for use with reduced PFZs in the future, then that label expansion will be adopted under this PMP.

**Table 2. Properties of Herbicide Active Ingredients Proposed for Use:**

Active Ingredient	Residual Activity*	Mode of Action	Selectivity**	Where and When Applied***
<b>aminocyclopyrachlor</b>	low	translocation	selective	foliage; post-emergent
<b>Aminopyralid</b>	moderate	translocation	selective	foliage; post-emergent
<b>Chlorsulfuron</b>	moderate	contact	selective	foliage; post-emergent
<b>Clopyralid</b>	high	translocation	selective	foliage; post-emergent
<b>Dicamba</b>	low	translocation	selective	foliage & cut surface; post-emergent
<b>Diflufenzopyr</b>	low	translocation	selective	Foliage, post-emergent
<b>Glyphosate</b>	low	translocation	non-selective	foliage & cut surface; post-emergent
<b>Halosulfuron</b>	moderate	translocation	Selective	foliage or soil, pre or post-emergence
<b>Imazapyr</b>	moderate	translocation	non-selective	foliage, post-emergence
<b>MCPA (dimethylamine salt)</b>	low	translocation	selective	foliage; post-emergent
<b>mecoprop-P (dimethylamine salt)</b>	low	translocation	selective	foliage; post-emergent
<b>metsulfuron-methyl</b>	moderate	translocation	non-selective	foliage, post-emergent
<b>Triclopyr</b>	low	translocation	selective	foliage & cut surface; post-emergent
<b>2,4-D Amine</b>	low	translocation	selective	foliage, post-emergent

\* LOW generally refers to residual soil activity of up to 40 days, MODERATE for residual soil activity of up to one year, and HIGH for residual soil activity of greater than one year.

\*\* Herbicides that control all vegetation are termed non-selective, while those that control certain types of vegetation (e.g., only grasses or only broadleaf) are termed selective.

\*\*\* Post emergent refers to treatments made after the vegetation has emerged through soil surfaces.

**Table 3. Use Patterns of Herbicide Active Ingredients**

Active Ingredient	Use Pattern
<b>aminocyclopyrachlor</b>	Is combined with the herbicide active ingredient metsulfuron-methyl to form the product Navius VM herbicide. Navius is a dispersible granule mixed in water and applied as a selective, foliar spray for control of undesirable brush and woody species in non-crop areas. It is quickly taken up by the leaves, stems and roots and translocated throughout the plant. Visible effects (bending and twisting of stems and leaves) may be seen on plants within a few hours of application.
<b>aminopyralid</b>	Is a selective, residual herbicide, giving season-long control when used at label application rates. It is useful for spot treatment control or suppression of many noxious weed and invasive plant species (e.g. biennial and perennial thistles, knapweeds, yellow starthistle, scentless chamomile and common tansy), woody plants, annual and perennial broadleaf weeds. It is effective only on actively growing plants. It is absorbed through leaves and roots, and translocates throughout the plant. It interrupts cell division and causes the plants to die. It is safe to desirable grasses, and its systemic and residual properties effectively control invasive plants at multiple growth stages.
<b>chlorsulfuron</b>	Is useful for the control of hard to manage annual and perennial broadleaf vegetation by both foliar and root uptake. It may be used to spot treat established species not controlled by other herbicides. Under this PMP, chlorsulfuron will not be used as a soil-applied residual herbicide. It is effective at very low application rates. It will not be applied near trees or other desirable plants, in areas where their roots may extend, or in locations where it may be moved or washed into contact with the roots.
<b>clopyralid</b>	Is a selective, residual herbicide that is useful for the spot treatment control of many species of broadleaf invasive plants. It is effective only

	<p>on actively growing plants. It is useful for the control of Canada thistle, perennial sowthistle, oxeye daisy, and scentless chamomile in areas where herbicides of long residual soil activity should not be used. It does not affect many woody species such as trees and shrubs. It can be used in areas where the over story of trees and shrubs are present at the infestation site and there is a need to minimize or prevent damage to these non-target plants. For perennial weeds, it will control the initial top growth and inhibit re-growth during the season of application.</p>
<b>dicamba</b>	<p>Is used for the spot treatment of young, actively growing broadleaf vegetation and brush species, including many species of invasive plants (e.g. Canada thistle, perennial sow thistle, leafy spurge, common tansy, and diffuse knapweed). It will control many broadleaf herbaceous species that cannot be effectively treated using physical controls or glyphosate applications. It can be safely mixed with other herbicides to broaden the number of target species controlled. Because it is a selective herbicide, it is useful in areas where grasses are to be retained on the site.</p>
<b>Diflufenzopyr</b>	<p>Is an ingredient in the herbicide product Overdrive which contains the active ingredients diflufenzopyr-sodium and dicamba. Overdrive controls broadleaf weeds in pasture, rangeland and non-cropland situations such as railroad, utility, pipeline and highway rights-of-way, railroad crossings, non-agriculture fencerows and airports. Because it is a selective herbicide, it is useful in areas where grasses are to be retained on the site.</p>
<b>glyphosate</b>	<p>Is a non-residual herbicide used to control a very large number of species of invasive plants. It is most useful in areas where low herbicide soil residual is required because of the close proximity of wells, water bodies and other environmentally sensitive features. It is deactivated quickly in the soil, where it moves very little from the point of application. Glyphosate is used to control a very large number of herbaceous broadleaf and grass species and woody vegetation. It can be applied to cut vegetation or young seedlings which emerge following trimming or hand pulling to further reduce site organic matter or where physical control methods are not effectively controlling vegetation. Glyphosate can also be used for selectively</p>

	<p>treating invasive plants such as the invasive knotweeds using foliar application, wipe on, or cut and insert methods. An application to Health Canada’s Pest Management Regulatory Agency to include stem injection as an application method for knotweed control to the label of the glyphosate containing product Roundup WeatherMax is in progress. If approved, that label expansion will be adopted under this PMP.</p>
<p><b>halosulfuron</b></p>	<p>Is a selective herbicide for the post-emergence control of nutsedge and numerous species of invasive plants and broadleaf weeds in turfgrass, ornamentals, some berry crops, landscaped areas and other specified non-crop areas. When applied as directed on the product label, many species of established turfgrasses are tolerant to halosulfuron.</p>
<p><b>imazapyr</b></p>	<p>Is a non-selective, residual herbicide that gives season-long control of most species of annual and perennial broadleaf plants, grassy weed species, and some species of invasive plants such as wild chervil in non-crop and industrial areas. It is effective at low application rates. It works by preventing germination of seeds, is readily absorbed through foliage and roots, and moves rapidly throughout the plant where it breaks down tissue. It is particularly useful in controlling vegetation that has not been effectively managed using a combination of physical controls and glyphosate application. Treated plants stop growing soon after spray application.</p>
<p><b>MCPA (dimethylamine salt)</b></p>	<p>Is a selective, foliar applied broadleaf herbicide used for the control of numerous species of invasive plants in non-crop and industrial areas. It is absorbed through the leaves or roots and is readily translocated in the plant. At recommended rates, MCPA persistence in the soil is up to one month in most growing conditions and up to 6 months in drier climates.</p>
<p><b>mecoprop-P (dimethylamine salt)</b></p>	<p>Is a selective, non-residual, translocated herbicide that interferes with growth regulation in invasive plant species. It is most effective when the target plant is growing rapidly, and is more actively taken up by the foliage than by the roots. Average persistence of mecoprop-P in soil is one to four weeks. Persistence is longer in cold, dry soils.</p>

<p><b>metsulfuron-methyl</b></p>	<p>Is a translocated, selective herbicide of moderate persistence used for invasive plant control. It is applied as a foliar spray. It rapidly inhibits the growth of susceptible plants but typical symptoms like discoloration may not be noticeable for several weeks after applications depending on growing conditions and plant susceptibility. Warm moist conditions following application promote its activity while dry cold conditions may reduce or delay activity. Invasive plants hardened off by cold weather or drought stress may not be controlled. Degree of control and duration of effect are dependent on the application rate used, sensitivity and size of the target species, as well as soil moisture and soil temperature. Invasive plants controlled include common tansy, kochia, scentless chamomile, Canada thistle and sow thistle.</p>
<p><b>triclopyr</b></p>	<p>Is a selective herbicide that controls many invasive broadleaf plants and is very effective in controlling many invasive shrubs and deciduous tree species. It works by accumulating in the areas of active cell growth and interfering with normal plant growth processes. It is absorbed by green bark, leaves, roots, and cut stem surfaces and moves throughout the plant.</p>
<p><b>2,4-D Amine</b></p>	<p>Is a selective, non-residual, translocated herbicide that interferes with growth regulation in many noxious weed and invasive plant species. Because it is selective, it is useful in areas where grasses are to be retained on the site. It is most effective when the target plant is actively growing, and is more actively taken up by the foliage than the roots.</p>

**Surfactants or Adjuvants**

Adjuvants and surfactants are chemicals or agents that are sometimes added to herbicide spray mix to allow easier mixing and to assist in the spreading of the herbicide spray mix, the wetting of and adherence to the surface of the plants being treated. This has been shown to decrease the possibility of drift (the movement of the applied material away from the intended target to adjacent areas by wind). Some adjuvants and surfactants may also be used to adjust the pH of the herbicide spray mix. Spray mixes that are highly or mildly alkaline, (i.e. pH greater than 7), have been shown to break down (degrade) or hydrolyze more rapidly reducing the effectiveness of the herbicide being applied. If required, surfactant/adjuvant products may be

added to the herbicide active ingredients proposed for use under this PMP provided they are registered for use and sale in Canada and have a valid Pest Control Products Act (PCP Act) registration number.

Additional background information on the environmental, toxicological and other parameters of the herbicides listed can be found in Appendix 3.

### **10.7.1 Description of Application Equipment Proposed for Use**

The following is a description of each type of application equipment proposed for use under this PMP:

- Backpack or hand held Sprayer: A portable, manually operated, low pressure container with a nozzle and a positive shut-off system used for the spot application of herbicides onto foliage, basal bark areas, or into or onto freshly cut stems and stumps.
- Vehicle mounted sprayer: Any tank and pump unit mounted onto a vehicle with one or multiple handguns and potentially one or more boom and/or boomless nozzle attachments. The vehicle may be a four-wheel drive truck or all-terrain vehicle and used for large, continuous infestations of priority invasive plant species.
- Wick/Wipe On Applicators: Absorbent pad, wicks or rope attached to a long-handled applicator or stick used to apply herbicides onto foliage, basal bark areas, or freshly cut stems or stumps.
- Squirt Bottle: Hand-held, non-pressurized container used to apply herbicides onto basal bark areas, or freshly cut stems or stumps.
- Injection Tools: Used to inject herbicides into individual stems.

## **11.0 Standard Operating Procedures**

Environmental protection is one of the principal reasons for the existence of each Ministry's Invasive Plant Program. Preventing the introduction and spread of invasive plant species is a key factor in long term invasive plant management success and protection of the environment. To support this, each Ministry has developed best management practices in collaboration with the Invasive Species Council of BC and these that can be found at: <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/management>.

In order to protect ecosystems, there are circumstances where the use of a herbicide is the only method that can effectively remove invasive plant species. This is particularly true when the target invasive plant species spreads by underground roots or rhizomes, or

can regrow from deep taproots, and 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 invasive plant establishment and spread is far greater than the risk of safe, localized herbicide use.

## **11.1 Environmental Procedures**

All invasive plant management activities proposed under this PMP will incorporate standard operating procedures 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.

In this PMP, all PFZs will comply with the standards contained in Division 7 of the IPMR. A PFZ is defined as an area of land that must not be treated with pesticides and be protected from pesticide contamination through either direct means (e.g. through herbicide drift) or indirect (e.g. soil and/or water movement). PFZs are measured by the horizontal distance from the high water mark and they will always be identified and flagged prior to any herbicide application. In order to decrease the risk of breaching a PFZ, appropriate buffer zones sufficient to ensure the maintenance of the PFZ, will be applied outside PFZs.

If herbicide is applied within a PFZ, this use is immediately reported to the confirmation holder who immediately reports it to the Ministry of Environment, Environmental Protection Division. The confirmation holder is responsible for inspecting the site, arranging any necessary testing, coordinating any required site remediation, and contacting any affected landowners.

### **11.1.1 Procedures to Protect Community Watersheds**

The following precautionary procedures will be implemented within community watersheds:

- PFZ procedures described in Section 11.1 will be followed for all community watersheds;

- The location of community watersheds to be protected will be verified by accessing the Community Watershed Database, maintained by the BC MOE, at the following web site;  
[http://www.env.gov.bc.ca/wsd/data\\_searches/comm\\_watersheds/index.html](http://www.env.gov.bc.ca/wsd/data_searches/comm_watersheds/index.html)
- Herbicides will not be stored within a community watershed for more than 24 hours prior to their use and they will be removed from the community watershed within 7 days of use, unless they are stored in a permanent structure;
- A 10 meter PFZ shall be maintained from the point of herbicide application and all bodies of water within the community watershed and only selectively applied glyphosate shall be used where necessary within this PFZ up to 1 meter away from high water;
- A 30 meter NTZ shall be maintained from all licensed water supply intakes or wells within the community watershed.
  - This 30 meter NTZ may be reduced by the PMP holder if priority invasive plants are present within the 30 meter NTZ, and the following four criteria are met:
    - 1) the PMP holder is reasonably satisfied that the smaller NTZ will prevent herbicide from entering the water supply intake or well;
    - 2) consultation with the well or water intake owner has occurred;
    - 3) rationale for the decision has been documented in writing PRIOR to treatment; and,
    - 4) the PMP holder and the land manager responsible for the jurisdiction being treated are in agreement to reduce the NTZ.
  - For water intakes from linear waterbodies such as streams, creeks or rivers:
    - 1) No NTZ is required for treatment downstream of a water intake, however the 10 meter PFZ requirements (or 1m PFZ if selectively applying glyphosate) will still be required.
    - 2) 30 meter NTZ is required upstream of a water intake.
  - All PFZs will be measured and marked/flagged prior to herbicide use.

### **11.1.2 Procedures to Protect Domestic and Agricultural Water Sources**

PFZ procedures described in Section 11.1 and in table 4 below will be followed for all domestic and agricultural water sources. The PMP holder shall ensure that all Certified Pesticide Applicators with authorization to work under this PMP take steps to determine the location of registered domestic and agricultural water sources prior

to herbicide application for invasive plant management near private and/or agricultural lands.

Certified Pesticide Applicators working under this plan shall:

1. Ensure both online water licence and well layer resources provided by ENV and listed below are reviewed prior to treatment:
  - a. The BC Water Resource Atlas  
<https://catalogue.data.gov.bc.ca/dataset/bc-water-resources-atlas/resource/ad27cad8-f5db-489b-9c87-96d3efe85104>
  - b. Groundwater wells and aquifers: <https://apps.nrs.gov.bc.ca/gwells/>
    - *NOTE: this website indicates that not all groundwater wells are registered with the province, as registration was voluntary until February 29, 2016. The PMP holder has been advised that only approximately 60% of wells are currently mapped within BC as of 2019;*
2. Review records in the BC Invasive Alien Plant Program (IAPP) database to check for comments indicating previous location of wells or water licence intakes in the area;
3. Conduct visual observation looking for wells, water lines into nearby creeks, notifications posted on private land fences, or other indicators that water is being extracted for domestic or agricultural purposes within 30m of the treatment area;
4. Attempt to contact landowners directly that have private lands located within 30m of a proposed treatment site to confirm the location of wells or water licence intakes and if they are currently active. Landowner contact is especially important in areas with new home construction or where the well and water licence shapefile layers indicate there are numerous wells located in the local area, as it may indicate that additional unmapped wells or water licenses are also present; and
5. Ensure that any time an unregistered/unmapped well or water licence intake is located, a comment is made in the IAPP database site record, so the presence of the well or water intake is available to inform all potential future treatments.

Table 4. describes minimum protective measures and reflects the standards specified in Sections 71(3) and 71(4) of the IPMR.

**Table 4: Minimum Protective Measures Under the IPMR to Protect Domestic and Agricultural Water Sources**

<i>IPMR</i> Section	Uses	Permitted Applications	NTZ
<b>71(3)</b>	All pesticide applications except bacterial pesticides	General Rule – Must maintain a 30 m NTZ around a water supply intake or well used for domestic or agricultural purposes, including water for livestock and irrigation purposes	30 m NTZ
<b>71(4)</b>	All pesticide applications except bacterial pesticides (Bacterial pesticides are not considered for use under this PMP)	May reduce the NTZ under section 71(3) if reasonably satisfied that the smaller zone will ensure that pesticide from the use will not enter the water supply intake or well	NTZ at discretion of Plan Holder

### 11.1.3 Procedures to Protect Water Bodies, Wetlands and Riparian Areas

In order to protect fish, riparian areas, and bodies of water from adverse effects during invasive plant management (chemical and non-chemical), the plan holder will implement the following procedures to minimize any adverse and lasting effects on natural ecosystems:

- PFZ procedures described in Section 5.1 will be followed for all bodies of water, wetlands and riparian areas;
- Ensure that whenever herbicide, manual or mechanical control methods are applied no impact to water bodies will occur. Reducing negative impacts to streamside vegetation and bank stability will reduce erosion and water turbidity;
- Ensure that best management practices that comply with the IPMR are applied during invasive plant management;
- Hold pre-work meetings with plan holder personnel and/or contractors and affected agencies to ensure all involved in the invasive plant management process can competently protect riparian areas and bodies of water during the course of the work;
- Prevent invasive plant control impacts on water bodies and riparian areas by ensuring that contract documents and prescriptions will describe best management practices that will include no refuelling of machinery, herbicide

mixing or clean up (excluding the case of an emergency spill), within 15 meters of a riparian zone and a requirement to hang “Pesticide-Free Zone” flagging along all PFZs and their associated buffer zones as required by Sections 73, 74 and 77 of the IPMR prior to applying herbicide; and

- Ensure that minimum protection measures are adhered to according to the requirements specified in the IPMR during herbicide applications for all bodies of water, dry streams, and classified wetlands.

#### **11.1.4 Procedures to Protect Wildlife Habitat/Species at Risk**

In order to protect wildlife and species at risk from adverse effects during invasive plant management, the plan holder will implement the following procedures to minimize any adverse and lasting effects on natural ecosystems:

- Consider sensitive ecosystems or 'at risk' plant, vertebrate or invertebrate species when developing treatment plans for a given site;
- Consult the following layers in iMapBC <http://maps.gov.bc.ca/ess/sv/imapbc>: WSI-IO-Red-listed Species – Nonsensitive; WSI-IO-Blue-listed Species – Nonsensitive; WSI-SO-Red-listed species – Nonsensitive; WSI-SO-Blue-listed Species – Nonsensitive; and Endangered Species and Ecosystems – Non-Confidential Occurrences – Conservation Data Centre;
- Ensure that there is communication with agencies responsible for species at risk prior to invasive plant management being carried out so that management plans can be adjusted accordingly;
- Ensure that best management practices (as derived from documents on species habitat, lifecycle information and locations) are applied during invasive plant management; and
- Hold pre-work meetings with plan holder(s) personnel and/or contractors and affected agencies to ensure all involved in the invasive plant management process can competently protect species at risk and wildlife habitat during the course of their work.

#### **11.1.5 Procedures to Prevent Herbicide Contamination of Natural Food Sources**

Berry picking, bee keeping areas, vegetable gardens, and areas containing agricultural crops or domestic animals are also found at many locations within the plan area. In addition, First Nations people within the plan area may use several species of plants

for ethno-botanical purposes. Most often, invasive plants become established in areas where past ground vegetation disturbance has occurred, such as road, landing and utility construction, timber harvesting, heavy cattle, horse, and/or wildlife grazing, all-terrain vehicle activity and other human induced and natural disturbances. These areas are not often traditional use plant areas because disturbance removes natural vegetation. This helps to greatly reduce the risk of human food contamination as there is often separation between those areas most likely to receive direct herbicide application for invasive plant control from those areas where ethno-botanical collections usually occur. The risk of human contact with herbicides still exists, as does the risk to affect natural use plants, therefore ongoing communications around areas and species generally used for collection of food sources will occur. Control measures applied in specific use areas will ensure resource plants are not contaminated with herbicide, and invasive plants are effectively removed.

#### **11.1.6 Procedures for Protecting First Nations Interests in Traditional Food/Medicine Gathering and Culturally Significant Areas**

First Nations people within the Plan Area may use several species of native plants for ethno-botanical purposes.

The plan holder shall ensure that, prior to herbicide applications for invasive plant management, procedures are developed and implemented to prevent herbicide contamination of food or medicinal plants intended for human consumption including:

- Identification of native plant species and culturally significant sites.
  - During the required consultation process, First Nations were invited to forward the names of those plant species of cultural importance, so that they are not inadvertently affected during treatment activities. Additional plant species and sites of cultural importance will be added to this list if identified by First Nations and others.
  - Efforts will continue through ongoing engagement to identify culturally significant plants and sites.
- Proposed treatment area notification:
  - Where requested, First Nations will be provided with information on where treatment is planned each spring,
- Invasive Plant management adjacent to traditional use plants and culturally significant sites:

- Provide annual training to on-ground treatment contractors to recognize traditional use plants and culturally significant sites;
- Non-chemical treatment methods of invasive plant management will be considered where treatment objectives can be achieved;
- Treatment Notices will be posted at public access points to proposed herbicide treatment areas advising of herbicide use near these sites. This will communicate that the area has been treated with herbicides and signs will advise when it is safe to re-enter the area. In most cases this is 24 hours from the time of herbicide application; and,
- Where possible, herbicide treatments shall be conducted at times to minimize impacts on food/medicinal plant production and harvesting (e.g., delay treatments until after the fruit has predominantly dropped from the plant, use of non-residual herbicides if possible) and on cultural uses (e.g., delay treatments until after traditional use occurs, use of non-residual herbicides if possible).

## **11.2 Procedures for Safe Herbicide Application**

Ensuring that correct environmental protection procedures are in place can be further strengthened by requiring that handling and applying herbicides is conducted in a manner that reduces the risk of accidents caused by human error or equipment malfunction.

### **11.2.1 Pre-Treatment Inspection Procedures for Identifying Treatment Area Boundaries**

The following procedures shall be implemented to ensure that treatment area boundaries are identified and, where necessary, clearly marked prior to herbicide applications:

- A pre-treatment inspection will be conducted to establish treatment boundaries and to document the location of environmentally sensitive areas;
- A pre-treatment meeting shall be held between the Contractor and the plan holder, or a representative of the plan holder, to confirm treatment area boundaries and the locations of environmentally sensitive features; and
- Marking/flagging of PFZs will be completed prior to herbicide application.

### **11.2.2 Procedures for Maintaining and Calibrating Herbicide Application Equipment**

All herbicide application equipment used under this PMP for invasive plant management will be safe, clean, in good repair, compatible with, and appropriate for the herbicide being applied. All equipment will be inspected and calibrated prior to the commencement of herbicide applications and once every 10 days throughout the application season. Backpack sprayers and vehicle mounted sprayers will also be re-calibrated when changing herbicide products or when nozzle output begins to vary. Calibration is not undertaken on wick/wipe applicators, or squirt bottles. An example of an Invasive Plant Treatment Calibration record is shown in Appendix 3.

### **11.3 Procedures for Monitoring Weather Conditions**

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.

The certified pesticide applicator has the final authority to decide when herbicide applications should be stopped due to inclement weather or adverse site conditions. Examples of conditions in which herbicide application will cease are as follows:

- When parameters are exceeded according to the manufacturer's label; OR
- When conditions prevent the herbicide product from being applied effectively according to the label instructions (e.g., periods of rain or snow); OR
- When wind speed and/or direction causes the foliar application of herbicides to drift and/or miss the target noxious weed or invasive plant; OR
- Ground wind velocity is over 8 km/hour for foliar or soil applications; OR
- The maximum air temperature exceeds 27°C, or the maximum stated on the herbicide label is exceeded; OR
- It begins to rain during the herbicide application increasing the chances of excessive runoff or leaching; OR
- There is ice or frost on the foliage.

## **12.0 Reporting, Notification and Consultation**

The plan holder, partnering organizations, and each contracting firm that applies herbicides under this PMP are committed to following the IPMR when managing invasive plants. We 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 IPMA are outlined in this section.

## **12.1 Reporting**

Accurate record keeping allows both plan holder and the Administrator, 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.

### **12.1.1 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 targeted for treatment;
- Trade name of each herbicide used and its registration number under the federal 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 data upon which its calibration was based;

- Any advice given to owners or managers regarding things such as safe re-entry time or any additional precautions that should be taken to minimize exposure to the pesticide.

Users of the PMP will maintain daily records of herbicide use, and all site assessment, invasive plant survey, treatment and monitoring records.

### **12.1.2 Annual Report for Confirmation Holders**

In accordance with Section 39 of the IPMR, the plan holder will provide to the Regional Administrator, Integrated Pest Management, the following information for each calendar year by January 31 in the next calendar year for operations conducted under this PMP during the calendar year:

- The name and address of the confirmation holder and their confirmation number;
- Trade names and active ingredients of the herbicides applied, including their PCP numbers;
- Locations and total area treated (ha);
- Methods used to apply herbicides;
- Quantity of each active ingredient applied (kg);
- Methods of non-herbicide pest controls used and the estimated total area of their use; and
- The web address for IAPP map display and data entry modules.

## **12.2 Notifications**

### **12.2.1 Annual Notice of Intent to Treat**

The plan holder will forward, in writing, to MOE, at least 21 days prior to treatment in each year during which the PMP is in effect, an Annual Notice of Intent to Treat (NIT) for the following year. The NIT will be submitted to each Regional Office of MOE within whose geographic boundaries herbicide applications are being proposed. The NIT will identify:

- Name and business location of confirmation holder(s);
- Proposed treatment methods;
- Herbicides proposed for use and their method of application;
- Estimated area proposed for treatment; and
- The web address for IAPP map display and data entry modules.

### **12.2.2 Notification of Contravention**

Section 72(1)(d) of the IPMR requires that a confirmation holder give written notice as soon as practicable to the administrator on a contravention of the IPMA or IPMR that involves the release of a pesticide into the environment. The plan holder commits to abiding by this requirement.

The plan holder has implemented contractor guidelines to ensure compliance with this Section. Failure of the contractor to observe the following requirements may be cause for contractor dismissal:

- Violation of the requirements of the IPMA or the IPMR;
- Mixing of herbicides in inappropriate locations such as near environmentally sensitive zones;
- Failure to use adequate personal protective equipment when required by the product label;
- Failure to flag PFZs prior to treatment;
- Application of treatment herbicides within prohibited zones;
- Improper clean-up or reporting of spills;
- Application of herbicides by uncertified personnel;
- Improper disposal of unused herbicides or containers;
- Improper equipment calibration;
- Application of herbicides under inappropriate or unsafe conditions;
- Failure to properly complete and submit daily operating logs or records; or
- Handling, storing, mixing, transporting, or applying herbicides in a manner that violates product labels.

### **12.2.3 Posting of Treatment Notices**

Treatment Notices will be posted in locations that are clearly visible and legible from each approach maintained by the plan holder for public/ employees/ contractors to access the treatment area or at locations where due diligence would require them. The signs will remain posted for 14 days following herbicide application, and will contain the following information:

- The trade name and active ingredient of the herbicide;
- The date and time of the herbicide treatment;
- The purpose of the treatment;
- The method of application;
- Precautions to be taken to prevent harm to people entering the treatment area;

- The PMP confirmation number;
- The plan holder(s) contact information; and
- For each treatment location, the applicator will maintain a record of where notices were posted.

The Treatment Notices will be:

- A minimum size of 550 square cm;
- Water resistant;
- Display the title “Notice of Herbicide Use: Spot Treatment of Invasive Plants” in bold letters that are clearly legible to a person approaching the treatment area; and
- Contain a cautionary symbol, like a stop sign or a raised hand that will draw the attention of a person approaching the treatment area.

## **12.3 Consultation**

### **12.3.1 Interagency Consultation and Coordination**

MFLNRO, MOTI and MOE - B.C. Parks, are leaders in invasive plant control in the province of British Columbia and are actively involved with coordinating and collaborating on invasive plant management programs with other ministries, agencies and stakeholders. Information on invasive plant surveys and treatments will be provided to these groups on an ongoing basis and is readily available through the IAPP application. Since the BC Weed Control Act states that ‘every occupier has the responsibility to control noxious weeds’, we will conduct our integrated invasive plant program within the plan area in communication and cooperation with other ‘land occupiers’ including, but not limited to the following:

- Utilities, specifically those with rights-of-way;
- First Nations;
- Local governments including Regional Districts and Municipalities; and
- Regional invasive species committees and other conservation-based non-government organizations.

### **12.3.2 On-going Engagement**

The plan holder will continue to engage with both the public and First Nations throughout the life of the PMP to receive information on operational plans and continue further education on the Plan and invasive plant management

### **12.3.2 Requests to Amend the PMP**

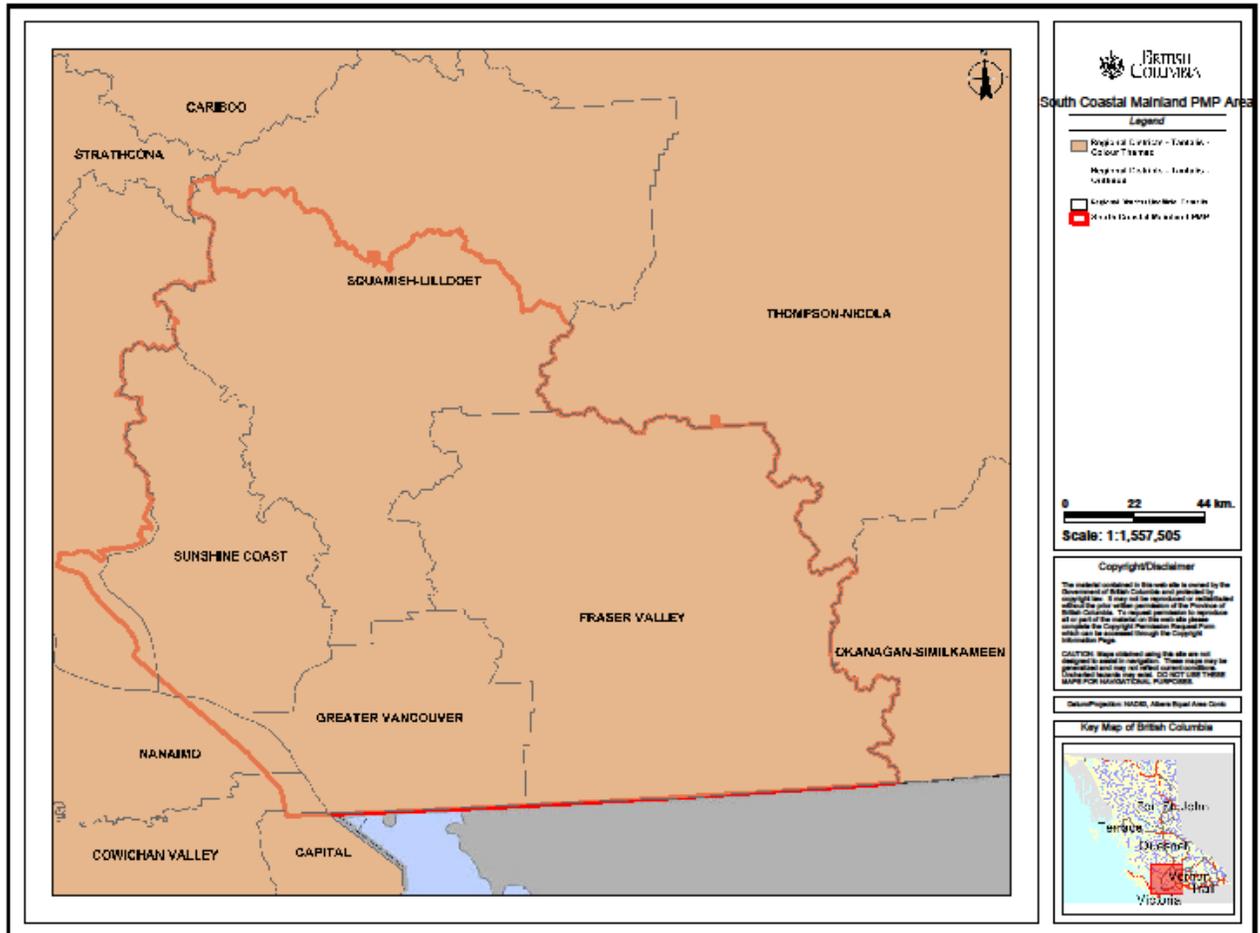
The plan holder will forward in writing to MOE any request for an amendment to the PMP. Amendment requests concerning new application techniques or similar changes will not require further public advertising or First Nations consultation, provided that the amendment request is within land owned or controlled by the plan holder under this plan. Amendments to add new active ingredients will require further public advertising and/or First Nations consultation.

## Appendix 1: Maps of the South Coastal Mainland (The Plan Area)

### Overview Map with the Plan Area Outlined in Purple:



## Map of the Plan Area with Regional Districts and the Ministry of Transportation and Infrastructure Regions



## Appendix 2: Invasive Plant Treatment Calibration Records

### Calibrating Backpack Sprayers

Even small backpack sprayers require calibrating. Accuracy and knowledge of the sprayer output is essential for proper application of herbicides. Knowing the sprayer output will ensure correct rates of herbicide is being applied so as to achieve the required level of control.

#### Before Calibration:

1. Make sure the tank is clean to prevent clogging of hoses and nozzles.
2. Check that all hoses and fittings are not leaking,
3. Ensure the nozzle is not worn or damaged.

These inconsistencies will certainly affect the output.

#### Calibrating:

First measure the delivery rate or the output of your backpack sprayer by:

1. Accurately measure and mark a test area in the field. For example, a 50 square meter area.
2. Pump up pressure on the backpack sprayer and begin spraying over the measured test area while maintaining a steady uniform walking speed and a steady pumping pace, ensuring you are covering the ground evenly with spray and keeping the height of the nozzle at the same distance above the ground. (Variation in speed and pumping pressure will change the output)
3. Track the amount of time it takes you to spray the area you have marked out.
4. Accurately measure the amount of water required to refill the tank by spraying water from your backpack into a container for the same period of time it took you to spray the measured area. (Ensure you maintain constant pump pressure)
5. Calibrate the sprayer delivery rate (output) by using the following formula to find the correct amount of herbicide to measure into your backpack.

$$\text{Sprayer Delivery Rate (L/ha)} = \frac{\text{Liters used in test} \times 10,000 \text{ m}^2}{\text{Test area (50 square meters)}}$$

i.e.:

$$\frac{\text{L} \times 10,000 \text{ m}^2}{10 \text{ m} \times 5 \text{ m}} = \frac{\text{L}}{50 \text{ m}^2} = \text{L/ha (sprayer delivery rate)}$$

Secondly, calculate the area that can be treated with a full tank:

$$\text{Area sprayed by 1 tank} = \frac{\text{Volume of spray mixture in tank (capacity in liters)}}{\text{Sprayer Delivery Rate (Liters per hectare)}}$$

i.e.:

$$\frac{\text{_____ L}}{\text{L/ha}} = \text{_____ ha. sprayed by 1 tank}$$

Thirdly, calculate the amount of herbicide to add to the backpack sprayer tank as follows:

$$\text{Amount of herbicide to add to tank} = \text{application rate of herbicide (Liters per hectare)} \times \text{area sprayed by one tank}$$

i.e.:

$$\text{Amount of product to add to tank} = \text{_____ rate (L/ha)} \times \text{_____ ha.} = \text{_____ liters or _____ milliliters (=amount of herbicide to add to tank)}$$

*(To convert liters to milliliters, multiply x 1,000)*

## Calibrating ATV / Boom Sprayers

Unit type: \_\_\_\_\_ Date: \_\_\_\_\_

### Determine spray volume to a test area:

(A) **Test strip area:** ( \_\_\_\_\_ m long) x ( \_\_\_\_\_ m wide) = \_\_\_\_\_ m<sup>2</sup>

(B) **Equipment specifications (where applicable)**

12 Transmission gear: \_\_\_\_\_

13 Engine RPM: \_\_\_\_\_

14 Speedometer setting: \_\_\_\_\_ km/h

(C) **Spray tank pressure:** \_\_\_\_\_ Kpa or \_\_\_\_\_ p.s.i.

(D) **Amount of time used to spray area:** \_\_\_\_\_ seconds

(E) **Volume of water used in test:** \_\_\_\_\_ liters

(F) **Calculate spray volume per unit area:**

1. Spray volume (L/ha) =  $\frac{\text{"water used in test" (=E) x 10,000m/ha}}{\text{Area of test strip in m}^2 \text{ (=A)}}$

2. Spray volume = \_\_\_\_\_ L/ha

(G) **Calculate # of Ha. one full spray tank will cover:**

• # of Ha =  $\frac{\text{Sprayer tank volume (\# of Liters)}}{\text{Spray volume (L/ha) (=F)}}$

(H) **Amount of product to add to tank:**

• Product amount (Liters) =  
Ha tank will cover (=G) x Application rate (L/ha)

**Note:** always refer to label for appropriate application rate and spray volume that corresponds with the herbicide and target weeds.

## **Appendix 3: Environmental, Toxicological and other Parameters of Herbicides**

As discussed in Section 4, there is a large volume of studies, information and other sources used by the Federal Health Canada's Pest Management Regulatory Agency (PMRA) to determine whether to register a product for use in Canada, and if registered what use conditions and mitigation actions, such as buffer zones, should be included on the product label. It is not the intent of this PMP to go into great detail on the science behind the label as the responsibility and authority to do that rests with the PMRA. PMRA has the resources including hundreds of scientists to evaluate the thousands of studies required from different habitats, using different laboratory and modelling techniques and measuring methods. These resources are also needed to sort and assess the variability resulting from such a volume of studies. PMRA works with its counterparts in other countries to align the processes used to regulate pest control products and ensure the protection of health and the environment.

From the Health Canada Web Page:

<http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/publi-regist/index-eng.php>

“One of the mandates of the *Pest Control Products Act* is to increase transparency in the pesticide registration system. A key mechanism for meeting this mandate is the Pesticide Public Registry.

The Public Registry is a collection of non-confidential information on pesticides and the pesticide regulatory system. All publicly available information on currently registered pesticides is available here.”

The Public Registry and other search engines, indicated in the following table, are some of the information sources used in development of this PMP. There is also a large volume of unpublished studies that are available in the public reading room of PMRA.

**Table 3 - Principal Information Resources Used in Determining Status and Parameters Considered in Herbicide Use**

WEB PAGE	ADDRESS
Health Canada – Public Registry	<a href="http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/publi-regist/index-eng.php">http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/publi-regist/index-eng.php</a>
ECOTOX database of the U.S. Environmental Protection Agency	<a href="http://cfpub.epa.gov/ecotox/">http://cfpub.epa.gov/ecotox/</a>
Ecological and Environmental Safety	<a href="http://www.sciencedirect.com/science/journal/01476513">http://www.sciencedirect.com/science/journal/01476513</a>
Journal of Environmental Quality	<a href="http://ieq.sci-journals.org/cgi/search">http://ieq.sci-journals.org/cgi/search</a>
Science direct	<a href="http://www.sciencedirect.com/science">http://www.sciencedirect.com/science</a>
The Extension Toxicology Network	<a href="http://extoxnet.orst.edu/">http://extoxnet.orst.edu/</a>
Canadian Environmental Quality Guidelines, (including the Water Quality Guidelines for the Protection of Aquatic Life)	<a href="http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf">http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf</a> <a href="http://www.ccme.ca/ourwork/water.html?category_id=101">http://www.ccme.ca/ourwork/water.html?category_id=101</a> search engine: <a href="http://ceqg-rcqe.ccme.ca/">http://ceqg-rcqe.ccme.ca/</a>