

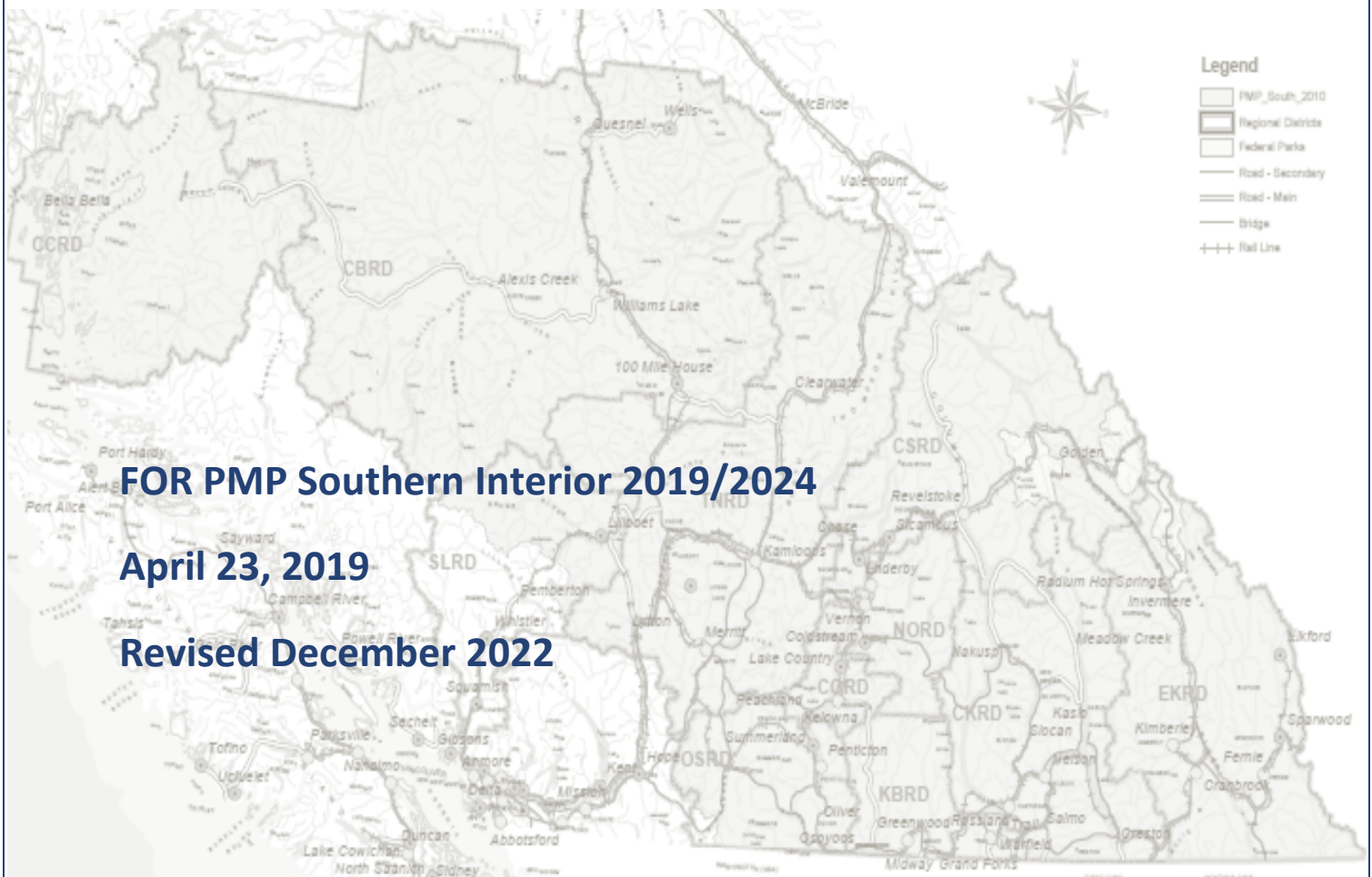


# Invasive Plant Pest Management Plan for Provincial Public (Crown) Lands in the Southern Interior of British Columbia

Ministry of Forests

*PMP CONFIRMATION # 402-0678-19/24*

*Expires April 23, 2024*



REVISIONS		
Revision #	Date	Description
1	March 2020	<ul style="list-style-type: none"> <li>Added Revisions table and Revised date on front page</li> <li>Expanded Section 5 to clarify expectations and 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 3.6.3 Biological Control</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 6.3.2 Ongoing Engagement for clarity</li> </ul>
2	April 2021	<ul style="list-style-type: none"> <li><b>Revised Section 5.1.6</b>, third bullet point: “Efforts will continue through ongoing engagement <b>and consultation</b> throughout the life of the plan to identify culturally significant plants and sites.”</li> </ul>
3	April 2021	<ul style="list-style-type: none"> <li><b>Revised Section 6.3.2</b>: “The plan holder will continue to engage <b>and consult</b> with both the public and First Nations...”</li> </ul>
4	December 2022	<ul style="list-style-type: none"> <li><b>Added</b> Appendix 2. <b>Added</b> Appendix 4 and related content. <b>Updated links</b> in Appendix 3.</li> </ul>

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## Executive Summary

An invasive plant is any non-native plant species that has the potential to cause undesirable or detrimental impacts to human or animal health, the economy, cultural values, and/or ecosystems. Invasive plants may displace native plant species, decrease biodiversity, reduce available forage and browse for wildlife and domestic animals, reduce habitat for rare and endangered species, contribute to loss of aesthetic values, and cause changes to ecological community structure and function. Some of these plants are toxic to humans and/or animals. Efforts to reduce their cumulative impacts are best achieved through an integrated approach of prevention and control.

In British Columbia the *Weed Control Act* and Regulations require land occupiers, as defined in the Act, to control provincially listed noxious weeds on both private and public land. The *Forest and Range Practices Act* and accompanying Regulations require forest and range tenure holders to incorporate measures in their forest and range plans to prevent the introduction or spread of listed invasive species. The *Integrated Pest Management Act* and Regulations provide the statutory authority to allow pesticide use on public lands as described in a Pest Management Plan.

Developed in compliance with the *Integrated Pest Management Act* and Regulations, this Pest Management Plan (“PMP”) outlines an Integrated Pest Management approach for the control of invasive plants on Provincial Public (Crown) Land, including prevention strategies, manual/mechanical treatment methods, biological and cultural controls, and the use of herbicides. The development of the PMP was led by the Ministry of Forests Invasive Plant Program in collaboration with the Ministries of Transportation and Infrastructure, and Environment and Climate Change Strategy (B.C. Parks).

The PMP is intended to describe and provide guidance for an integrated pest management approach to address invasive plants on Provincial Public (Crown) Land; it is not meant to be an operational plan. Where appropriate, government ministries work collaboratively with regional invasive species organizations or other partnering agencies to design operational treatment plans within the Pest Management Plan area.

The PMP covers the treatment of invasive plants on Provincial Public (Crown) Land in the southern interior of British Columbia. The area encompassed by the Pest Management Plan includes threatened grasslands, extensive geographic and community watersheds, vast timber, agricultural, recreational and ecological values, as well as endangered native species and plant communities, critical wildlife habitat values and unparalleled biodiversity.

## 1.0 Introduction

Section 24(2) (g) of the *Integrated Pest Management Regulation (IPMR)* requires the preparation of a Pest Management Plan (PMP) for herbicide use for the management of invasive plants on more than 50 hectares a year of public land (i.e. Provincial Public (Crown) Land).

This PMP is a plan that describes:

- The program delivered to manage invasive plant populations and reduce damage caused by these plants using an integrated pest management approach; and
- Methods for handling and applying herbicides to meet program objectives.

This PMP is intended to describe and provide guidance for an integrated pest management approach to management of invasive plants on Provincial Public (Crown) Land; it is not meant to be an operational plan. Where appropriate, government ministries work collaboratively with regional invasive species organizations or other partnering agencies to design operational treatment plans within the PMP area.

### 1.1 Purpose and Objectives of this PMP

This PMP describes how the Ministries of Forests, Environment and Climate Change Strategy (BC Parks), and Transportation and Infrastructure will achieve effective management of invasive plants on Provincial Public (Crown) Land within the southern interior of BC using the principles of integrated pest management, while protecting environmental and human health values.

This PMP is designed to replace the existing PMP (Confirmation # 738-0024-14/19) dated April 22, 2014.

The objectives of the PMP are to ensure the following:

- Legal accountability with the provisions of the *Integrated Pest Management Act (IPMA)* and *IPMR*, as well as applicable federal, provincial and local government laws and regulations;
- The effective use of IPM principles;
- Public and First Nations awareness of, and input into, invasive plant management at the landscape level; and
- The responsible use of herbicides.

All existing populations of invasive plants will not necessarily be treated under this PMP. In some cases, existing populations may be prevented from expanding beyond a defined containment boundary, whereas other populations may be too extensive to effectively treat except on extremely high value sites, such as habitats with species at risk. Generally,

the focus of treatments will be on invasive plants that are expanding into new geographic areas, and those on the leading edges or gaps between treatment areas where there is a risk of further spread into previously uninhabited, susceptible areas.

## **1.2 Plan Holder and Description of the PMP Area**

The PMP holder will be the BC Ministry of Forests (FOR); however the PMP also applies to the Ministries of Environment and Climate Change Strategy (BC Parks) and Transportation and Infrastructure

This plan broadly covers the geographic area from the Cariboo Chilcotin coast to the south coast, across the southern interior to the Alberta border. Specifically, Provincial Public (Crown) Land within the geographic area defined as the Cariboo, Kootenay/Boundary, Thompson/Okanagan and northern portion of the West Coast FOR Regions. The northern and northwestern boundaries align with the boundaries delineating the Cariboo, Central Coast, and Thompson Nicola Regional Districts. The eastern extent of the Kootenay/Boundary Region, the southern extent of the Thompson/Okanagan and Kootenay/Boundary regions, and most of the western extent of the Thompson/Okanagan region constitute the remaining boundaries. This plan covers the Ministry of Transportation and Infrastructure's (TRAN) Southern Interior Region including the Rocky Mountain, West Kootenay, Okanagan-Shuswap, Thompson-Nicola and Cariboo Districts and all Parks and Protected Areas in the Kootenay Okanagan and Cariboo Thompson Regions under responsibility of BC Parks, Ministry of Environment and Climate Change Strategy (BC Parks).

Appendix 1 contains a map showing the geographic boundaries of the area covered by this PMP.

## **1.3 Use of This Plan on Provincial Public (Crown) Land**

This PMP provides the guidance for invasive plant management on Provincial Public (Crown) Land; it informs and guides the development of annual operating plans. It is recognized that many areas serve as introduction/pick up points and vectors of spread for invasive plants, such as highways, Natural Resource road systems, recreation sites, trails, and parks. 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 collaboratively with regional invasive species organizations and local governments to implement effective invasive plant management regimes across jurisdictions.

Local governments and other agencies or non-government organizations delivering invasive plant programs on behalf of the Province may be authorized by the PMP holder to



use this plan for invasive plant management activities on Provincial Public (Crown) Land, provided that the following are adhered to:

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

## **1.4 Term of Plan**

This plan shall be in effect for a five-year period from May 1, 2019 to April 30, 2024.

## **1.5 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:

Sheryl Wurtz, P.Ag.  
Invasive Plant Specialist  
Ministry of Forests  
Range Branch  
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Kamloops, B.C. V2C 2T3  
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E-mail: [Sheryl.Wurtz@gov.bc.ca](mailto:Sheryl.Wurtz@gov.bc.ca)

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

The principal land uses within the PMP area are forestry, agriculture, tenured grazing, mining, recreation, hunting, fishing, medicinal and food plant gathering, and guide-outfitting. The area is well known for its land and water based recreational values. There are many parks and protected areas that support numerous outdoor activities, such as hiking, skiing, boating, hunting, fishing, nature appreciation and photography.

## **2.0 Invasive Plants and Noxious Weeds**

Invasive plants are plants that are non-native or alien to the ecosystem under consideration. Their introduction and spread causes, or is likely to cause, economic or environmental damage, or harm to human health. In B.C. the term invasive plant is synonymous with invasive alien plant.

Invasive plants, including noxious weeds, threaten the natural environment and are recognized globally as the second greatest threat to biodiversity. Free from the plant pests that keep them in check in their native ranges, invasive plants reproduce rapidly and spread aggressively, dominating natural areas and altering biological communities. The result of these invasions can include reduced recreation and crop values, damaged infrastructure, displaced native vegetation that is



important forage for wildlife and livestock, reduced biodiversity including species at risk, damaged native ecosystems and infrastructure, and cultural and human health impacts (e.g. allergic reactions, skin burns and abrasions, acute toxicity).

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

**Invasive plant** - species that are non-native to the ecosystem under consideration, and whose introduction and spread causes, or is likely to cause, economic or environmental damage, or harm to human health. In B.C. the term invasive plant is synonymous with invasive alien plant. Invasive plants regulated under the *Forest and Range Practices Act* are included in this definition.

**Noxious weed** – invasive plant species regulated under the BC *Weed Control Act (WCA)*. The WCA is administered by FOR.

**In the context of this PMP, the term “invasive plant” will be used to include both invasive plants and noxious weeds.**

**Regional Invasive Species Organizations** – Refers to regional non-profit societies (organizations) that coordinate invasive species management in a specific region of BC. This term includes organizations that only coordinate invasive plant management activities.

## 2.1 How Invasive Plants Are Spread

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

Although wind, water, domestic and wild animals can disperse invasive plant seeds, human activity is often the dominant cause of invasive plant introductions and/or spread. Invasive plants are introduced and spread by the following activities:

- **Construction and maintenance:** movement and transportation of soil and fill on highways, secondary roads, utility corridors, rail lines, pipe lines and power lines;
- **Forestry operations:** road/landing/skid trail building and maintenance, machinery movement during harvesting, post-harvest site preparation, and log hauling;
- **Range management activities:** over-grazing, herding livestock, construction of stock trails, water developments, fences and corrals;
- **Mining operations:** road building and maintenance, movement of machinery, creation of permanent openings in the forest canopy;

- **Horticultural practices:** importing and planting species which over time become invasive, careless disposal of garden refuse, and unintentional seed introduction in soil; and
- **Recreation activities:** disturbance of soil by all-terrain and other vehicles; spread of invasive plants by vehicles, boats, camping equipment and clothing; and the disposal and resulting spread of aquatic plants into watercourses.

## 2.2 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 alien plants are beneficial to people (e.g. apples, wheat) while some become nothing more than nuisance weeds to gardens and human-influenced landscapes. Unfortunately, a small proportion are serious threats to natural areas, native ecosystems, our economy and human health. These serious threats are those invasive plant species that will be addressed by this PMP.

There are also legislative requirements to control invasive plants. The *Weed Control Act* and Weed Control Regulation require land owners and occupiers (public and private lands) to control provincially listed noxious weeds, as well as additional species that are identified as noxious within specified Regional Districts.

There are a number of traits that can be used to describe the nature of invasive plants in comparison to native species; some of which include the following:

- Fast growth rates;
- Prolific seed production and/or vegetative reproduction;
- Irregular germination ability allowing establishment during non-ideal conditions;
- Ability to alter soil conditions to benefit only the invasive species in question;
- Production of toxins to ward off grazers and/or predators; 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;
- Negatively affect culturally important sites;
- Altered fire regimes; and
- Reduced access to recreation areas.

### **3.0 The Integrated Invasive Plant Management Program**

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 for invasive plants 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 organizations and local governments; and
- Ongoing resourcefulness and innovation by invasive plant managers.

The Ministries of Forests, Environment and Climate Change Strategy (BC Parks), and Transportation and Infrastructure recognize 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. When developing annual operating plans, the PMP holder will respond to these requests through best available means, such as open house gatherings, email notifications, website postings, etc.

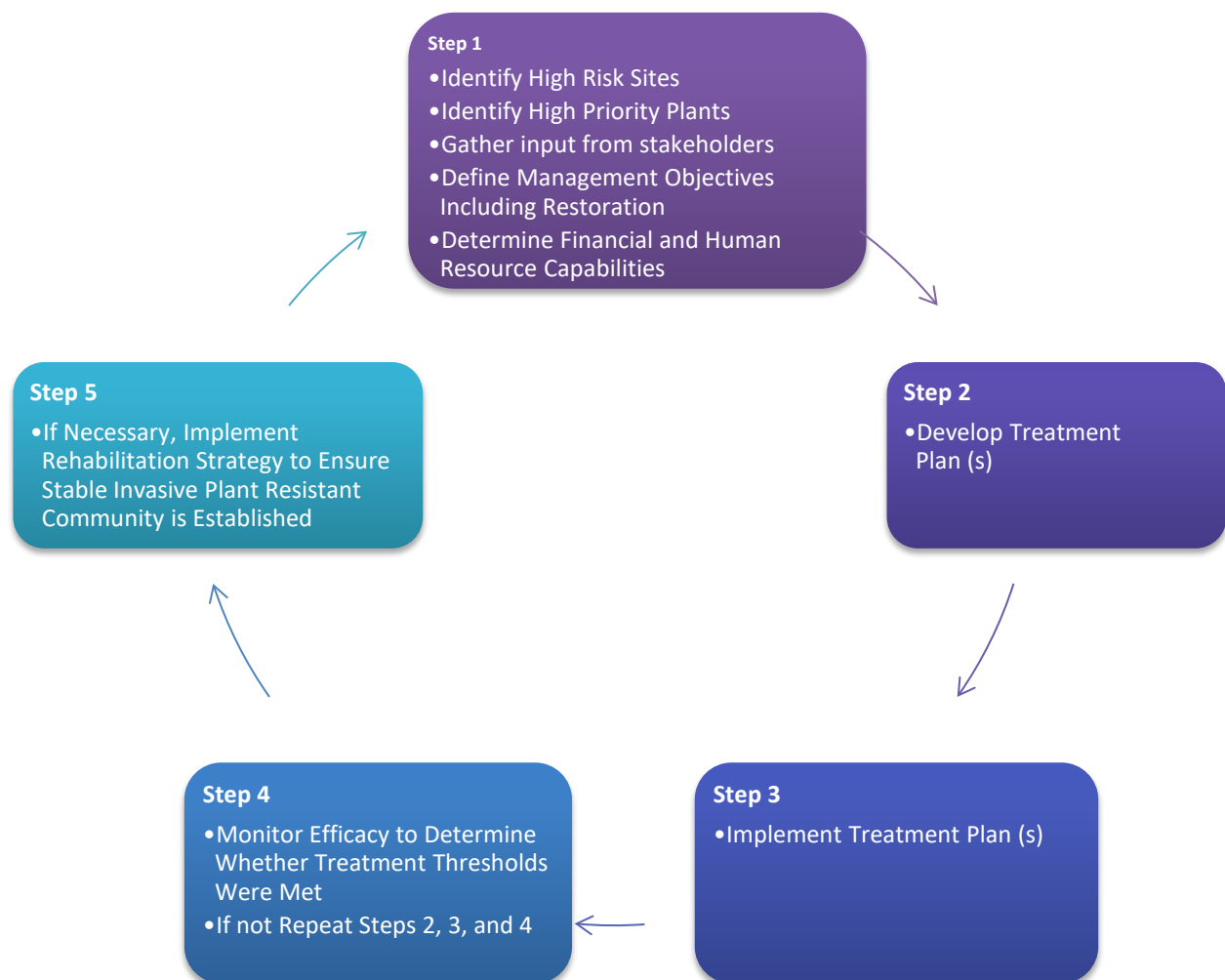
The elements of the Invasive Plant IPM program for this PMP include:

- Prevention;

- Identification;
- Surveys, Inventory and Data Management;
- Establishing Priorities and Management Strategies;
- 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**



### 3.1 Prevention

Preventing the initial introduction, 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 rights-of-way, natural resource road and recreation 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. 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 the southern interior of BC are generally more resistant to invasion by invasive plants. Most invasive plant species are excluded from mature forests due to the shading provided by the trees' wide, dense canopies. Susceptible habitats are created when forest openings occur, typically associated with resource extraction, urbanization, or by natural disturbance (e.g. wildlife, flood). Prompt seeding of disturbances that create exposed mineral soil is an important tool to prevent the establishment of invasive plants and minimize soil erosion.

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 PMP area;
- Keep equipment yards and storage areas as free of invasive plants as practicable 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:
  - specifying that the individual species in each mix is Common No. 1 grade or better;
  - requiring blended seed mixtures meet the grade requirements for Common No. 1 Forage Mixture or native seed mix; and
  - checking the Certificates of Seed Analysis (See: [https://www2.gov.bc.ca/assets/gov/driving-and-transportation/environment/invasive-species/invasive\\_plant\\_hiding\\_in\\_seed.pdf](https://www2.gov.bc.ca/assets/gov/driving-and-transportation/environment/invasive-species/invasive_plant_hiding_in_seed.pdf)) for each species in the seed mixture prior to mixing to ensure no invasive plant contaminants are present, and rejecting any seed lots that are contaminated.

## 3.2 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 FOR 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, and Ministry Invasive Plant Specialists have access to taxonomic networks to provide additional support if required. Any species found that is a potential new invader to BC is collected, confirmed by taxonomists, and added to the Royal BC Museum herbarium.

### 3.3 Surveys, Inventory and Data Management

Invasive plant surveys are observations made at a single point in time to determine the occurrence of one to many plant 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 many invasive plant 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 Plants 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 confirming a new incursion of a species and finding isolated patches of expanding species. The survey confirms invasive plant infestation location, extent, size, distribution, and density.

Surveys may be conducted by truck, ATV, motorbike, bicycle, boat, horseback, 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 is an asset for 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 plants. Such areas may include:

- Roadsides, ditches, pullouts 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.

When a target species is detected, the information is recorded on a *Site and Invasive Plant Inventory Record*. If it is a new site, information specific to the site and the invasive plant is recorded. If the site is an existing site, only the Site ID and data specific to the survey of any invasive plant infestation(s) will be recorded.

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 or proximity to riparian. Site photos may also be taken. If the surveyor is unable to correctly identify a particular plant species a sample or photographs are 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 invasive plant species populations, 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 given the extent of area managed and number of invasive plant species and infestations, collecting treatment and treatment monitoring data and updating survey data significantly helps to maintain the inventory.

### **3.4 Management Strategies**

Managing invasive plant populations under an “injury threshold” approach is complex and 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 targeted species. Invasive plants that are determined to be a high threat 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 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 may be 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.

### 3.4.1 Early Detection Rapid Response

The management objective of this strategy is to extirpate all sites with the goal of removing the invasive plant threat from the target area. The discovery of a new invader to the province invokes the provincial Early Detection and Rapid Response (EDRR) Plan developed by the BC 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, based on assessed risk; this process is known as “regional EDRR”.

### **3.4.2 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 (i.e. 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 well established or established at all. 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 3.4.3. 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.

### **3.4.3 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 new desired state. Biological control (for species with agents available) is often used behind containment lines, either by itself or in combination with other management strategies, 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.

## **3.5 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***

- Invasive plant species not present in BC or in the PMP area, but likely to establish if introduced; and
- *Management Focus:* Education and Awareness; Early Detection and Rapid Response.

#### ***Category 2: Eradicate***

- Invasive plant species that are new to the PMP or management area (e.g. park or protected area, regional invasive species organization boundary, regional district, natural resource district or region, province) 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 species and may take many years of repeated treatments to be achieved. Requires implementation of the B.C. Early

Detection and Rapid Response Plan for invasive plant species identified under the Provincial Early Detection and Rapid Response Program.

### ***Category 3: Contain***

- New infestations of established invasive plant species in the area(s) 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 line may be established and mapped online 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 that may be employed in containment; and
- *Management Focus:* Containment of the invasive plant species population to the current location(s) and/or distribution.

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

- Established low-density or high-density infestations that are widely distributed and fairly common throughout the PMP 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.

## **3.6 Invasive Plant Treatment Options**

All treatment options are considered after it has been established that an invasive plant species or infested 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 to achieve the management objectives. The following treatment options are considered for use either individually or in combination:

- Mechanical control
- Cultural control;
- Biological control; and
- Targeted application of herbicides.

### **3.6.1 Mechanical Control**

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

- Covering/Smothering;
- Cutting;
- Digging/Excavating;
- Girdling;
- Hand pulling;
- Mowing;
- Pruning;
- Stabbing;
- Tilling;
- Spot burning; and
- Potential new methods in development (e.g. steam).

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

- Involve using 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 other methods 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. This technique requires regular, repeated treatments throughout the growing season. 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 can be costly and labour intensive and may include removal of concrete or fencing for example, 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.

### **3.6.2 Cultural Control**

Targeted grazing, re-vegetation, and addition of soil amendments (e.g. fertilizer) 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 an economical approach if livestock are readily available;
- 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);
- May create conflicts with wildlife populations (e.g. predation; threat of disease transmission);
- May stimulate vegetative growth of some invasive plant species and encourage spread and increased density;
- May require additional infrastructure construction to contain livestock; and,
- Animal husbandry and transportation costs can be prohibitive.

Re-vegetation of disturbed or heavily invasive plant infested areas to support development of a desired plant community and eventual return to a healthy functioning ecosystem also has advantages and challenges. In some circumstances, supporting the natural succession of a site is the best solution. Some of the considerations when choosing to revegetate an area as an invasive plant cultural control approach include:

- Are appropriate native or agronomic seeds or plants available and locally adapted to the site?
- Is the timing of seeding or planting appropriate?
- Are soil conditions and forecasted precipitation favourable for establishment?
- Is the seedbed appropriate for the seeding/planting method?
- Is site preparation needed and by what means?
- Will re-vegetation achieve the desired outcome or are other invasive plant management treatments needed as well (pre and post revegetation treatments)?

Soil amendments, including fertilizer, used on invasive plant infested areas can assist in reducing some invasive plant populations that are not well established and dense. Soil amendments support more vigorous native plant growth which in turn can help shade out shade-intolerant invasive plants. Fertilizer can change the soil chemistry making the fertilized area less favourable for some invasive plant species to thrive and expand. However, the soil type and moisture regime will affect response, and only a few invasive plant species are potentially negatively impacted.

The cost of soil amendments and application method may prohibit use over larger landscapes.

### **3.6.3 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
- If an agent is available for the invasive plant and is adapted to the location, it may be 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.

### **3.6.4 Herbicide Application**

All herbicides are applied on a targeted or 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 on a given site.

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 are not used within pesticide free zones near water sources and/or drinking wells etc. (See section 5.1);
- 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) should not be used on plants growing on soils containing greater than 70% sand or in areas that directly 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 soil seed bank.

### 3.7 Treatment Method Selection

Generally, no method will achieve control in a single application; 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 Figure 2.

**Figure 2: General conditions associated with treatment options.**

Treatment	Conditions for Use
<u>Manual and Mechanical</u> (e.g. covering/smothering, cutting, digging/excavating, girdling, hand pulling, mowing, pruning, stabbing, tilling, spot burning)	<ul style="list-style-type: none"> <li>• New, small incursions;</li> <li>• Applicable to most species but aggravate some situations, e.g., rhizomatous species such as hawkweeds, spurge and toadflax, or knotweed species;</li> <li>• Sometimes require restoration (to some extent) with grasses and forbs, and/or native plant species.</li> </ul>
<u>Cultural</u> (e.g., targeted grazing by sheep, cattle, goats, revegetation; soil amendments)	<ul style="list-style-type: none"> <li>• Targeted grazing: <ul style="list-style-type: none"> <li>○ Wide spread palatable invasive plant species; target plant population size is variable, otherwise similar to mechanical treatments.</li> <li>○ No other options are either available or desirable</li> </ul> </li> <li>• Revegetation &amp; soil amendments: <ul style="list-style-type: none"> <li>○ Infested site is limited in density and extent;</li> <li>○ soils are favourable for treatment type</li> <li>○ invasive plant species present is shade-intolerant or is affected by soil amendments</li> </ul> </li> </ul>
<u>Biological</u> (i.e. systematic release of insects and diseases that feed or attack exclusively on targeted invasive plant species)	<ul style="list-style-type: none"> <li>• Older, more established invasive plant populations 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>
<u>Chemical</u> (i.e. judicious, strategically targeted use of herbicides)	<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.

## **3.8 Monitoring and Evaluation**

Monitoring is repeated over time so changes in invasive plant populations can be identified and tracked. It is conducted regularly and is used to detect new invaders, to measure the effect of treatments on the target invasive plants 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 Province's Invasive Plant Programs are effectively managing invasive plants. Some specific components of monitoring are described below.

### **3.8.1 Species Monitoring**

Inventory surveys, or pre-treatment monitoring, are completed visually, are repeated over time, and provide 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. The exception to this is a site that has a new, priority species that is encountered during the delivery of treatment activities. In years following an initial survey, site survey information is updated from treatment information collected in the field.

### **3.8.2 Treatment Monitoring and Evaluation**

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

- Compliance with the commitments made in this PMP;
- Compliance with the *IPMA* and *IPMR* and other legislation;
- Accurate 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 of the biocontrol agents released;
- 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.

## **4.0 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;
- Procedures for safely storing herbicides;
- Procedures for safely mixing, loading and applying herbicides;
- Procedures for the safe disposal of empty herbicide containers and unused herbicides;
- Procedures for responding to herbicide spills; and,
- Identification of each herbicide that will be used under the Plan, the manner of its application, and the type of equipment required for each manner of application.

### **4.1 Qualifications and Responsibilities of Persons Applying Herbicides**

The transportation, storage, handling, application and disposal of pesticides are governed by federal and provincial legislation. 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 or supervised by a person who holds a Pesticide Applicator Certificate endorsed for the class of pesticide and the pesticide use required under this PMP. Uncertified applicators must complete assistant applicator

training annually as per *IPMR* Division 5.1. Those authorized to treat invasive plants under this PMP will be provided with pre-work information and sufficient oversight to ensure they fully understand the legislative requirements contained in the PMP.

The responsibilities of the Certified Pesticide Applicator are to:

- Confirm that uncertified applicators have successfully completed annual assistant applicator training;
- Be in continuous attendance at the site with available proof of certification;
- Ensure that applications do not violate this PMP or applicable legislation;
- Supervise no more than 4 assistant applicators at one time;
- Maintain continuous contact, auditory and/or visual, with the assistant applicators;
- Be within 500 meters of persons being supervised; and
- Comply with the standards contained in Division 7 of the *IPMR*.

## 4.2 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 certain transport requirements/procedures.

The PMP holder and Ministries of Environment and Climate Change Strategy (BC Parks) and Transportation and Infrastructure will ensure that personnel and/or contractors follow these procedures for safely transporting herbicides within the PMP 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 will either be kept in their original containers with intact labels, or they may be stored in appropriate containers that have a copy of the label affixed to the outside of the container. Herbicides that come in large 10 liter containers can be transferred to smaller, easy to use containers for transport to, and use at, small sites;
- 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.

### **4.3 Procedures for Safely Storing Herbicides**

The PMP holder will ensure that these procedures for safely storing herbicides within the Plan Area are followed:

- Ensure that herbicides are stored in accordance with the *IPMA*, *IPMR* and the Work Safe BC document *Standard Practices for Pesticide Applicators*;
- Keep herbicides in their original containers and with original packaging. If original packaging is not available, the herbicides shall be placed in appropriate containers that have a copy of the label 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 MSDS of herbicides stored;
- Ensure that the person responsible for the storage area notifies the appropriate fire department of the presence of herbicides on the premises; and,
- Ensure that herbicides that release vapors 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.

Persons responsible for the herbicide storage shall ensure that all herbicides are stored in a locked canopy or similar arrangement, separate from the driver and personal protective gear.

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

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

- Ensure that all mixing, loading and application of herbicides is carried out by, or directly supervised by, a Certified Pesticide Applicator with the appropriate category of certification, and that all manufacturer’s recommendations, as specified on the herbicide labels, are adhered to;

- Ensure that all mixing, loading and application of herbicides is 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 PFZs, NTZs, bodies of water, fish or wildlife habitat, water sources, or other environmentally sensitive features (e.g., agricultural production areas);
- Ensure that containers used to mix, prepare or apply herbicides are not washed or submerged in any body of water;
- Ensure that eye wash station(s), protective clothing, safety spill kits, spill response plans, a copy of the invasive plant PMP, each herbicide product's MSDS, emergency telephone numbers and first aid supplies are present and available at or near each mixing, loading or treatment site;
- Follow all directions and restrictions on herbicide product labels, including adhering to the recommended re-entry times to treated areas unless personal protective equipment is worn; and,
- Ensure that the listed herbicides in this PMP will only be mixed with water as a carrier for herbicide applications. Prior to any water being collected in the field from a natural source in invasive plant applications, a fresh water permit will be acquired from the Ministry of Environment and Climate Change Strategy (ENV).

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

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

The PMP 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, as appropriate;
- Ensure that empty herbicide containers are returned to the herbicide distributor as part of their recycling program; or triple rinsed 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).

## 4.6 Procedures for Responding to Herbicide Spills

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

- Ensure that a herbicide spill kit accompanies all vehicles carrying herbicides within the Plan area, and contains, as a minimum, the instructions for spills, emergency telephone numbers, kitty litter and/or chemical spill pads, large plastic garbage bags, shovels, an ABC type fire extinguisher, polyethylene or plastic tarp (3 x 3m minimum), dustpan and shop brush, flagging tape and rope, a 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 disposed of only in a designated landfill;
  9. When more than 5 kg or liters of herbicide<sup>1</sup> is spilled, the person responsible for the project will immediately report it to Emergency Management BC by telephoning 1-800-663-3456 or, where that is impractical, to the nearest detachment of the R.C.M.P.; and
  10. An approved representative of the plan holder will be notified of the details related to the spill as soon as is practical by the project/contract supervisor.

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<sup>1</sup> *Environmental Management Act Spill Reporting Regulation*, Reportable Levels for Certain Substances, Item #19

## 4.7 Herbicide Selection and Use

The herbicides intended for use under this PMP are described below. Herbicide selection is driven first by the conditions of the site, and secondly by the target species. Currently, only glyphosate products may be used up to 1 meter above the high water mark if selectively applied for control of noxious weed or invasive plants regulated under the *Forest and Range Practices Act* (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), while the remaining herbicides can only be used where a 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.

### Properties and Use Patterns of Herbicide Active Ingredients Proposed for Use:

**2,4-D** - 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. Example product trade names include: Grazon, 2,4-D Amine, Restore, Dyvel DS, Dyvel DSp, Reclaim, Reclaim II, Tordon 101

**Aminocyclopyrachlor** - 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. Example product trade names include; Truvist, Navius

**Aminopyralid** - is a broadleaf specific herbicide registered for use in invasive plant control. It is a synthetic enzyme, which functions by its systemic mode of action. It is absorbed by both leaves and roots, and translocates throughout the plant. It is a selective herbicide because the active ingredient does not cause significant mortality or impacts on tree and brush species or grasses. It provides up to three years of residual control which allows for treatment under tree canopies and through native brush species. Example product trade names include; Milestone, Restore, Clearview, Reclaim and Reclaim II

**Chlorsulfuron** - Is useful for the control of hard to manage annual and perennial broadleaf vegetation by both foliar and root uptake. Chlorsulfuron 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 and it has a long residual in the soil when there is high soil pH. 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. Example product trade names include; Truvist

**Clopyralid** - is a selective, residual herbicide that is less persistent in soil than picloram and it does not injure trees or shrubs when applied to target herbaceous species in close proximity. Example product trade names include; Lontrel 360, Transline,

**Dicamba** – is a selective, non-residual herbicide used for the treatment of young, actively growing broadleaf weeds, brush species, and some species of invasive plants. Because it is selective, it is useful in areas where grasses are to be retained on the site. Example product trade names include; Dyvel DS, Dyvel DSp, Vanquish, Overdrive, Banvel VM, Banvel II,

**Diflufenzopyr** – improves the efficacy of certain auxin-like herbicides, such as dicamba, on many broadleaf weed species; it is currently only available in combination with dicamba. Diflufenzopyr aids in the activity of these broadleaf herbicides by causing increased disruption of normal growth patterns at a plant's growing points in the roots and shoots. Much like Picloram, it may persist in the soil, it cannot be used near desirable trees or their root systems, and care must be taken to avoid areas where soil may be moved or where there is a shallow aquifer or domestic water intake, especially where there are permeable soils. It also may not be used in any residential areas. Example product trade names include; Overdrive

**Flazasulfuron** – is a selective herbicide used for control of a both annual and perennial species. It is a selective systemic herbicide for pre-emergence and early post- emergent uses. It has a broad spectrum of activity for grasses, broadleaf weeds and sedges. It is rapidly absorbed into the plant leaves, translocating through xylem and phloem to the meristem where it stops plant growth. Symptoms include discoloration of new leaves and halting growth within a few hours. Visual symptoms appear in three to four days with complete death in twenty to twenty-five days. It is safe to birds, fish, bees and other beneficial insects. Example product trade names include; LongRun

**Flumioxazin and pyroxasulfone** is an effective preemergence herbicide used on selective grass and broadleaf weeds. It provides residual for up to 3 months and is most effective when applied to clean, weed free soil. Preemergent seedlings are controlled when exposed to sunlight following contact of soil applied herbicide. Length of residual control is dependent on application rate, rainfall and temperature conditions. This combination will assist in prevention of herbicide resistance. Example product trade names include; Torpedo

**Fluroxypyr** - is a selective herbicide for the control of annual broadleaved weeds in rangeland, permanent pasture, rights-of-way, industrial and other non-crop areas. It is effective for controlling hard-to-kill annual broadleaved weeds such as kochia (including glyphosate-resistant plants). It is a systemic auxin-type herbicide and moves within the plant for control of above-ground and underground plant tissues. The product controls weeds by disrupting normal plant growth patterns. Symptoms include epinasty (twisting of the stems) and swollen nodes. Example product trade names include; PastureGard, Spotlight, Surmount, Escalade,

**Glyphosate** - is a non-selective, non-residual herbicide that kills all vegetation on contact, and since it kills grasses as well as broadleaf invasive plants, its use is limited. It is not persistent because it is rendered inactive when it contacts soil. It may be used within 1 meter of a high water mark if selectively applied for invasive plant control, and application near water is generally by wick or stem injection. Example product trade names include; Crush it, CrushR Plus, Rodeo, Round Up, WeatherMax, Transorb, Vantage, Vantage Plus II, Vantage XRT, VP480, Glyfos,

**Halosulfuron** - is a selective herbicide for the post-emergence control of nutsedge and numerous species of invasive plants and broadleaf weeds in turfgrass, ornamentals, 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. It is currently only available in Canada as Sandea© which is only registered for use in crop areas. Example product trade names include; Sandea

**Imazapyr** - is a non-selective, residual herbicide that gives season-long control of most species of annual and perennial broadleaf plants, grassy weeds species, and some species of invasive plants. 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. Example product trade names include; Arsenal, Powerline, Habitat.

**Mecoprop-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. Example product trade names include; Dyvel DS/Dyvel DSp.

**Metsulfuron methyl** - is a non-selective, residual herbicide that is effective in the suppression and management of difficult to control invasive plants such as common tansy and Canada thistle. It works by causing rapid inhibition of plant cell division and growth. Example product trade names include; Escort, Clearview, Reclaim, Reclaim II, Navius

**Picloram** - is a selective, broadleaf specific, residual herbicide that can remain in the soil for several years and continue to control susceptible vegetation. It is a systemic herbicide for use on a wide variety of broadleaf invasive plants. Because picloram may persist in the soil, care must be taken to avoid areas where soil may be moved or where there is a shallow aquifer or domestic water intake. The mode of action and soil persistence allows for a broader application window. Example product trade names include; Tordon 22K, Grazon, Tordon 101,

**Rimsulfuron** – is a selective herbicide. It stops plant growth by inhibiting amino acids essential for cell division and plant growth. Typical symptoms usually appear in 5 to 7 days but may take longer if cool and/or dry conditions persist. Does not provide residual control of grass or broadleaf weed seedlings after application. Example product trade names include; Elim and Prism

**Triclopyr** – is a selective herbicide that controls many invasive broadleaf plants, and is very effective in controlling many new identified 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. Example product trade names include; PastureGard, Garlon XRT.

**Surfactant or Adjuvants** - Adjuvants, including surfactants, are chemicals or agents that are sometimes added to the herbicide spray mix to allow easier mixing, and to assist in the spreading of the herbicide spray mix and 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. Blue herbicide spray marker dye is regularly used as it enables the herbicide applicator to see where they have treated, thus eliminating over-spray and identifying missed target plants. Example product trade names include; Basicid Blue, Hi-Light, Turf Mark.

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



#### 4.7.1 Description of Application Equipment Proposed for Use

The following is a description of each type of spot application equipment that will be used 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 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.

**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.

**Injection Tools:** Used to inject herbicides into individual stems.

## 5.0 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.

## 5.1 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 aware of the locations 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 the context of this PMP, the term riparian is used to mean an area of land adjacent to a stream, river, lake or wetland that contains vegetation that, due to the presence of water, is distinctly different from the vegetation of adjacent upland areas.

In this PMP, all PFZs will comply with the requirements contained in Division 7 of the *IPMR*. A PFZ is defined as an area of land that must not be treated with pesticides and must be protected from pesticide contamination by either direct (e.g. through herbicide drift) or indirect (e.g. soil and/or water movement) means. 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 inadvertently applied within a PFZ, this use is immediately reported to the PMP holder who immediately reports it to ENV, 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.

### 5.1.1 Procedures to Protect Community Watersheds

The following precautionary procedures will be implemented within community watersheds:

- PFZ procedures described in Section 5.1 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 ENV, 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:
    - 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.
    - 30 meter NTZ is required upstream of a water intake.
- All PFZs will be measured and marked/flagged prior to herbicide use.

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

PFZ procedures described in Section 5.1 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 license 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 license intakes and if they are currently active. Landowner contact is especially important in areas with new home construction or where the well and water license 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 license 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.

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

**Figure 3: Minimum Protective Measures Under the IPMR to Protect Domestic and Agricultural Water Sources.**

<b>IPMR Section</b>	<b>Uses</b>	<b>Permitted Applications</b>	<b>NTZ</b>
71(3)	All pesticide applications except bacterial pesticides	<b>General Rule</b> – 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 meters
71(4)	All pesticide applications except bacterial pesticides (Bacterial pesticides are not considered for use in 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

### 5.1.3 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 PMP 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 refueling 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.

#### **5.1.4 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 PMP 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; and
  - WSI-SO-Blue-listed Species – Nonsensitive; and Endangered Species and Ecosystems – Non-Confidential Occurrences – Conservation Data Centre;
- All PFZs will be measured and marked/flagged prior to herbicide use.
- 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 PMP 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.

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

Berry picking, bee keeping areas, vegetable gardens, organic farms, and areas containing agricultural crops or livestock are also found at many locations within the plan area. In addition, First Nations people within the PMP area use several species of plants for ethno-botanical purposes. Invasive plants readily become established in areas where past ground and 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. This disturbance and invasive plant encroachment displaces native vegetation; as a result, these areas often provide limited opportunities for natural food harvesting. 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.

Organic growers' certification bodies will be contacted to determine the location of certified organic farms to enable communication with known organic operators and discussion of treatment methods and timing. The PMP holder will consider alternative non-herbicide treatment methods adjacent to organic agriculture farms at the request and upon commitment by the agriculture producer to complete the treatments to achieve the desired invasive plant control objectives for the site(s). Provincial Public (Crown) Land will not be used as buffer zones for adjacent private organic farms.

Invasive plant herbicide treatments and honey bee interactions may be perceived risks within the Plan area. Review of scientific literature and the herbicide labels for products covered under this PMP has been completed and will be maintained. All proposed products have low to no bee toxicity. Bee keepers who raise concerns regarding invasive plant treatments on Provincial Public (Crown) Land adjacent to hives on private land will be encouraged to participate in annual land manager invasive plant planning sessions. Accommodations regarding timing of treatments to miss the flowering period may be a possible solution where practical.

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

First Nations people within the PMP 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 and consultation throughout the life of the plan 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;
  - Ensure on-ground treatment contractors are following chance find management guidelines (See Appendix 4) when performing manual/mechanical treatments that disturb the soil.
  - 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).

## **5.2 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.



### **5.2.1 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 application:

- 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 PMP holder, or a representative of the PMP 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.

### **5.2.2 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 injection tools. An example of an Invasive Plant Treatment Calibration record is shown in Appendix 5.

## **5.3 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 which herbicide applications should 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.

## 6.0 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.

### 6.1 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 PMP holder will ensure that each of the required records described below are maintained.

#### 6.1.1 Confirmation Holder Use Records

The PMP holder, Ministries, 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;
- Jurisdiction (ownership) of the treatment location;
- 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;
- Purpose for each treatment; EDRR, containment, or rehabilitation; and,
- 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.

### **6.1.2 Annual Report for Confirmation Holders**

In accordance with Section 39 of the *IPMR*, the plan holder will provide to the Regional Administrator, *IPMA*, 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
- A .kmz file of all sites treated with herbicide the previous calendar year.

## 6.2 Notification

### 6.2.1 Annual Notice of Intent to Treat

The PMP holder will forward, in writing, to ENV, 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 ENV 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
- A .kmz file of all sites intended for possible treatment with herbicide during that calendar year.

### 6.2.2 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 PMP 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 cleanup or reporting of spills;
- Application of herbicides by uncertified personnel without appropriate supervision;
- 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.

### 6.2.3 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;
- Precautions to be taken to prevent harm to people entering the treatment area;
- The PMP confirmation number and
- The PMP holder(s) contact information.

The Treatment Notice signs 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.

For each treatment location, the applicator will maintain a record of where notices were posted.

## 6.3 Consultation

### 6.3.1 Interagency Consultation and Coordination

The Ministries of Forests, Environment and Climate Change Strategy (BC Parks), and Transportation and Infrastructure, are leaders in invasive plant prevention and control in 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 inventories 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 PMPP area in communication and cooperation with other land managers including, the following:

- Local governments (Regional Districts and Municipalities);
- First Nations;
- Utilities, specifically those with rights-of-way;
- Railways;
- Timber companies;
- Ranchers;
- Non-government organizations (e.g. The Nature Trust, Ducks Unlimited Canada, Regional Invasive Species Organizations)

We will also continue to participate in annual stakeholder based invasive plant planning and coordination sessions, often facilitated by regional invasive species organizations.

### **6.3.2 On-going Engagement**

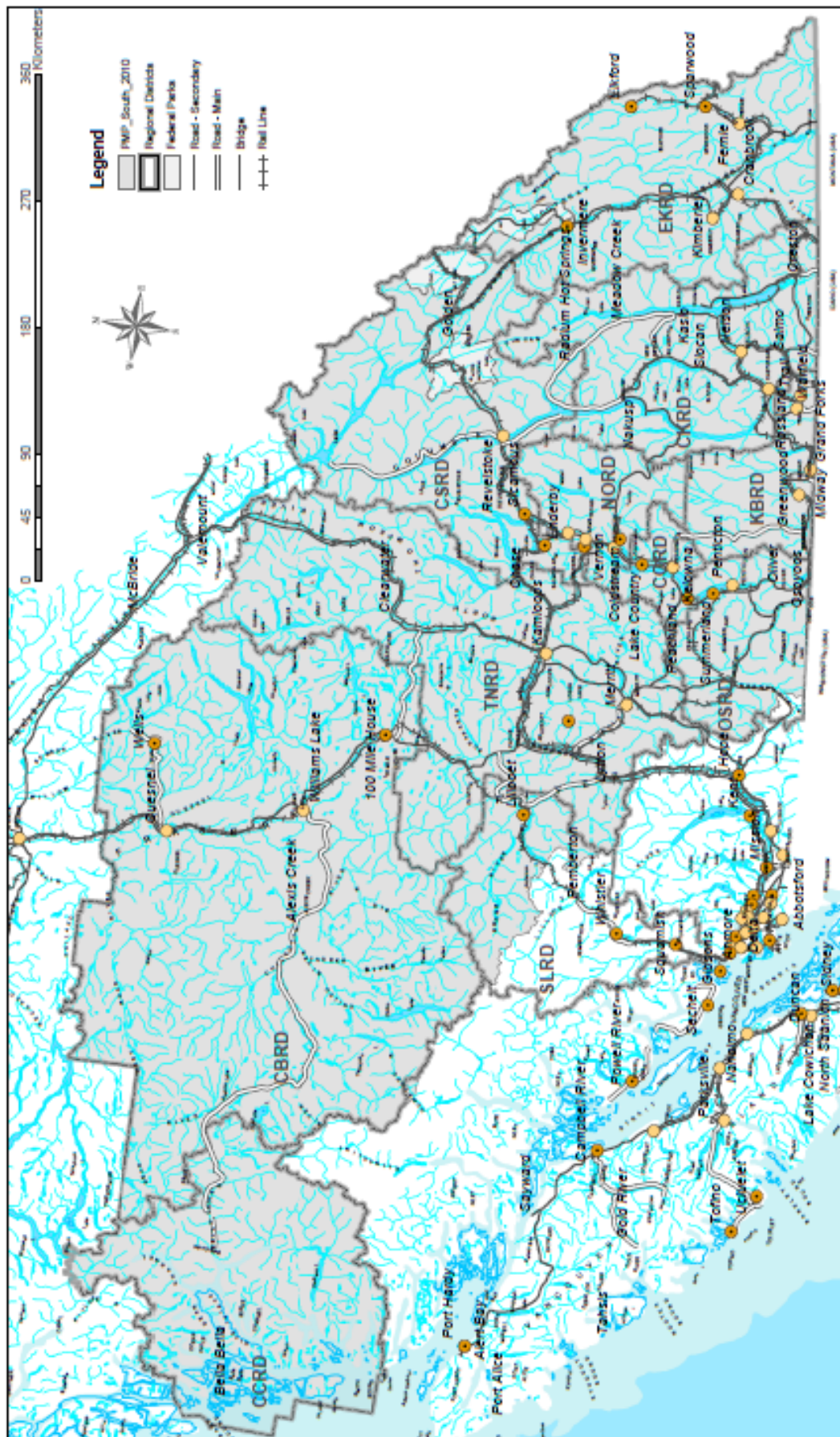
The plan holder will continue to engage and consult with both the public and First Nations throughout the life of the PMP to receive information on operational plans and continue further education on the Plan and invasive plant management.

### **6.3.3 Requests to Amend the PMP**

The PMP holder will forward in writing to the Ministry of Environment, Integrated Pest Management, any request for an amendment to the PMP. Amendment requests concerning new ground based, targeted/spot 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 PMP holder. Amendments to add new active ingredients will require further public advertising and/or First Nations consultation.



## Appendix 1: Map of PMP Area



## Appendix 2: Definitions

**Control:** Manage invasive plants on a site to prevent spread from that site.

**EDRR:** Early Detection Rapid Response – is a strategy that will prevent a species from establishing by detecting it when it first arrives and responding quickly to reports so that effective eradication can occur. EDRR involves having systems for recruiting and training a large number of people to act as ‘spotters’ who look for newly arriving species. This is coupled with a reporting and evaluation system that quickly confirms identity and indicates the degree of risk presented by the newly arrived species and begins a course of action or response to eradicate the species from B.C. while communicating Province wide alerts.

**Eradicate:** Remove all plants from a site or area. This may require several years of treatment.

**IAPP:** Invasive Alien Plant Program - The Invasive Alien Plant Program (IAPP) Application is the database for invasive plant data in B.C. It is intended to co-ordinate/share information generated by various agencies and non-government organizations involved in invasive plant management. The application has been developed to allow the entry, edit and query of invasive plant information including: site details; invasive plant inventory information; planning; treatment methods and data; and, monitoring data.

<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/iapp>

**Industrial area:** Industrial is considered as one type of non-cropland that encompasses facilities where manufacturing, processing or storage of commercial goods occurs.

**IMISWG:** Since 2004, the Inter-Ministry Invasive Species Working Group (IMISWG) has provided policy direction, coordination and collaborative delivery of provincial invasive species programs for the Province of B.C.

Several land-based ministries have responsibility for noxious weed and invasive plant management, including Ministries of Forests, Agriculture, Environment, Transportation and Infrastructure, and Energy and Mines. The IMISWG functions to bring together provincial ministries and agencies, each with unique mandates, program goals and technical expertise. Other participating agencies include the Ministry of Community, Sport and Cultural Development, the Oil and Gas Commission, Ministry of Health, Ministry of Aboriginal Rights and Reconciliation, and the Solicitor General.

**Invasive plant** – are non-native or alien to the ecosystem under consideration. Their introduction causes, or is likely to cause, economic or environmental damage, or harm to human health. In B.C. the term invasive plant is synonymous with invasive alien plant.



**Noxious weed** – any invasive plant species designated by regulation to be noxious under the B.C. *Weed Control Act* (WCA) and Regulations.

**No-Treatment Zone (NTZ)**: is defined in the IPMR as an area of land that must not be treated with pesticide. NTZs will be identified, marked/flagged prior to any herbicide application.

**Pesticide-free zone (PFZ)**: an area of land that must not be treated with pesticides and must be protected from pesticides moving into it. PFZs are measured by the horizontal distance from the high water mark. PFZs will be identified, marked/flagged prior to any herbicide application.

**REDRR**: Regional Early Detection Rapid Response – is a strategy that will prevent a newly arrived species from establishing by detecting it when it first arrives *in a Region* and responding quickly to reports so that effective eradication can occur. REDRR involves having systems for recruiting and training a large number of people to act as ‘spotters’ who look for newly arriving species. This is coupled with a reporting and evaluation system that quickly confirms identity and indicates the degree of risk presented by the newly arrived species and begins a course of action or response to eradicate the species from a Region while communicating Region-wide alerts.

**Regional Invasive Plant or Species Committee** – refers to regional non-profit committees that coordinate invasive plant and/or species management in a specific region of B.C.

**Rehabilitation / Restoration**: When invasive plant species manage to establish and spread they can have long lasting and sometimes irreversible impacts. If the lost values or degradation of the impacted habitat have significant and important consequences, e.g., critical wildlife habitat, economically important agriculture impacts or loss of culturally valued plants and habitats, rehabilitation of sites may be justified. Given adequate resources, planning and time frames ongoing rehabilitation efforts may result in restoration of the degraded habitats to native habitats.

**Residential**: Residential is defined on some herbicide labels as "sites where bystanders including children may be potentially exposed during or after spraying. This includes around homes, schools, parks, playgrounds, playing fields, public buildings or any other areas where the general public, including children could be exposed."

**Selective Application**: is defined in the IPMR. It means the application of a pesticide to individual plants so that the vegetation between the individual plants is not treated.

**Targeted or Spot treatment**: The IPMR, Section 77.1 states: "...must not apply herbicide more than 1.5 m from a targeted weed or plant." It is important to try and control

seedlings and seed drop from the plants while not impacting competing vegetation or risking contamination of sensitive habitats. The applicator will ascertain what constitutes spot treatment with applications being equal or less than the 1.5 meters specified in the regulations. Examples, if seed drop has occurred and a herbicide that has some residual nature is being used then it may be desirable to treat up to 1.5 meters from the plant. When using glyphosate, because of impacts on competing vegetation, only the individual plants should be treated and no or minimal application of glyphosate will occur on non-target vegetation or the ground.

**Urban:** Urban is defined as areas within town or city legal limits or boundaries.

## Acronyms and Abbreviations

ATV	All-Terrain Vehicle
BC	British Columbia
EDRR	Early Detection Rapid Response
ENV	Ministry of Environment and Climate Change Strategy's Integrated Pest Management program
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
FRPA	Forest and Range Practices Act
IPM	Integrated Pest Management
IPMA	Integrated Pest Management Act
IPMR	Integrated Pest Management Regulation
MOTI	Ministry of Transportation and Infrastructure
MSDS	Material Safety Data Sheet
NIT	Notice of Intent to Treat
NTZ	No Treatment Zone
PCP	Pest Control Products
PFZ	Pesticide Free Zone
PMP	Pest Management Plan
PMRA	Pest Management Regulatory Agency
REDRR	Regional Early Detection Rapid Response
WCA	Weed Control Act
WHMIS	Workplace Hazardous Materials Information System

## **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="https://acsess.onlinelibrary.wiley.com/journal/15372537">https://acsess.onlinelibrary.wiley.com/journal/15372537</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="https://ccme.ca/en/resources">https://ccme.ca/en/resources</a> search engine: <a href="http://ceqg-rcqe.ccme.ca/">http://ceqg-rcqe.ccme.ca/</a>

## Appendix 4: Chance Find Management Guidelines for Invasive Plant Management Operations



Chipped stone flakes and core artifacts

### INTRODUCTION

MOTI, FLNRORD, and BC Parks are committed to the responsible management of heritage sites within the South Coastal Mainland PMP plan area. The intent of these chance find procedures is to provide contractors working under this PMP with guidelines for the appropriate response to the discovery of known or suspected heritage sites during invasive plant treatment activities. The objective for providing this information is to minimize disruption to treatment activities while promoting the preservation and proper management of heritage sites.

The following sections:

- 1) Describe the provincial heritage regulatory framework;
- 2) Present step-by-step guidelines for heritage site chance find management, including a procedure for the identification, treatment and management options for human remains;
- 3) Identify the limitations of the Chance Find Management Guidelines; and,
- 4) Provide a list of heritage management contacts to be notified in the event that heritage resources are encountered during construction activities.

### BC REGULATORY FRAMEWORK

Heritage sites in British Columbia are managed in accordance with the *Heritage Conservation Act* (RSBC 1996, c. 187). Section 12 of the *Heritage Conservation Act* (HCA) specifies that an individual (or corporation) must not damage, excavate, dig in or alter, or remove any heritage object from a heritage site, except in accordance with a permit issued by the Minister. The HCA confers automatic protection upon all heritage sites that pre-date AD 1846, regardless of whether they are recorded in the Provincial Heritage Register, and regardless of whether they are located on Crown land or private property. Certain sites, including human burials and rock art sites with heritage value, are automatically protected, regardless of their antiquity.

It's important to note that all archaeological sites, regardless of their condition, are protected by the HCA and that it does not distinguish between "intact" (i.e., those sites which are in a pristine, or undisturbed state) and "disturbed" (i.e., those sites which have been subject to alteration, permitted or otherwise) sites. Post AD 1846 historical heritage sites can be protected by Provincial Ministerial Order or Designation by an Order-in-Council.

### GUIDELINES FOR CHANCE FIND MANAGEMENT

**Step 1:** If suspected archaeological materials or features are encountered, stop work in the immediate vicinity of the find and secure the area. Do not undertake further work that could disturb the find, including moving any soil from the vicinity of the site or adjacent spoil material;

**Step 2:** Contact the Archaeology Branch (see Contacts) for advice on further action;

**Step 3:** Inform the Ministry Representative (see Contacts).

Note: Based on the nature of the incident, it may be determined that there are no further concerns and activities may continue, or further assessment or mitigation may be required.



Fire altered rock



Waterlogged basket (cleaned)



Shell midden deposits

## MANAGEMENT OPTIONS

In the event that an archaeological site is confirmed, discussions will occur between the Archaeology Branch, the contractor, First Nations, and the Ministries in order to select the appropriate management option\*. Options could include:

- 1) Avoidance through partial activity redesign or relocation. This results in minimal impact to the archaeological site, is the preferred option from a cultural resource management perspective and is the least expensive option. An archaeologist impact assessment may be required to define site limits;
- 2) Application of temporary and/or permanent site protection measures as approved by the Archaeology Branch (e.g., fencing off the site, capping the soil). An archaeological impact assessment to identify site boundaries and archaeological monitoring to verify the effectiveness of protective measures may be required;
- 3) Archaeological mitigation consisting of controlled excavations or archaeological construction monitoring; and,
- 4) Monitoring of construction or maintenance activities near the site by a professional archaeologist.

\*A permit under Section 12 of the HCA may be required prior to undertaking any of these options.

## CHANCE FIND – HUMAN REMAINS

- 1) If suspected human remains are encountered (either intact or disturbed), immediately stop invasive plant management activities and secure the area;
- 2) Do not undertake further work that could disturb the remains. This includes disturbing and/or moving soil;
- 3) Inform the Ministry Representative of the discovery;
- 4) Contact the Archaeology Branch;
- 5) A designate shall contact all First Nations with traditional interests in the area;
- 6) The archaeologist or designate may visit the site with First Nations representatives;
- 7) If it is determined that the human remains are not archaeological in nature (i.e., forensic), the local policing authority and Office of the Coroner will be contacted by the Archaeology Branch;
- 8) Discussions between the Archaeology Branch, First Nations, archaeologist, and the contractor will identify appropriate follow-up procedures including the appropriate treatment of the human remains and reburial procedures.



Bone and antler artifacts

## LIMITATIONS

This document was prepared for the exclusive use of invasive plant management contractors working under the Invasive Plant Pest Management Plan for Provincial Public (Crown) Lands in South Coastal Mainland BC. Consistent with the intent of the *Heritage Conservation Act*, contractors are advised that if unanticipated cultural materials or features are encountered during invasive plant management activities, all work in the immediate area should cease, and the guidelines for heritage site chance find management, as presented above, should be implemented. Should contractors have any concerns about archaeological deposits or human remains, an archaeologist should be contacted for direction.

## CONTACTS

### MINISTRY REPRESENTATIVE:

Grahame Gielens, Environmental Roadside Manager  
 Email: [Grahame.Gielens@gov.bc.ca](mailto:Grahame.Gielens@gov.bc.ca)  
 Phone: (778) 362-4523

### ARCHAEOLOGY BRANCH RECEPTION:

Email: [Archaeology@gov.bc.ca](mailto:Archaeology@gov.bc.ca)  
 Phone: (250) 953-3334



## Appendix 5: 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:

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



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)**

- Transmission gear: \_\_\_\_\_
- Engine RPM: \_\_\_\_\_
- 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.