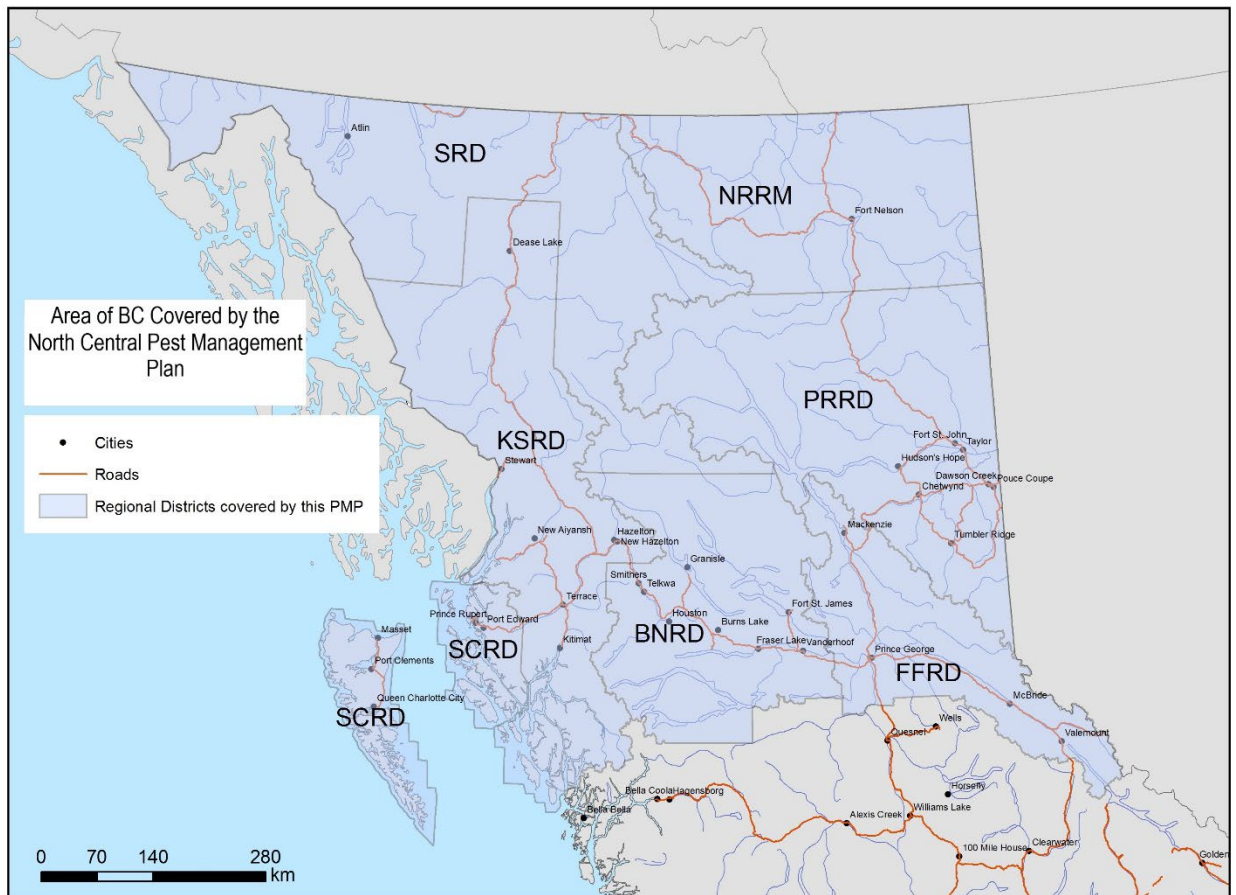




Invasive Plant Pest Management Plan for Provincial Public (Crown) Lands in Central and Northern British Columbia



PMP #FLNR C&N BC 402-0680-20/25

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Revised: January 2024

REVISIONS

Revision #	Date	Description
1	April 2021	Revised Section 5.6: first bullet, point 2: “Efforts will continue through ongoing engagement and consultation to identify culturally significant plants and sites.”
2	April 2021	Revised Section 6.3: last paragraph: “The ministries also engaged consulted with all First Nations in the plan area to share information and request input.....”
3	April 2021	Section 6.4: “The plan holder will continue to engage and consult with both the public and first Nations...”
4	February 2022	Added Revised map of the PMP area to the Title Page. The new map removes the MOTI Area 20 in the Valemount area that overlaps the Southern Interior Pest Management Plan area.
5	February 2022	Changes to the PMP area description in the body of the text (Section 1.2) to match the PMP area changes outline in the Revision #4 above.
6	February 2022	Appendix #1 – added a revised map of the PMP Area which shows the same changes as those described in Revision #4 above.
7	December 2022	Added Acronyms and Abbreviations section below Appendix 2. Added Appendix 4 Chance find management guidelines for invasive plant operations. Updated links in Appendix 3. Updated the Table of Contents. Added page numbers. Updated contact phone and fax numbers.
8	January 2024	Changed Person Responsible for Managing Invasive Plants (pg 9) to Crystal Chadburn, Senior Invasive Plant Specialist.

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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. For the purpose of this document, the term “invasive plants” includes “invasive alien plants”, “weeds” and “noxious weeds”. Invasive plants 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 and can be a threat to infrastructure, reduce sight-lines on roads and cause significant economic losses to many industries, including agriculture, forestry and tourism. Efforts to reduce their cumulative impacts are best achieved through an integrated approach of prevention and control.

The *Weed Control Act* and Regulations in British Columbia 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 (“PMP”).

The development of this PMP was led by the Invasive Plant Program of the Ministry of Forests (FOR), with collaboration and assistance from the Ministries of Environment and Climate Change Strategy (BC Parks), and Transportation and Infrastructure (MOTI). Developed in compliance with the *Integrated Pest Management Act and Regulations*, it outlines an Integrated Pest Management (IPM) approach for the control of invasive plants on Provincial public land, including prevention strategies, manual/mechanical treatment methods, biological and cultural controls, and the use of herbicides.

This plan is intended to describe and provide guidance for an IPM approach for invasive plants on Provincial public land; it is not meant to be an operational plan. The Ministries work collaboratively together and with interested First Nations, and, where appropriate, with other land managers, local governments, regional invasive species committees or other partnering agencies to design annual operational treatment plans within the PMP area each year.

This PMP covers the management of invasive plants on Provincial Public (Crown) Land under the jurisdiction of FOR, MOTI, and BC Parks, within the central and northern interior of British Columbia. This area encompasses a diversity of important ecosystems ranging from dry open meadows in the Sub Boreal Spruce zone, to wet, closed-canopy rainforests and alpine areas. It has vast environmental, timber, agricultural, oil and gas, and recreational values, including some rare native species and plant communities, and critical fish and wildlife habitats. This PMP aims to protect environmental values through managing invasive plants.

1.0 Introduction

Section 24(2)(g) of the BC *Integrated Pest Management* Regulation (IPMR) requires the preparation of a Pest Management Plan (PMP) for the management of noxious weeds and invasive plants on more than 50 hectares a year of public land, where herbicide is part of the management approach.

This PMP is a plan that describes:

- The program for managing invasive plant populations and reducing damage caused by these plants using an integrated pest management approach; and,
- The methods of handling, preparing, mixing, applying, and otherwise using herbicides within the program.

This plan is intended to describe and provide guidance for an integrated pest management approach for control of invasive plants on Public land; it is not meant to be an operational plan. The Ministries work collaboratively together and with interested First Nations, and where appropriate, with other land managers, local governments, regional invasive species committees or other partnering agencies to design annual operational treatment plans within the PMP area each year.

1.1 Purpose and Objectives of this PMP

1.1.1 Purpose

This PMP describes how the Ministries of Forests (FOR), Environment and Climate Change Strategy (BC Parks), and Transportation and Infrastructure (MOTI) will ensure the effective management of invasive plants on Provincial public lands within central and northern B.C. while also protecting environmental and human health values.

This PMP is designed to replace the existing PMP (Confirmation # 402-0664-15/20).

1.1.2 Objectives

The objectives of this PMP are to ensure:

- 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 incorporation and effective use of the principles of IPM;
- The responsible use of herbicides; and,
- First Nations and public awareness of, and input into, invasive plant management at the landscape level.

All existing populations of invasive plants on Provincial public land within the plan area 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 for treatments will be on high priority and high-risk invasive plants that are new to the area, 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. The main goal is to completely control priority invasive plant sites and allow native or desirable species to re-establish.

1.2 Plan Holder and Description of the PMP Area

The PMP holder will be the B.C. Ministry of Forests (FOR); however the PMP also applies to BC Parks and MOTI.

The plan area will be specific to Provincial public land under the jurisdiction of FOR, MOTI, and BC Parks within the following geographical area:

- South of the Yukon and Northwest Territories to north side of the Cariboo area; from Haida Gwaii east to the Alberta border;
- The Regional Districts of Skeena-Queen Charlotte, Kitimat-Stikine, Stikine, Bulkley-Nechako, Fraser-Fort George, Peace River, and the Northern Rockies Regional Municipality.

A map showing the geographic boundaries of the areas covered by this PMP is shown in [Appendix 1](#).

The plan area encompasses areas/lands under the jurisdiction of the following “partnering ministries”:

- The B.C. Ministry of Transportation and Infrastructure (MOTI)’s Northern Region;
- The B.C. Ministry of Environment and Climate Change Strategy (ENV),-B.C. Parks, (BC Parks) Skeena, Omineca, Peace, and West Coast Regions;
- The B.C. Ministry of Forests (FOR): Fort Nelson, Fort St. James, Coast Mountains, Mackenzie, Nadina, Peace, Prince George, Vanderhoof, Skeena-Stikine, Coast - Haida Gwaii and the northern portion of Headwaters Natural Resource Districts.

The plan area contains a diverse array of natural and modified areas including forest, grassland, alpine, subalpine, riparian and marine/estuarine ecosystems, pastures, and utility and transportation corridors. Resource uses and activities within this area may include, conservation (e.g. wildlife enhancement or protection), fishing, hunting, trapping, berry picking, plant gathering, grazing, recreation, tourism, mining, gas and oil development, forestry, transportation and water. Invasive plants can negatively impact all of these resources and the uses of them. Provincial Public land is also immediately adjacent to private land throughout the region and co-ordination through regional invasive plant committees and local governments is necessary for the overall success of invasive plant management programs.

1.3 Use of This Plan on Provincial public Land

This PMP provides the guidance for invasive plant management on Provincial public land; it informs and guides the development of annual operating plans. It is recognized that people using Provincial public land such as transportation corridors, Natural Resource road systems, recreation sites, trails, and parks can serve as means for the spread of invasive plants. Control of invasive plants in these areas is a critical component of a regional approach to successful invasive plant management.

Contractors, local governments, First Nations, or other agencies or non-government organizations working in partnership with the Province of British Columbia may be authorized to work under this PMP for IPM activities on Provincial public lands, provided that the following are adhered to in a signed letter of agreement:

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

For the purposes of this PMP, the following definition applies:

Provincial public Land – Provincial jurisdiction public or Provincial Public (Crown) Land, under the jurisdiction of FOR, MOTI or BC Parks.

1.4 Term of Plan

This plan shall be in force for a five-year period from the date that Confirmation of a Pesticide Use Notice has been obtained from the Ministry of Environment and Climate Change's Integrated Pest Management program (ENV).

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:

Crystal Chadburn, PAg.
Senior Invasive Plant Specialist
Ministry of Forests – Range Branch
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Tel: (250) 701-3821

E-mail: Crystal.chadburn@gov.bc.ca

1.6 Public Use within the Plan Area

The principal land uses within the PMP area are: forestry, agriculture, mining, gas and oil development, recreation, hunting, fishing and medicinal and food plant gathering. Substantial timber harvest levels support numerous sawmills and pulp mills. The area is also well known for its land and water based recreational activities. There are also many high use Provincial Parks and Protected Areas including conservation areas, conservancies, recreation areas and sites and resort tenures that are popular tourism destinations. Hunting, fishing and non-consumptive activities like hiking, nature photography, boating and research activities are also popular. Provincial Public land is also used for harvesting of medicinal and food plants and fur bearing animals.

2.0 Invasive Plants and Noxious Weeds

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

Invasive plants 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, loss of native vegetation that is important forage for wildlife and livestock, reduced biodiversity including displaced species at risk, damaged native ecosystems 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 – 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.

Additional definitions may be found in [Appendix 2](#).

2.1 How Invasive Plants Are Spread

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

- Construction and maintenance on transportation and utility corridors, rail lines, ship yards, highways, pipe lines and power lines, moving and transporting soil, gravel and fill;

- Forestry operations: road/landing/skid trail building and maintenance, machinery movement during harvesting, post-harvest site preparation and planting, log hauling;
- Range activities: grazing, herding livestock, supplemental feeding and building of fences, stock trails, water developments and corrals;
- Mining operations: road building and maintenance, movement of machinery, soil disturbances and storing of top soil, creation of permanent openings in the forest canopy cover;
- Gas and oil exploration and development: well drilling and pipeline construction, movement of machinery, creation of temporary and permanent openings in forest canopy cover;
- Use of seed mixes that are contaminated with invasive plant seed.
- Horticultural practices: importation and planting of plant species that over time become invasive, careless disposal of garden refuse, unintentional seed introduction in soil; and,
- Recreational activities: disturbance of soil by all-terrain vehicles, and other recreational activities, spread of invasive plants by hikers, vehicles and boats, and the dumping 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 invasive plants become nothing more than nuisance weeds to gardens and human-influenced landscapes, however, a small proportion end up as serious threats to natural areas and native ecosystems. These serious threats are those invasive plant species that will be addressed by this PMP.

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

Invasive plants are able to establish quickly and out-compete native plants; some of which are rare and at risk. Many invasive plants have short life cycles, while others are extremely long-lived (e.g. broom and gorse may live for 50 years or more, and their seed bank (seed buried in the soil) may remain viable for decades). Seed banks allow plants to germinate, grow and set seed while environmental conditions are favourable. Some invasive plant species further increase their advantage over native species by producing toxins that inhibit the growth or establishment of other plants. Because they are introduced, these species have few or no natural predators in B.C.'s environments, thus giving them a further advantage over native species.

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

- Fast growth rates;
- Profuse reproduction by seeds and/or vegetative structures;
- Specially adapted seeds to assist their movement by wind, water or animals;

- Prickles, spines, thorns, or sap that can cause physical injury and repel animals;
- Irregular germination ability allowing establishment during non-ideal conditions;
- Ability to alter soil conditions to benefit only the invasive species in question
- Allelopathy (production of chemicals that inhibit the growth of other plants); and,
- Unhindered growth and reproduction resulting from introduction without the predators that impact the plant in its native habitat.

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

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

3.0 The Integrated Invasive Plant Management Program

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

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

Successful implementation of an IPM program requires:

- Strategic, monitoring-based, prevention-oriented management;
- Extensive communication and cooperation among Federal and Provincial agencies, First Nations, local governments, private industry, landowners, and the general public;
- Public education and awareness programs, such as those delivered in cooperation with local governments, the Invasive Species Council of BC, regional invasive species committees or other non-profit agencies; and,
- Continued resourcefulness, research and innovation by invasive plant managers.

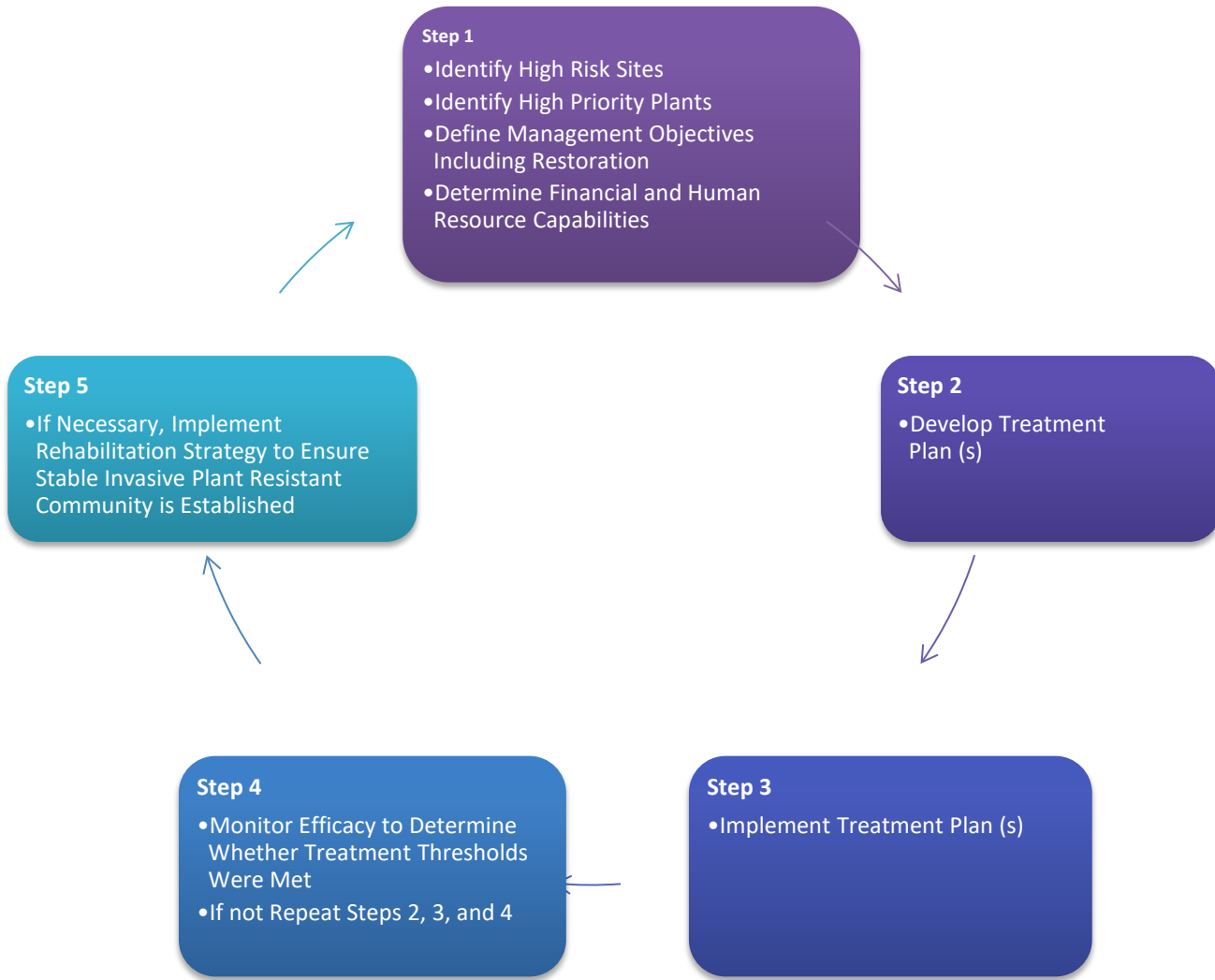
FOR, MOTI and BC Parks recognize that within the larger plan area, there are localized areas with unique social and cultural values whose residents may wish to have further input and discussion on the operational delivery of invasive plant treatments under this PMP. The plan holder will respond to these requests while developing annual operating plans through best available means, such as open house gatherings, email notifications, website postings, etc.

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

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

Provincial Government, First Nations, 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 establishment and spread of invasive plants is the single most effective method of invasive plant control.

If a new invasive plant species does manage to arrive in B.C. the most effective method of control then is to prevent it from establishing and spreading. This requires awareness and training of specialists, naturalists, and local residents so that they know what species to look for and how to report these new invasive species; reporting systems that are linked to quick assessment processes; and, response systems that quickly plan and implement management before the new species can firmly establish and start spreading. Communication through the Federal, Provincial, Regional and local level is necessary for all these components to be in place and to determine how the alien species are arriving so that preventative actions can be strengthened.

If a new invasive species does manage to establish, prevention of spread is a priority. This is achieved not only by direct control treatments but also by promoting healthy 'weed resistant' habitats in areas not infested. Prevention of spread, habitat health and 'weed resistance' are affected by activities that disturb natural habitats like road or recreational trail development, right of way disturbances for fence construction, timber harvesting, livestock grazing and oil and gas development. For these reasons it is important to clean equipment, livestock and outer clothing and footwear to prevent the introduction and spread of invasive plant seeds to non-infested sites. Prompt seeding of disturbances using certified seed is also an important tool to establish healthy weed resistant plant communities and prevent the establishment of invasive plants as well as minimizing soil erosion.

The following are examples of land management practices that can help prevent invasive plant establishment and/or inhibit invasive plant growth. FOR (and those ministries authorized to undertake invasive plant control under this PMP) will implement the following practices, as applicable, on a site-specific basis:

- Prevent the movement of soils contaminated with priority invasive plant seed and vegetative plant parts (e.g. gravel pit material used in road construction and maintenance, yard and garden waste dumping);
- Maintain soil, subgrade or surfacing material that is being moved during road construction as free as practicable of invasive plants or seeds
- Educate roadside mower, excavator and grader operators on work practices that will reduce spreading invasive plant seeds and plant parts;
- Keep equipment yards and storage areas free of invasive plants as practicable to prevent the spread of plant parts and seeds from these high traffic areas;
- Inspect clothing and vehicle/equipment undercarriages when working in, and prior to leaving, areas known to contain invasive plants;
- Clean and wash clothing and equipment, dislodging plant seeds or plant parts, and contain 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;
- 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 an ecologically appropriate seed mix that is free of invasive plants that are considered a threat in the area. Request and check the Certificates of Seed Analysis for each species in the seed mixture *prior to mixing* to ensure no invasive plant contaminants using guideline here: Checking the Certificates of Seed Analysis (https://www2.gov.bc.ca/assets/gov/driving-and-transportation/environment/invasive-species/invasive_plant_hiding_in_seed.pdf);
- Manage grazing to maintain healthy plant communities that are resistant to invasive plant establishment and invasion;
- Minimize disturbance of desirable vegetation where possible; and
- Educate staff and contractors to identify priority invasive plant sites that exist or threaten to establish within the PMP area.

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 B.C., and the Royal B.C. 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 B.C. is collected, confirmed by taxonomists, and added to the Royal B.C. 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 or many species within a defined landscape. The difference between a survey and an inventory is

that an inventory is a cataloguing of all invasive plants of concern within a management area, whereas a survey is an individual observation or a sampling of a representative portion of a larger landscape. In other words, an inventory is the overall picture within the geographic area, which is made up of one or many invasive plants surveys.

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

Invasive plant surveys focus primarily on priority invasive plant species that are new to an area and pose a high risk of causing negative impacts, including species listed either under *FRPA's Invasive 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 discovering a new incursion of a species, and finding isolated patches of expanding species. The survey(s) confirms invasive plant infestation extent, size, distribution, and density.

Inventories/surveys may be conducted by truck, ATV, motorbike, bicycle, boat, helicopter, 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 invasive species prefer lakeshores, ponds, sloughs, creeks, river edges, marshes and seepage areas. Experience with biogeoclimatic zone/subzone may also assist in focusing survey efforts. Areas that have been recently disturbed or that receive disturbance on a regular basis are carefully inventoried/surveyed, as they are generally the preferred habitats of invasive species. Such areas may include, but are not limited to:

- Roadsides, ditches, pull-outs and landings;
- Mining, gas and oil exploration and development activities
- 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.

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

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

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) The risk or impacts that are caused by the invasive plant,
- 2) species distribution across a defined landscape,

- 3) invasiveness (threat) of the invasive plant species,
- 4) susceptibility of habitats that are invaded or threatened by the species, and
- 5) 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)**

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

If a species is determined to be localized to a small area, or a new incursion to the management area or region, the resulting management objective may be to extirpate the species from the infested sites through a regional early detection and rapid response treatment plan. If the localized infestation covers a much larger area and there is no chance of eradicating the population, the resulting management objective is to contain the infestation in order to stop the spread and establishment into un-infested areas. This is referred to as **Containment**. Finally, if a species is determined to be endemic across the majority of a defined area(s) of susceptible habitat behind a containment line, the resulting management action is referred to as **Rehabilitation**. Rehabilitation actions include biological control measures, intensive treatments, and re-vegetation. The potential for a species to cause impacts in the future due to high density indicates that rehabilitation may be required. These three strategies are discussed further below.

3.4.1 Early Detection Rapid Response

The objective of EDRR is to eliminate infestations of new, high risk invasive plant species before they become established within the province or region. The discovery of a new invader to the province invokes the B.C. EDRR Plan

(<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/edrr> developed by the Inter-Ministry Invasive Species Working Group which may also involve the federal government if the species is new to Canada. A new incursion of an invasive plant species into a region from another part of the province is also managed to achieve extirpation, 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 established. Once a containment line is drawn, intensive management is focused on the smaller outlier or satellite infestations located outside of the main infestation. Management of some sites, such as extensive infestations in Pesticide Free Zones (PFZ) (See [Appendix 2](#) for definition) 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 lines typically cover one or several drainages or a portion of a valley. These lines 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 desired state. Biological control (for species with agents available) is often used within 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 (See [section 3.6.3](#) for more information about Biological Control). 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 Treatment Thresholds

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.

Ideally, treatments are executed when invasive plant population levels are low; long before the injury threshold is reached, thereby reducing expenses and the unnecessary introduction of treatment agents into the environment. In some cases there may be no tolerance for invasive plant species at all (i.e. zero treatment threshold for EDRR), and in other cases the number of invasive plants that can be tolerated before control measures are considered may be much greater. This decision relates directly to the values threatened or sites occupied by a priority invasive plant (e.g. a site with a rare and endangered plant species or plant community may prompt a treatment decision at low invasive plant population levels). Other considerations include seasonality, weather conditions, financial and human resources, site accessibility, site conditions, target species, distribution, and percent cover, and the ecological, economic, societal consequences of not treating, and the availability of effective control/treatments.

3.6 Invasive Plant Treatment Options

Treatments occur only when monitoring indicates thresholds have been reached and treatment is necessary. All options may require more than one treatment.

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

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

3.6.1 Mechanical Control

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

- Prescribed burning
- Cultivation/Tilling
- Dead-heading/Pruning
- Covering/Smothering;
- Digging/Excavating;
- Hand pulling;
- Hot water/Steam
- Mowing;
- Mulching
- Sheet Mulching

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 herbicides cannot be used; for example they may be the best option when in close proximity to environmentally sensitive features;
- May be effective at reducing invasive plant density or movement off site; and/or

- Result in minimal or no impact to fish habitat as long as erosion and sedimentation are controlled.

Some of the limitations of manual and mechanical control include:

- Mowing is less effective on low-growing plants, or those that have the ability to re-sprout quickly after disturbance. Mowing may not be the best choice on a site if seed feeding bio-control agents are present;
- Cutting effectiveness is largely dependent on plant species, stem diameter, time of cut, and age of the plant;
- Spot burning can pose safety issues for both workers and the environment;
- Burning and/or mowing exacerbates the growth of some invasive plant species, especially those that reproduce by rhizomes;
- Covering/smothering may be costly and labour intensive because treatment sites require regular monitoring to detect and repair torn materials and may prevent native vegetation from re-establishing on the site;
- Excavating may be costly and labour intensive and may include removal of concrete or fencing 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; reproductive vegetative 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/or fertilization are examples of cultural control methods. Managing public use of land to reduce or prevent invasive plant infestation is another example of a cultural control.

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

- May be economical if livestock are readily available and trained;

- May retard plant development and seed formation and will gradually deplete root reserves because 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);
- Animal husbandry and transportation costs can be prohibitive.
- May create conflicts with wildlife populations (e.g. predation; treat of disease transmission);
- May stimulate vegetative growth of some invasive plants species and encourage spread and increased density; and,
- May require additional infrastructure construction to contain livestock.
 - 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 in the best solution. Some of the considerations when choosing to revegetate an area as an invasive plant cultural control approach includes: 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 the 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 re-vegetation 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 needed to help shade out shade-intolerant invasive plants. Soil chemistry can be altered with the use of fertilizer to order to create less favourable soil conditions for some invasive plant species. However, the soil type and moisture regime will affect response, and only a few invasive plant species are potentially negatively impacted. Soil amendments and application methods may be cost prohibitive over large 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. They 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 Applications of Herbicides

Following careful consideration of the use of the IPM treatment options herbicides are used when no other method of control is practical or effective. All herbicides are applied on a targeted or spot application basis to control invasive plants with the goal of reducing herbicide use on each site over time. The benefits of targeted or spot applications of herbicides include:

- Effective, safe and easy to use IPM tool;
- Results in complete control in a shorter period than other methods, allowing for more sites to be managed in an area, and therefore greater permanent control at the landscape level (ie less chance from ongoing re-establishment and less treatments required over time);
- 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 or soil compaction.

Some of the limitations for use of herbicides include the following:

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

3.7 Treatment Method Selection

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

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

Table 1 - **General Conditions associated with treatment options**

Treatment	Conditions for Use
<p><u>Manual and Mechanical</u> (e.g. covering/smothering, cutting, digging/excavating, girdling, hand pulling, mowing, pruning, stabbing, tilling, spot burning)</p>	<p>New, small infestations;</p> <p>Applicable to most species but aggravate some situations, e.g., rhizomatous hawkweed species or knotweed species;</p> <p>Sometimes require re-vegetation (to some extent) with grasses, forbs and/or native plant species.</p>
<p><u>Cultural</u> (i.e. targeted grazing by sheep, cattle, goats, re-vegetation; soil amendments etc.)</p>	<p>Targeted grazing:</p> <ul style="list-style-type: none"> • Wide spread palatable invasive plant species; target plant population size is variable, otherwise similar to mechanical treatments. • No other options are either available or desirable. <p>Revegetation and soil amendments:</p> <ul style="list-style-type: none"> • Infested site is limited in density and extent; • Soils are favourable for treatment type • Invasive plant species present is shade-intolerant or is affected by soil amendments
<p><u>Biological</u> (i.e. systematic release of insects and diseases that feed or attack exclusively on targeted invasive plant species)</p>	<p>Older, more established incursions generally with widespread occurrences of target species beyond treatment site;</p> <p>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.</p>
<p><u>Chemical</u> (i.e. judicious, strategically targeted use of herbicides)</p>	<p>Infestation size is variable;</p> <p>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) (See definition in Appendix 2), high public use areas during peak season, or other sensitive areas.</p>

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

3.8.1 Species Monitoring

Inventory surveys, or pre-treatment monitoring, are completed visually, repeated over time, and provide a record of information about invasive plant occurrence, density, and site characteristics. FOR, MOTI and BC Parks maintain the integrity of the species inventory by routinely monitoring invasive plant sites and updating surveys as resources allow. Most sites are inventoried annually before receiving an initial treatment through species-specific, and/or geographic-specific survey activities; an 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 treatments, both chemical and non-chemical, are monitored annually to ensure the following:

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

Biological control treatments are monitored to determine the following:

- Establishment 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.

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

4.0 Operational Information

The operational information in this section includes:

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

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. Ministry personnel, contractors, and other agencies working under this PMP 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:

- B.C. Ministry of Environment, Canadian Pesticide Education Program Applicator Core Manual; and,
- Work Safe B.C. (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, and all other applicable legislation.

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 shall ensure that Ministry personnel, contractors, and other agencies working under this PMP 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 shall be kept in their original containers and with original labels. If original labels are not available, the herbicides shall be placed in appropriate containers that have the trade name, active ingredient concentration and pesticide registration number affixed to the outside of the container. Herbicides that come in large 10 litre containers can be transferred to smaller, easy to use containers for transport, and use at small site;
- Ensure that the vehicle is equipped with a first aid kit, fire extinguisher, spill contingency plan and kit, and that the vehicle operator has been trained on how to handle spills;
- Ensure that all documents and placards are carried in, or placed on, transport vehicles if required under the *Transportation of Dangerous Goods Act*, the IPMA or the IPMR; and,
- Ensure that the vehicle operator reads and understands the herbicide labels and the product Material Safety Data Sheet (MSDS) for all herbicides being transported.

4.3 Procedures for Safely Storing Herbicides

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

- Ensure that herbicides are stored in accordance with the IPMA, IPMR and the Work Safe B.C document *Standard Practices for Pesticide Applicators*;
- Keep herbicides in their original containers and with original packaging. If original packaging is not available, the herbicides shall be placed in appropriate containers that have the trade name, active ingredient concentration and pesticide registration number affixed to the outside of the container;
- Ensure that storage facilities are locked when left unattended, ventilated to the outside atmosphere, are entered only by persons authorized to do so, and that there is a placard affixed and maintained on the outside of each door leading into the storage area bearing, in block letters that are clearly visible, the words “WARNING – CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY”;
- Keep storage facilities separate from work and living areas, and away from food, flammable materials, bodies of water and water sources;
- Ensure the storage facility is equipped with necessary spill equipment, first aid kits, and the appropriate Material Safety Data Sheets of herbicides stored;
- 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 vapours, and bear a "poison" symbol on the label, are stored in a storage facility that is not attached to or within a building used for living accommodation.
- 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 plan holder shall ensure that Ministry personnel, contractors, and other agencies working under this PMP follow these procedures for safely mixing, loading and applying herbicides within the Plan Area are adhered to:

- Ensure that all mixing, loading and application of herbicides is carried out by, or directly supervised by, a Certified Pesticide Applicator with the appropriate category of certification, and that all manufacturer’s recommendations, as specified on the herbicide labels, are adhered to;
- Ensure that all mixing, loading and application of herbicides are undertaken in a safe manner. All mixing and loading shall be undertaken only in areas at least 15 meters from, and selected to prevent any spilled herbicides from entering into pesticide-free zones, no treatment zones, bodies of water, fish or wildlife habitat, water sources, or other environmentally sensitive features (e.g., agricultural production areas);
- Ensure that containers used to mix, prepare or apply herbicides are not washed or submerged in any body of water;

- Ensure that eye wash station(s), protective clothing, safety spill kits, spill response plans, a copy of the 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 plan holder personnel, the responsibility of container disposal will lie with the contractor, or other agencies working under this PMP.

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

- Ensure that all herbicide waste is disposed of in a manner consistent with relevant laws, and in accordance with the manufacturer’s instructions as noted on the product label, as appropriate;
- 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 plan holder shall ensure that Ministry personnel, contractors, and other agencies working under this PMP follow these procedures for responding to herbicide spills within the Plan Area. 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 , large plastic garbage bags, shovels, an ABC type fire extinguisher, polyethylene or plastic tarp (3m 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 litres of herbicide¹ is spilled, the person responsible for the project will immediately report it to the Emergency Management B.C. 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(s) will be notified of the details related to the spill as soon as is practical by the contractor or project supervisor.

¹*Environmental Management Act* Spill Reporting Regulation, Reportable Levels for Certain Substances, Item #19.

4.7 Herbicide Selection and Use

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 away from the high water mark if selectively applied for control of noxious weed or invasive plants (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, unless the label of that herbicide product requires a greater buffer zone beyond the 10m. However, if a product on the following list is approved for use within PFZs in the future, then that label expansion will be adopted under this PMP.

The list of herbicide active ingredients shown in Section 4.7.1 below includes all possible active ingredients that may be used within the term of the PMP. However, due to the proposed 5 year duration of the PMP, it is not possible to precisely forecast with certainty which herbicide active ingredients will or will not be used from this list. Many of the herbicide active ingredients listed for possible use within this PMP are sold under a variety of Trade Names. The Plan holder reserves the right to utilize any and all of the available products (i.e. Trade Names) for the above listed active ingredients, provided that they are registered for the intended purpose under the Federal Health Canada's *Pest Control Products (PCP) Act*.

4.7.1 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.

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 one of the newer broadleaf specific herbicides 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.

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.

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.

Diflufenzopyr - improves the efficacy of certain auxin-like herbicides, such as dicamba, on many broadleaf weed species. 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. Currently in Canada, diflufenzopyr is only found in the herbicide products OVERDRIVE® and Distinct WDG®.

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. Currently in Canada, Fluroxypyr is found in the herbicide product SIGHTLINE®.

Glyphosate - is a non-selective, non-residual herbicide that kills all vegetation on contact. It is not persistent because its effects are rendered inactive when it contacts soil, and the product binds to the soil and is not mobile. It may be used up to 1 meter away from a high water mark if selectively applied for invasive plant control. 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 weed 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. Imazapyr is found in the herbicide product ARSENAL®

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.

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.

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.

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.

Surfactant or Adjuvants - Adjuvants and surfactants are chemicals or agents that are sometimes added to herbicide spray mix to allow easier mixing, and to assist in the spreading of the herbicide spray mix 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 to mildly alkaline (i.e. pH greater than 7) have been shown to break down (degrade) or hydrolyze more rapidly, reducing the effectiveness of the herbicide being applied. If required, surfactant/adjuvant products may be added to the herbicide active ingredients proposed for use under this PMP.

Herbicide Active Ingredient Formulations - A number of the herbicide active ingredients listed above are included in different final products as different formulations. For example 2,4-D is available as an Amine, an Ester and a Choline. While each formulation has slightly different characteristics (ie. volatility), they break down in the environment the same way.

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

4.7.2 Description of Application Equipment Proposed for Use

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

Backpack and Hand Held Sprayers: A portable, manually operated, low pressure container with a nozzle and a positive shut-off system used for the spot application of herbicides onto foliage, basal bark areas or into or onto freshly cut stems and stumps.

Vehicle mounted sprayer: A motorized vehicle equipped with a pump, holding tank for spray mix, and nozzles (low pressure) attached to handguns, booms and or boomless nozzles used for spot and broadcast applications of herbicides onto foliage. The vehicle may be a four-wheel drive truck or an 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.

Squirt Bottle: Hand-held, non-pressurized container used to apply herbicides onto foliage, basal bark areas or freshly cut stems or stumps.

Injection Tools: Used to inject herbicides into individual stems.

No aerial application or heli-spraying will be conducted under this PMP.

5.0 Environmental Protection Strategies and 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 B.C and these can be found at: <https://bcinvasives.ca/resources/publications>

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. In addition, targeted application of herbicide often has the least long-term footprint on the site, as compared to mechanical or cultural controls, and enables the fastest recovery of desirable vegetation at the site.

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

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

The term riparian is used, in the context of this plan, 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.

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

The following precautionary procedures will be implemented within community watersheds:

- PFZ procedures described in Section 5.0 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 B.C. Ministry of Environment and Climate Change Strategy, at the following web site
http://www.env.gov.bc.ca/wsd/data_searches/comm_watersheds/index.html.
For the City of Dawson Creek information and maps of the community watershed are available at the City of Dawson Creek Watershed Department page:
<http://www.dawsoncreek.ca/cityhall/departments/water/watershed/dawson-creek-watershed-atlas/>
- Herbicides shall not be stored within a community watershed for more than 24 hours prior to their use, and 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 shall be measured and marked/flagged prior to herbicide use.

5.2 Procedures to Protect Domestic and Agricultural Water Sources

PFZ procedures described in Section 5.0 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 license 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 licence intakes and if they are currently active. Landowner contact is especially important in areas with new home construction or where the well and water licence shapefile layers indicate there are numerous wells located in the local area, as it may indicate that additional unmapped wells or water licenses are also present; and
5. Ensure that any time an unregistered/unmapped well or water licence intake is located, a comment is made in the IAPP database site record, so the presence of the well or water intake is available to inform all potential future treatments.

Table 2 describes the minimum protective measures that shall be implemented. The No Treatment Zones (NTZs) in this table reflect the standards as specified in Sections 71(3) and 71(4) of the IPMR.

Table 2 - Minimum Protective Measures under the IPMR to Protect Domestic and Agricultural Water Sources

IPMR Section	Uses	Permitted Applications	NTZ *
71(3)	All pesticide applications except bacterial pesticides	General Rule – Must maintain a 30 m NTZ around a water supply intake or well used for domestic or agricultural purposes, including water for livestock and irrigation purposes	30 m NTZ
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

*See the definition in [Appendix 2](#)

5.3 Procedures for Protecting Riparian Areas, Bodies of Water and Wetlands

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 5.0](#) will be followed for all bodies of water, wetlands and riparian areas;
- Ensure that whenever herbicide, manual or mechanical control methods are applied, efforts are made to prevent harmful alteration, damage or destruction to fish or their habitat. Reducing negative impacts on streamside vegetation and bank stability will reduce erosion and water turbidity.
- Ditches with water are considered to be a water body under the IPMR unless they are "self-contained" (i.e., there is/will be no outflow at any time of year). A 10 m PFZ must be maintained around a water body for all herbicides except glyphosate. For noxious weed control using glyphosate, the PFZ can be reduced to 1 m away from high water if selective treatment is used.
- Ensure that whenever control methods involving herbicide application are proposed in areas identified as Karst lands, that the Best Management Practices specific to herbicide applications, as identified in the provincial government publication entitled "*Karst Management Handbook*

for British Columbia”, are adhered to (<http://www.for.gov.bc.ca/hfp/publications/00189/Karst-Mgmt-Handbook-web.pdf>);

- Ensure that best management practices that comply with the IPMR are applied during invasive plant management.
- Hold pre-work meetings with plan holder(s) personnel and/or contractors and affected agencies to ensure all involved in the invasive plant management process can competently protect riparian areas and bodies of water during the course of their work.
- Prevent invasive plant control impacts on water bodies and riparian habitat by ensuring that contract documents and prescriptions will describe best management practices, including, but not limited to, no refuelling of machinery or herbicide mixing within 15 meters of a riparian zone, no clean up (excluding the case of an emergency spill), and including a requirement to install descriptive flagging such as “Riparian Zone” and “Pesticide-Free Zone” placed at appropriate intervals.

Ensure that the minimum protection measures during herbicide applications for bodies of water (temporary, permanent, fish-bearing, not fish-bearing), dry streams, and classified wetlands are adhered to according to the requirements specified in the IPMR.

5.4 Procedures to Protect Wildlife Habitat/Species at Risk

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

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

- Hold pre-work meetings with plan holder(s) personnel and/or contractors and affected agencies to ensure all involved in the invasive plant management process can competently protect species at risk and wildlife habitat during the course of their work.

5.5 Procedures to Prevent Herbicide Contamination of Food Sources Intended for Human Consumption

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.

5.6 Procedures to Protect First Nations Interests in Traditional Food/Medicine Gathering and Culturally Significant Areas

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

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

- Identification of native plant species and culturally significant sites:
 - During the required consultation process, First Nations were invited to forward the names of those plant species of cultural importance, so that they are not inadvertently affected during treatment activities. Additional plant species and sites of cultural importance will be added to this list if identified by First Nations and others.
 - Efforts will continue through ongoing engagement and consultation to identify culturally significant plants and sites.
- Proposed treatment area notification:
 - Where requested, First Nations will be provided with information on where treatment is planned each spring,
- Invasive Plant management adjacent to traditional use plants and culturally significant sites:
 - Provide annual training to on-ground treatment contractors to recognize traditional use plants and culturally significant sites;
 - Non-chemical treatment methods of invasive plant management will be considered where treatment objectives can be achieved;
 - Ensure on-ground treatment contractors are following chance find management guidelines (see [Appendix 4](#)) when performing manual/mechanical treatments that disturb the soil;
 - 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).

5.7 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.

5.7.1 Pre-Treatment Inspection Procedures for Identifying Treatment Area Boundaries

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

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

5.7.2 Procedures for Maintaining and Calibrating Herbicide Application Equipment

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

An example of an Invasive Plant Treatment Calibration record is shown in [Appendix 5](#).

5.7.3 Procedures for Monitoring Weather

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, Consultation, Ongoing Engagement and Plan Amendments

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. The plan holder will maintain a high standard of communication, record keeping and professionalism when developing and consulting on this PMP and any future amendments that may arise. Specific activities in these areas, as well as requirements under the IPMA are outlined in this section.

6.1 Reporting

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

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

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

6.1.1 Confirmation Holder Use Records

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

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

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

- Trade name of each herbicide used and its registration number under the federal *Pest Control Products (PCP) Act*;
- For each herbicide used, the method and rate of application and the total quantity used;
- Prevailing meteorological conditions including temperature, precipitation and velocity and direction of the wind, these conditions should be measured at the beginning of each day before starting treatment, re-measured if obvious changes in environmental conditions occur throughout the day, and re-measured at the end of any treatment day;
- A record for each piece of the holder's herbicide application equipment that requires calibration, showing when the equipment was calibrated and the data upon which its calibration was based;
- Any advice given to owners or managers regarding things such as safe re-entry time or any additional precautions that should be taken to minimize exposure to the pesticide.

In addition to maintaining daily records of herbicide use, all users of the PMP will retain records of site assessment and invasive plant inventory as well as operational herbicide and other treatment records. These records will include:

- Site assessment and invasive plant inventory forms;
- Treatment notifications;
- Maps of invasive plant sites, treatment and biological control;
- Pre and post treatment records of sites; and
- Project checklists including equipment, First Aid and spill kit.

Most of the inventory, assessment, treatment and monitoring information will be entered into and housed in the Invasive Alien Plant Program, IAPP.

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 Act Registration 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
- Geo-referenced data of all the sites treated with herbicide the previous calendar year.

6.2 Notifications

The plan holder commits to providing the following notifications with respect to this PMP:

6.2.1 Notification of PMP Confirmation

The plan holder will, within 7 days of the plan confirmation date, make available, for the term of the confirmation, a copy of the confirmation and the PMP with relevant maps at their local office to allow inspection by the public as well as posting on the FOR website at:

<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/integrated-pest-management/pmp-pup>

6.2.2 Annual Notice of Intent to Treat

As per section 42 of the IPMR, the plan 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). The NIT will identify:

- Name and business location of confirmation holder(s);
- Estimated area proposed for treatment;
- Proposed treatment methods;
- Herbicides proposed for use and their method of application; and,
- The web address for IAPP map display and data entry modules.
- A .kmz file of all sites intended for possible treatment with herbicide during that calendar year.

6.2.3 Notification of Contravention

Section 72(1)(d) of the IPMR requires that a confirmation holder give written notice to the administrator on a contravention of the IPMA or IPMR that involves the release of a pesticide into the environment. The plan holder commits to abiding by this requirement. The plan holder will also be responsible for inspecting the site, arranging any necessary testing, coordinating any required site remediation, and contacting any affected landowners.

In addition, the plan holder has implemented contractor guidelines to ensure compliance. Failure of the contractor to observe the following requirements may be cause for contractor dismissal:

- Violation of the requirements of the IPMA or the IPMR;
- Mixing of herbicides in inappropriate locations such as near environmentally sensitive zones;
- Failure to use adequate personal protective equipment when required by the product label;
- Failure to flag PFZs prior to treatment;

- Application of treatment herbicides within prohibited zones;
- Improper clean-up or reporting of spills;
- Application of herbicides by uncertified personnel 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.

6.2.4 Posting of Treatment Notices

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

- The trade name and active ingredient of the herbicide that will be used;
- The date and time of the herbicide used;
- The purpose of the treatment;
- Precautions to be taken to prevent harm to people entering the treatment area;
- The PMP confirmation number;
- The plan holder(s) contact information;

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

The Treatment Notices shall be:

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

6.3 Consultation

Prior to submitting a Pesticide Use Notice to ENV for PMP confirmation, the plan holder carried out a consultation process with the public and First Nations. The objectives of conducting consultations when this PMP was at the draft stage were:

- To increase awareness of the PMP process and of the principles of Integrated Pest Management which are embodied in the PMP;

- To ensure that there is an opportunity to identify concerns, and for the plan holder(s) to address those concerns before the PMP is finalized and a Pesticide Use Notice submitted for confirmation;
- To ensure a transparent and accountable review process for the PMP;
- To educate on the need to manage invasive plants; and,
- To explain how the planning process that is described in the PMP recognizes the need to protect human health and the environment.

The public was notified of the PMP development and invited to consult via notices in local community newspapers within the geographic boundaries of the plan.

As per Section 61(1) of the IPMR, at least 45 days before submitting a Pesticide Use Notice, the first of 2 notices, at least 40 cm² in size, was published within a 2 week period in newspapers circulated in the various communities (or nearest communities).

During the public consultation process, the draft PMP was accessible to the public in various locations, as stated in the public notifications and on FLNR's Invasive Plant Program website to allow the public to view and download the PMP text and the maps.

<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/integrated-pest-management/pmp-pup>

The ministries also consulted with all First Nations in the plan area to share information and request input into the development of the plan and promote on-going meaningful communication on invasive plant management.

6.4 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.

6.5 Requests to Amend the PMP

The plan holder will forward in writing to ENV – Integrated Pest Management any request for an amendment to the PMP. Amendment requests concerning new application techniques or similar changes will not require further public advertising or First Nations consultation; provided that the amendment request is within land owned or controlled by the plan holder. 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, Acronyms & Abbreviations

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	https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/protecting-your-health-environment/public-registry.html
ECOTOX database of the U.S. Environmental Protection Agency	http://cfpub.epa.gov/ecotox/
Ecological and Environmental Safety	https://www.sciencedirect.com/journal/ecotoxicology-and-environmental-safety
Journal of Environmental Quality	https://access.onlinelibrary.wiley.com/journal/15372537
Science direct	http://www.sciencedirect.com/science
The Extension Toxicology Network	http://extoxnet.orst.edu/
Canadian Environmental Quality Guidelines, (including the Water Quality Guidelines for the Protection of Aquatic Life)	https://ccme.ca/en/resources

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.



Fire altered rock

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.



Waterlogged basket (cleaned)

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.



Shell midden deposits

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.

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
Phone: (778) 362-4523

ARCHAEOLOGY BRANCH RECEPTION:

Email: 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:

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

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

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

i.e:

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

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

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

i.e:

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

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

Calibrating ATV / Boom Sprayers

Unit type: _____ Date: _____

Determine spray volume to a test area:

(A) **Test strip area:** (_____ m long) x (_____ m wide) = _____ m²

(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) = $\frac{\text{"water used in test" (=E)} \times 10,000\text{m/ha}}{\text{Area of test strip in m}^2 \text{ (=A)}}$

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.