



**Invasive Plant
Pest Management Plan
for the
Southern Interior of
British Columbia**

**Range Branch
BC Ministry of Forests and Range**

MFR PMP 402-0656-10/15

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Executive Summary

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

The *Ministry of Forests and Range Act*, Section 4, outlines the Ministry's purpose and function to encourage maximum productivity of, and to manage, protect, and conserve its forest and range resources; managing invasive plants is an important component of this function. The goals of the Ministry of Forests and Range Invasive Plant Program are to: 1) prevent the establishment of new invasive plant species, 2) to contain the spread of existing invasive plant populations, and, 3) to minimise their impacts on ecosystems and resources on Crown land. In order to meet these goals, the principles of Integrated Pest Management are applied to deliver a balanced approach that uses a combination of knowledge, best practices, and actions to achieve invasive plant management objectives.

In British Columbia 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 42 listed invasive species. The *Weed Control Act* and Regulations require land occupiers, as defined in the Act, to control 21 provincially listed noxious weeds on both private and public land. 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.

This Pest Management Plan was developed by the Ministry of Forests and Range, Range Branch, Invasive Plant Program in compliance with the *Integrated Pest Management Act* and Regulations. It outlines an Integrated Pest Management approach for the control of invasive plants on provincial Crown land, and it includes prevention strategies, manual/mechanical treatment methods, biological and cultural controls, and the use of herbicides.

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

1 Introduction

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

A PMP is a plan that describes:

- the program delivered to manage invasive plant populations and reduce damage caused by these plants based on integrated pest management (IPM); and,
- methods for handling and applying herbicides to meet program objectives.

1.1 Purpose and Objectives of this PMP

This PMP describes how the Ministry of Forests and Range (MFR) will achieve effective management of invasive plants on provincial Crown land within the southern interior of BC using the principles of IPM, while protecting environmental and human health values.

The objectives of the PMP are to ensure the following:

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

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

1.2 Plan Holder and Description of the PMP Area

The PMP holder will be the BC MFR.

The plan area will be specific to provincial Crown land within the geographic area defined as the Southern Interior Forest Region, with the northern boundary modified to align with boundaries delineating the Cariboo, Central Coast, and Thompson Nicola Regional Districts. The eastern, western and southern extents of the Southern Interior Forest Region constitute the remaining boundaries of the plan.

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

1.3 Use of Plan on Provincial Crown Land

This PMP will provide the guidance for invasive plant management on Crown land. It is recognized that many areas serve as vectors of spread for invasive plants, such as Forest Service road systems, recreation sites and trails. Control of invasive plants in these areas is a critical component of a regional approach to successful invasive plant management. The MFR works collaboratively with regional weed committees to implement effective invasive plant management regimes across jurisdictions, where appropriate.

Partnering agencies may be authorized to use this PMP for invasive plant management activities on Crown lands, provided that the following are adhered to in a signed letter of agreement:

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

1.4 Term of Plan

This plan shall be in effect for a five-year period from April 1, 2010 to March 31, 2015.

1.5 Persons Responsible for Managing Invasive Plants

The persons responsible for coordinating the management of invasive plants under this PMP, and the principal contacts for information related to this plan are:

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1.6 Public Use Within the Plan Area

The principal land uses within the PMP area are forestry, agriculture, tenured grazing, mining, recreation, hunting, fishing, medicinal and food plant gathering, and guide-outfitting. The area is well known for its land- and water-based recreational values; there are many high use Provincial Parks and Protected Areas including conservation areas, conservancies, recreation areas, resort tenures, and wilderness recreation sites that are popular tourist destinations. Non-consumptive activities such as hiking, photography, boating and research activities are also popular.

2 Invasive Alien 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.

These 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, displaced native vegetation that is important forage for wildlife and livestock, reduced biodiversity including species at risk, and damaged native ecosystems.

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

Invasive plant - any invasive alien plant species that has the potential to cause undesirable or detrimental impacts to our economy, human health, animals or ecosystems. Invasive plant species may be listed under the *Forest & Range Practices Act (FRPA)*, Invasive Plant Regulation, administered by MFR.

Noxious weed – any weed designated by regulation to be noxious under the *BC Weed Control Act (WCA)* and Regulations, administered by the BC Ministry of Agriculture and Lands.

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

2.1 How Invasive Plants are Spread

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

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

- Construction and maintenance: movement and transportation of soil and fill on highways, secondary roads, utility corridors, rail lines, pipe lines and power lines;
- Forestry operations: road/landing/skid trail building and maintenance, machinery movement during harvesting, post harvest site preparation, and log hauling;
- Range management activities: over-grazing, herding livestock, construction of stock trails, water developments, fences and corrals;
- Mining operations: road building and maintenance, movement of machinery, creation of permanent openings in the forest canopy;
- Horticultural practices: importing and planting species which over time become invasive, careless disposal of garden refuse, and unintentional seed introduction in soil; and
- Recreation activities: disturbance of soil by all-terrain and other vehicles, spread of invasive plants by vehicles, boats, camping equipment and clothing, and the spread of aquatic plants in watercourses.

2.2 The Need to Control Invasive Plants

Hundreds of species of plants have been intentionally or unintentionally introduced to North America since European exploration and settlement began. Many of these alien plants 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 *WCA* and Regulations require land occupiers, as defined in the Act to control 21 species of provincially listed noxious weeds on both private and public lands, as well as an additional 25 species that are identified as noxious within specified Regional Districts.

There are a number of traits that can be used to describe the nature of invasive plants in comparison to native species; some of which include but are not limited to the following:

- Fast growth rates;
- Prolific seed production and/or vegetative reproduction;
- Irregular germination ability allowing establishment during non-ideal conditions;
- Ability to alter soil conditions to benefit only the invasive species in question;
- Production of toxins to ward off grazers and/or predators; and
- Unhindered growth and reproduction resulting from introduction without the predators that impact the plant in its native habitat.

Because of these traits, their ability to outcompete native plants can result in large, dense infestations that have the ability to:

- Cause a decline in plant and animal biodiversity;
- Alter soil nutrient and hydrological cycles;
- Reduce soil productivity by affecting mycorrhizal fungi or changing chemistry (allelopathic chemicals);

- Negatively affect the habitat of rare and endangered species;
- Reduce the quality and quantity of forage for grazing and browsing wildlife and livestock;
- Decrease the quality of water and fish habitat;
- Change ecological community structure and function; and
- Alter fire regimes.

3 The Integrated Invasive Plant Management Program

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

Successful implementation of an IPM program requires the following:

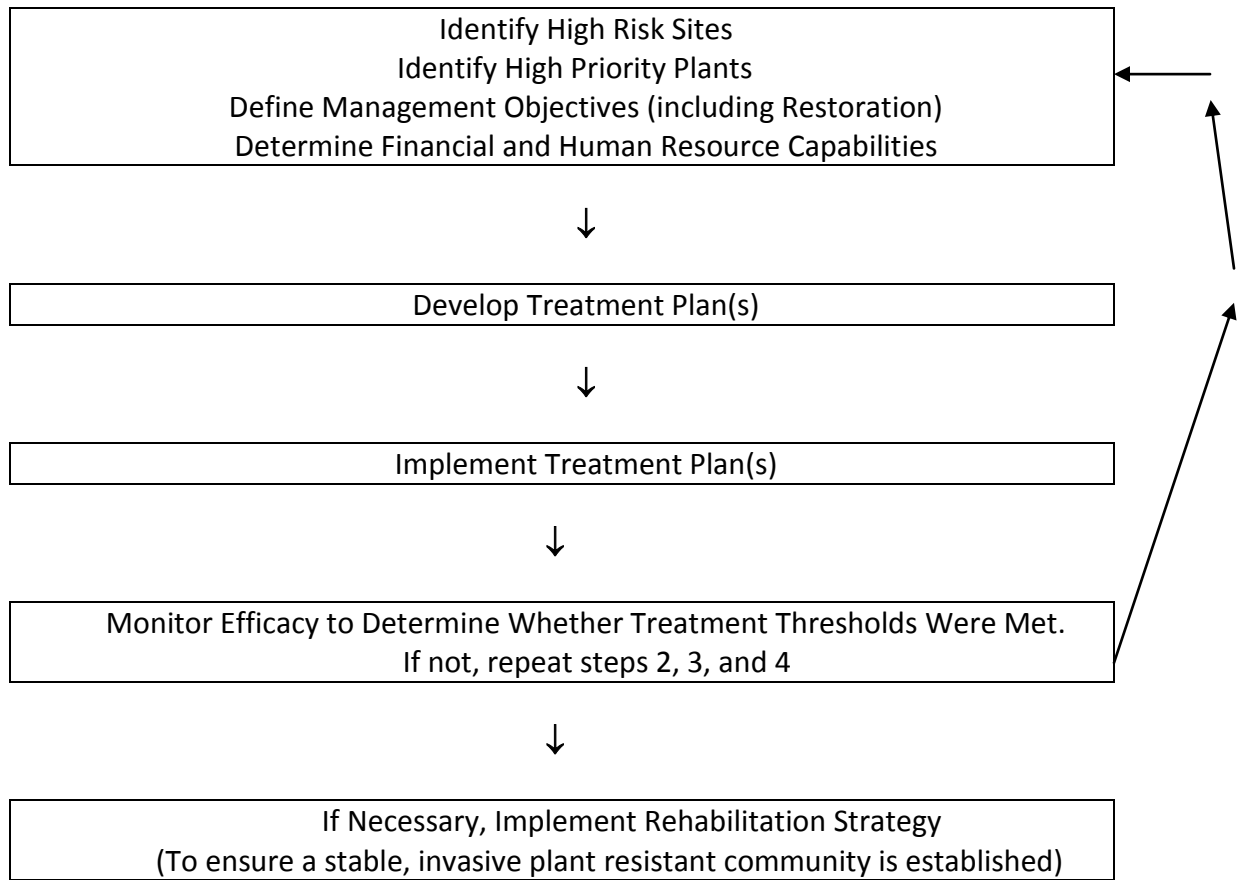
- Strategic, monitoring-based, prevention-oriented management;
- Extensive communication and cooperation among federal and provincial agencies, non-government organizations, First Nations, local governments, private industry, and landowners;
- Public education and awareness programs implemented in cooperation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

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

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

MFR and agencies 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. Invasive plants will invade those areas that provide suitable habitat for their survival and proliferation. Often this includes areas of soil disturbance such as road and recreation trail developments, right of way clearing for fence construction, and timber harvesting. Preventing invasive plant seeds or propagules from being deposited on these sites, revegetating disturbed areas to ensure vigorous competing vegetation, and maintaining healthy, native plant communities through appropriate grazing management practices are important preventative measures.

Consideration of invasive plants is a required component of Forest Stewardship Plans, Range Use Plans, and Range Stewardship Plans. Anyone carrying out a forest or range practice must perform measures to prevent the introduction or spread of invasive plants listed in the *Invasive Plants Regulation of the Forest and Range Practices Act (FRPA)*, as prescribed in operational plans or as authorized by the minister.

The MFR Invasive Plant Program provides information for licensees to consider when developing invasive plant measures in their operational plans. The guidance is focused on preventing and minimizing the establishment and spread of invasive plants through managing dispersal vectors and

establishing or maintaining healthy competitive vegetation. Some examples of measures license holders may consider incorporating include:

- Maintain soil, subgrade or surfacing material that is being moved during road construction as free as practicable of invasive plants or seeds;
- Educate staff and contractors to identify priority invasive plant sites that exist or threaten to establish within the plan area;
- Keep equipment yards and storage areas as free of invasive plants as practicable using mechanical, cultural or chemical treatments;
- Inspect clothing and vehicle/equipment undercarriages for plant parts or propagules if working in an area known to contain invasive plants;
- Remove (clean and wash) plant seeds or propagules from clothing and/or equipment by dislodging and containing associated water, mud and dirt on-site or at designated cleaning stations;
- Keep roadside infestations sufficiently away from road surfaces so that plant parts or seeds are not inadvertently transported by vehicles and equipment;
- Keep equipment and/or livestock out of infested areas where practicable;
- Manage grazing to maintain healthy plant communities that are resistant to invasive plant establishment and invasion; and
- Re-vegetate disturbed areas adjacent to, or known to be at risk from priority invasive plant establishment using an appropriate combination of scarification, seeding with grass seed that is predominately free of invasive plant seed such as Common #1 Forage Mixture or better, fertilizer mulch or other. This activity could occur as: a) part of road, landing and skid trail construction or maintenance or site preparation; b) after woody debris piles are burned, following timber harvesting of fence or fence line clearing; c) around range developments and areas of cattle congregation.

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 provides an electronic atlas accessible to anyone with internet access. The Ecology section of Research Branch within MFR maintains a herbarium of native and introduced plant samples collected from BC, and the Royal BC Museum may also occasionally provide species identification services to the Invasive Plant Program. All staff and contractors engaged in managing invasive plants are provided plant identification training and reference materials.

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 to 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 can be conducted at different intensity levels, or categories, depending upon the individual situation.

Invasive plant surveys focus primarily on those species listed either under *FRPA's Invasive Plant Regulation*, or in the *WCA Regulation*, or on priority species identified by local weed committees which are not regulated by provincial legislation. Surveys are also an important first step in discovering a new incursion of a species, and finding isolated patches of expanding species. The survey(s) confirms invasive plant infestation extent, size, distribution, and density.

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

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

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

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

Information recorded at an invasive plant site includes the UTM coordinate (northing, easting and zone), location, date, species, estimated size of the infestation in hectares, distribution, density, and any pertinent site characteristics or additional information. Site photos may also be taken. If the surveyor is unable to correctly identify a particular plant species a sample is taken for proper identification. Invasive plant surveys and inventories are conducted in accordance with the methodology outlined in MFR's Invasive Plant Program Reference Guide (<http://www.for.gov.bc.ca/hra/Plants/application.htm>).

Invasive plant survey and inventory data is housed within the 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: <http://www.for.gov.bc.ca/hra/Plants/application.htm>.

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 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. MFR's approach is based on selection of the optimum management strategy for each invasive plant species as presented below.

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

Upon review of the current inventory data for each species, the distribution of known sites will either be considered localized within a defined area of susceptible habitat, or endemic across the majority of susceptible habitat. If an invasive plant species is detected and confirmed to be a new

incursion to the province, a provincial response plan is engaged with the objective of eradicating the new invader. This is referred to as **Early Detection Rapid Response**. 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 uninfested 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 revegetation. The potential for a species to cause impacts in the future due to high density indicates that rehabilitation may be required. These three strategies are discussed further below.

3.4.1 Early Detection Rapid Response

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

3.4.2 Containment

The management objective of this strategy is to control all targeted invasive plant species sites outside a defined infested area. This is accomplished by delineating a geographic polygon, referred to as a containment line, around the infested area, and targeting all sites outside of the line for extirpation in order to stop the spread of the species. Action taken inside the containment line is then referred to as rehabilitation which is explained in section 3.4.3. The containment area may be small or large depending on the distribution of the species; small containment polygons typically cover one or several drainages or a portion of a valley. These polygons are often small enough that they are easily delineated within the boundaries of a regional weed committee, and are 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. Regardless of their size, the susceptible habitat outside a containment line becomes the targeted treatment area for each invasive plant species.

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 behind containment lines, either by itself or in combination with other management strategies, to weaken the invasive plant population by decreasing its density and ability to reproduce. In summary, the management strategy of rehabilitation is to reduce the potential impacts at a site caused by high invasive plant densities, recognizing that eradication is no longer feasible, and that future management of the site must take the continued existence of these plants into account.

3.5 Establishing Priorities

Once a plant species has been designated a threat either through legislation, a formal risk assessment process, or through monitoring and/or regional weed committee determination, it will be given a designated priority for control. Prioritizing invasive plants for containment activities involves consideration of both the species and the site and may be accomplished by using a priority matrix. Species are first prioritized according to their relative threat to undisturbed habitat as illustrated in Table 1.

Table 1: An example of invasive plant prioritization.

CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
Anchusa	Baby's breath	Bachelor's buttons	Bull thistle
Leafy spurge	Bluweeed	Black knapweed	Dalmatian toadflax
Marsh thistle	Canada thistle	Brown knapweed	Diffuse knapweed
Perennial pepperweed	Common tansy	Burdock spp.	Hound's-tongue
Puncturevine	Field scabious	Common toadflax	Nodding thistle
Rush skeletonweed	Hoary alyssum	Giant knotweed	St. John's wort
Spotted knapweed	Ox-eye daisy	Gorse	
Sulphur cinquefoil	Plumeless thistle	Hoary Cress	
Yellow hawkweed spp.	Purple loosestrife	Japanese knotweed	
Yellow starthistle	Scotch thistle	Meadow knapweed	
	Tansy ragwort	Russian knapweed	
	Teasel	Scentless chamomile	
	Scotch broom		
	Yellow iris		

The definitions of each category are as follows:

Category 1: Invasive plants that pose extreme risk for invasion and spread into undisturbed sites. These species have the ability to become the most abundant plant across a site or area, often becoming the dominant species. The invasion may occur slowly or rapidly. This category also includes new species not currently present in an area.

Category 2: Invasive plants that pose a high risk of invasion and spread into undisturbed sites. These species may become very prevalent and abundant across some or all of a site or area but may require some disturbance to become the dominant species.

Category 3: Invasive plants that pose a moderate risk to invasion and spread into new areas and often require disturbance to become significantly abundant in an area.

Category 4: Invasive plants that pose a low to moderate risk of invasion and spread into undisturbed sites. Disturbance is required to allow these species to become abundant. Species that have been reduced to an acceptable level as a result of successful biological programs are included here.

Categories are reviewed often and species may be added or moved between categories at any time if new introductions occur, if a region is identified as threatened by a species, or if the performance of a species has been altered due to the impacts of biological control agents or improved land management practices.

Site prioritization, the second component of the priority matrix, is summarized in Table 2.

Table 2: Site priority definitions.

Priority	Purpose or Intent of Treatment
1 Extremely High Risk	<ul style="list-style-type: none"> • Intent is to stop the spread of invasive plants in areas that are generally less than or equal to 0.25 ha • Widely separated by distance or physical barrier from the main infestation • Threatening non-infested, highly susceptible areas • High probability of control
2. High Risk	<ul style="list-style-type: none"> • Generally less than or equal to 0.5ha • Intent is to stop the enlargement of sites in highly susceptible areas • Good probability of control
3. Moderate Risk	<ul style="list-style-type: none"> • Intent is to stop the enlargement of sites of greater than or equal to 0.5 ha in highly susceptible areas or less than or equal to 0.5 ha in moderately susceptible areas. • Good probability of control
4 Low Risk	<ul style="list-style-type: none"> • To stop the enlargement/contain sites in moderately susceptible areas of greater than or equal to 0.5ha. • Good probability of control.

The final component of the Priority Matrix is the combination of species and site categories that will define what level of program may be delivered with currently available funding. This is summarized in Table 3 below.

Table 3: Priority matrix and program definitions.

Species Category	Site Category	Program Definition and Objectives
1	1	<u>Critical Program:</u> Objectives are to stop the spread and establishment of species by eradicating only the new and geographically isolated, high priority plant sites. Containment lines will expand under this program level.
1	2	
1	3	
2	1	
2	2	<u>Containment Program:</u> Objectives are to stop the spread of a plant species by eradicating all sites outside containment lines to stop spread and establishment. Containment lines are expected to hold or be reduced in size.
2	3	
3	1	
1	4	
2	4	<u>Full Program:</u> Objectives are to meet containment program objectives and the needs of local rehabilitation objectives in order to maintain ecological values.
3	2	
3	3	
3	4	

3.6 Invasive Plant Treatment Options

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

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

3.6.1 Mechanical Control

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

- Covering/Smothering;
- Cutting;
- Digging/Excavating;
- Girdling;
- Hand pulling;
- Mowing;
- Pruning;
- Stabbing;
- Tilling; and
- Spot burning.

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

- Involve 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 (e.g. first option to be considered 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 impacts to fish habitat.

The limitations of mechanical control are as follows:

- Mowing is less effective on low-growing plants, or those that have the ability to resprout 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;
- Covering/smothering may be costly and labour intensive because treatment sites require regular monitoring to detect and repair torn materials;
- Excavating may be costly and labour intensive 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 may facilitate the re-establishment of invasive plants; and
- Repeated follow-up treatments must be conducted to remove all new germinates for three to five years or longer, dependant on the length of time the targeted species' seed remains viable.

When targeting a site for eradication, as in early detection and containment objectives, removal of any viable seed remaining after herbicide application is extremely important to avoid increasing the soil seed bank. Proper disposal of invasive plants or invasive plant parts following mechanical control is important; invasive plants, plant parts and seeds should be bagged and disposed of in a landfill or other designated disposal site.

3.6.2 Cultural Control

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

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

- May be economical;
- May retard plant development and seed formation and will gradually deplete root reserves 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; and
- animal husbandry and transportation costs can be prohibitive.

3.6.3 Biological Control Agents

Biological control agents are predominantly insects and are introduced when and where appropriate to reduce invasive plant populations. They attack and weaken target invasive plant species and over time reduce the plant density. This treatment option is most often used behind containment lines to assist in rehabilitation of infested areas.

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

<http://www.for.gov.bc.ca/hfp/biocontrol/index.htm>

The benefits of using biological control agents include the following:

- Affords long-term control on sites with well-established invasive plant populations;
- Used in areas where other treatment methods may not be feasible, such as pesticide free zones (PFZ); and
- They reduce invasive plant populations below a level where significant environmental or economic damage occurs.

Some of the limitations of using biological control include the following:

- Some agents may be slow to effect target species because they can take up to 5 or 10 years to become established and disperse; and
- Biological control agents are not available for all invasive plant species.

3.6.4 Herbicide Application

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

The benefits of spot applications of herbicides include:

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

Herbicides are not used within ten meters of water (with the exception of wipe-on application of glyphosate or new approvals of aminopyralid (see section 4.7)) and their usefulness is limited in areas with seasonal water courses and on sites with coarse soils.

3.7 Treatment Method Selection

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

General conditions associated with selection and use of treatment options are shown in Table 4.

Table 4: General conditions associated with treatment options.

Treatment	Conditions for Use
Manual and Mechanical (e.g. covering/smothering, cutting, digging/excavating, girdling, hand pulling, mowing, pruning, stabbing, tilling, spot burning)	<ul style="list-style-type: none"> • new, small incursions used to limit rhizomatous root spread to prevent seed production • applicable to most species but aggravate some situations, e.g., larger hawkweed sites • sometimes requires restoration (to some extent) with native grasses and plant species
Cultural (i.e. targeted grazing by sheep, cattle, goats, etc.)	<ul style="list-style-type: none"> • incursion size is variable, otherwise similar to mechanical treatments
Biological (i.e. systematic release of insects and diseases that feed or attack exclusively on targeted invasive plant species)	<ul style="list-style-type: none"> • older, more established incursions generally with widespread occurrences of target species beyond treatment site • currently only applicable to thistles, knapweeds, toadflaxes, tansy ragwort, leafy spurge, hound's-tongue, and St. John's wort within the PMP area
Chemical (i.e. judicious, strategically targeted use of herbicides)	<ul style="list-style-type: none"> • incursion size is variable • restricted use within close proximity to: species at risk, domestic water intakes, water licenses, agricultural food production systems, environmentally sensitive or riparian areas, PFZs, no treatment zones (NTZ), or public use areas.

Other considerations include seasonality, weather conditions, financial and human resources, site accessibility, site conditions, target species composition and percent cover, and the ecological, economic, 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 repeated over time provide a record of information about invasive plant occurrence, density, and site characteristics. Surveys are completed visually and critical observations are recorded. MFR maintains the integrity of the species inventory by routinely monitoring invasive plant sites and updating surveys as resources allow. Many sites are inventoried before receiving an initial treatment through species-specific, and/or geographic-specific survey activities; an exception to this is a site that has a new, priority species that is encountered during the delivery of treatment activities. In following years, site survey information is updated from treatment information collected in the field.

3.8.2 Treatment Monitoring

Chemical and mechanical treatment sites are evaluated following treatment as soon as it is possible to observe efficacy. A minimum of 10% of treatment sites are monitored annually following treatment to ensure the following:

- Compliance with the commitments made in this PMP;
- Compliance with the *IPMA* and *IPMR* and other legislation; and
- Correct completion of IAPP treatment records.

The following information is assessed during treatment monitoring:

- Efficacy of control method used;
- Protection of environmentally sensitive areas;
- Potential or actual impacts to non-target vegetation or soils;
- Re-growth of invasive plants;
- Re-treatment requirements, if any; and
- Cost-effectiveness of the treatment program.

Biological control treatments are monitored to determine the following:

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

4 Operational Information

The operational information included in this section includes the following:

- 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. Personnel and their contractors will follow safe handling practices including workplace requirements for Workplace Hazardous Materials Information System (WHMIS) labeling and worker education. The required practices for pesticide applicators are detailed in:

- Worker's Compensation Board of British Columbia (1998) *Occupational Health and Safety Regulation – BC Regulation 296/97 as amended by BC Regulation 185/99 – Sections 6.70 to 6.109*;
- BC Ministry of Environment, Lands and Parks (2005) *Handbook for Pesticide Applicators and Dispensers*; and
- Workers' Compensation Board of British Columbia (1990) *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.

The responsibilities of the Certified Pesticide Applicator are to:

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

4.2 Procedures for Safely Transporting Herbicides

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

The plan holder will ensure that ministry personnel and/or contractors follow these procedures for safely transporting herbicides within the Plan area:

- Ensure that herbicides are carried in a compartment that is secured against spillage and unauthorized removal. The compartment shall be separate from food and drinking water, safety gear, spill containment equipment and people;
- Ensure that all herbicide containers are inspected for defects prior to transporting. Herbicides will either be kept in their original containers with intact labels, or they may be stored in appropriate containers that have a copy of the label affixed to the outside of the container. Herbicides that come in large (i.e.: 10 liter) containers can be transferred to smaller, safer, easy to use containers for transport to, and use at small sites;
- Ensure that the vehicle is equipped with a first aid kit, fire extinguisher, spill contingency plan and kit, and that the vehicle operator has been trained to handle spills;
- Ensure that all documents and placards are carried in, or placed on, transport vehicles as required under the *Transportation of Dangerous Goods Act*, the *IPMA* or the *IPMR*; and
- Ensure that the vehicle operator reads and understands the herbicide labels and the product Material Safety Data Sheet (MSDS) for all herbicides being transported.

4.3 Procedures for Safely Storing Herbicides

The plan holder will ensure that ministry personnel follow these procedures for safely storing herbicides within the Plan Area:

- Ensure that herbicides are stored in accordance with the *IPMA*, *IPMR* and the WorkSafeBC document *Standard Practices for Pesticide Applicators*;
- Keep herbicides in their original containers and with original packaging. If original packaging is not available, the herbicides will be placed in appropriate containers that have a copy of the label affixed to the outside of the container;
- Ensure that storage facilities are locked when left unattended, ventilated to the outside atmosphere, are entered only by persons authorized to do so, and that there is a placard affixed and maintained on the outside of each door leading into the storage area bearing, in block letters that are clearly visible, the words “WARNING – CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY”;
- Keep storage facilities separate from work and living areas, and away from food, flammable materials, bodies of water and water sources;
- Ensure the storage facility is equipped with necessary spill equipment, first aid kits, and the appropriate MSDS of herbicides stored;
- Ensure that the person responsible for the storage area notifies the appropriate fire department of the presence of herbicides on the premises; and
- Ensure that herbicides that release vapors, and bear a "poison" symbol on the label are stored in a storage facility that is not attached to or within a building used for living accommodation.

The plan holder has no direct control of the herbicide storage practices of its contractors while they are not under contract to MFR. Some contractors may store herbicides for extended periods of time in vehicles when performing a number of herbicide treatments for the plan holder(s). The contractor’s

vehicle is considered a mobile storage unit. Persons responsible for herbicide storage will 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 and/or contractors follow these procedures for safely mixing, loading and applying herbicides within the Plan Area:

- Ensure that all mixing, loading and application of herbicides is carried out by, or directly supervised by, a Certified Pesticide Applicator with the appropriate category of certification, and that all manufacturer's recommendations, as specified on the herbicide labels, are adhered to;
- Ensure that all mixing, loading and application of herbicides is undertaken in a safe manner. All mixing and loading shall be undertaken only in areas at least 15 meters from, and selected to prevent, any spilled herbicides from entering PFZs, NTZs, bodies of water, fish or wildlife habitat, water sources, or other environmentally sensitive features (e.g., agricultural production areas);
- Ensure that containers used to mix, prepare or apply herbicides are not washed or submerged in any body of water;
- Ensure that eye wash station(s), protective clothing, safety spill kits, spill response plans, a copy of this invasive plant PMP, each herbicide products 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 for use in invasive plant applications, a fresh water permit will be acquired from the MOE.

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.

The plan holder will ensure that ministry personnel and/or contractors follow these procedures for the safe disposal of empty herbicide containers and unused herbicides within the Plan Area:

- Ensure that all herbicide waste is disposed of in a manner consistent with the requirements of the BC *Environmental Management Act, Special Waste Regulation*, 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 will ensure that ministry personnel and/or contractors follow these procedures for responding to herbicide spills within the Plan Area. If contractors that work under this PMP have their own spill response plan, they must meet or exceed the following plan:

- Ensure that a herbicide spill kit accompanies all vehicles within the plan area, and contains, as a minimum, emergency telephone numbers, agricultural white lime (25 kg.), kitty litter (2-20 kg. bags), large plastic garbage bags (4), shovels (2), pesticide neutralizing solution (1), an ABC type fire extinguisher, polyethylene or plastic tarp (3 x 3m minimum), dustpan and shop brush, flagging and rope, a herbicide first aid kit, and personal protective clothing/equipment (rubber gloves, safety glasses); and
- Ensure that the following spill procedures are followed if a herbicide spill occurs within the plan area:
 1. All personnel shall be protected from herbicide contamination by wearing appropriate protective clothing and safety gear;
 2. Any person exposed to a herbicide shall be moved away from the place of the spill;
 3. First aid should be administered, if required;
 4. The source of the spill should be stopped;
 5. The spilled material should be stopped from spreading by creating a dam or ridge;
 6. The project supervisor shall ensure operations cease until the spill is contained and the source is repaired;
 7. Absorbent material shall be spread over the spill, if applicable, to absorb any liquid;
 8. The absorbent material shall be collected in garbage bags or containers with the contents clearly marked and removed from the spill site, and disposed of in a landfill;
 9. When more than one liter of herbicide is spilled, the person responsible for the project will immediately report it to the Invasive Plant Specialist; 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 project/contract supervisor.

4.7 Herbicide Selection and Use

The herbicides intended for use under this PMP are described below. Herbicide selection is driven first by the conditions of the site, and secondly by the target species. Currently, only glyphosate products may be used within 1 meter of a high water mark, while the remaining herbicides can only be used where a 10 meter PFZ can be maintained by ensuring an adequate buffer zone. Milestone application within the PFZ is currently under review and if approved by the Ministry of Environment (MOE), will be included as an option under this PMP. All herbicides listed below are subject to intermittent product name changes, therefore an equivalent product may be used provided it contains the same formulation of active ingredients.

Milestone is one of the newest broadleaf specific herbicides for use in invasive plant control. Aminopyralid, a synthetic enzyme, is the active ingredient and functions by its systemic mode of action. This product is considered a reduced risk herbicide due to its fast aquatic degradation and low groundwater advisory. *Milestone* is more selective than picloram because the active ingredient does not cause significant mortality or impacts on tree and brush species as well as grasses, but does provide up to three years of residual control on primary target species such as knapweed and sulphur cinquefoil. This allows for treatment of these plants under tree canopies and through native brush species. Another formulation that may be used has the Trade Name *Restore*, which consists of aminopyralid and 2,4-D Amine.

Tordon 22K is a selective, broadleaf specific, residual herbicide that can remain in the soil for several years and continue to control susceptible vegetation. This is a systemic herbicide for use on a wide variety of broadleaf invasive plants. The active ingredient is picloram which may persist in the soil, therefore 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.

Round-up is a non-selective, non-residual herbicide that kills all vegetation on contact. Since it kills valuable grasses as well as broadleaf invasive plants, its use is very limited. Application is generally by wick or stem injection and it is used close to water when other herbicides cannot. There is no soil persistence and the active ingredient glyphosate is rendered inactive once in contact with soil.

Lontrel & Transline is a selective, residual herbicide containing clopyralid. It is less persistent in soil than picloram and it does not injure trees and shrubs when applied to target herbaceous species in close proximity to their stems.

Grazon is a herbicide containing both 2,4-D and picloram. Therefore it provides immediate control with the 2,4-D and longer-term, residual control typical of picloram. *Grazon* provides a wider application window than either picloram or 2,4-D alone. 2,4-D is a selective, non-residual herbicide that targets most broadleaf invasive plants and brush.

Escort is a product containing metsulfuron methyl as an active ingredient. *Escort* is a non-selective herbicide that is effective in the suppression and control of hard to control invasive plants. *Escort* is commonly used on invasive plants that are difficult to kill such as common tansy and Canada thistle.

Dyvel DSp herbicide contains dicamba, 2,4-D and mecoprop-p as active ingredients for broadleaf invasive plant control. It is used in the Invasive Plant Program for the control of hoary alyssum.

Vanquish herbicide contains dicamba alone and allows for treatment of hoary alyssum where 2,4-D Amine use is not permitted (e.g.. near highways rights-of way).

2,4-D Amine is a broadleaf specific herbicide used for many broadleaf and woody invasive plants. 2,4-D Amine can be tank mixed with other label indicated herbicides to increase efficacy for certain plant species and environmental conditions.

Clearview is a combination of aminopyralid (as in *Milestone*) and metsulfuron-methyl (as in *Escort*) in one product that allows for better control of most broadleaf plants. At the time of PMP development, the product is currently under review with the Pesticide Management Regulatory Agency of Health Canada and registration is pending. It is expected to be available in early 2010.

Reclaim is another new herbicide expected to be available in early 2010. It is a combination of aminopyralid, metsulfuron-methyl and 2,4-D. It is currently under review with the Pesticide Management Regulatory Agency of Health Canada and registration is pending.

Surfactant is used when treating plants which have some physical characteristic that limits herbicide uptake. For example, blueweed treatment with most herbicides requires the use of a surfactant due to a pubescent leaf surface and thick cuticle which can reduce chemical uptake.

4.7.1 Description of Application Equipment Proposed for Use

The following is a description of each type of spot application equipment that will be used under this PMP:

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

Vehicle mounted sprayer: Any tank and pump unit mounted onto a vehicle with one or multiple handguns and potentially one or more boom and/or boomless nozzle attachments. The vehicle may be a four-wheel drive truck or all terrain vehicle.

Wick/Wipe On Applicators: Absorbent pad, wicks or rope attached to a long-handled applicator or stick used to apply herbicides onto foliage, basal bark areas, or freshly cut stems or stumps.

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.

5 Standard Operating Procedures

Environmental protection is one of the principal reasons for the existence of the Invasive Plant Program. 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 site goals require extirpation of all target species, or restoration of a site is required because a particular injury threshold has been exceeded. MFR recognizes that the benefits of safe, localized herbicide use far outweigh the damage to ecosystem health and function that can result from invasive plant establishment and spread.

5.1 Environmental Procedures

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

- community watersheds;
- domestic and agricultural water sources (e.g. wells for irrigation);
- riparian areas and all bodies of water whether or not they contain fish;
- wildlife habitat and species at risk; and
- food plants intended for human consumption.

In this PMP, all PFZs will comply with the standards contained in Division 7 of the *IPMR*. A PFZ is defined as an area of land that must not be treated with pesticides, and 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.

PFZs will be identified and marked or flagged as required prior to any herbicide application.

In order to decrease the risk of breaching a PFZ, appropriate buffer zones will be applied outside PFZs. Products containing glyphosate are eligible for wick application within a PFZ up to one meter from the high-water point of any riparian area. Glyphosate products may also be used within an ephemeral water source providing that the zone will be free of water for at least 48 hours after application.

5.1.1 Procedures to Protect Community Watersheds

Before herbicide applications may occur within 100 meters of a community watershed boundary, the following precautionary procedures must be implemented:

- The location of community watersheds to be protected will be verified by accessing the Community Watershed Database, maintained by the BC MOE, at the following web site;

http://www.env.gov.bc.ca/wsd/data_searches/comm_watersheds/index.html

- Herbicides will not be stored within a community watershed for more than 24 hours prior to their use, and they will be removed from the community watershed within 7 days of use, unless they are stored in a permanent structure;
- A 10 meter PFZ shall be maintained from the point of herbicide application and all bodies of water within the community watershed;
- A 30 meter PFZ shall be maintained down slope from the point of herbicide application and all licensed water intakes within the community watershed;
- A 100 meter PFZ shall be maintained upslope from the point of herbicide application and all licensed water intakes within the community watershed;
- Herbicide use will be discontinued if herbicide residues or breakdown products are detected at a community watershed water intake, and further use shall not be undertaken until the BC

Ministry of Health Services, medical health officer, has been satisfied that all required measures have been implemented to preserve water quality.

5.1.2 Procedures to Protect Domestic and Agricultural Water Sources

The plan holder shall ensure that prior to herbicide applications for invasive plant management near private and/or agricultural lands, the locations of registered domestic and agricultural water sources shall be verified visually and/or by assessing applicable government web sites. Attempts to identify and locate unregistered domestic and agricultural water sources will be made by visual observations followed by attempting to contact the owner/occupier of the land prior to herbicide applications should a potentially unregistered water source be observed.

5.1.3 Procedures to Protect Water Bodies and Riparian Areas

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

- PFZ procedures described in Section 5.1.1 will be followed for all bodies of water and riparian areas;
- Ensure that whenever herbicide, manual or mechanical control methods are applied, efforts are made to eliminate harmful alteration, damage or destruction to water bodies. Reducing negative impacts on streamside vegetation and bank stability will reduce erosion and water turbidity. To prevent contamination of water, broadcast treatment with glyphosate will not be applied to ditches that flow directly or indirectly into streams;
- Ensure that best management practices (as derived from documents on species habitat, lifecycle information and locations) 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 the work;
- Eliminate invasive plant control impacts on water bodies and riparian areas by ensuring that contract documents and prescriptions will describe best management practices, including, but not limited to, no refueling of machinery or herbicide mixing within 15 meters of a riparian zone, no clean up (excluding the case of an emergency spill) or disposal of herbicide materials within 15 meters of riparian zones, and including a requirement to install descriptive flagging such as “Riparian Zone” and “Pesticide-Free Zone” placed at appropriate intervals; and
- Ensure that minimum protection measures are adhered to according to the requirements specified in the *IPMR* during herbicide applications for all bodies of water, dry streams, and classified wetlands.

5.1.4 Procedures to Protect Wildlife Habitat/Species at Risk

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

- Ensure that where sensitive ecosystems or 'at risk' plant, vertebrate or invertebrate species have been identified in higher-level plans, wildlife management areas, and other plans, they will be managed accordingly within the PMP;
- 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.

5.1.5 Procedures to Prevent Herbicide Contamination of Natural Food Sources

Berry picking is common throughout the plan area. Bee keeping areas, vegetable gardens, and areas containing agricultural crops or domestic animals are also found at many locations within the plan area, but generally removed from any potential treatment area(s). In addition, First Nations people within the plan area may use several species of plants for ethno-botanical purposes. Most often, invasive plant sites occur in areas where past ground vegetation disturbance has occurred, such as road, landing and utility construction, timber harvesting, heavy cattle, horse, and/or wildlife grazing, all-terrain vehicle activity, and other human induced and natural disturbances. These areas are not often traditional use plant areas because disturbance removes natural vegetation. This helps to greatly reduce the risk of human food contamination as it separates 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 with First Nations is important and encouraged. This allows First Nations to share information on traditional use plants of concern and/or areas where collection or propagation may occur, as well as for the Invasive Plant Program to share information on identification of priority invasive plants. Exchanging information will help protect traditional use plants from any damage or impact from both invasive plants and/or any particular treatment that could be used to manage them. Control measures being applied in specific use areas can be adapted to ensure herbicide contamination does not occur, and to ensure that the appropriate treatment effectively removes invasive plants and protects resource plants.

5.2 Procedures for Safe Herbicide Application

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

5.2.1 Pre-Treatment Inspection Procedures for Identifying Treatment Area Boundaries

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

- A pre-treatment inspection will be conducted to establish treatment boundaries and to document the location of environmentally sensitive areas;
- A pre-treatment meeting shall be held between the Contractor and the plan holder to confirm treatment area boundaries and the locations of environmentally sensitive features; and
- Marking/flagging of PFZs not immediately noticeable to an applicator will be completed prior to herbicide application.

5.2.2 Procedures for Maintaining and Calibrating Herbicide Application Equipment

All herbicide application equipment used under this PMP for invasive plant management will be safe, clean, in good repair, compatible with, and appropriate for the herbicide being applied. All equipment will be inspected and calibrated prior to the commencement of herbicide applications and weekly throughout the application season. An example of an Equipment Calibration and Checklist form is shown in Appendix 2. Backpack sprayers shall also be re-calibrated when changing herbicide products or when nozzle output begins to vary.

5.3 Procedures for Monitoring Weather Conditions

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

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

- When conditions prevent the herbicide product from being applied effectively according to label instructions (e.g. periods of rain or snow);
- Ground wind velocity is over 8 km/hour for foliar application;
- The maximum temperature stated on the herbicide label is exceeded; or
- Precipitation is forecast within four hours of application.

6 Reporting, Notification and Consultation

The Invasive Plant Program is committed to following the *IPMR* when managing invasive plants. We will maintain a high standard of communication, record keeping and professionalism when developing and consulting on this PMP and any future amendments that may arise. Specific activities in these areas, as well as requirements under *IPMA* are outlined in this section.

6.1 Reporting

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

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

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

6.1.1 Confirmation Holder Use Records

The plan holder, partnering agencies 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:

- The date and time of the herbicide use;
- The name of the invasive plant targeted for treatment;
- The trade name of each herbicide used and its registration number under the federal Act;
- For each herbicide used, the method and rate of application and the total quantity used;
- The 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; and
- 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.

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:

- IAPP sSite and Invasive Plant Survey Record forms;
- Maps of invasive plant sites, treatment and biological control locations;
- IAPP Treatment records; and
- Project checklists including equipment, First Aid and spill kit.

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 name and active ingredient of the herbicide(s) applied, including their PCP numbers;
- Locations and total area treated (ha); and

- Quantity of each active ingredient applied (kg).

6.1.3 Annual Notice of Intent to Treat

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

- Name and business location of confirmation holder(s);
- Proposed treatment methods;
- Herbicides proposed for use and their method of application; and
- Estimated area proposed for treatment.

6.2 Requests to Amend the PMP

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

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

- Violation of the requirements of the *IPMA* or the *IPMR*;
- Mixing of herbicides in inappropriate locations such as near environmentally sensitive zones;
- Failure to use adequate personal protective equipment when required by the product label;
- Application of treatment herbicides within prohibited zones;
- Improper cleanup or reporting of spills;
- Application of herbicides by uncertified personnel without appropriate supervision;
- Improper disposal of unused herbicides or containers;
- Improper equipment calibration;
- Application of herbicides under inappropriate or unsafe conditions;
- Failure to properly complete and submit daily operating logs or records; or
- Handling, storing, mixing, transporting, or applying herbicides in a manner that violates product labels.

6.4 Posting of Treatment Notices

Treatment Notices will be posted in locations that are clearly visible and legible from each approach maintained by the plan holder for public/employees/contractors to access the treatment area or at locations where due diligence would require them. The signs shall remain posted for 48 hours following herbicide application, and contain the following information:

- The trade name and active ingredient of the herbicide;
- The date and time of the herbicide treatment;
- The purpose of the treatment;
- The method of application;
- Precautions to be taken to prevent harm to people entering the treatment area;
- The PMP confirmation number;
- The plan holder(s) contact information; and
- For each treatment location, the applicator will maintain a record of where notices were posted.

The Treatment Notices shall be:

- A minimum size of 550 sq. cm;
- Water resistant; and
- Display the title “**Notice of Pesticide Use**” in bold letters that are clearly legible to a person approaching the treatment area. Substitution of “pesticide” with “herbicide” is permissible.

An example of a Treatment Notice is shown in Appendix 3.

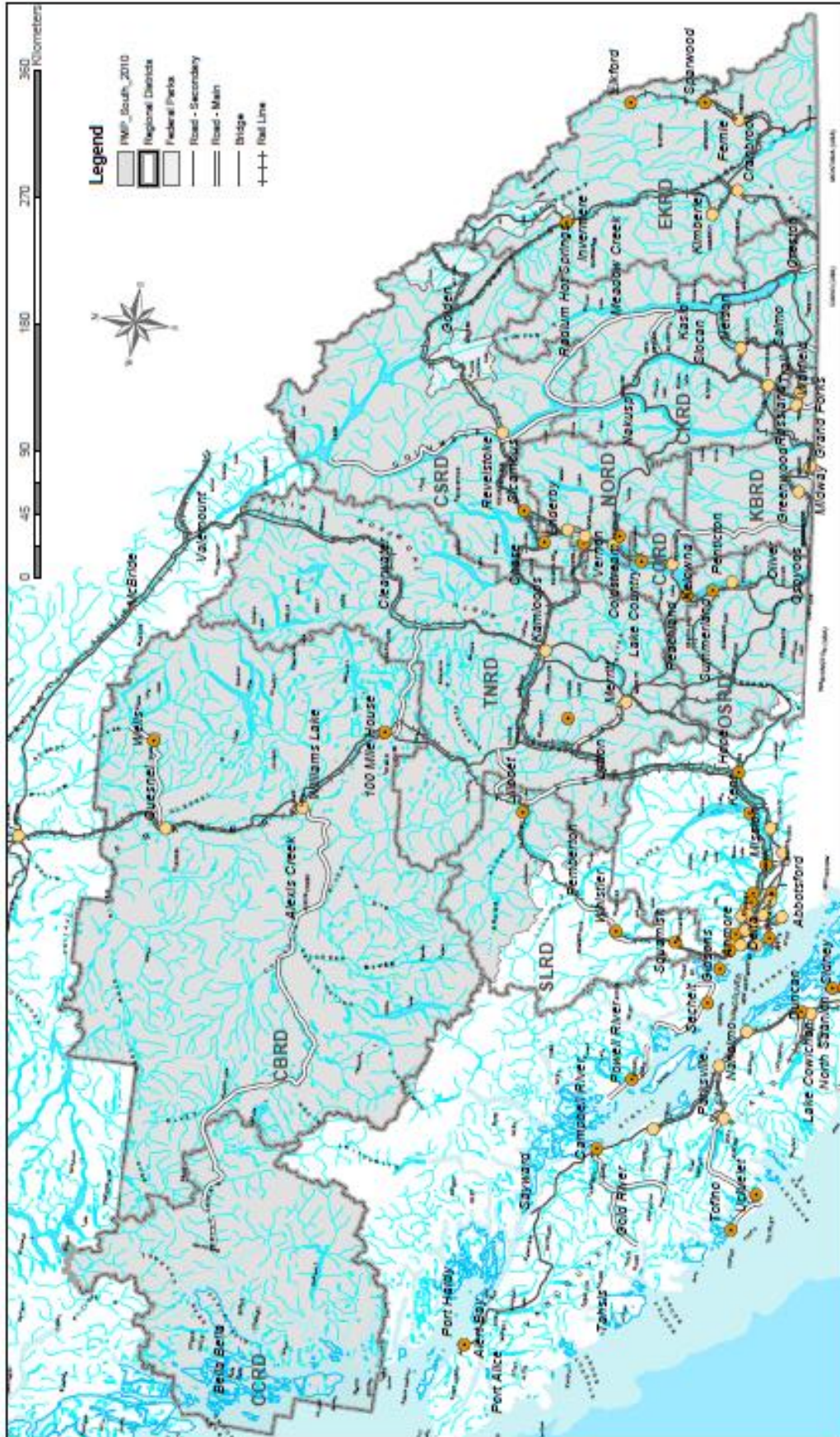
6.5 Interagency Consultation and Coordination

MFR is a leader in invasive plant control in the province of British Columbia and is actively involved with coordinating and collaborating on invasive plant management programs with other ministries, agencies and stakeholders. Information on invasive plant inventories and treatments will be provided to these groups on an ongoing basis, and is readily available through the IAPP application. Since the BC *Weed Control Act* states that 'every occupier has the responsibility to control noxious weeds', MFR will conduct its integrated invasive plant program within the plan area in communication and cooperation with other 'land occupiers' including, but not limited to the following:

- BC Ministry of Agriculture and Lands;
- BC Ministry of Transportation and Infrastructure;
- BC Ministry of Environment, including Protected Areas Division;
- Integrated Land Management Bureau;
- Utilities, specifically those with rights-of-way;
- First Nations;
- Local governments including Regional Districts and Municipalities; and
- Regional weed committees and other conservation-based non-government organizations.

Appendix 1: Map of the Plan Area.

Area of Southern Interior of BC for proposed Pest Management Plan



Appendix 2: Example Equipment Calibration Form

INVASIVE PLANT TREATMENT CALIBRATION RECORD

Date _____
Calibration # _____
Employer _____
Calibration Location _____

Instructions for backpack or handgun sprayer (for 400L / ha delivery rate)

Measure a 5m by 5m square in a field or landing away from any riparian area or watercourse. Using only water in equipment, measure the time taken with each piece of equipment and nozzle combination to fill a measuring cup to 1.0 L. This time indicates the time taken for a piece of equipment to release 400 L of carrier to 1 hectare of area. If you using a delivery rate of 200 L / ha, measure the time taken to fill to 0.5 L. Have every applicator evenly cover the 25m test square in the time allotted for each piece of spray equipment. Record equipment and applicator times below with each applicator understanding the swath speed for correct coverage with each piece of equipment. Each applicator will undergo three calibrations with each piece of equipment.

Equipment and Applicator Summary

Applicator	Spray equipment	Correct Time (sec)	Calibration attempts (sec)
			1
			2
			3
			1
			2
			3
			1
			2
			3
			1
			2
			3
			1
			2
			3
			1
			2
			3



NOTICE OF PESTICIDE USE

Treatment Area:

Pest(s) To Be Controlled:

Pesticide Name(s), Active
Ingredient(s) & Registration
Number(s) (PCP):

Start Time & Date Of Pesticide
Application:

Alternate Start Time & Date:

Pesticide User Licensee Name
& Licence Number:
Telephone Number:

Precautions to Minimize
Exposure to Pesticides:

Do not enter the treated area before

Do not remove this sign before

For emergency medical information contact:
B.C. Drug and Poison Information Centre 1-800-567-8911 or 604-682-5050