



Pest Management Plan for Invasive Alien Plants on Provincial Crown Lands in Central and Northern British Columbia

**BC Ministry of Natural Resources
Operations**

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Executive Summary

An invasive alien plant is any plant species not native to BC that has the potential to pose undesirable or detrimental impacts to our economy, human health, animals and or ecosystems. For this PMP the term invasive plants or invasive alien plants are used as well as some of the other terms used to describe these plants including weeds and noxious weeds. Threats posed by existing and potential invasive plant species are significant and growing. Having originated from other parts of the world, once introduced and established these plants with no natural predators can proliferate and aggressively out-compete native plants that underpin and sustain our natural ecosystems. The socio-economic impacts to the province are large with impacts on recreation, wildlife, fisheries, agriculture, forestry and First Nations cultural, medicinal and food plants. Invasive plants also complicate efforts to reduce or mitigate impacts of gas and oil, mining, transportation, utility and timber activities.

This Pest Management Plan (PMP) was developed by the Invasive Plant Program of the Ministry of Forests & Range (MFR), Range Branch with collaboration and assistance from the Ministries of Environment, Agriculture and Lands and Transportation and Infrastructure. The purpose of the PMP is to provide the ability to meet obligations for invasive plant management as outlined in the *Weed Control Act* and the *Forest and Range Practices Act* and facilitate the Governments partnerships in invasive plant management as outlined in the invasive plant management strategies developed by the North West Invasive Plant Council, NWIPC, and the North East Invasive Plant Committee, NEIPC. The PMP is developed in accordance with the *Integrated Pest Management Act* and its accompanying regulations. This PMP outlines an integrated pest management (IPM) approach for invasive alien plants which includes public awareness, site reporting systems, inventory, planning, prevention strategies and biological, cultural, manual, mechanical and herbicide treatments on provincial Crown lands under the authority of the partnering agencies – the Ministry of Transportation and Infrastructure, the Ministry of Environment, the Ministry of Agriculture and Lands, and the Ministry of Forests & Range.

This PMP covers the management of invasive alien plants on provincial Crown land within the geographic area defined by the Northwest Invasive Plant Council, NWIPC, and the Northeast Invasive Plant Committee, NEIPC. The area corresponds to the Regional Districts of Skeena-Queen Charlottes, Kitimat-Stikine, Bulkley-Nechako and Fraser-Fort George and the Stikine Region for NWIPC and the Peace River Regional District and Northern Rockies Regional Municipality for NEIPC. There is also a portion of the Thompson Nicola Regional District from Albreda to north of Vavenby within the area covered by the PMP. The area is south of the Yukon & Northwest Territories to approximately 53 deg to 52 deg 9 min latitude and from the Alberta Boarder to Haida Gwaii. This area encompasses a diversity of ecosystems ranging from dry open meadows in the Sub Boreal Spruce zone, to wet, closed-canopy rainforests and alpine areas. This area of BC has vast timber, agricultural and recreational values, as well as some rare native species and plant communities, critical fisheries and wildlife habitats and unparalleled biodiversity. These are the values that the PMP aims to protect.

In British Columbia legislation requires land occupiers to control invasive alien plants. The *Forest and Range Practices Act* and accompanying Invasive Plant Regulation requires the prevention of the introduction or spread of 42 named species. The *Weed Control Act/Regulation* requires that land occupiers, as defined in the Act, control noxious weeds on both private and Crown land and has named 21 noxious plant species on their Provincial list. There are also species listed in the Community Charter Regulation and other species that are as yet unlegislated that have associated detrimental impacts. This PMP targets high priority invasive plants. The principal goal is to prevent the introduction of invasive alien plants, reduce the spread of existing invasive alien plant populations and to minimize the impacts to high risk sites (i.e. ecologically important natural areas, riparian area, agriculture production areas, recreational areas, etc.) within this geographical area.

1.0 Introduction

Section 24(2)(g) of the Integrated Pest Management Regulation (IPMR) requires the preparation of a Pest Management Plan (PMP) for herbicide use for the management of noxious weeds and invasive plants on more than 50 hectares a year of public land (e.g. provincial Crown land). This PMP replaces a series of Pest Management Plans and Pesticide Use Permits that have been developed and used since the *Pesticide Control Act* required them in the late 1970s.

A PMP is a plan that describes:

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

1.1 Purpose and Objectives of this PMP

1.1.1 Purpose

The primary purpose in developing this PMP is to provide a single document that describes a multi-agency approach and planning process, using the principles of integrated pest management, (IPM), which will both ensure the effective management of invasive alien plants on provincial Crown lands within central and northern BC while also protecting environmental and human health values.

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 responsible use of herbicides;
- The incorporation and use of the principles of IPM;
- Public and First Nations awareness of, and input into, invasive plant management;
- That the effective use of an IPM program takes into account environmentally sensitive areas and land uses; and,
- That there is continued investigation into alternative non-chemical methods of invasive plant management while recognizing that for several species, herbicide use may be required for management.

Under this PMP, existing populations of invasive alien plants may not necessarily be controlled, but rather, kept from expanding further (i.e. beyond defined containment polygons).

1.2 Identifying Information

1.2.1 Identification of Plan Holder

The PMP holder will be the BC Ministry of Forests & Range (MFR).

1.2.2 Geographic Boundaries and Description of the PMP Area

The plan area will be specific to provincial Crown land within the geographical area defined by NWIPC, NEIPC and a portion of the Southern Interior Weed Management Committee, SWIPC. Specifically:

- South of the Yukon and Northwest Territories to approximately 52 deg 9 minutes to 53 degrees; east of the Alberta boarder to the Pacific Ocean including Haida Gwaii;
- The Regional Districts of Skeena-Queen Charlottes, Kitimat Stikine, Bulkley Nechako, Fraser Fort George, Peace River, the portion of the Thompson Nicola Regional District from Albreda to north of Vavenby, the Stikine Region 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 also encompasses areas/lands under the jurisdiction of the following “partnering agencies”:

- The BC Ministry of Transportation and Infrastructure’s (MoT), Northern Region;
- The BC Ministry of Environment (MoE), Parks and Protected Areas Division, Skeena, Omineca and Peace Regions;
- The BC Ministry of Forests & Range (MFR): Northern Interior Forest Region and Haida Gwaii Forest District including lands under the jurisdiction of the Integrated Land Management Bureau (ILMB); and,
- The BC Ministry of Agriculture and Lands (MAL), including lands under the jurisdiction of Crown Land Administration Division (CLAD).

The plan area contains a diverse array of natural and modified areas including forested, grassland, alpine, subalpine, riparian and marine/estuarine ecosystems, pastures, and utility and transportation corridors. Within this area, resource uses and activities include, but are not limited to, conservation (e.g. wildlife enhancement or protection), hunting, trapping, grazing, recreation, tourism, mining, gas and oil development, logging, transportation and water. Invasive plants can negatively impact all of these resources and the uses of them. Provincial Crown land is also immediately adjacent to private land throughout the region and co-ordination through the NWIPC and NEIPC (the regional invasive plant committees) and local governments is seen as integral to the overall success of the program.

1.3 Use of This Plan on Provincial Crown Land

Many areas of provincial Crown land under the jurisdiction of MoT and MFR, road systems and utility corridors in particular, serve as vectors of spread of invasive plants into wilderness areas including MoE parks, conservancies, and protected areas. Transportation corridors (e.g. roads and highways) and recreational sites (e.g. BC Parks facilities) are generally recognized as principal areas from which invasive plants can spread to adjacent high-risk sites such as sensitive and critical terrestrial ecosystems. Consequently, control of invasive plants in all areas is a critical component to successful invasive plant management.

In addition to MFR conducting invasive plant inventory/activities on lands under their jurisdiction this PMP allows partnering agencies to conduct (or allow to be conducted), invasive plant inventory/activities on areas/land over which they have jurisdiction (as outlined in Section 1.2.1), provided that the following are adhered/committed to:

- 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*).

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 MoE.

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:

Range Ecology Specialist
Ministry of Natural Resources Operations
2000 S. Ospika Boulevard, Prince George, BC, V2N 4W5
Tel: (250) 614-7433 Fax: (250) 614-7435
E-mail: Laura.Blonski@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 Crown land is also used for harvests of medicinal and food plants and fur bearing animals.

2.0 Invasive Alien Plants

The Invasive Plant Council of BC defines invasive plants as: “Any invasive alien plant species that has the potential to pose undesirable or detrimental impacts on humans, animals or ecosystems.”

Invasive alien plants are non-native plants that have found their way to BC. They cause ecological, economic and social problems for the province. Without the insect predators or plant pathogens that naturally control their populations in their native habitats, invasive alien plants can quickly spread out of control. These non-native plants may have an advantage over our native plants on disturbed sites. Often, they exhibit aggressive growth and out-compete crops and native plant species, adversely affecting economic and natural resources. The resulting invasion can reduce recreational and crop values, displace native vegetation (and therefore forage for wildlife and livestock), reduce biodiversity including species at risk, and damage native ecosystems.

Problems caused by invasive alien 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 alien plant species.

Definitions

Invasive plant - a plant that aggressively forms dense stands approaching monocultures and can cause social, economic or environmental harm. It is a species that may also be listed under the *Forest & Range Practices Act* (FRPA), Invasive Plant Regulation, administered by MFR. For this PMP invasive plant and invasive alien plant are synonymous.

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 (MAL).

Alien - plant did not exist in central or northern BC prior to European settlement and/or its natural range did not include central or northern BC historically.

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

2.1 Invasive Plant General Characteristics

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

- Early maturation;
- 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;
- The ability to parasitize other plants;
- Allelopathy (production of chemicals that inhibit the growth of other plants); and,

- High photosynthetic rates.

2.2 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 and fill;
- Forestry operations (e.g. road/landing/skid trail building and maintenance, machinery movement during harvesting, post harvest site preparation, log hauling);
- Range activities (e.g. grazing, herding livestock, supplemental feeding and building of stock trails, water developments and corrals);
- Mining operations (e.g. 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, (e.g., well drilling and pipeline construction, movement of machinery, creation of temporary and permanent openings in forest canopy cover);
- Horticultural practices (e.g. importation and planting of plant species which over time become invasive, careless disposal of garden refuse, unintentional seed introduction in soil); and,
- Recreational activities (e.g. disturbance of soil by all terrain vehicles, ATVs, and other recreational activities, spread of invasive plants by hikers, vehicles and boats, and the dumping of aquatic plants into watercourses).

2.3 The Need to Control Invasive Plants

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 may remain viable for decades). This allows such 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 these environments, thus giving them a further advantage over native species.

Invasive plants can cause ecological problems by:

- Competing with native vegetation for light, moisture and nutrients;
- Causing declines in biodiversity;
- Altering nutrient and hydrological cycles;
- Reducing soil productivity by affecting mycorrhizal fungi or changing chemistry (allelopathic chemicals);
- Negatively affecting the habitats of rare and at risk species;
- Reducing the quality and quantity of forage for grazing and browsing wildlife and livestock;
- Reducing food supplies for many plant-feeding insects;
- Decreasing water quality, quantity and fish habitat;
- Changing ecological community structure and function;

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- Increasing wildfire hazard, (e.g. broom can change fire cycles & intensity);
- Dominating sites for prolonged periods after establishment (altering the ecosystem components); and,
- Hindering restoration efforts and increasing costs to rehabilitate disturbed ecosystems.

3.0 The Integrated Invasive Plant Management Program

This section deals specifically with the objectives and steps for managing invasive plants on central and northern BC provincial Crown land using the principles of IPM.

This PMP aims to achieve effective, long-term invasive plant prevention and management compatible with both the legislated mandate(s) for their 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 treatment 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, and lower environmental impacts from control activities.

Successful implementation of an IPM program requires:

- Multiple-tactic, monitoring-based, prevention-oriented management;
- Extensive communication and cooperation among federal and provincial agencies, First Nations, local governments, private industry, and landowners;
- Implementing public education and awareness programs (in cooperation with NWIPC & NEIPC); and,
- Continued initiative and innovation by invasive plant managers.

The elements of an IPM program for this PMP are:

- **Prevention;**
- **Pest Identification;**
- **Conducting Inventories/Surveys and Monitoring Pest Populations;**
- **Establishing Injury Levels and Treatment Thresholds;**
- **Pest Treatment Options and Treatment Method Selection; and,**
- **Post-Treatment Evaluations.**

MFR [and MoE (Protected Areas Division), MAL, and MoT, who may be authorized to conduct activities under this plan] are committed to the principles and practice of IPM, and the implementation of the IPM steps as outlined on the following diagram in their integrated program to manage invasive plants:

Figure 1: The 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. The first line of prevention is stopping these alien species from entering Canada. The lead on this is the Canadian Food Inspection Agency, CFIA, <http://www.inspection.gc.ca/english/toce.shtml>. NWIPC & NEPIC, working with the Invasive Plant Council of BC and the BC Inter-Ministry Invasive Species Working group, assist the CFIA with activities such as the ‘Least Wanted Plants Project’. Regional and local knowledge is provided in assessing the risk presented by alien plants and in establishing detection systems for those plants in case they do arrive in Canada.

If an aggressive alien plant does manage to arrive in BC the most effective method of control then is to prevent it from establishing and spreading. This requires awareness and training of local residents so that they know what species to look for and how to report these new alien species; reporting systems that are linked to quick assessment processes; and, response systems that quickly plan and implement management before the alien 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 alien species do manage to establish, prevention of spread is attained not only by control treatments but also by promoting healthy ‘weed resistant’ habitats in areas not infested. Prevention of spread, habitat health and ‘weed resistance’ are effected 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 is also an important tool to establish healthy weed

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resistant plant communities and prevent the establishment of invasive plants as well as minimizing soil erosion.

The agencies developing this PMP, (MOE, MAL, MOT & MFR), through their partnership in NWIPC and NEIPC, work on education and awareness so that prevention techniques can be developed and implemented. Further information on education and preventative measures can be obtained from the NWIPC web site at: <http://nwipc.org/>

The following are examples of land management practices that, if implemented, can help prevent invasive plant establishment and/or inhibit invasive plant growth. The MFR (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 invasive plant seed and vegetative plant parts (e.g. gravel pit material used in road construction and maintenance, yard and garden waste dumping);
- 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 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;
- Remove (by cleaning or washing) plant seeds or plant parts from clothing and equipment, dislodging and containing associated water, mud and dirt;
- Keep roadside infestations sufficiently away from road surfaces so that plant parts or seeds are not inadvertently transported to uninfested areas;
- Keep equipment out of infested areas; and,
- Proactively re-vegetate disturbed areas when invasive plants are in proximity using an appropriate combination of encouraging native plants, scarification, seeding, (seed that is a grade of Common #1 Forage Mixture or better will be used for all seeding and seeding prescriptions will be developed using materials such as the seeding manual developed by NEIPC), and fertilizing and/or mulching during road, landing and skid trail construction or maintenance, or site preparation.

Preventative work requires awareness and collaboration at the international, national, provincial, regional and local levels. NWIPC and NEIPC work with the Invasive Plant Council of BC to deliver the following initiatives in central and northern BC:

- Grow me instead – a program that promotes awareness amongst nurseries and gardeners, responsible gardening and native plant alternatives to aggressive alien ornamental plants.
- Targeted Invasive Plant Solutions – TIPs – a program that promotes awareness and provides training focused on the best management practices, and Integrated Pest Management (IPM) principles, for operational activity or specific invasive plant species.
- Spotters Network Workshops - workshops designed to enable local community groups or organizations to learn about invasive plants in their area including identification, management, and reporting.
- NWIPC & NEIPC members attend local community events to provide training and promote awareness on identification of invasive plants and best management practises, reporting systems for invasive plant sites and support for integrated invasive plant management. The NWIPC 2008

Annual report table 3.2.7.3, available as a download from <http://nwipc.org/downloads.php> , lists the 68 events attended by NWIPC members in 2008.

3.2 Pest Identification

The accurate identification of invasive plants is important for the following reasons:

- To conduct invasive plant inventories and to monitor invasive plant populations;
- Control may or may not be required, depending on the plant’s growth stage, physical location, degree of invasiveness, and how widespread it is; and,
- Control methods may differ depending on the plant species. Some may be easily controlled by non-chemical methods but others may only be effectively managed through a combination of chemical and non-chemical methods.

3.2.1 Available Resources for Invasive Plant Identification

For invasive plant management it is important to have a basic understanding of plant biology, including knowledge of growth stages, life cycles and classification, so that the safest most appropriate and effective control methods may be used. There are numerous publications that will assist in the identification of invasive plants. Fact Sheets (including Weed Alerts), guidebooks and brochures and web based information will all assist in the identification, management and control of invasive plants. The following table indicates some of the web sites where information on invasive plant identification can be accessed:

Table 1: Web Sites for Invasive Plant Identification and Information in BC

NWIPC	http://nwipc.org/
BC Ministry of Agriculture and Lands	www.weedsbc.ca www.agf.gov.bc.ca/cropprot/weeds.htm www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm
Invasive Plant Council of BC (Fact Sheets)	http://invasiveplantcouncilbc.ca/
BC Ministry of Forests and Range	http://www.for.gov.bc.ca/HRA/Plants/

NWIPC and NEIPC also host training sessions each year open to all interested persons with strong encouragement for contractors to attend. The training includes invasive plant identification and the use of the inventory – information management system used by the various partners for invasive plant management in BC, (the Invasive Alien Plant Program, IAPP is web based and located at: <http://www.for.gov.bc.ca/HRA/Plants/application.htm>).

NWIPC and NEIPC also have Early Detection Rapid Response, EDRR, plans that indicate the mechanisms for confirming the identification of invasive plants newly arriving in BC.

3.3 Conducting Inventories and Monitoring Pest Populations

Inventories of invasive plant species within the plan area are required to address resource impacts of invasive plants and to effectively plan provincial, regional, and local management strategies.

Monitoring invasive plant species (especially priority species) through regular inspections is an essential planning and prevention tool. The data obtained from the invasive plant monitoring is needed to determine what action is required, if any, to reduce the possibility of their spread and to determine post-treatment effectiveness.

3.3.1 Conducting Invasive Plant Inventories/Surveys

Invasive plant inventory data pertaining to this PMP is housed within the Invasive Alien Plant Program (IAPP) Application. This comprehensive database contains and allows for extraction of relational (data and statistics) and spatial (mapping) information, and can be accessed at the following web site:

<http://www.for.gov.bc.ca/hra/Plants/application.htm>

Invasive plant inventories/surveys will generally focus on invasive plant species listed under *FRPA*, Invasive Plant Regulation, the *Weed Control Act* and Regulations, the *Community Charter Act*, and priority species as deemed by the NWIPC & NEIPC (some of which are yet to be regulated by provincial legislation).

Invasive plant inventories/surveys will be conducted in accordance with the methodology outlined in the IAPP Application reference guides.

Inventories/surveys may be conducted by truck, ATV, motorbike, bicycle, boat, by helicopter 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. For example, when conducting inventories/surveys in the rare suboreal spruce saskatoon – wheatgrass ecosystems, it is advisable to proceed by foot to reduce impact and disturbance.

Once the inventory/survey area is determined, those roads, trails and areas that are likely to be susceptible for invasion by the target species will be surveyed more closely. 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. A review of each invasive species' biogeoclimatic zone/subzone preferences may also assist in focusing survey efforts, and experience with site series or plant associations is beneficial. 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, pullouts and landings;
- Mining, gas and oil exploration and development activities
- Recreation sites;
- Openings in the forest canopy;
- Burned areas;
- Air strips;

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- Gravel pits;
- Areas where vehicle traffic and loading/unloading is common;
- Areas of heavy livestock and/or wildlife use;
- Areas where there has been recent development, or construction sites where machinery has been present; or,
- 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* or the *Invasive Plant Chemical & Mechanical Treatment Record*, (see Appendix 2). If it is a new site, then information specific to the site is recorded as well as for the invasive plant found at the site. If the site is an existing site, then only the Site ID and data specific to the survey of any invasive plant infestation found will be recorded.

The information collected (and recorded) for an invasive plant site shall include the UTM coordinates (northing, easting and zone), location, date, species, size of infestation (ha), and may include distribution, density, any pertinent site characteristics or additional information, and site photos. If the surveyor is unable to correctly identify a particular plant species as an “invasive alien”, a sample will be taken for proper identification.

3.3.2 Monitoring Invasive Plant Populations

Government staff program partners and contractors monitor target invasive plants on a regular basis. Monitoring priority invasive plant species through regular review of goals and inspections is an essential planning and prevention tool. The data and reports from monitoring are used to determine what action is required, if any, to reduce the possibility of spread and to adjust goals as defined in the NWIPC & NEIPC Plans.

Monitoring consists of an ongoing assessment of sites, activities and integration of awareness, inventory, treatment and planning to adjust goals and determine which sites in which locations have priority for treatments. Details about sites and invasive plants are documented using MFR’s *Site and Invasive Plant Inventory Record*. Information is stored and made available through the IAPP Application and the information can be used to focus monitoring efforts on high priority species in or adjacent to high-risk areas.

Monitoring provides a record of information about invasive plant occurrence, density, and site conditions. Monitoring is done visually and critical observations are recorded. All sites are assessed before a treatment prescription is developed. The prescription, which can include doing nothing, is usually developed by the crews conducting inventories and treatments just before the treatment occurs. Pre-treatment evaluations ensure that the proposed treatment is the most effective for the targeted vegetation and site.

Site integrity will be maintained by routinely inspecting and monitoring invasive plant sites for potential or existing problems. Invasive plants that threaten public safety are high priority species. Sites are monitored based on a rotational cycle. Species composition, projected growth rates, site location, and human and financial resources will determine this cycle.

3.4 Establishing Injury Levels and Treatment Thresholds

Invasive plant management is a process that continues over many years. Managers are continually prioritizing treatment areas and balancing the priorities with their resources. This process is called "setting treatment action levels." Because invasive plants are alien the preferred threshold is to prevent the alien species from entering central and northern BC, the Province of BC, western Canada and Canada. If a species manages to arrive and demonstrates or is assessed to be very aggressive attempts are made to contain the spread of the species by delineating agreed upon and shared 'Containment Polygons', (see Appendix 4). Within the contained areas and for species that have spread beyond the abilities of the invasive plant program to contain, thresholds are established to determine action. The decision to take action and apply control measures is based on the information gathered through assessment processes and from the monitoring program. Treatments are not made in accordance with a predetermined schedule, but rather when and where monitoring reveals that they are needed. All management decisions are made on a site-specific basis to the variation of physical, environmental and other factors in central and northern BC. In essence, no two sites are the same. Determining when treatments are needed involves the cooperative or shared agreement that the species on the site needs to be managed for extirpation, containment, rehabilitation or monitored.

In addition to the above, before herbicide applications can occur in Parks and Protected Areas the Area Supervisor must be notified and determine whether a Level 1 and or 2 Parks and Protected Area Impact Assessment is required.

Definitions

Injury level - the level after which the growth of a given invasive alien plant population at a specific site will cause some unacceptable impact e.g. to public safety, recreation, natural or managed ecosystems.

Treatment threshold - the level when a particular treatment should be applied in order to keep a given plant population at a given site from reaching the injury level.

Extirpation - is the permanent removal of 100% of an invasive plant species from a selected site. This is usually only attainable for a small isolated patch/clump of an invasive plant or noxious weed species and may take many years of repeated treatments.

Containment - is to keep a species population within a defined geographic area, (polygon) or outside of an established boundary. Containment will occur when there are a few localized occurrences that must be kept from expanding to new locations, essentially breaking over the defined line. Preventing or reducing access to areas with invasive plant infestations is also a strategy employed in containment. (See Appendix 3).

Rehabilitation - is used where there are widespread incidences of an invasive alien plant species. Treatments are focussed to where the impacts would be greatest if the species were left unchecked and for those species and sites for which suitable and effective bio control agents are available. Management aims to reduce invasive plant population sizes to such a level that they have a limited impact on the environment and economy.

3.4.1 Establishing Injury Levels

3.4.1.1 Prevention of establishment of invasive alien plants, EDRR

For alien invasive plant species that have not arrived in BC the approach is to prevent their introduction or to have reconnaissance systems that provide early detection and rapid removal of any sites before they have a chance to establish and spread. Invasive alien plants are kept out of BC and Canada through cooperative arrangements between the Provincial and Federal Governments. The Federal Canadian Food Inspection Agency works with the Provincial Inter-Ministry Invasive Species Working Group, IMIASWG, and the Invasive Plant Council of BC, IPC, (which NWIPC and NEIPC are members of), to develop awareness and checks to try and prevent the introduction of new alien plant species to Canada. When new species arrive NWIPC and NEIPC engage their Early Detection Rapid Response, EDRR, Plans that are based on the draft Provincial EDRR Framework being developed by IMIASWG and IPC.

3.4.1.2 Containment of aggressive invasive alien plants

When an invasive plant has established it is assessed for its aggressiveness. If there are clear indications that the species will cause significant injury without management, adequate resources are available and a shared or consensus agreement amongst the various agencies, organisations and individuals conducting invasive plant management programs in the area can be reached, a containment polygon can be established and housed in IAPP, (see Appendix 4). Outside the containment polygon all sites of the species being contained are usually managed. Management usually involves repeated inventories, treatments and monitoring but for some sites, such as extensive infestations in Pesticide Free Zones, PFZs, treatments may not occur and management may focus on increased levels of extension and monitoring.

3.4.1.3 Rehabilitating infested areas

When invasive plants establish and spread over extensive areas and are within a containment polygon or infestations are so extensive that containment polygons cannot be established a method for further defining injury level is used. This involves the categorization of invasive plants and the prioritization of sites.

3.4.1.3.1 Categorizing Invasive Plants

The range of habitats and aggressiveness within those habitats that invasive plants will infest and dominate or degrade are estimated. This is done by using an assessment tool that was developed for NWIPC & NEIPC and which will soon, winter of 2009-10, be augmented by an assessment tool developed by the IMIS WG and IPC. Some steps in the assessment include reviewing literature on the habitat range and aggressiveness of invasive plants, seeking advice from scientists and having the collective membership of NWIPC and NEIPC, which has substantial expertise and experience, assess invasive plants. The various invasive plants present or threatening central and northern BC are then categorized. The process is flexible and reviewed on an ongoing basis. When

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additional information becomes available NWIPC & NEIPC work towards consensus to retain or change an invasive plant’s category. Based on similar provincial groupings, invasive plants are assigned one of the following categories in the NWIPC & NEIPC Plans.

Table 2: Categories of Invasive Plants for NWIPC & NEIPC

NWIPC

CATEGORY 1 - EXTREMELY INVASIVE
Category 1 invasive plants invade even undisturbed habitats and dominate them. Domination implies the invasive plant becomes the most abundant species across the entire site or area of the plant community being invaded. The invasion can progress slowly or rapidly.
CATEGORY 2 - VERY INVASIVE
Category 2 invasive plants invade even undisturbed habitats. They become very prevalent and may form dense patches but usually do not dominate the entire site or area of the plant community. If category 2 invasive plants invade the entire site or plant community they tend not to dominate the site.
CATEGORY 3 – INVASIVE
Category 3 invasive plants can invade undisturbed habitats but they usually require some disturbance to gain entry. Once in a habitat they usually do not dominate the site unless there are management problems.
CATEGORY 4 - AGGRESSIVE OR UNDER BIOCONTROL
Category 4 invasive plants can invade even undisturbed habitats but they do so at a slow pace and rarely dominate the site. Category 4 invasive plants may go through large population fluctuations. This may be the result of the fluctuation in biocontrol agent populations or cyclic patterns the plant displays.

NEIPC

A. Prohibited Invasive Species	B. Primary Invasive Species	C. Secondary Invasive Species
Prohibited invasive plants are highly competitive with an ability to spread rapidly.	Primary invasive plants have the ability to spread rapidly but are not as aggressive as prohibited invasive plants.	Secondary invasive plants can spread easily but the requirement to contain them is usually site specific. Invasive plants under successful biological control and certain native plants may be included in this category.

The 2009 listing of invasive plants by category for NWIPC & NEIPC are in Appendix 3. The listing is reviewed and updated annually and can be viewed on the NWIPC web page and obtained by contacting NEIPC or any of the participants of this PMP.

3.4.2 Prioritizing Invasive Plant Sites

The size, location and surrounding habitat of invasive plant infestations need to be assessed to assist in decisions and resource allocations for invasive plant management. Based on similar provincial groupings, invasive plant sites are given a rating or priority as follows.

Table 3: Invasive Plant Site Risk Priorities for NWIPC & NEIPC

NWIPC

PRIORITY	PURPOSE OR INTENT
1 Extremely High Opportunity for Control	To stop the spread of invasive plants threatening currently un-infested, highly susceptible areas. These sites are less than or equal to 0.25 ha and there is a good expectation of control. This priority also includes sites that are threatening a large neighbouring economic base, for example, seed and other high value crops.
2 High Opportunity for Control	To stop the enlargement of sites in highly susceptible areas. These sites are less than or equal to 0.5 ha. Must have a reasonably good expectation of control.
3 Moderate Opportunity for Control	To stop the enlargement of sites 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.
4 Low Opportunity for Control	To stop the enlargement/contain sites greater than 0.5 ha in moderately susceptible areas.

NEIPC

Priority or Opportunity for Control	Site condition / management intent or goal
1 Extremely High	A relatively small infestation (up to ¼ ha or ½ acre) likely to spread to large highly susceptible areas or high value crops (e.g. certified seed). Intent is to prevent establishment or spread, and to eliminate the local population. Effective treatment (eradication or containment) is critical.
2 High	Moderate sized infested area (about half a hectare or 1 ¼ acres) in susceptible areas, and with a good expectation that control will be effective. Goal is to contain the infested area.
3 Moderate	Larger infested area (greater than half a hectare or 1 ¼ acres) in less susceptible areas, and with some expectation that control will be effective. Goal is to stop the enlargement of the infested area.
4 Low Opportunity for Control	Infested areas larger than five hectares or 12 acres, where control would require prohibitively high investment of resources Goal is to reduce the damage from the infested area if possible, or at least record changes in the extent.

3.4.3 Establishing Treatment Thresholds

With some applications, the treatment threshold may be reached when the plant population has reached unacceptable numbers. For other types of applications or controls, (e.g. release of biological control agents), the treatment might be applied at a stage in the plant’s life cycle rather than at a particular population level. Some treatments are better suited to dealing with large plant populations for reasons of economies of scale. In some cases there may be no tolerance for invasive plants 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

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much greater. This decision relates directly to the sites threatened or 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). 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. Regardless, setting treatment thresholds is often a function of the available financial and human resources.

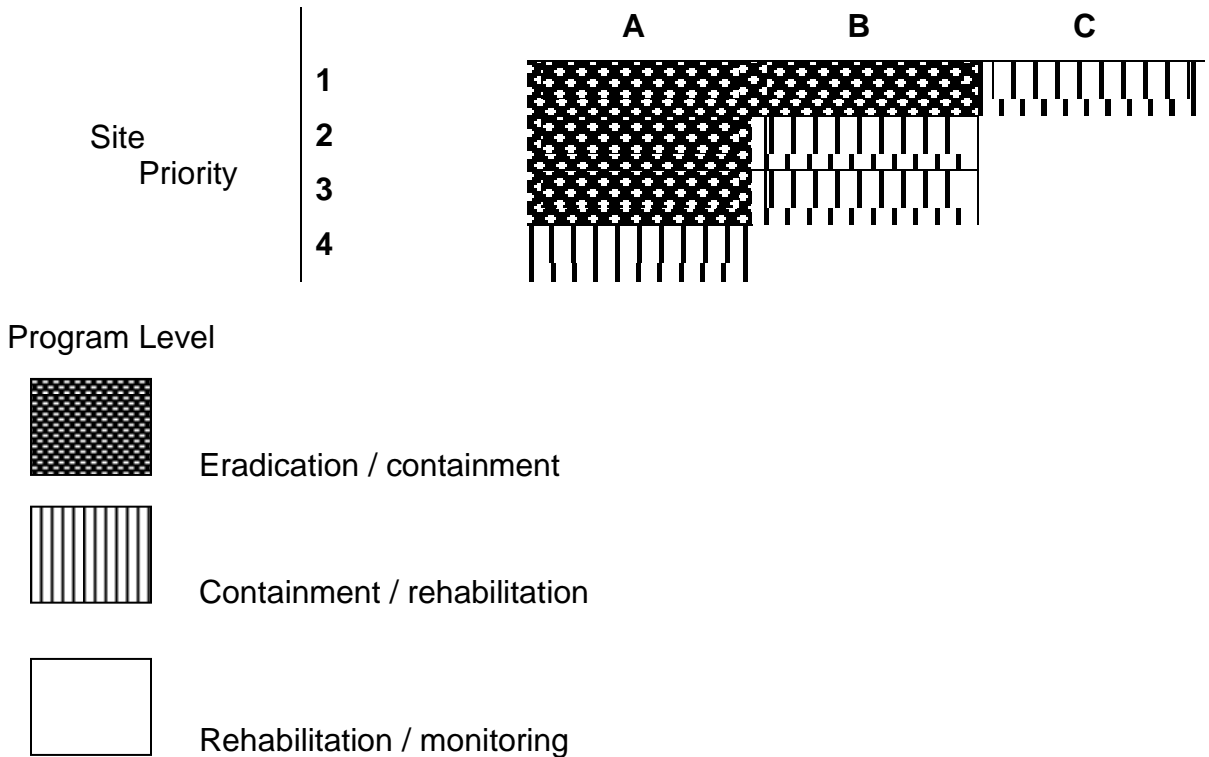
The following tables illustrate the various combinations of site risk priorities and species category classes used to establish a control strategy/treatment priority. The number of sites and allocation of funding also influence overall program control strategy.

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Table 4: Treatment Thresholds and Program Levels for NWIPC & NEIPC

IP CATEGORY	SITE PRIORITY	NWIPC PROGRAM LEVEL
1	1	Critical program level, EDRR & Containment - control is required. The immediate requirement is to prevent newly arriving and invasive plants that have low population in northwest BC from establishing and or spreading. The goal is to eliminate the local population of the IP or to prevent spread from defined areas.
1	2	
1	3	
2	1	
2	2	Control program level - doesn't deal with all invasive plant problems but keeps things from getting worse. The need for control treatment is reviewed in the context of the support and demands of other agencies, area residents and goals for the area. The requirement is to identify the areas infested with invasive plants and those habitats that are not infested and use this information to prevent further expansion of invasive plant populations.
2	3	
3	1	
1	4	
2	4	Comprehensive program level – all new invasive plant infestations controlled, established infestations contained and work begins on rehabilitation of infested areas. Rehabilitation will be attempted when biological control agents are available and effective. Rehabilitation using methods other than biological control will not be undertaken unless specific requests are made and action or treatments can be justified by an analysis of risks costs and benefits.
3	2	
3	3	
3	4	

NEIPC
Invasive Plant Category



3.5 Pest Treatment Options and Treatment Method Selection

Treatments occur only when **monitoring** indicates **thresholds** have been reached and **treatment** is necessary. Several methods are selected from educational, biological, cultural, manual, mechanical, and chemical control tactics, and then integrated into a treatment program. Vigilant record keeping is cornerstone to the program’s success. The provincial IAPP Application is where records are and will be kept: <http://www.for.gov.bc.ca/hra/Plants/application.htm>

3.5.1 Treatment Method Selection

The integration of a number of treatment strategies into an IPM program has been shown to be more effective than using a single option alone. Generally, no single method will control an invasive plant infestation in a single treatment. The success of different treatment methods depends on the type of invasive plant you are trying to control and the characteristics of the site. The choice of a treatment method(s) generally relates to specific invasive plant and site characteristics. Treatment selection is based on information compiled from invasive plant and site monitoring results.

General conditions associated with use of treatment options are shown in the following table:

Table 5: 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 (flaming))	<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 rehabilitation (to some extent) by seeding or other activities
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 • feasibility increases if there are livestock industries in the area • experience in managing and handling livestock is needed • infrastructure such as fencing to contain livestock, watering facilities, etc are sometimes needed
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 and St. John’s wort within the PMP area
Chemical (i.e. judicious, strategically targeted use of herbicides)	<ul style="list-style-type: none"> • reasonable efforts to use effective non-chemical means have been exhausted • 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, pesticide free zones (PFZ), no treatment zones (NTZ), or public use areas.
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Other considerations include seasonality, weather conditions, financial and human resources, site accessibility, site conditions, target species composition and percent cover, and the consequences of not treating.

3.5.2 Pest Treatment Options

IPM involves the use of different techniques to control invasive plants. When treatment thresholds are met or surpassed, the following treatment option or options will be considered:

- Manual and mechanical control (**non-chemical**);
- Cultural control (**non-chemical**);
- Use of biological control agents (**non-chemical**); and,
- Selective and spot, (*IPM Act Reg 77.1 spot = not more than 1.5 m from targeted plant*), applications of herbicides (**chemical**).

3.5.2.1 Manual and Mechanical Control

Manual and mechanical control methods that may be used in the integrated invasive plant management program include:

- Covering/Smothering;
- Cutting;
- Digging/Excavating;
- Girdling;
- Hand pulling;
- Mowing;
- Pruning;
- Stabbing;
- Irrigating or spaying with ocean water;
- Tilling; and
- Spot burning (Flaming).

Rationale, Selection Criteria, and Benefits of Using Manual and Mechanical Control

Manual and mechanical methods of invasive plant control:

- 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);

- Are sometimes an effective approach to reduce invasive plant infestations or limit their movement off site; and
- Have only small and short-term impacts on fish and wildlife.

Limitations of Manual and Mechanical Control

- If rare, endangered or protected wildlife or plants and plant communities are present then the number of people and degree of activity to manage invasive plants can negatively impact the species of concern.
- Mowing is less effective on low-growing plants that are growing beneath the mowing height, and can result in more stems being produced (because it cuts the tops of plants, allowing more buds to grow), and cannot be done when flower-feeding bio-control agents are working on a site;
- Cutting effectiveness is largely dependent on the plant species, stem diameter, time of cut, and age of the plant;
- Irrigation or spraying with ocean water is only possible for sites adjacent to the ocean and if rainfall is not adequate to flush the soil salination issues may occur;
- Flaming can pose safety issues for both workers and the environment;
- Some invasive plant species respond favourably to burning and/or mowing;
- Covering/smothering can be very costly and labour intensive, as treatment sites require regular monitoring to detect and repair torn material(s);
- Covering/smothering can also impact the site by causing increase soil compaction;
- Excavating can be very costly and labour intensive as complete removal of all root fragments must be obtained to prevent re-growth; and,
- Rehabilitation and restoration, including prompt re-establishment of native vegetation, is highly recommended to prevent erosion and the re-establishment of invasive plants; and repeated follow-up treatments must be conducted to remove all new germinants, often for 3-5 years, sometimes longer. The availability of seeds or seedlings of native plants is often very limited.

Disposal of Invasive Plants/Plant Parts Following Manual or Mechanical Treatments

Proper disposal of invasive plants or invasive plant parts following manual or mechanical treatments is very important. As a general rule, invasive plants, plant parts and seeds should be bagged and disposed of in a landfill or other designated disposal site. Information on proper disposal for specific invasive plant species can be found at the Invasive Plant Council of BC web site:

<http://www.invasiveplantcouncilbc.ca/resources/targeted-invasive-plant-solutions-tips>

3.5.2.2 Cultural Control

Targeted grazing is the only cultural control method currently available for the integrated invasive plant management program.

Rationale, Selection Criteria, and Benefits of Using Targeted Grazing

Targeted grazing (e.g. using livestock, cattle, goats, sheep, etc) for invasive plant control:

- Can be economical particularly if local livestock producers are willing to cooperate;
- May retard plant development and seed formation and gradually deplete root reserves (by the continual grazing of the tops of young plants); 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;

Limitations of Targeted Grazing

- Is a “non-selective treatment” therefore sometimes native or desirable vegetation is eaten in conjunction with the targeted invasive plants;
- Can impact the site by causing increased soil compaction and fecal contamination of water, and,
- Animal husbandry and transportation costs can be prohibitive.

3.5.2.3 Biological Control Agents

It is the intent of the MFR to introduce biological control agents when and where appropriate to reduce invasive plant populations. Biological control agents (predominately insects) are released to attack and weaken target invasive plant species and over time reduce their population size.

A complete listing of biological control agents that are in general use and those being developed for invasive plants in British Columbia is available on-line at:

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

The biological control agent plan for central and northern BC that lists the agents and number of releases is updated annually and can be found under downloads on the NWIPC web page: <http://nwipc.org/index.php>

Rationale, Selection Criteria, and Benefits of Using Biological Control Agents

- Have proven effective in reducing populations and plant vigor on sites with well-established invasive species populations;
- Are typically utilized in areas where invasive plant infestations and distribution are too extensive to be reduced effectively by other treatment methods;
- Once established provide inexpensive long-term management of invasive plant populations;
- Field releasing is relatively inexpensive and scheduling with other duties keeps release and monitoring costs low;
- Reduce invasive plant populations below a level where significant environmental or economic damage occurs; and,
- There are very few known worker and public safety issues associated with releasing biological control agents.

Limitations on Using Biological Control Agents

- After their introduction, biological control agents can take 5 to 10 years to become established and increase to numbers large enough to cause damage to the target plants;
- Ongoing monitoring is required to determine establishment, dispersal and impact on invasive plant populations;
- Does not result in elimination of the invasive plant species from sites and sometimes several agents are required to have any measurable impact on invasive plant vigor or populations;
- Some specialized equipment and training is required for transporting, releasing, distributing and monitoring biological control agents;
- Costs to study, rear and screen agents for release are high and the time to develop a bio control agents can be very long, decades;
- Biological controls are not available for very many invasive plant species; and,
- There is some uncertainty as to whether native flora and fauna are impacted by release of biological agents.

3.5.2.4 Applications of Herbicides

All herbicide applications under this PMP will be targeted to invasive plants with an emphasis on minimizing damage to non target species. Existing populations of invasive plants may not necessarily be treated, but rather, prevented from expanding further (i.e. beyond a defined containment polygon). The focus of treatments will be on “leading edges” (i.e. perimeter edges) or gaps between treatment areas that pose risk of further spread into priority sites. Application techniques will be selected that minimize injury to non-target plants and soils through spray drift and leaching in soils.

Rationale, Selection Criteria, and Benefits of Using Spot Applications of Herbicides

Herbicides offer a useful tool that can be integrated with other invasive plant management techniques. For example, herbicides are used to initially treat infestations so that the size of the infestation can be reduced making manual treatments feasible; early summer herbicide treatments of large number of rosettes and seedlings are often followed with late summer and fall manual treatments of mature plants; herbicide treatments are used for the core of larger sites while manual treatments are applied to the edges and outrider plants; and fertilizers and herbicides are integrated to improve management of invasive alien plants.

- With the exception of biological control agents, the economic costs of treating many invasive plant sites with herbicides may be significantly lower than other treatment methods and efficacy or degree of control is usually much higher;
- It is very unlikely that manual, mechanical or cultural techniques alone will be effective at achieving the required level of control to reduce the spread of invasive plants and

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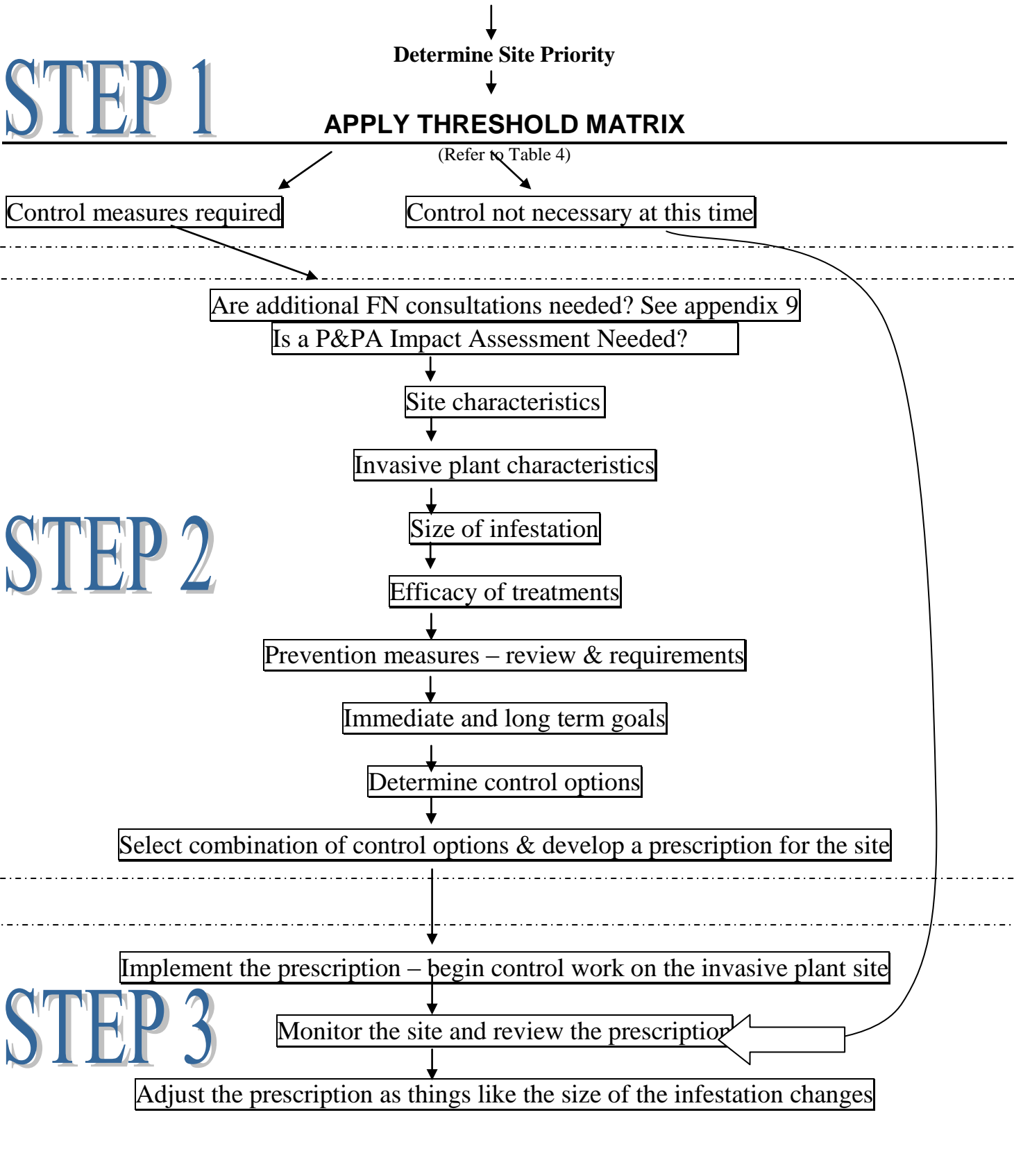
manage existing infestations at priority sites due to the specialized biology and persistence of invasive plants;

- The use of herbicides applied at prescribed label application rates will provide excellent control of target invasive plants (i.e. listed on the label); and,
- The impacts resulting from judiciously applied, targeted use of specific herbicides (that readily break down in the environment) may be less significant than the degradation of habitat as a result of invasive plant infestations (i.e. “biological pollution”).

Limitations on Using Spot Applications of Herbicides

- With the exception of herbicides containing the active ingredient glyphosate as outlined in the Integrated Pest Management Regulation section 74, herbicides cannot be applied to invasive plants growing within 10 meters of water bodies, dry streams, or classified wetlands;
- At least one follow-up application is generally required to give total control of most invasive plant species though often follow-up treatments can be manual such as hand pulling; and,
- Exposure to herbicides may present a risk to workers, the public and untargeted species of plants and animals (e.g. wildlife).

Figure 2: Flow Chart for Determining Pest Management Options
Identify Invasive plant(s) & Determine Invasive plant Category(ies)



3.6 Post Treatment Evaluations

Selected treatment sites will be inspected and evaluated to ensure:

- Compliance with the commitments made in this PMP;
- Compliance with the *IPMA* and *IPMR*;
- The required level of control was achieved by the treatment;
- The treatments were necessary and appropriate to attain the goals outlined in the *NWIPC* and *NEIPC* strategic plans and the various Invasive Plant Management Area, *IPMA*, plans; and,
- Information is collected and shared.

Agency staff, *NWIPC* & *NEIPC* Partners or qualified contractors will undertake post-treatment monitoring at selected treatment sites. Records and data collected will be entered into the *IAPP* Application. Each year *NWIPC* & *NEIPC* prepare a monitoring plan that is presented to, approved and implemented by the membership. The *NWIPC* monitoring plan is posted on their web page at: <http://nwipc.org/index.php>

When evaluating the results of both chemical and non-chemical controls, the following information/data shall be collected (by visual observations / see Section 3.6.3 and appendix 9 for monitoring – sampling proposal) and recorded:

- Whether the control technique(s) chosen provided acceptable control;
- Whether environmentally sensitive areas were adequately protected;
- Whether the established *PFZs* and *NTZs* were appropriate for the treatment method used;
- Whether there was any observable off-site herbicide movement or impact on surrounding or adjacent non-target vegetation or soils in the area;
- Whether the herbicide application rate needed to be adjusted based on the results;
- Whether there was re-growth of invasive plants treated by manual or mechanical methods;
- Whether there was need for follow-up treatments at the site;
- The cost-effectiveness of the treatment program;
- If inspected within 2 weeks of herbicide treatment, whether signage at the site was present and appropriate.

The timing and procedure for evaluating specific treatment programs will depend on the treatment method. Agencies operating under this PMP shall take reasonable efforts to ensure that treatment sites are evaluated within one year of the treatment.

The success of biological control releases will be evaluated for agent establishment within 2 years after release for applicable species. Once establishment is verified assessment of dispersal and efficacy of the agent will occur.

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.

3.6.2 Detection of Non Compliance

As indicated in the NWIPC monitoring plan and Section 6.2.4 of this PMP, when contraventions to this PMP are found through monitoring an incident specific process will be initiated that includes immediate notification of the Ministry of Environment, Environmental Protection Division. Staff from that Division is chairing the NWIPC Pesticide Issues Committee and notification will be passed on to the committee members including the Ministry of Forests and Range Invasive Plant Specialist and the Program Manager for NWIPC. If the incident is in the NEIPC operating area, the Coordinator for NEIPC will receive immediate notification. All other government and non government agencies and organizations that may be impacted will be notified.

An incident specific process will be developed. This usually involves the development of a work plan, either by NWIPC and NEIPC members or an independent consultant, for review, adjustment and approval. The process may include sampling of water courses and or wells and determination of the relevant environmental standards. The Contaminated Site Regulations and Canadian Water Quality Guidelines set forth by the Canadian Council of Ministers of Environment as well as No Observed Effects Levels, NOELs as discussed in appendix 5, Table 12, may be used. If levels of herbicides are found to exceed the standards decided on, herbicide applications in the effected water shed will be stopped. If required additional sampling will occur and the Ministry of Environment and impacted parties will be consulted on further actions and mitigations.

3.6.3 Pesticide Use and Water Quality Monitoring & Studies

Concerns about contamination of watercourses with herbicides and potential impacts of such contamination on fish were expressed during consultations in the development of this PMP. There were requests to monitor water quality.

Washington State Department of Ecology conducts studies and regular monitoring of herbicide applications when those applications are made directly to water courses. (See: <http://www.ecy.wa.gov/biblio/pesticidemonitoring.html>). Results of this monitoring are published, for example, “2004 Freshwater Emergent Noxious and Quarantine Weed Water Quality Group Monitoring Plan Results” (http://www.ecy.wa.gov/Programs/wq/pesticides/final_pesticide_permits/noxious/monitoring_data/2004_noxious_emergent_monitoring_results.pdf) and “2007 Annual Group Monitoring Results for Herbicide Applications to Freshwater Emergent Noxious and Quarantine Weeds Pre-formed Under the Noxious Weed National Pollutant Discharge Elimination System (NPDES) Permit (<http://agr.wa.gov/plantsinsects/weeds/npdespermits/docs/MonitoringResultsFreshwater.pdf>). An example of the results is 4 out of 5 knotweed sites stem injected with glyphosate had no detectable concentrations of glyphosate after the treatment.

This PMP does not involve the application of herbicides to water courses and has buffer and pesticide free zones to reduce risks of pesticide contamination to water courses. Also, it is not within the authority or available resources to conduct this level of monitoring solely under this PMP. As in Washington State, such monitoring needs to occur and be led at the State or Provincial Level. NWIPC

& NEIPC will be asked to promote and support such monitoring. Appendix 9 indicates this as an ongoing consultation issue with this PMP. To ensure that reliable data are collected and appropriately maintained the Washington State Procedures, such as: “Annual Group Monitoring Plan For Lake and River Aquatic Herbicide Applications performed under the Noxious Weed National Pollutant Elimination System Discharge (NPDES) Permit”

(http://www.ecy.wa.gov/Programs/wq/pesticides/final_pesticide_permits/noxious/monitoring_data/lakes_monitoring_plan.html) will be cited.

4.0 Operational Information

The operational information included 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. MFR, MoE, MAL, and MoT 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;
- Have available proof of certification;

- Supervise no more than 4 uncertified assistants at one time;
- Maintain contact, auditory and/or visual, with the uncertified assistants; 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 shall 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 shall be kept in their original containers and with original labels. If original labels are not available, the herbicides shall be placed in appropriate containers that have the trade name, active ingredient concentration and pesticide registration number affixed to the outside of the container;
- Ensure that the vehicle is equipped with a first aid kit, fire extinguisher, spill contingency plan and kit, and that the vehicle operator has been trained on how to handle spills;
- Ensure that all documents and placards are carried in, or placed on, transport vehicles if required under the *Transportation of Dangerous Goods Act*, the *IPMA* or the *IPMR*; and,
- Ensure that the vehicle operator reads and understands the herbicide labels and the product Material Safety Data Sheet (MSDS) for all herbicides being transported.

4.3 Procedures for Safely Storing Herbicides

The plan holder shall 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 Workers' Compensation Board document *Standard Practices for Pesticide Applicators*;
- Keep herbicides in their original containers and with original packaging. If original packaging is not available, the herbicides shall be placed in appropriate containers that have the trade name, active ingredient concentration and pesticide registration number affixed to the outside of the container;
- Ensure that storage facilities are locked when left unattended, ventilated to the outside atmosphere, are entered only by persons authorized to do so, and that there is a placard affixed and maintained on the outside of each door leading into the storage area bearing, in block letters that are clearly visible, the words "WARNING – CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY";
- Keep storage facilities separate from work and living areas, and away from food, flammable materials, bodies of water and water sources;
- Ensure the storage facility is equipped with necessary spill equipment, first aid kits, and the appropriate Material Safety Data Sheets of herbicides stored;

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- 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 them. 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 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 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 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 this integrated vegetation management plan, 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. This will help ensure that quantities of herbicides being mixed and used are consistent with labels;
- 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 and surfactants to dilute herbicide concentrations.

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

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

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

- Ensure that all herbicide waste is disposed of in a manner consistent with 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 5.3 (procedures for safely storing herbicides).

4.6 Procedures for Responding to Herbicide Spills

The plan holder shall ensure that ministry personnel and/or contractors follow these procedures for responding to herbicide spills within the Plan Area. If contractors that work under this PMP have their own spill response plan, they must meet or exceed the following 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 (3 m x 3m minimum), dustpan and shop brush, flagging tape and rope, a herbicide first aid kit, and personal protective clothing/equipment (rubber gloves, safety glasses); and,
- Ensure that the following spill procedures are followed if a herbicide spill occurs within the plan area:
 1. All personnel shall be protected from herbicide contamination by wearing appropriate protective clothing and safety gear;
 2. Any person exposed to a herbicide shall be moved away from the place of the spill;
 3. First aid should be administered, if required;
 4. The source of the spill should be stopped;
 5. The spilled material should be stopped from spreading by creating a dam or ridge;
 6. The project supervisor shall ensure operations cease until the spill is contained and the source is repaired;
 7. Absorbent material shall be spread over the spill, if applicable, to absorb any liquid;
 8. The absorbent material shall be collected in garbage bags or containers with the contents clearly marked, removed from the spill site, and placed in garbage bags or containers;
 9. When more than one litre of herbicide is spilled, the person responsible for the project will immediately report it to the Provincial Emergency Program by telephoning 1-800-663-3456 or, where that is impractical, to the 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.

4.7 Identification of Each Herbicide That Will Be Used Under the Plan, the Manner of Its Application, and the Type of Equipment Required for Each Manner of Application

The herbicide active ingredients proposed for use under this PMP, their manner of application, and the type of equipment required for each manner of application are outlined in the following table. Section 5 and Appendix 5 also have information on parameters for herbicide selection such as persistence, mobility and soil factors. The collection of information is summarized and updated annually by NWIPC & NEIPC and provided as a tool to crews to assist in selection of herbicides in developing prescriptions that include herbicides – see Appendix 6. It must be noted that each herbicide active ingredient listed in this table may be registered for sale and use in Canada as one or more products (e.g. the active ingredient glyphosate is currently available in over 120 registered products). Any or all products that are registered for sale or use in Canada, and that contain one or more of the active ingredients proposed for use, may be used within this PMP:

Table 6: Herbicide Active Ingredients Proposed for Use. (Applications rates are indicated on the product labels and all applications will be at those rates or lower).

Active Ingredient	Preferred Target Species
Aminopyralid (Milestone)	Many broadleaf invasive plants
Aminopyralid + 2,4-D (Restore)	Many broadleaf invasive plants
Aminopyralid+Metsulfuron-methyl (Clearview or equivalent)	Most broadleaf invasive plants
Aminopyralid+Metsulfuron-methyl + 2,4-D (Reclaim or equivalent)	Most broadleaf invasive plants
Picloram (Tordon 22K)	Most broadleaf invasive plants Canada Thistle Leafy Spurge & Toadflax
Picloram, 2,4-D (Grazon or Tordon 101)	Broadleaf invasive plants
Clopyralid (Transline, Lontrel or Equivalent)	Species in the Compositae family
Glyphosate (Round-up or equivalent)	All plants (non-selective)
Metsulfuron methyl (Escort)	Canada thistle, Perennial pepperweed, Common Tansy, Field Scabious
Dicamba (Banvel, Vanquish or equivalent)	Hoary Alyssum
2,4-D (Amsol 2,4-D Amine 500 or equivalent)	Broadleaf invasive plants (use on coarse texture soils in preference to products containing dicamba or picloram and only with the most selective of application techniques – see table 13.)
Tryclopypyr, (Garlon, Release, Remedy or equivalent)	Most shrubs and trees
Surfactants	On plants with physical characteristic limiting uptake of herbicide

4.7.1 Description of Application Equipment Proposed for Use

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

Backpack 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 or into or onto freshly cut stems and stumps.

ATV/Quad: 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.

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

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

Injection Tools: Used to inject herbicides into individual stems.

Truck mounted sprayer: Trucks equipped with a pump, holding tank for spray mix and nozzles (low pressure) attached to handguns, booms and or boomless nozzles used for the spot and broadcast applications of herbicides onto foliage

5.0 Environmental Protection Strategies and Procedures

All invasive plant management activities proposed for use under this PMP will incorporate:

- Strategies to protect community watersheds;
- Strategies to protect domestic and agricultural water sources;
- Strategies to protect fish and wildlife, riparian areas, bodies of water and wildlife habitat;
- Strategies to prevent herbicide contamination of food intended for human consumption;
- Pre-treatment inspection procedures for identifying treatment area boundaries;
- Procedures for maintaining and calibrating herbicide application equipment; and
- Procedures for monitoring weather conditions and strategies for modifying herbicide application methods for different weather conditions.

In this PMP, all PFZs and NTZs will comply with the standards contained in Division 7 of the IPMR.

5.1 Scientific Resources Used in Determining Risks, Mitigations, Standards and Guidelines.

Invasive alien species present a serious risk and the intent of the PMP is to manage and reduce that risk while minimizing negative aspects and risks associated with treatments used to manage invasive alien plants. There is a significant amount of science documenting the risks that alien invasive species present. For example, from the United Nations <http://www.fao.org/docrep/008/y5968e/y5968e14.htm>

“Biological invasions by alien species are now considered the second leading factor in biodiversity loss globally; on islands, invasive alien species are considered the main factor contributing to extinctions of native vertebrates (mammals, birds etc). The impacts of invasive alien species on biodiversity and ecosystem functioning are immense, insidious and often complex. Directly or indirectly, these impacts have ramifications for sustainable development and poverty alleviation (see also: Office of Technology Assessment, 1993, Lowe *et al.*, 2000).”

5.1.1 Scientific Resources in Regards to Risks from the Use of Chemical Herbicides

A large volume of scientific studies, information and experience is used to reduce risk to the environment and health when using chemical herbicides. In order to use an herbicide it must have passed rigorous review and re-assessments as required by Health Canada. The restrictions and requirements for protective measures such as buffer zones to water courses are determined by this research and incorporated on the Product Label. Health Canada also 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. The Government of BC can impose further restrictions and protective measures on the use of Pesticides on Crown Land using the *Integrated Pest Management Act, IPMA*. This PMP adheres to the restrictions and protective measures from Health Canada and the *IPMA* as minimum requirements and may impose further restrictions and protective measures to meet regional and local needs. Additional information on the science, status of herbicides in the PMP and strategies in selecting herbicides is contained in Appendix 5.

5.1.2 Pest Control Products Act, Health Canada and the Pest Management Regulatory Agency, PMRA

The use of herbicides in Canada is regulated under the *Pest Control Products Act*. The Pest Management Regulatory Agency, PMRA, a branch of Health Canada, conducts scientific evaluation and decision-making process for pest control products in Canada. PMRA employs over 300 qualified scientists dedicated to the evaluation of pesticides, many of whom have doctorates and masters credentials in the fields of human health sciences, environmental and agricultural sciences. For an initial product registration or for a re-evaluation of an existing product thousands of studies are submitted, reviewed and used to determine if a pesticide will be registered or acceptable for continued registration and if so what restrictions and use conditions, such as buffer zones, will be required. As part of the assessments, PMRA reviews of all relevant information, including the database of studies provided by registrants, published scientific reports and journal articles where appropriate, regulatory reviews by US EPA and other countries, and use pattern information from various surveys and sources.

Assessment of Acceptability

- Integrate scientific assessments from the various streams (i.e., Health, Environment, Value, Chemistry)
- Dietary and non-dietary health risks as well as environmental risks must be evaluated to determine if a new pesticide or use is acceptable for registration, or if an existing pesticide is acceptable for continued registration
- Value considerations: efficacious, phytotoxicity, lowest effective rate, socio-economic considerations

Considerations

- Complete scientific data base for all areas
- Adequacy of submitted data for all areas
- Encumbered by other issues e.g. very persistent compound
- Risk management considerations e.g. conditions of use; use changes; rate changes; compliance
- Other mitigation measures e.g. buffer zones, protective equipment, application equipment

Registration Decision

Options:

- No registration if health or environmental risks or value unacceptable
- No registration if there is insufficient information
- Yes if risks and value acceptable
- Yes with conditions (e.g. confirmatory chemistry data; long-term monitoring)

Consultation

- Public consultation on all proposed major regulatory decisions for both new registrations and re-evaluations (generally 60 day comment period)
- All comments considered and assessments are revised as necessary
- Decisions are published and includes responses to comments
- Stakeholders have option of filing a science-based notice of objection within 60 days of the decision

**The use of a pesticide other than indicated on the label is a contravention of the
*Pest Control Products Act***

5.1.3 *Integrated Pest Management Act*, BC Ministry of Environment, Integrated Pest Management Program, Environmental Protection Branch

Under the *Integrated Pest Management Act* and its Regulations additional risk management considerations and conditions of use can be applied to herbicide use on Crown Lands. For example, Regulation 73 & 74 of the *IPMA* Regulations applies a Pesticide Free Zone which, for aminopyralid, exceeds the conditions on the label.

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The BC Ministry of Environment can be contacted for information, input and consultations on scientific information at: <http://www.env.gov.bc.ca/epd/ipmp/contacts.htm>

Pest Management Plans developed under the *IPMA*, in consideration of local conditions and other factors, can apply additional considerations and conditions of use. Through partnership with NWIPC and NEIPC the proponents support research evaluating treatments such as salt water treatment of knotweeds, targeted grazing and development of bio control agents as well as Timing Rate Trials for herbicides. Information on these studies and projects can be found on the NWIPC web page at: <http://nwipc.org/>

NWIPC & NEIPC, working with the BC Ministry of Agriculture and Lands produce, update and supply herbicide use guidelines each year to crews working under this PMP. PMRA information, including re-evaluation reports, and changes to the *IPMA* and regulations as well as other trials and studies, such as timing – rate trials, are reviewed to update these guidelines. The draft 2010 Guidelines are in Appendix 6.

Appendix 5 contains a series of tables with information on the PMRA Status, science, environmental, toxicological and other parameters used to assist in deciding when herbicides will be used and which herbicides should be considered in prescriptions. In summary the following strategies and science are used to protect the environment when using herbicides:

1. Treatment is necessary as indicated by this PMP and NWIPC & NEIPC Strategies. That is, a serious environmental, economic or cultural risk exists from the establishment or spread of an invasive alien plant species and the site has been detected early enough that management is feasible.
2. Reasonable efforts to use effective non-chemical means have been exhausted.
3. Site characteristics including soil texture, target and competing vegetation, slope, distance to water courses, probability of shallow aquifers, uses and potential uses are assessed.
4. Characteristics of the invasive alien plant species are determined to indicate the most suitable times for treatments by different methods, efficacy of various treatment methods and time frame for re-visits to the site.
5. Herbicide characteristics such as mobility, persistence and ecological impacts are assessed in respect to site characteristics and it is determined that use of an herbicide possess no or minimal risk.
6. Application methods such as spot spraying, wick application and stem injection are assessed in respect to site characteristics and an application method is selected that reduces any possible risks from herbicide use.
7. A treatment prescription that integrates the treatment tools with the invasive plant characteristics and site characteristics is developed, implemented, monitored and adjusted. For example, treatment of an aggressive newly arrived alien plant may be with herbicides using a wick applicator after the target plant has bolted followed by ongoing manual treatments for several years. Prescription and monitoring information are housed in IAPP.

5.2 Strategies and Procedures to Protect Community Watersheds

Under this plan, herbicide applications proposed to occur within 100 meters of a community watershed boundary will, if applicable, abide by the following strategies and procedures:

- The location of community watersheds to be protected will be verified by accessing the Community Watershed Database, maintained by the BC Ministry of Environment, at the following web site; http://www.env.gov.bc.ca/wsd/data_searches/wrbc/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.asp>
- 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;
- A 30 meter PFZ shall be maintained down slope from licensed water intakes within the community watershed;
- A 100 meter PFZ shall be maintained upslope from all licensed water intakes within the community watershed;
- All PFZs shall be measured and marked/flagged prior to herbicide use; and
- Herbicide use shall 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.

5.3 Strategies and Procedures to Protect Domestic and Agricultural Water Sources

The plan holder shall ensure that prior to herbicide applications for invasive plant management, strategies are developed and implemented that identify and protect domestic and agricultural water sources. The table below describes the minimum protective measures that shall be implemented. The NTZs in this table reflect the standards as specified in Sections 71(3) and 71(4) of the IPMR.

Table 7: 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	May reduce the NTZ under section 71(3) if reasonably satisfied that the smaller zone will	NTZ at discretion

	except bacterial pesticides	ensure that pesticide from the use will not enter the water supply intake or well	of applicator
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Definition: **No-treatment zone (NTZ)** – an area of land that must not be treated with pesticides. NTZs will be identified, marked/flagged prior to any herbicide application.

The plan holder shall ensure that, prior to herbicide applications for invasive plant management, 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 and/or by attempting to contact the owner/occupier of the land prior to herbicide applications.

5.4 Strategies for Protecting Fish and Wildlife, Riparian Areas, Bodies of Water and Wildlife Habitat

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

- Ensure that whenever herbicide, manual or mechanical control methods are applied, efforts are made to eliminate 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 if selective treatment is used. If the water in the ditch is temporary and free-standing (is not flowing into other water bodies) and at no time is, or flows into, a fish bearing water body, then glyphosate can be applied up to but not below the high water mark of the ditch.
- 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 protective measures may be implemented, where possible;
- 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 MFR 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 whenever control methods involving herbicide applications are proposed the buffers, other restrictions, application methods and such described in Sections 5.1, 5.2, 5.3 and 5.4 are adhered to. This should reduce or eliminate the risk of effects, both individual and population, on non target and aquatic biota.
- Ensure that best management strategies (as derived from documents on species habitat, lifecycle information and locations) are practiced during invasive plant management;

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- 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, riparian areas, bodies of water and wildlife habitat during the course of the work.
- In order to reduce invasive plant control impacts on fish and wildlife, riparian areas and wildlife habitat, ensure 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 a requirement to install descriptive flagging such as “Riparian Zone” and “Pesticide-Free Zone” placed at appropriate intervals.

Table 8: PFZ Requirements under the IPMR When Applying Herbicides for Invasive Plant Control

• Permitted Application	PFZ	Regulation Section
<p><u>Non-glyphosate and aminopyralid Applications</u></p> <p>Around or along a body of water or dry stream and classified wetland using any pesticide except glyphosate, subject to label restrictions and including all application methods</p>	10 meter PFZ	73(1)
<p><u>Glyphosate Applications</u></p> <p>If the glyphosate product is applied by selective application methods up to but not below the high water mark of temporary, free-standing bodies of water that are not fish-bearing at any time of the year and do not drain directly into a fish-bearing body of water</p>	1 meter PFZ above the high water mark	74(2)(a) and 77(2)
<p>If the glyphosate product is applied by selective application methods over a dry stream that is not fish-bearing at any time of the year and do not drain directly into a fish-bearing body of water</p>	0 meter PFZ	74(2)(b)
<p>If the glyphosate product is applied by selective application methods in proximity of a body of water or a classified wetland that is fish bearing or that drains directly into a fish bearing body of water or a dry stream that when wet is fish bearing or drains directly into a fish bearing body of water</p>	2 meter PFZ	74(1)(a)ii

- 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. These requirements are summarized in the following table:

Definition: **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.

5.5 Strategies to Prevent Herbicide Contamination of Food Intended for Human Consumption

Berry picking is common throughout the plan area. For example, huckleberries, goose berries and strawberries, are frequently used as food. 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 not in immediate proximity to potential treatment area(s). In addition, First Nations people within the Plan Area may use several species of plants for ethno-botanical purposes.

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

- During the required consultation process, First Nations will be 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 of cultural importance will be added to this list if identified by First Nations and others. Efforts will continue through formal and informal consultation to determine the locations of these culturally significant plants. Measures will be made to assess the resource and accommodate wherever possible. Some measures could include delay of treatment or alteration of treatment boundaries;
- Non-chemical methods of invasive plant management shall be considered where treatment objectives can be achieved;
- If control methods involve the application of herbicides, increased NTZs may be maintained around areas where food for human consumption is growing;
- Treatment notices, (Appendix 8), shall be posted at public access points to proposed herbicide treatment areas advising of treatment near the food crops. This will ensure that people are aware that the area has been treated with herbicides; and,
- Where possible, herbicide treatments shall be conducted at times to minimize impacts on food plants (e.g., delay treatments until after the fruit has predominantly dropped from the plant).

5.6 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;
- Treatment area boundaries and the location of environmentally sensitive features shall be mapped, the maps, if not done by the contractor, will be made available to the Contractor;

- A pre-season meetings 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 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 back pack sprayers shall be inspected and calibrated prior to the commencement of herbicide applications each year, and weekly throughout the application season. An example of an Equipment Calibration and Checklist form is shown in Appendix 7. Contractors will also be required to complete operational logs or tracking sheets that must be submitted at the least on a monthly basis (along with treatment records) to the Contract Coordinator that includes information on equipment maintenance and calibration. Calibration is not undertaken on wick/wipe on applicators, squirt bottles or injection tools.

Backpack sprayers shall also be re-calibrated when changing herbicide products or when nozzle output begins to vary.

5.8 Procedures for Monitoring Weather Conditions and Strategies for Modifying Herbicide Application Methods for Different Weather Conditions

Weather Monitoring

Wind speed and temperature will be determined. This can be done in various manners including the use of an anemometer and thermometer or similar devices before herbicide treatment occurs to ensure weather conditions are suitable for herbicide application, and periodically during herbicide applications.

Wind speed and direction, precipitation, temperature and sky conditions (clear, overcast, cloudy, partly cloudy) will be recorded for foliar herbicide applications. Temperature, precipitation, frost and dew conditions will be recorded for stem, bark, wick/wipe-on and stump applications. Persons applying herbicides are responsible for checking each product label for guidelines for applying herbicides under various weather conditions.

Stop Treatment Conditions

The certified pesticide applicator has the final authority on when herbicide applications should be stopped due to inclement weather or adverse site conditions. Backpack herbicide operations shall be stopped when parameters are exceeded according to the manufacturer's label.

Herbicide applications shall be stopped:

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- When conditions prevent the herbicide product from being applied effectively according to label instructions (e.g., periods of rain or snow); OR
- When wind speed and/or direction causes the foliar backpack application of herbicide to drift and/or miss the target invasive plants; OR
- Ground wind velocity is over 8 km/hour for foliar application; OR
- The maximum temperature stated on the herbicide label is exceeded; OR
- It begins to rain, increasing the chances of excessive runoff and leaching; OR
- There is ice or frost on the foliage.

6.0 Reporting, Notification and Consultation

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

Both the plan holder and each contracting firm that applies herbicides for the plan holder 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 by the use or the purpose of the herbicide use;
- 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:

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- 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 name and active ingredient of the herbicide(s) applied, including their Pest Control Product, PCP, numbers;
- Locations and total area treated (ha); and,
- Quantity of each active ingredient applied (kg).

6.2 Notifications

The plan holder commit 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.

6.2.2 Annual Notice of Intent to Treat

As per section 42 of the IPMR, for the purpose of an annual Notice of Intent to Treat, the plan holder will ensure that IAPP is up to date and the planning and other functions in IAPP can be used to produce detailed maps showing the proposed treatment locations for the applicable calendar year, which indicate the following for each treatment location:

- The proposed treatment areas; and
- The geographic or other sensitive features that require a PFZ or NTZ.

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 areas;
- Proposed treatments;
- Herbicides proposed for use and their method of application; and,
- The total area proposed for treatment.

6.2.3 Requests to Amend the PMP

The plan holder will forward, in writing, to MoE, amendments requested for the PMP. Amendment requests to add 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.

6.2.4 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.

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;
- Application of treatment herbicides within prohibited zones;
- Improper cleanup or reporting of spills;
- Application of herbicides by uncertified personnel without appropriate supervision;
- Improper disposal of unused herbicides or containers;
- Improper equipment calibration;
- Application of herbicides under inappropriate or unsafe conditions;
- Failure to properly complete and submit daily operating logs or records; or,
- Handling, storing, mixing, transporting, or applying herbicides in a manner that violates product labels.

6.2.5 Public Notification Prior to Treatment

Notification of individuals, communities and organizations in the time and manner as agreed during the public consultation process, will be completed prior to treatments. The plan holder will maintain a record of all public notifications for each treatment area.

6.2.6 First Nations Notification Prior to Treatment

Notification of First Nations in the time and manner as agreed during the First Nations consultation process will be completed prior to treatments. The plan holder will maintain a record of all First Nations notifications for each treatment area.

6.2.7 Employee Notification Prior to Treatment

The flow of traffic and materials such as culverts from Government facilities presents serious risks of transport of invasive plant over long distances and sometimes into remote areas. As such, Government facilities need periodic invasive plant management treatments. When treatments are required the plan holder will provide notification to all potentially affected employees in advance of all herbicide treatments via electronic mail, bulletins and written postings (i.e., Treatment Notices). Examples may include notifying Park Facility Operators and Area Supervisors responsible for parks within the targeted area, maintenance personnel with the BC Ministry of Transportation and Infrastructure and Ministry of Forests and Range staff.

Management for most Government Facilities in central and northern BC is through Workplace Solutions Innovations, WSI. WSI will be notified before treatments by any method are done on Government facilities.

6.2.8 Posting of Treatment Notices

At the time of treatment with herbicides, Treatment Notices will be posted in locations so that they are clearly visible and legible for public/employees/contractors to access the treatment area or at locations where due diligence would seem to require them. The signs shall remain posted for 2 weeks 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; and,

The Treatment Notices shall be:

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

An example of a Treatment Notice is shown in Appendix 8:

6.3 Consultations

6.3.1 Public Consultation Plan

Prior to submitting a Pesticide Use Notice to MoE for PMP confirmation, the plan holder will carry out a consultation process with the public.

The objectives of conducting consultations when this PMP is at the draft stage are:

- To increase public awareness of the PMP process and of the principles of Integrated Pest Management which are embodied in the PMP;
- To ensure that the public have 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 the public 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 will be 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, will be published within a 2 week period in newspapers circulated in the various communities (or nearest communities).

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

<http://www.for.gov.bc.ca/hra/plants/index.htm>

6.3.2 Public Consultation Report

The plan holder will submit to the Administrator of the *IPMA*, a Public Consultation Report that contains:

- A summary of public consultations, including the names of those who provided input the nature of their concerns and/or recommendations, and the plan holder response to the input from the public.
- A list of newspapers in which notification of the pending PMP submission appeared, along with the publication dates and a photocopy or tear sheet of a representative advertisement.

6.3.3 First Nations Consultation Plan

In addition to the objectives for public consultation outlined in Section 6.3.1, the plan holder will consult with First Nations to avoid infringement on aboriginal rights, treaty rights, or cultural values by the PMP. The plan holder not only has an obligation to consult with First Nations, it must also attempt to address their concerns and accommodate their cultural interests.

Consultation processes must take into account the BC Treaty negotiation process and the current litigation actions by First Nations respecting aboriginal land use or sovereignty. Both of these major issues can have an impact on the plan holder invasive plant management program. In light of the above sensitivities and special concerns, the plan holder is committed to establishing and maintaining positive relationships with First Nations through meaningful and respectful consultation.

In conducting these First Nations consultations, the plan holder will follow all of the procedures outlined in the May, 2006 publication entitled *“Draft Guidelines for IPM Proponents Conducting Consultations with First Nations”*, published by the BC Ministry of Environment, Integrated Pest Management Program.

Table 9: The First Nations within the geographic area covered by the PMP include:

Acho Dene Koe (Fort Liard First Nation)	Kaska Tribal Council	Saikuz First Nation
Adams Lake Indian Band	Kelly Lake Mets Settlement Society	Saulteau First Nation
Blueberry River First Nation	Kitkatla First Nation	Shuswap Indian Band
Canim Lake Band	Kitselas First Nation	Simpcew First Nation
Carcross Tagish First Nation	Kitsumkalum First Nation	Skii Km laxha First Nation
Champagne and Aishihik First Nations	Kwadacha Nation (Ft. Ware)	Skin Tye First Nation
Cheslatta First Nation	Lax Kwalaams Band	Stellat'en First Nation
Daylu Dena First Nation	Lhatko Dene Nation, Red Bluff Band	Tahltan Band
Dease River First Nation	Lheidli T'enneh First Nation	Tahltan Central Council
Dene Tha' First Nation	Lhoosk'us Dene Band	Takla Lake First Nation
Doig River First Nation	Little Shuswap Indian Band	Taku River Tlingit First Nation
Fort Nelson First Nation	McLeod Lake Indian Band	Teslin Tlingit Council
Gitanyow First Nation	Metlakatla First Nation	Tl'azt'en First Nation
Gitanyow Hereditary Chiefs Office	Nadleh Whut'en First Nation	Treat 8 Tribal Association
Gitga'at First Nation	Nakadz'li First Nation	Tsay Keh Dene Band
Gitxsan Chiefs Office	Nat'oot'en, Lake Babine Nation	Ts'il Kaz Koh First Nation, (Burns Lake Band)
Haida Nation	Nazko First Nation	Tsilhqot'in National Government
Haisla First Nation	Nee Tahi Buhn	Ulkatcho First Nation
Halfway River First Nation	Neskonlith Indian Band	West Moberly First Nation
Heiltsuk First Nation	Nisga'a Lisims Government	Xats'ull First Nation
Iskut First Nations	Office of Wet'suwet'en	Yekooche First Nation
Kaska Dena Tribal Council	Prophet River First Nation, Dené Tsaa Tse K'Nai	

6.3.4 First Nations Consultation Report

In order to facilitate Ministry consideration of the adequacy of First Nations consultations and of the plan holder response to any issues raised, the plan holder will prepare a report that describes the consultation process and outcomes. This report will be submitted to the Administrator of the *IPMA*, in conjunction with the submission of the Pesticide Use Notice application. A copy of this report will also be provided to the First Nations with whom consultation was conducted and to the Ministry prior to initiation of a pesticide use. When the report is sent to a First Nation, a letter will be included that indicates to the First Nation that they may submit comments or concerns regarding the report to the Ministry.

6.3.5 Interagency Consultation and Coordination

MFR has been a leader in invasive plant control in the province of British Columbia and actively involved with coordinating invasive plant management programs with other Ministries, agencies and stakeholders. Information on invasive plant inventories, treatment and biological weed control will be provided to these groups on an ongoing basis. 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:

- BC Ministry of Agriculture and Lands
- BC Ministry of Transportation and Infrastructure
- BC Ministry of Environment, including Protected Areas Division
- Transportation and utilities, including CN Rail, BC Hydro, British Columbia Transmission Corporation, and various Gas and oil companies
- First Nations
- Mining companies
- Local governments including Regional Districts and Municipalities
- NWIPC and NEIPC
- The Nature Trust of BC
- Range Act agreement holders
- Forest Act agreement holders
- Guides, Outfitters and trappers

PMP for Invasive Alien Plants on Provincial Crown Lands for Central & Northern BC

Appendix 1: Map of PMP Area



PMP for Invasive Alien Plants on Provincial Crown Lands for Central & Northern BC



Ministry of
Forests and Range

INVASIVE PLANT CHEMICAL & MECHANICAL TREATMENT RECORD

POP #s 2-4-D 14725; Bamel 18837; Esort 23005; Mission 28137
Rastone 28137/28271; Vancouver 28990; Grazon 28649
Roundup 19944; Jordon 22K 9005; Transline 24094

OTHER HERBICIDE

REGISTRATION #

CERT NUMBER

CERT NUMBER

DATA ENTERED INTO IAPP

TREATMENT DATE: YYMMDD

ENTERED BY: AGENCY: EMPLOYER: PMP NUMBER:

CERTIFIED APPLICATORS: CERT NUMBER: SUPERVISOR SIGNATURE: OTHER APPLICATORS: CERT NUMBER:

ACTIVITY	New Site	Site ID OR Paper File ID	UTM Zone	Easting	Northing	Invasive Plant Not Found	Time of Application	Species 1		Species 2		Species 3		Area Treated (ha)	Temperature (°C)	Windspeed (Kmh)	Wind Direction	Treatment Method	Name of Herbicide	Application Rate (L Herbicide/ha)	Amount of Mix Used (L)	Spreyer Delivery Rate (L Mix/ha)
								%	Distribution Code	%	Distribution Code	%	Distribution Code									
<input type="checkbox"/> CHEMICAL <input type="checkbox"/> MECHANICAL <input type="checkbox"/> SURVEY ONLY	<input type="checkbox"/>	JURISDICTION		LOCATION OR ROAD NAME/Km		<input type="checkbox"/>								COMMENTS								
<input type="checkbox"/> CHEMICAL <input type="checkbox"/> MECHANICAL <input type="checkbox"/> SURVEY ONLY	<input type="checkbox"/>	JURISDICTION		LOCATION OR ROAD NAME/Km		<input type="checkbox"/>								COMMENTS								
<input type="checkbox"/> CHEMICAL <input type="checkbox"/> MECHANICAL <input type="checkbox"/> SURVEY ONLY	<input type="checkbox"/>	JURISDICTION		LOCATION OR ROAD NAME/Km		<input type="checkbox"/>								COMMENTS								
<input type="checkbox"/> CHEMICAL <input type="checkbox"/> MECHANICAL <input type="checkbox"/> SURVEY ONLY	<input type="checkbox"/>	JURISDICTION		LOCATION OR ROAD NAME/Km		<input type="checkbox"/>								COMMENTS								
<input type="checkbox"/> CHEMICAL <input type="checkbox"/> MECHANICAL <input type="checkbox"/> SURVEY ONLY	<input type="checkbox"/>	JURISDICTION		LOCATION OR ROAD NAME/Km		<input type="checkbox"/>								COMMENTS								
<input type="checkbox"/> CHEMICAL <input type="checkbox"/> MECHANICAL <input type="checkbox"/> SURVEY ONLY	<input type="checkbox"/>	JURISDICTION		LOCATION OR ROAD NAME/Km		<input type="checkbox"/>								COMMENTS								

Mechanical Treatments Mandatory Fields: Date of Treatment Agency Jurisdiction Site ID OR UTM Zone, Easting & Northing Species 1 Treatment Method Area Treated Name of Herbicide Application Rate Amount of Mix Used
Chemical Treatments Mandatory Fields: All fields indicated in Mech. Treatments, PLUS: Certified Applicator and Number Application Time Temperature Windspeed

Appendix 3: Lists and Categories of Invasive Plants from NWIPC & NEIPC.
NWIPC

CATEGORY 1 - EXTREMELY INVASIVE			
Category 1 invasive plants invade even undisturbed habitats and dominate them. Domination implies the invasive plant becomes the most abundant species across the entire site or area of the plant community being invaded. The invasion can progress slowly or rapidly.			
Common Name	Scientific Name	Common Name	Scientific Name
Broom, Scotch	<u>Cytisus scoparius</u>	Knotweeds	<u>Fallopia & Polygonum sp.</u>
Gorse	<u>Ulex europaeus</u>	Policeman's helmet or Himalayan balsam	<u>Impatiens glandulifera</u>
Hawkweeds	<u>Hieracium spp.</u>	Scabious, field or blue buttons	<u>Knautia arvensis</u>
Himalayan blackberry	<u>Rubus discolor</u>	Spurge leafy	<u>Euphorbia esula</u>
Hoary alyssum	<u>Berteroa incana</u>	Sulphur cinquefoil	<u>Potentilla recta</u>
Iris, yellow flag	<u>Iris pseudacorus</u>	Tansy, common	<u>Tanacetum vulgare</u>
Knapweed, black, brown & greater	<u>Centaurea nigra, jacea & scabiosa</u>	Thistle, marsh plume	<u>Cirsium palustre</u>
Knapweed, spotted	<u>Centaurea stobe, (syn. C. maculosa & C. biebersteinii)</u>		
CATEGORY 2 - VERY INVASIVE			
Category 2 invasive plants invade even undisturbed habitats. They become very prevalent and may form dense patches but usually do not dominate the entire site or area of the plant community. If category 2 invasive plants invade the entire site or plant community they tend not to dominate the site.			
Common Name	Scientific Name	Common Name	Scientific Name
Blueweed	<u>Echium vulgare</u>	Knapweed, diffuse	<u>Centaurea diffusa</u>
Burdock, common	<u>Arctium minus</u>	Loosestrife	<u>Lythrum spp.</u>
Bluet, mountain	<u>Centaurea montana</u>	Ragwort, tansy	<u>Senecio jacobaea</u>
Chamomile, scentless	<u>Matricaria maritima</u>	Thistle, Canada	<u>Cirsium arvense</u>
Chicory	<u>Cichorium intybus</u>	Thistle, plumeless	<u>Carduus acathoides</u>
Daisy, oxeye	<u>Chrysanthemum leucanthemum</u>	Toadflax, Dalmatian	<u>Linaria dalmatica</u>
Hound's-tongue	<u>Cynoglossum officinale</u>		

PMP for Invasive Alien Plants on Provincial Crown Lands for Central & Northern BC

TABLE CONTINUED.

CATEGORY 3 - INVASIVE			
Category 3 invasive plants can invade undisturbed habitats but they usually require some disturbance to gain entry. Once in a habitat they usually do not dominate the site unless there are management problems.			
Common Name	Scientific Name	Common Name	Scientific Name
Baby's-Breath	<u>Gypsophila paniculata</u>	Thistle, Russian	<u>Salsola kali</u>
Catchfly, night-flowering	<u>Silene noctiflora</u>	Thistle, sow	<u>Sonchus spp.</u>
Comfrey	<u>Symphytum officinale</u>	Toadflax, yellow	<u>Linaria vulgaris</u>
Goat's-beard	<u>Tragopogon spp.</u>	Wormwood or absinthium	<u>Artemisia absinthium</u>
Thistle, bull	<u>Cirsium vulgare</u>		
CATEGORY 4 - AGGRESSIVE OR UNDER BIOCONTROL			
Category 4 invasive plants can invade even undisturbed habitats but they do so at a slow pace and rarely dominate the site. Category 4 invasive plants may go through large population fluctuations. This may be the result of the fluctuation in biocontrol agent populations or cyclic patterns the plant displays.			
Common Name	Scientific Name	Common Name	Scientific Name
Blue buttons	<u>Centaurea cyanus</u>	Medic, black	<u>Medicago lupulina</u>
Bluebur, western	<u>Lappula echinata</u>	Mullein	<u>Verbascum thapsus</u>
Buckwheat, wild	<u>Polygonum convolvulus</u>	Mustard, dog	<u>Erucastrum gallicum</u>
Bugloss, small	<u>Lycopsis arvensis</u>	Mustard hedge	<u>Sisymbrium officinale</u>
Campion, bladder	<u>Silene cucubalus</u>	Mustard, tumble	<u>Sisymbrium spp.</u>
Cockle, white	<u>Silene latifolia ssp. alba</u>	Mustard, wild	<u>Sinapis arvensis</u>
Dock, curled	<u>Rumex crispus</u>	Pineapple weed	<u>Matricaria matricarioides</u>
Fleabane, Canadian	<u>Conyza canadensis</u>	Primrose, evening	<u>Oenothera biennis</u>
Groundsel, common	<u>Senecio vulgaris</u>	St. John's-wort	<u>Hypericum perforatum</u>
Hawk's-beard, narrowleaf	<u>Crepis tectorum</u>	Stinkweed or Pennycress	<u>Thlaspi arvense</u>
Hemp-nettle	<u>Galeopsis tetrahit</u>	Tarweed	<u>Madia glomerata</u>
Hop-clover	<u>Trifolium aureum</u>	Thistle, nodding	<u>Carduus nutans</u>
Lamb's-quarter	<u>Chenopodium spp.</u>	Vetch, tufted	<u>Vicia cracca</u>

NEIPC

Plant species invasiveness in Northeast BC

<p>A. Prohibited Invasive Species</p> <p>Prohibited invasive plants are highly competitive with an ability to spread rapidly.</p>	<p>B. Primary Invasive Species</p> <p>Primary invasive plants have the ability to spread rapidly but are not as aggressive as prohibited invasive plants.</p>	<p>C. Secondary Invasive Species</p> <p>Secondary invasive plants can spread easily but the requirement to contain them is usually site specific. Invasive plants under successful biological control and certain native plants may be included in this category.</p>
<ul style="list-style-type: none"> • hawkweeds, orange & yellow, <u>Hieracium spp</u> • hound's tongue, <u>Cynoglossum officinale</u>, (not reported in the region but expected to show up soon). • goatgrass, jointed, <u>Aegilops cylindrica</u> • knapweeds, <u>Centaurea diffusa</u>, diffuse knapweed, <u>C. maculosa</u>, spotted knapweed; and others that may show up • knotweed, Japanese & giant – <u>Fallopia spp</u> • leafy spurge & cypress spurge, <u>Euphorbia esula</u> & <u>cyparissias</u> • marsh plume thistle, <u>Cirsium palustre</u> • scabious, field or blue buttons <u>Knautia arvensis</u> • rush skeletonweed <u>Chondrilla juncea</u>, • tansy, common, <u>Tanacetum vulgare</u> • velvetleaf, <u>Abutilon theophrasti</u> 	<ul style="list-style-type: none"> • blueweed, <u>Echium vulgare</u> • buckwheat, tartary, <u>Fagopyrum tataricum</u> • burdocks, <u>Arctium spp.</u> • canada thistle, <u>Cirsium arvense</u> • wild caraway – <u>Carvi commun</u> • chamomile, scentless, <u>Matricaria maritima</u> • cockle or campion, white <u>Lychnis alba</u>, • Hoary Cress, <u>Lepidium draba</u> • green foxtail, <u>Sertaria viridis</u> • Pepper weed, <u>Lepidium latifolium</u> • plumeless thistle, (not reported in the region), <u>Carduus acanthoides</u>, • kochia, <u>Kochia scoparia</u> • loosestrife, <u>Lythrum spp.</u> • mustard, wild, <u>Sinapsis arvensis</u> • night-flowering catchfly, <u>Silene noctiflora</u> • oxeye daisy, <u>Chrysanthemum leucanthemum</u> • russian thistle, <u>Salsola kali</u> • sow thistles, <u>Sonchus spp.</u> • tansy ragwort, (not reported in the region), <u>Senecio jacobeeae</u> • toadflax, common: <u>Linaria vulgaris</u> and • dalmatian: <u>L. dalmatica</u> 	<ul style="list-style-type: none"> • bladder campion, <u>Silene cucubalus</u> • bluebur, western, <u>Lappula echinata</u> • buckwheat, wild, <u>Polygonum convolvulus</u> • bull thistle, <u>Cirsium vulgare</u> • chickweed, mouse eared – <u>Cerastium spp.</u> • chicory, <u>Cichorium intybus</u> • cleavers, <u>Galium aparine</u> • curled dock and sheep sorrel, <u>Rumex spp.</u> • dragonhead, American - <u>Dracocephalum parviflorum</u> -- native • goat's-beard or oyster plant, <u>Tragopogon dubius</u> • flixweed, <u>Descurainia sophia</u> • foxtail barley (native), <u>Hordeum jubatum</u> • groundsel, common, <u>Senecio vulgaris</u> • hawksbeard, narrowleaf, <u>Crepis tectorum</u> • hemp nettle, <u>Galeopsis tetrahit</u> • lamb's-quarters, <u>Chenopodium spp.</u> • mallow, <u>Malva neglecta</u> • mullein, <u>Verbascum thapsus</u> • mustard, dog - <u>Eruscastrum gallicum</u> • mustards, <u>Sisymbrium spp.</u> • nodding thistle, <u>Carduus nutans</u> • pineapple weed, <u>Matricaria matricarioides</u> • prickly lettuce – <u>Lactuca serriola</u> • quackgrass, <u>Agropyron repens</u> • smartweed – <u>Polygonum spp.</u> • St. John's-wort, <u>Hypericum perforatum</u> • stinkweed, <u>Thlaspi arvense</u> • stork's bill, <u>Erodium spp.</u> • spurry, corn, <u>Spergula arvensis</u> • tarweed, (native), <u>Madia glomerata</u> • water hemlock, western, (native), <u>Cicuta douglasii</u> • wild oats, <u>Avena fatua</u> • wormwood or absinthium, <u>Artemisia absinthium</u> • yarrow (native) – <u>Achillea millefolium</u>

Appendix 4:

Protocol to Establish Invasive Plant Containment Lines in the IAPP Application

Approved by IMIPWG May 26, 2009

DEFINITION:

The objective of containment in invasive plant management is to prevent large infestations from spreading to un-infested areas. Establishing containment lines around targeted invasive plant species' infestations defines the areas that require treatment and assists in management planning. Inside the containment line the infestation of the invasive plant species is extensive and it is not possible to eradicate the target species. Outside the line the infestation is limited and preventing spread and achieving a long term goal of eradication is possible.

The establishment and location of containment lines is determined through stakeholder consensus and are set within geographic areas such as Regional Invasive Plant Committee boundaries or cross-regional areas of the Province. The location of the containment line is based on considerations of the following: a) target invasive plant species' current distribution and abundance; b) known vectors and projected rate of spread; c) natural barriers to movement (e.g. height of land, lakes or rivers), d) ecological factors, and e) other management objectives within the area. Containment lines are housed in the Invasive Alien Plant Program (IAPP) Application, so that their locations are communicated and clear to all stakeholders and their invasive plant management crews.

Outside the containment polygon or area all sites of the species being contained need to be managed including enhanced awareness work, inventory, treatment, and monitoring. Management objectives inside a containment line may include rehabilitation of sites, or specific inventory and control actions on areas deemed to be critical from an economic or conservation perspective.

PROCEDURES:

As the support and action of all stakeholders and partners is required for successful containment of invasive plants, the following steps are required to establish containment lines:

- 1) Members of regional Invasive Plant Committees can propose and discuss containment lines. If lines are wholly within the regional invasive plant committee's area and consensus agreement on the location of the line can be reached, the request is forwarded to the Inter-Ministry Invasive Plant Working Group (IMIPWG) for review.
- 2) If proposed lines cross the boundaries of two or more regional invasive plant committees, all committees affected must agree to the lines and locations before they are forwarded to the IMIPWG.
- 3) An agency or organisation can propose containment lines to the IMIPWG, the Invasive Plant Council of BC (IPCBC), as well as to regional invasive plant committees. Proposals received by the IMIPWG or IPCBC will be referred to the affected regional committee(s) for consideration and support, and the committee will ensure final submission to the IMIPWG.
- 4) The IMIPWG will review proposed containment lines and either approve their inclusion in IAPP or discuss with those making the proposal why inclusion is not approved at that time or at that location.
- 5) If lines are approved for inclusion in IAPP, those making the proposal will work with the IAPP Technician to have the lines uploaded into IAPP.

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- 6) Regular review and adjustment of containment lines is the responsibility of the sponsoring regional committees, agencies and organisations, and the IMIPWG.

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APPENDIX 5: Environmental, Toxicological and other Parameters Considered for Herbicide Use.

As discussed in Section 5, there is a large volume of studies, information and other sources used by PMRA to determine whether to register a product 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 modeling 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 10 Principal Information Resources Used in Determining Status and Parameters Considered in Herbicide Use.

WEB PAGE	ADDRESS
Health Canada – Public Registry	http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/publi-regist/index-eng.php
ECOTOX database of the U.S. Environmental Protection Agency	http://cfpub.epa.gov/ecotox/
Ecological and Environmental Safety	http://www.sciencedirect.com/science/journal/01476513
Journal of Environmental Quality	http://jeq.sci-journals.org/cgi/search
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)	http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf http://www.ccme.ca/ourwork/water.html?category_id=101 search engine: http://ceqg-rcqe.ccme.ca/

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Table 11: PMRA Status for Herbicides Proposed for Use in the PMP.

HERBICIDE	PMRA STATUS	PMRA & OTHER NOTES	CONSULTATION & PMP NOTES
aminopyralid	Regulatory Note: Aminopyralid January 17, 2007	PMRA - Granted temporary registration Registered under the EPA's Reduced Risk Pesticide Initiative. New Milestone™ herbicide has been reviewed and registered under the Reduced Risk Pesticide Initiative of the U.S. Environmental Protection Agency. This unique designation is reserved for compounds that demonstrate lower risk to the environment and humans than marketplace standards.	The BC Ministry of Agriculture and Lands began including aminopyralid in the timing rate trials they run in the NWIPC & NEIPC areas in 2006. After initial assessment and evaluation NWIPC began using aminopyralid on a trial basis in 2007. By 2008 both NWIPC and NEIPC included Milestone as an herbicide in the programs. The Peace River Regional District, (NEIPC member), has requested the Ministry of Environment consider inclusion of aminopyralid in IPMA Regulation 74.
Picloram	Re-Evaluation Decision Document: picloram January 14, 2009 http://www.hc-sc.gc.ca/cps-spc/pubs/pest/decision/rvd2009-02/index-eng.php	After a re-evaluation of the herbicide picloram, Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the <i>Pest Control Products Act</i> and Regulations, is granting continued registration of products containing picloram for sale and use in Canada. An evaluation of available scientific information found that products containing picloram do not present unacceptable risks to human health or the environment when used according to label directions.	
Clopyralid	PMRA Re-evaluation work plan (Feb. 2, 2010) http://www.hc-sc.gc.ca/cps-spc/pubs/pest/decision/rev2009-07/index-eng.php	The PMRA's re-evaluation program examines older pesticides using current scientific standards to make sure they are still acceptable. The PMRA considers potential risks as well as value of pesticide products to ensure they meet modern standards established to protect human health and the environment.	PMP will be adjusted based on findings of Re-evaluation
Glyphosate	PMRA Re-evaluation work plan (April 2009 to March 2010 http://www.hc-sc.gc.ca/cps-spc/alt_formats/pdf/pubs/pest/decisions/rev/rev2010-02-eng.pdf	The PMRA's re-evaluation program examines older pesticides using current scientific standards to make sure they are still acceptable. The PMRA considers potential risks as well as value of pesticide products to ensure they meet modern standards established to protect human health and the environment.	PMP will be adjusted based on findings of Re-evaluation
Metsulfuron methyl	Re-Evaluation Decision Document: metsulfuron methyl, 10 November, 2008 http://www.hc-sc.gc.ca/cps-spc/pubs/pest/decision/rvd2008-35/index-eng.php	An evaluation of available scientific information found that products containing metsulfuron methyl have value in the food and crop industry and do not present unacceptable risks to human health or the environment when used according to revised label directions. As a condition of the continued registration of metsulfuron methyl uses, new risk-reduction measures must be included on the labels of all products. No additional data are required at this time.	There are no plans to use Metsulfuron methyl in the formulation Escort. New herbicides may contain metsulfuron methyl and will only be used under this PMP after timing rate trails have been conducted by the BC Ministry of Agriculture and Lands in the NWIPC and or NEIPC areas and results, including environmental impacts, reviewed

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			by NWIPC & NEIPC members.
Dicamba	Re-Evaluation Decision Document: Dicamba, August 5, 2008 http://www.health.gc.ca/cps-spc/pubs/pest/decisions/rvd2008-28/index-eng.php	After a thorough re-evaluation of the herbicide dicamba (3,6-dichloro-2-methoxybenzoic acid), Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the Pest Control Products Act and Regulations, has decided to allow continued registration for the sale and use in Canada of certain products containing dicamba.	
2,4-D	Re-Evaluation Decision Document: (2,4-Dichlorophenoxy) acetic Acid [2,4-D] 16 May, 2008 http://www.health.gc.ca/cps-spc/pubs/pest/decisions/rvd2008-11/index-eng.php	“After a thorough re-evaluation of the herbicide (2,4-dichlorophenoxy) acetic acid [2,4-D], Health Canada’s Pest Management Regulatory Agency (PMRA), under the authority of the <i>Pest Control Products Act</i> and Regulations, has decided to allow continued registration for the sale and use in Canada of certain products containing 2,4-D. C Products containing 2,4-D do not pose unacceptable risks to human health or the environment. They also have value for lawn and turf, agriculture, forestry and industrial uses when used according to the label directions proposed in previous consultation documents.	Two people requested that 2,4-D not be used then went on to indicate that no herbicides should be used.
Triclopyr	Re-Evaluation Decision Document: triclopyr, February 10, 2006 http://www.health.gc.ca/cps-spc/pubs/pest/decisions/rrd2006-02/index-eng.php	The PMRA has determined that triclopyr is acceptable for continued registration. Mitigation measures to further protect workers and the environment are specified in this Re-Evaluation Document (Appendix II).	Has not been used by NWIC or NEIPC. Will only be used in trial situations such as timing rate trials. Such trials will be evaluated for environmental impacts in the habitats and climates of NWIPC & NEIPC

Table 12: Environmental Parameters Considered in the Use of Herbicides, (information from references listed in table 11 and principally from Etoxnet.Orst.edu)

Active Ingredient	Persistence	Mobility / solubility in water	Impacts on aquatic and some terrestrial spp.
aminopyralid	<ul style="list-style-type: none"> rapid photo transformation in upper layers of surface water, otherwise is persistent in water– aqueous photolysis (half-life=0.6 days¹), aerobic aquatic half-life 462-990 days, and stable in anaerobic aquatic systems classified as non-persistent to slightly persistent in most soils (half-life of 6–39 days), but can be persistent in others (half-life of 330–533 days) Aerobic soil half-life 103.5 days and longer in some soils. Tier 1 modelling 	<ul style="list-style-type: none"> Because aminopyralid is highly water soluble (2.5 g/L), is stable to hydrolysis and aquatic biotransformation and does not photo transform on soil, it is expected to be mobile in soil meaning it has the potential to leach through the soil column and reach ground and surface water. This predicted behaviour has resulted in the following mitigation statements on the label: <ul style="list-style-type: none"> Site characteristics and conditions that may lead to runoff include, but are not limited to: heavy rainfall, moderate to steep slope, bare soil, poorly draining soil (e.g., soils that are compacted or fine textured such as clay). To reduce leaching and runoff, 	<ul style="list-style-type: none"> fish do not appear to be highly sensitive to aminopyralid and aminopyralid has been classified as practically nontoxic to fish by the U.S. EPA” The aquatic risk assessment determined that there was negligible risk to freshwater and marine invertebrates, fish and algae from the proposed uses and use rate of Aminopyralid Liquid Concentrate Herbicide (assuming a maximum application rate of 120 g a.i./ha). The risk to potentially susceptible aquatic plants such as submerged or emergent dicots and monocots is unknown as no data are

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	<p>using the longest half lives did not result in aquatic concentrations that approach levels of concern for aquatic plants and animals.</p> <ul style="list-style-type: none"> In aquatic systems, the primary route of degradation is photolysis in upper layers of surface water, otherwise aminopyralid is persistent in water, where a laboratory experiment yielded a half-life of 0.6 days. 	<p>avoid application of this product when heavy rain is forecast.</p> <ul style="list-style-type: none"> Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body. Avoid use where soils are permeable (e.g., sandy soil) and/or the depth to the water table is shallow. 	<p>available. These plants are an important part of the aquatic ecosystem, providing food and shelter for many species both aquatic and terrestrial. Aquatic dicot and monocot rooted plants may be susceptible to aminopyralid based on studies with terrestrial plants (high to very high risk). Therefore, in lieu of new data requirements, it is recommended that the terrestrial buffer zones be used to protect aquatic habitat.</p>
Picloram	<ul style="list-style-type: none"> moderately to highly persistent in the soil environment, with reported field half-lives from 20 to 300 days and an estimated average of 90 days In laboratory studies, sunlight readily broke down picloram in water, with a half-life of 2.6 days but is stable in anaerobic sediments. According to EFSA, picloram has a photolysis half-life of 2 days in natural waters and 3.5 days in the laboratory study (equated at summer sunlight at 40 degrees N latitude at pH 5). This is only applicable to the upper layers of surface water, otherwise picloram is stable in the aquatic environment. 	<ul style="list-style-type: none"> Classified as highly water soluble and highly mobile in soil. According to the EPA RED (EPA-738-F-95-018, August 1995) “eventual contamination of groundwater is virtually certain in areas where picloram residues persist in overlying soil. Once in ground water, picloram is unlikely to degrade, even over a period of several years.” Water-soluble. It can move with water in irrigation or drainage ditches. Do not apply to soils that are very permeable (textures of sandy loam to sand) throughout the entire profile and which also have an underlying shallow aquifer. Do not apply to soils containing sinkholes over limestone bedrock. Do not apply to soils whose surfaces are composed of severely fractured rock or unconsolidated gravel and underlaid with an aquifer. 	<p>moderately toxic to fish</p> <p>Picloram is a systemic herbicide effective against dicotyledonous species. The risk to potentially susceptible aquatic plants such as submerged or emergent dicots is unknown as no data are available. These plants are an important part of the aquatic ecosystem, providing food and shelter for many species both aquatic and terrestrial.</p> <p>A transformation product of picloram, found in water is aminopyralid (the 3,6-dichloro analogue) Ref. EFSA Journal 2009; 7(12):1390 http://www.efsa.europa.eu/en/efsajournal/doc/s1390.pdf</p>
Clopyralid	<ul style="list-style-type: none"> It is degraded almost entirely by microbial metabolism in soils and aquatic sediments. Classified as non-persistent to persistent in aerobic soils, depending on environmental conditions that maximize soil microbial population and activity. In soil, stable to photolysis i.e. or not expected to undergo photolysis is not degraded by sunlight or hydrolysis. Considered persistent in anaerobic aquatic environments but classified as moderately persistent in aerobic aquatic systems. Not susceptible to photolysis or hydrolysis in aquatic environment. 	<ul style="list-style-type: none"> Is more water-soluble and has a lower adsorption capacity than picloram. Water solubility is 143 g/L @ 20 degrees C, classified as highly water soluble and does not adsorb strongly to soils and therefore may leach into groundwater and enter surface water in run-off. Water monitoring has revealed clopyralid residues in groundwater as well as surface water. 	<ul style="list-style-type: none"> Classified as practically non-toxic to fish and aquatic invertebrates but slightly to moderately toxic to algae It's LC50s for bluegill sunfish and rainbow trout are 125 mg/L and 104 mg/L, respectively. classified as slightly toxic to practically non-toxic to birds on an acute oral basis and slightly toxic on a dietary basis classified as practically non-toxic to honeybees and no effects on earthworms up to 1.50 mg/kg soil negligible risk to wild mammals at highest application rate of 298.9 g a.i./ha the assessment of clopyralid indicates risk of adverse effects to non-target terrestrial plants. There is also a potential for clopyralid to leach to groundwater and to move to surface water

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			through runoff.
Glyphosate	<ul style="list-style-type: none"> moderately persistent in soil, with an estimated average half-life of 47 days. Reported field half-life range from 1 to 174 days. field studies conducted in agricultural and forest soils indicate an aerobic soil half-life of 32 days (half-life of 32 days is classified as slightly persistent) glyphosate under goes microbial degradation in the aquatic environment with a typical half-life of 7-14 days which is classified as slightly persistent. 	<ul style="list-style-type: none"> strongly adsorbed to most soils, even those with lower organic and clay content. Thus, even though it is highly soluble in water, field and laboratory studies show it does not leach appreciably, but does have the potential to contaminate surface waters through soil erosion, as it adsorbs to soil particles suspended in runoff. 	<ul style="list-style-type: none"> Technical glyphosate acid is practically nontoxic to fish and may be slightly toxic to aquatic invertebrates. Under certain use conditions may cause adverse effects to non-target aquatic plants. Additional data are needed to fully evaluate the effects of glyphosate on non-target terrestrial plants. Considered non-toxic to honeybees In general, glyphosate alone is less toxic than the common glyphosate products. Part of these differences can be explained by the toxicity of the surfactant (detergent-like ingredient) in some products.
Metsulfuron methyl	<ul style="list-style-type: none"> Half-life estimates for metsulfuron-methyl in soil are wide ranging from 10 – 178 days, with an overall average of reported values of 30 days. Persistent in anaerobic soil In the aerobic aquatic environment, metsulfuron-methyl is moderately persistent to persistent (half-life 43-294 days) and in anaerobic aquatic conditions is moderately persistent (half-life 49-76 days). 	<ul style="list-style-type: none"> Both metsulfuron methyl and its breakdown products are mobile and hence can move freely in soil. However, field studies have shown varying degrees of leaching. The potential for leaching is especially prominent in non-acidic soils because of increased solubility and decreased soil adsorption. Leaching in terrestrial field studies ranged from very little leaching beyond the 22 cm soil depth to leaching up to and further than 35 cm soil depths (soils depths lower than 35 cm were not sampled in these studies). Water runoff on the soil surface can move the residues into nearby bodies of water such as ponds and rivers. Water monitoring of these bodies of water have revealed residues, but at concentrations below levels of environmental concern. 	<ul style="list-style-type: none"> no adverse toxicological effects on terrestrial invertebrates (including honeybees), birds or mammals on an acute oral, dietary and reproductive basis. not considered toxic to freshwater invertebrates and fish on an acute basis. Chronic effects to freshwater fish and invertebrates are not expected. As metsulfuron methyl is a herbicide, adverse effects to non-target terrestrial plants are expected. Plant emergence and vegetative vigour studies conducted with 10 plant species indicated that, although the seeds of most plant species emerged successfully, plants did not follow normal growth patterns. The effects are likely due to the ability of metsulfuron methyl to inhibit a plant enzyme responsible for cell division and plant growth Metsulfuron methyl affected cell density, biomass and growth rate of freshwater and marine/estuarine algae. Metsulfuron methyl significantly affected frond density and biomass of duckweed and growth rate, root density and surface leaf area of other aquatic vascular plants.
dicamba	<ul style="list-style-type: none"> moderately persistent in soil. The half-life of dicamba in soil is typically 1 to 4 weeks. Aerobic soil biotransformation half-life 	<ul style="list-style-type: none"> studies suggest the order of mobility is dicamba>picloram>2,4-D² dicamba is highly soluble in water (6.07 g/L), has organic carbon partition coefficients (K_{oc}s) ranging from 3.5-21 and has the potential to leach to groundwater. 	<ul style="list-style-type: none"> low toxicity to fish. The LC50 (96-hour) for technical dicamba is 135 mg/L in rainbow trout and bluegill sunfish, greater than 100 mg/L in grass shrimp, and greater than 180 mg/L in fiddler

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	<p>2.9-21 days) and is considered non persistent to slightly persistent under anaerobic soil conditions half life was 84 days and is considered moderately persistent</p> <ul style="list-style-type: none"> • In water, microbial degradation is the main route of dicamba disappearance. Photolysis is not an important route of transformation. • Aquatic hydrolysis, volatilization, adsorption to sediments, and bioconcentration are not expected to be significant. • Dicamba is moderately persistent in aerobic aquatic environments (half-lives ranging from 39.8-45.5 days). • Volatilization (vapour pressure = 3.4×10^{-5} mm Hg at 25°C) from soil and plant surfaces may contribute to the dissipation of dicamba in the environment which may lead to adverse effects on non-target plants, through redeposition, in the vicinity of the treatment field. Laboratory studies investigating the volatility of dicamba confirm that some dicamba will volatilize from the treatment field and could potentially cause damage to crops in adjacent fields via redeposition through rain, dry deposition, etc. Dicamba has been detected in ambient air samples in Canada at concentrations up to 1.29 ng/m³. 	<ul style="list-style-type: none"> • Surface water monitoring for dicamba (provided by Environment Canada and provincial authorities) indicates that dicamba is a common active ingredient detected in Canadian surface waters 	<p>crab and sheepshead minnow. The LC50 (48-hour) for dicamba is 35 mg/L in rainbow trout, 40 mg/L in bluegill, 465 mg/L in carp³, and 110 mg/L in Daphnia magna, a small freshwater crustacean</p>
<p>2,4-D</p>	<ul style="list-style-type: none"> • Soil microbes are primarily responsible for its disappearance. • photo transformation is not a major route of transformation for 2,4-D and hydrolysis is not an important route of transformation for 2,4-D acid or the amine forms • aerobic soil half-lives range from 0.22 - 31 days and 0.25 - 29 days in water (classified as nonpersistent to slightly persistent for both 	<ul style="list-style-type: none"> • Relatively immobile in the soil. studies suggest the order of mobility is dicamba>picloram>2,4-D* • 2,4-D acid and the amine forms are very soluble in water and adsorption to soil is very weak (Koc < 150). This means the potential for leaching of 2,4-D to groundwater is high, if the downward flow of water is rapid. Provided the rate of movement is slow, leaching will be attenuated by rapid biotransformation in the upper soil horizons and little residue will be found at depth owing to its relatively short half-life in soil (U.K. 	<ul style="list-style-type: none"> • Some formulations of 2,4-D are highly toxic to fish while others are less so. For example, the LC50 ranges between 1.0 and 100 mg/L in cutthroat trout, depending on the formulation used. 2,4-D esters are much more toxic to aquatic invertebrates and fish than the acid and amine forms. • The lowest 96-hour LC50s for cold water species (rainbow trout) are 240 mg a.e./L for 2,4-D acid and the amines, 7.2 mg a.e./L for the ethylhexyl ester (EHE)

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	<p>environmental compartments).</p> <ul style="list-style-type: none"> • Under anaerobic conditions, 2,4-D is classified as persistent in soil and aquatic systems. 	<p>MAFF 1993). In a national survey of 68 000 wells throughout agricultural areas of the United States, 2,4-D was found to be the third most frequently detected pesticide. It was detected in 2.3% of samples collected (USEPA 1992, Wood and Anthony 1995).</p> <p>The proposed 2,4-D products: 2,4-D Grazon Herbicide (Reg. No. 26649), Tordon (Reg. No. 9007), Restore (Reg. Nos. 28551 and 28552) and 2,4-D Amine 500 (Reg. No. 14725) all contain forms of 2,4-D amine salts</p>	<p>and 0.47 mg a.e./L (rainbow trout) for butoxyethyl ester (BEE). For warm water fish (bluegill sunfish).</p> <ul style="list-style-type: none"> • For warm water fish (bluegill sunfish), the lowest 96-hour LC50s are 40 mg a.e./L for the 2,4-D acid and the amines, > 5.0 mg a.e./L for EHE and 0.61 mg a.e./L for BEE. The lowest chronic (embryo larval stage) NOECs are 17.1 mg a.e./L (fathead minnow) for the acid and amines, and 0.12 mg a.e./L (fathead minnow) for EHE.
<p>Triclopyr</p>	<ul style="list-style-type: none"> • In natural soil and in aquatic environments, the ester and amine salt formulations rapidly convert to the acid, which in turn is neutralized to a relatively nontoxic salt. It is effectively degraded by soil microorganisms and has a moderate persistence in soil environments. • Hydrolysis of the ester in water is base-catalyzed, and under conditions of low pH and cool temperatures, can be slow (e.g., DT50 of 208 days at 15°C and pH 5). Photolysis seems to be the most rapid means of transformation of the ester in the aquatic environment (DT50 of 1.5-2.0 days). • The half-life in soil ranges from 30 to 90 days, depending on soil type and environmental conditions, with an average of about 46 days. The DT50 of triclopyr in lab studies ranged from 9.6 days in high organic soil at 35 degrees Celsius to 361 days in low organic carbon soils at 15 degrees Celsius. Field studies done in Northern Ontario showed DT50s of about 14 days for both sandy and clay soils at approximately 13 degrees Celsius. • Reported half-lives in water are 2.8 to 14.1 hours 	<ul style="list-style-type: none"> • is not strongly adsorbed to soil particles and is highly soluble in water therefore has the potential to be mobile. 	<ul style="list-style-type: none"> • The triclopyr acid and triclopyr amine salt are practically nontoxic to fish. LC50 (96-hour) of 117 mg/L in rainbow trout and 148 mg/L in bluegill sunfish. Triclopyr ester is classified as highly toxic to rainbow trout (96 hour LC50: 0.74 mg/L), bluegill sunfish (96 hour LC50: 0.87 mg/L) and coho salmon (96 hour LC50: 1.3 mg/L) • Triclopyr acid is practically nontoxic to aquatic invertebrates (<i>Daphnia magna</i> 24 hour LC50 of 203 mg/L and 48 hour LC50 of 133 mg/L). • Triclopyr butoxyethyl ester is slightly toxic to aquatic invertebrates – EC50 12 mg/L <p>McCall et al. (1988) have explained the difference in fish toxicity as being the result of different rates of uptake of the ester and acid. In the absence of any environmental dissipation of the ester, the authors estimated the bioconcentration factor at 400 for the ester as compared to 0.5 for the acid. The ester, therefore, is taken up rapidly by the fish; then it is metabolized to the acid which increases in concentration to toxic levels within the fish.⁴</p>

1. Aqueous photolysis data was corrected for natural sunlight at 40 degrees latitude, sunlight in northern B.C. is expected to be of less intensity and aqueous photolysis may be longer than 0.6 days. Also, under environmental conditions, slower photo transformation is expected due to light interception by suspended solids, cloud cover and wave length attenuation by water depth i.e. intensity of sunlight decreases with water depth.

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2. Mobility of Dicamba, Picloram and 2,4-D in Soil Columns. R. Grover, *Weed Science*, Vol. 25, No. 2 (Mar., 1977), pp. 159-162

3. Unable to verify values, not part of the PMRAs endpoints database.

4. McCall, P.J.; Laskowski, D.A.; and Bidlack, H.D. (1988). Simulation of the Aquatic Fate of Triclopyr Butoxyethyl Ester and its Predicted Effects on Coho Salmon. *Environ. Toxicol. Chem.* 7: 517-527.

Table 13: Toxicological Parameters Considered in the Use of Herbicides

Active Ingerdient	Summary, Chronic toxicity No Observed Effect levels, NOEL, LC50*, etc	References ¹
aminopyralid	<ul style="list-style-type: none"> • Rainbow trout: 96 hour LC50 >100 mg/L-“fish do not appear to be highly sensitive to aminopyralid and aminopyralid has been classified as practically nontoxic to fish by the U.S. EPA” • Aminopyralid was found to be practically non toxic in acute toxicity tests on terrestrial and aquatic animals. • Leopard frog: 96 hour LC50>95.2 mg/L • Earthworms: acute LC50>1000 mg/kg soil • Honeybee oral: LD50>100 ug/bee • Honeybee contact: LD50 >117 ug/bee or based on application rate: 131 kg/ha • Bobwhite quail: dietary NOEC = 5556 mg/kg body weight • Mallard duck: dietary NOEC=5496 mg/kg body weight 	<ul style="list-style-type: none"> • http://www.fs.fed.us/foresthealth/pesticide/pdfs/062807_Aminopyralid.pdf • Environmental Fate and Ecological Risk Assessment for Registration of Aminopyralid, (http://www.epa.gov/opprd001/factsheets/aminopyralidEFEDRA.pdf)http://www.epa.gov/opprd001/factsheets/aminopyralidEFEDRA.pdf <p>For more details see PMRA’s REG2007-01 at:</p> <ul style="list-style-type: none"> • PMRA Regulatory Note 2007-01, http://www.hc-sc.gc.ca/cps-sp/pepubs/pest/_decisions/reg2007-01/index-eng.php
Picloram	<ul style="list-style-type: none"> • Canadian Water Quality Guidelines for the Protection of Aquatic Life - 29 ug/L • moderately toxic to fish • NOEL 20 to 50 mg/kg • LC50* 70 mg/L LC50** 17.5 – 20 mg/L • EPA RED lists the following endpoints: • Rainbow trout, acute LC50: 5.50 mg/L • Bluegill sunfish acute LC50: 14.5 – 19.4 mg/L • <i>Daphnia magna</i> acute LC50: 34.4 mg/L • Field runoff conditions for cutthroat trout concluded that concentrations as low as 290-610 ug/L will affect survival and growth 	<ul style="list-style-type: none"> • http://ceqg-rcqe.ccm.ca/ & http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf • http://www.epa.gov/iris/subst/0256.htm • http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/picloram-piclorame/index-eng.php • Ecotox had 253 studies for LC • EPA RED Picloram EPA 738-R95-019 August 1995 http://www.epa.gov/oppsrrd1/REDs/0096.pdf
Clopyralid	<ul style="list-style-type: none"> • NOEL** 50 TO 1500 mg/kg/day • LC50** 94.4 to 2,802 mg/L • Rainbow trout acute (96 hour) LC50: >100 mg/L • Bluegill sunfish acute (96 hour) LC50: >102 mg/L • Fathead minnow, early life stage (34 day) NOEC: 10.8 mg/L • <i>Daphnia magna</i> 48 hour EC50: >99 mg/L • <i>C. Riparius</i> 28-day EC50 (emergence): >97 mg/L • Honeybees, 48-hour oral LD50: >200 ug/bee • Honeybees, 48 hour contact LD50: >98.1 ug/bee • Earthworms 14-day LC50: >1000 mg kg soil dry weight 	<ul style="list-style-type: none"> • http://www.epa.gov/EPA-PEST/1997/May/Day-16/p12913.htm • LC50 for trout • http://www.invasive.org/gist/products/handbook/11.Clopyralid.pdf • Draft Assessment Report – public version- Clopyralid Volume 3, Annex B, B.9, February 2005 • EFSA Scientific Report (2005) 50, 1–65, Conclusion on the peer review of clopyralid • http://dar.efsa.europa.eu/dar-web/provision
Glyphosate	<ul style="list-style-type: none"> • Canadian Water Quality Guidelines for the Protection of Aquatic Life – 65 ug/L • NOEL was considered to be 100 mg/kg bw per day.28 • LC50** 12 to 380 mg/L – see general comment 	<ul style="list-style-type: none"> • http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/glyphosate/index-eng.php & http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf • 227 studies for LC50 salmon on <i>Ecotox</i>

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	<p>on the use of IRIS</p> <ul style="list-style-type: none"> From US EPA Ecotox Database 2005 cold water fish (rainbow trout) 96 hr LC50: 140 mg/L; warm water fish (Bluegill sunfish) 96 hr LC50: 140 mg/L, marine estuarine fish (Sheepshead minnow) 96 hr LC50: 1000 mg/L; <i>Daphnia magna</i> acute, 48 hr LC50: 780 mg/L 	<ul style="list-style-type: none"> Torstensson, N.T.L., L.N. Lundgren, and J. Stenström. 1989. Influence of climate and edaphic factors on persistence of glyphosate and 2,4-D in forest soils. <i>Ecotoxicol. Environ. Safety</i> 18:230-239. http://www.epa.gov/oppefed1/general/databasesdescription.htm#ecotoxicity
Metsulfuron methyl	<ul style="list-style-type: none"> Refer to Table 2 in PRVD2008-08 for a complete list of ecotox endpoints used by PMRA 	<ul style="list-style-type: none"> http://extoxnet.orst.edu/pips/metsulfu.htm
Dicamba	<ul style="list-style-type: none"> Canadian Water Quality Guidelines for the Protection of Aquatic Life – irrigation, .000 ug/l, livestock watering 10 ug/L NOEL** 3-1500 mg/kg/day Please refer to Section 5.2 of PRVD2007-05 for ecotox endpoints used by PMRA 	<ul style="list-style-type: none"> http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf http://www.epa.gov/iris/subst/0223.htm Ecotox had 85 LC50 studies
2,4-D	<ul style="list-style-type: none"> Canadian Water Quality Guidelines for the Protection of Aquatic Life – 4 ug/L NOEL** 30 – 98 mg/kg/day Please refer to PACR2007-06 for ecotox endpoints used by PMRA 	<ul style="list-style-type: none"> http://www.riverinstitute.ca/envtech/Documents/WQA/CEQG%20aquatic%20life.pdf http://www.epa.gov/EPA-PEST/1997/April/Day-11/p9371.htm
Triclopyr	<ul style="list-style-type: none"> NOEL** 3 – 400 mg/kg/day Please refer to E91-02 for endpoints used by PMRA 	<ul style="list-style-type: none"> http://www.epa.gov/iris/subst/0223.htm 253 studies for LC50

There are hundreds of studies that indicate a wide range of LC50s & NOEL. This table provides some example ranges from the literature.

1. Please note that the references in this table to IRIS (EPA's Integrated Risk Information System) should not be used in reference to ecotoxicological parameters – IRIS is intended for the use of human health risk assessments and are appropriate for use in determining ecotox or environmental fate endpoints. The EPA maintains ecotox and environmental fate databases – for contact info see: <http://www.epa.gov/oppefed1/general/databasesdescription.htm#ecotoxicity>

* LC 50s, form the Handbook for Pesticide Applicators and Dispensers, British Columbia Ministry of Environment. Fifth Edition, 2005,

** LC 50 & NOEL from Ecotox – U.S. Environmental Protection Agency.

Table 14: Buffer zones and Pesticide Free Zones Adjacent to Water Proposed for the PMP.

Active Ingredient	Pest Control Products Act – LABEL	Integrated Pest Management Act	Additional Conditions for PMP	TREATMENT NOTES
Non chemical treatments, manual, cutting mowing, sea water, targeted grazing				For sensitive habitats such as stream and river banks care will be taken to remove only target vegetation and keep disturbances to a minimum when doing treatments like hand pulling and digging.
All herbicides		10 meters except for applications done under IPM Act Regulation 74	Herbicides used only after other treatment options have been exhausted.	Spot treatments of targeted species usually with wick applicators, stem injector, back pack, hand held sprayers or hand guns. If near monoculture of targeted species are present booms or boomless nozzles may be used if the treatment meets EDRR, Containment or Rehabilitation requirements.
aminopyralid	<ul style="list-style-type: none"> 10 meters downwind, no buffers required upwind. 	10 meters	<ul style="list-style-type: none"> 10 meters The Peace River Regional District, a NEIPC partners, has requested and is working with the Ministry of Environment for the inclusion 	<p>Due to its reduced risk status aminopyralid will be the preferred herbicide to use if possible.</p> <p>Only one application per growing season per site.</p>

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			of aminopyralid in the IPMA reg. 74. If and when that change occurs the guidelines provided to crews by NWIPC & NEIPC will be updated. I.e., aminopyralid would be considered when treatments are necessary within 10m of water courses.	
Picloram	<ul style="list-style-type: none"> Contact appropriate provincial regulatory authorities 	10 meters	<ul style="list-style-type: none"> The 10 meter buffer will be increased to 30 meters if up slope from fish bearing water courses.* Picloram containing products will not be used in urban or residential areas, (Appendix 8 – definitions) 	<ul style="list-style-type: none"> Do not use if there are any possibilities that soil will be moved from site. Picloram is very difficult to clean from sprayers. Use a different sprayer for applying other materials to desirable plants or crops.
Clopyralid	<ul style="list-style-type: none"> Avoid contamination of non-target land, water or irrigation ditches. Do not use Lontrel 360 Herbicide in the following areas: standing or flowing water; the inner banks or bottoms of irrigation ditches 	10 meters	<ul style="list-style-type: none"> Clopyralid may replace picloram containing products when applications are up slope, (30 m+), of fish bearing water courses. 	<ul style="list-style-type: none"> Unlike picloram, clopyralid is less damaging to trees and should be used as an alternate to picloram when treating broad leaved invasive species that are near or under the canopies of trees.
Glyphosate	<ul style="list-style-type: none"> 15 meters for field sprayers, 10 meters if they are shrouded. 	<ul style="list-style-type: none"> Reg 74 in table 8 – up to 2 meters to fish bearing waters if selective application method used. 	<ul style="list-style-type: none"> No broadcast applications. Treatments under IPMA reg 74 will be done with wick, dauber applicators or stem injection. If back pack sprayers are used individual plants will be treated. 	<ul style="list-style-type: none"> Glyphosate is non selective and kills the vegetation, e.g., grasses, that are needed to reduce re-invasion of sites and only selective application methods should be used so that only target plants are killed. Do not apply glyphosate to stream or river banks if the soils are unvegetated and likely to move or be washed into the watercourse.
Metsulfuron methyl	<ul style="list-style-type: none"> 15 meters 	<ul style="list-style-type: none"> Label requirements 		<ul style="list-style-type: none"> Metsulfuron methyl is rarely used in the program but may be an ingredient in future products.
Dicamba	<ul style="list-style-type: none"> Leave an adequate buffer zone between areas to be treated and sensitive plants. 	<ul style="list-style-type: none"> 10 meters** 	<ul style="list-style-type: none"> Dicamba is rarely used. 	<ul style="list-style-type: none"> Dicamba may be required if hoary alysuum continues to move into central and northern BC
2,4-D	<ul style="list-style-type: none"> Appropriate buffer zone should be established between treatment areas and aquatic systems. 	<ul style="list-style-type: none"> 10 meters 		<ul style="list-style-type: none"> 2,4-D is usually used as a component of herbicides such as Grazon. As Grazon contains picloram the restriction mentioned above apply.
Triclopyr	<ul style="list-style-type: none"> Consult 	<ul style="list-style-type: none"> 10 		<ul style="list-style-type: none"> Triclopyr has not been

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	with the appropriate provincial authorities.	meters**		used by NWIPC & NEIPC and may not be used in the future. This PMP and the NWIPC & NEIPC guidelines will be reviewed before triclopyr is used.
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*Woodward, D.F. [Assessing the hazard of picloram to cutthroat trout](#). Journal of Range Management. Volume 32 (1979) Number 3, May 1979 p. 230-232.

** registered products containing dicamba and triclopyr have buffer zones much larger than 10m for aerial application (in most cases), please consult label prior to application. Aerial applications will not occur under this PMP.

Appendix 6: NWIPC & NEIPC Suggested Herbicide Guidelines for Invasive Plant Treatments – 2010.
 (These are updated annually or if there is a change in the status of an herbicide).

Notes:

SUGGESTED HERBICIDE GUIDELINES FOR INVASIVE PLANT TREATMENTS

Draft Feb. 2010

Notes:

- Product labels and PMPs take precedence over any suggestions made in this document. The final authority is the label.
- If the location of domestic water sources is 1 double point of weeds using manual methods only.
- When treating near residences or areas where water supplies come from shallow aquifers, use manual methods or glyphosate.
- Regulation 77 (1) of the Invasive Pest Management Act allows for treatment of a spot to be 1.5 meters up from a target weed. For selective herbicides spray a 1.5 meter radius around individual plants or outer edge of a patch of target plants if there is a suspicion drop or soil banking of seed. (See note about glyphosate and treatment of individual plants).

Chemical	Treatment Site
Tordon 22K	DO NOT
Grazon	<ul style="list-style-type: none"> • Apply under tree canopy (within the drip line) or within plantations. • Apply to coarse texture soils (greater than 70% sand). • Apply to roadside ditches where they drain directly or indirectly into creeks even if the watercourse is dry at the time application.
Escort	<ul style="list-style-type: none"> • Apply where groundwater or shallow aquifers are within 1.5 meters of the surface unless there is at least 50cm of soil finer than loamy sand.
Banvel	<ul style="list-style-type: none"> • Apply Tordon or Grazon 30 meters up slope from fish bearing watercourses if application is occurring under PMP 402-06/04. • Do not use Tordon 22K in residential areas.
Lontrel	CAN
	<ul style="list-style-type: none"> • Apply up to the edge of ditches where there is no natural watercourse past the ditch (crosses road in creek or forested areas and a minimum 10 meter pesticide free zone from adjacent creeks can be maintained).
	DO NOT
	<ul style="list-style-type: none"> • Apply on coarse textured soils but only if there is good vegetation cover, i.e., not bare ground. • Apply under tree canopy. • Apply up to edge of roadside ditches where they don't drain directly into a fish bearing waters (dry creek is not fish bearing) and a 10 meter pesticide free zone can be maintained along the fish stream and/or natural watercourse.
Milestone	DO NOT
	<ul style="list-style-type: none"> • Apply under tree canopy (within the drip line) or within plantations. • Slope textured herbicide in yards over night as the pesticide mix is only viable for easy or tricking.
glyphosate products	DO NOT
	<ul style="list-style-type: none"> • Use glyphosate if there is desirable non-targeting vegetation unless there are environmental considerations; treatment is of individual plants (e.g. wilding), or reseeding is planned. • Glyphosate products may be less effective when plants are just started. <p>Glyphosate products are the only herbicides to be used in MOT gravel pits and quarries.</p> <ul style="list-style-type: none"> • Apply under tree canopy if wickeds. • Apply within 2 metres of the high water mark of water bodies provided the treatment will not increase stream bank erosion. (See Integrated Pest Management 2010, Regulation 74 (1)(a)(ii)).

SUGGESTED HERBICIDE GUIDELINES FOR INVASIVE PLANT TREATMENTS

Draft Feb. 2010

Chemical	Tordon 22K	Grazon*	Lontrel*	Milestone*	Round-up, Vantage, etc. glyphosates
Active Ingredient	Picloram	Picloram	Chlorpyrifate	Aminopyralid	
Product Concentration	240 g/L	65/240 g/L	350 g/L	240 g/L	350 g/L
Spray volume / CALIBRATE	400 L/ha	150 - 200 (400) L/ha	100 - 200 (400) L/ha	100 - 400 L/ha	100 - 200 (400) L/ha
Persistence in Soil	Active for 3 to 5 years (longer in the soils)	Active for up to 3 years	Non-active 40 day 1/2 life	Active for up to 3 years	None
Weed Species	Spray	Spray	Spray	Spray	WAS
Ancusa	Yes	Yes	N/A	N/A	Yes
Blueweed	Yes	Yes	N/A	N/A	Yes
Canada thistle	Yes	Yes	N/A	N/A	Yes
Common ragwort	Yes	Yes	Yes	Yes	Yes
Diffuse knapweed	Yes	Yes	Yes	Yes	Yes
Field scabious	Yes	Yes	N/A	Yes	Yes
Hawkweeds	Yes	Yes	Yes	Yes	Yes
Hoary alyssum	N/A	N/A	N/A	N/A	N/A
Light spurge	Yes	Yes	N/A	N/A	N/A
Stive daisy	Yes	Yes	Yes	Yes	Yes
Scotless chironomile	Yes	Yes	Yes	Yes	Yes
Spotted knapweed	Yes	Yes	Yes	Yes	Yes
Sulphur cinerifol	Yes	Yes	N/A	Yes	Yes

Chemical	Round-up, Vantage, etc. glyphosates
Active Ingredient	Disinfectant
Product Concentration	480 g/L
Spray volume / CALIBRATE	
Persistence in Soil	
Weed Species	Spray
Hoary alyssum	Yes
Light spurge	Yes
Stive daisy	Yes
Scotless chironomile	Yes
Spotted knapweed	Yes
Sulphur cinerifol	Yes

* If application is under PMP 402-0644 exhaust non herbicide treatments before applying herbicides. Eg., pull and dig non herbicide considered.

Milestone is a reduce risk herbicide and should be the first herbicide considered.

Lontrel provides better control on Knapweed when in the flower stage than Tordon 22K. However, Tordon can provide up to several years residual control.

Avoid application of herbicides if heavy rainfall is expected.

Herbicide applications must stop if wind speeds exceed 8 km/hr.

Do not apply herbicides if it is dead rain.

If it is necessary to apply herbicides to coarse textured soils use Mark or dabbler applicators.

Mark and No Treatment Zone, NTZ, adequate to ensure the 10 meter buffer. (See IFM Act Regulations 71, 73 & 74.

Stands should be used with most herbicide applications.

Appendix 7: Equipment Calibration and Checklist

CALIBRATION RECORD

	Date _____
	Calibration # _____
	Company _____
	Calibration Location _____

Instructions for backpack sprayer (for 400L / ha application)

Measure a 5m by 5m square in a field or landing at least 20 m away from any riparian area or watercourse. Using 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. 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.

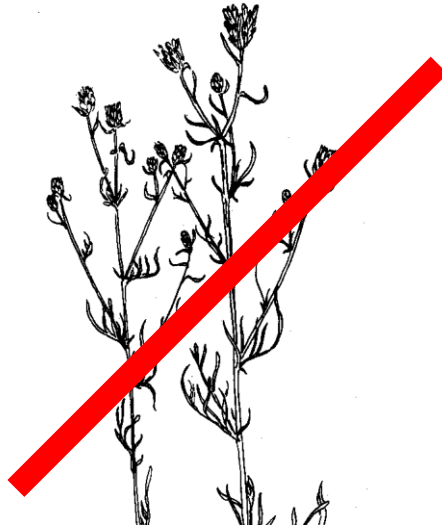
Equipment and Applicator Summary

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

Appendix 8: Example of Treatment Sign

NOTICE

HERBICIDE APPLICATION



SPOT TREATMENT OF INVASIVE PLANTS (WEEDS)

FOR INFORMATION CONTACT

--

SEE BACK OF SIGN FOR ADDITIONAL DETAILS

HERBICIDE (Active Ingredient): REGISTRATION NO:

CHECK OFF HERBICIDE(S) BEING APPLIED

- | | | |
|--------------------------|------------------------------------|----------------|
| <input type="checkbox"/> | <u>Tordon 22K (Picloram)</u> | <u># 9005</u> |
| <input type="checkbox"/> | <u>Grazon (Picloram and 2,4-D)</u> | <u># 26649</u> |
| <input type="checkbox"/> | <u>Roundup (Glyphosate)</u> | <u># 13644</u> |
| <input type="checkbox"/> | <u>Transline (Clopyralid)</u> | <u># 24085</u> |
| <input type="checkbox"/> | <u>Milestone (Aminopyralid)</u> | <u># 28137</u> |
| <input type="checkbox"/> | _____ | _____ |
| <input type="checkbox"/> | _____ | _____ |
| <input type="checkbox"/> | _____ | _____ |

TARGET SPECIES, weed(s): _____

PESTICIDE USE PERMIT OR PEST MANAGEMENT PLAN #

APPLICATION TIME: ____ : ____ AM PM

APPLICATION DATE: ____/____/____
 Day Month Year

**SAFETY CAUTION: AVOID SKIN CONTACT
WITH TREATED VEGETATION FOR 24 HOURS
AFTER APPLICATION**

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APPENDIX 9 – Ongoing Consultations

PERSONS, GROUP OR ORGANISATION	CONSULTATION ITEM OR ISSUE	NOTES
Ministry of Environment, Inter-Ministry Invasive Species Working Group, IPC BC, NWIPC & NEIPC	Development of a provincial led program for monitoring pesticide applications to Freshwater and Emergent Invasive Alien Species.	See Section 3.6.3. Washington State has examples to use in development: Annual Group Monitoring Plan for Lake and River Aquatic Herbicide Applications performed under the Noxious Weed National Pollutant Elimination System Discharge (NPDES) Permit (http://www.ecy.wa.gov/Programs/wq/pesticides/final_pesticide_permits/noxious/monitoring_data/lakesmonitoring_plan.html)
Haida Nation	Use of herbicides on Haida Gwaii	There has been an agreement by NWIPC partners not to use herbicides for invasive alien plant management on Haida Gwaii without further consultations with the Haida Nation. The Haida Nation is reviewing the situation with knotweeds and the testing of stem injection of glyphosate for knotweed management. Any such testing will be reviewed and approved by the Haida Nation before it proceeds.

APPENDIX 10 – Additional Definitions and Glossary of Acronyms (*This will be further developed*)

Containment See appendix 4

EDRR Early Detection Rapid Response – If the first line of prevention, the Canadian or BC border, is breached and a new invasive alien plant species arrives in BC the strategy is to have effective EDRR that will prevent that species from establishing. The BC EDRR Framework and Plan will be released in 2010. 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 BC while communicating Province wide alerts. Regional committees such as NEIPC and NWIPC are key players in BC’s EDRR program.

Ditches with water 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 if selective treatment is used. If the water in the ditch is temporary and free-standing (is not flowing into other water bodies) and at no time is, or flows into, a fish bearing water body, then glyphosate can be applied up to but not below the high water mark of the ditch.

Ditches that are dry If a dry ditch is a dry stream as defined by the IPMR then the same regulations apply as if it had water in it as above, except glyphosate may be applied over a dry stream that does not drain directly into a fish bearing water body at any time.

There are no regulations with respect to pesticide use in or around a dry ditch that is not a dry stream. However, given the possibility of transport of products such as picloram, it may be prudent when using such products to maintain a PFZ around dry ditches that when wet flow into fish bearing water bodies or riparian areas. Such a PFZ is especially recommended if treatment of the dry ditch is within 100 m of a fish bearing water body or riparian area.

Ditches that are contained There are no regulations with respect to pesticide use beside water in ditches that are self-contained (i.e., are not a body of water under the IPMR).

IAPP Invasive Alien Plant Program - The Invasive Alien Plant Program (IAPP) Application is the database for invasive plant data in BC. 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.
<http://www.for.gov.bc.ca/HRA/Plants/application.htm>

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- Industrial area:** Industrial is considered as one type of non cropland that encompasses facilities where manufacturing, processing or storage of commercial goods occurs.
- IMIS WG** The Inter-Ministry Invasive Species Working Group is made up of senior staff representing Provincial Government Ministries including the Ministries of Agriculture and Lands, Environment, Energy Mines and Petroleum Resources, Forests and Range, Tourism Culture and Arts, Transportation and Infrastructure and the Oil and Gas Commission. IMIAS WG has direct influence on this PMP through its adjudication and authorization of EDRR, Containment Lines, funding, etc.
- IPC BC** The Invasive Plant Council of BC, IPC BC, is a registered, non-profit organisation whose members are involved in all aspects of invasive plant management. Members include technical specialists working for government and industry, weed committee coordinators, First Nations representatives, foresters, forest technologists, biologists, ranchers, horticulturists, recreation enthusiasts, gardeners, and other concerned individuals. Membership is open to everyone willing to work collaboratively. <http://invasiveplantcouncilbc.ca/about-us/about-ipc>
- NEIPC** The North East Invasive Plant Committee – NEIPC was formed in 2003 as a subcommittee of the Peace River Regional District Weed Committee. It delivers invasive plant management programs that integrate awareness with site reporting, inventory, planning, treatment and evaluation and assessment so that the goals of EDRR, containment and rehabilitation in the NEIPC Strategic Plan can be accomplished. NEIPC uses a pooled resources delivery model for invasive plant management. In this model partners pool their resources, staff and funds, to work towards the shared goals outlined in the NEIPC Strategic Plan. NEIPC is subdivided into 4 Invasive Plant Management Areas, IPMAs, Fort Nelson, North Peace, South Peace and Pine Pass IPMAs. First Nations, through partnerships with NEIPC, are developing invasive plant programs and taking on invasive plant management throughout NEIPC’s area.
- NWIPC** The North West Invasive Plant Council, NWIPC, was established in 1992 to provide resolution of issues and coordination for invasive plant management programs first in northwest BC and later expanding to central and northern BC. The Council is made up of agencies, organizations and individuals that carry out invasive plant programs or have an interest in those programs. NWIPC is a not for profit organisation that integrates aspects of invasive plant management such as awareness, site reporting, inventory, planning, treatments and assessments. NWIPC operates under a pooled resources model where the partners and stakeholders may contribute resources to a funding pool to deliver programming based on shared strategies and goals. NWIPC is subdivided into 7 Invasive Plant Management Areas, IPMAs, Haida Gwaii, Stikine-Skeena, Houston, Burns Lake, Vanderhoof, Prince George and the Robson Valley. Each IPMA has an IPMA Contractor / manager whose responsibility it is to see that the NWIPC Strategies are implemented so that work towards the shared goals occurs. The contractors /

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managers conduct or coordinate inventory and treatments for all stakeholders and partners. First Nations, through partnerships with NWIPC, are developing invasive plant programs and taking on invasive plant management throughout NWIPC's area. NWIPC has a web page at: <http://nwipc.org/index.php>.

- Rehabilitation / Restoration When alien 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."
- Spot treatment: IPM Act Regulation 77.1 "...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 should occur on non target vegetation or the ground.
- Urban: Urban is defined as areas within town or city legal limits or boundaries.