

# **Pest Management Plan for the Southern Interior Forest Region Invasive Alien Plants**

**MoF-RSI-IAPP-2005**



**February 2005**

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## EXECUTIVE SUMMARY

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This is a Pest Management Plan (PMP) developed for the Invasive Alien Plant Program (IAPP) of the Ministry of Forests (MoF) Southern Interior Forest Region (RSI). It has been developed in accordance with the *Integrated Pest Management Act* and accompanying regulations. This PMP outlines the integrated pest management (IPM) approach for the control of invasive alien plants, which includes use prevention, manual, biocontrol, mechanical and use of pesticide techniques on Crown land.

The Southern Interior Forest Region has twelve forest districts and spans an area from north of Quesnel to the US border and is bounded by the coastal mountains to the west and Rocky Mountains to the east (Figure 1). This area encompasses a diversity of ecosystems ranging from grasslands, through dry and wet forested areas, to alpine; each with an array of flora and fauna. The region is home to important red and blue listed species and plant communities, critical biodiversity and wildlife habitat values, important livestock forage, numerous community watersheds, timber values, recreational sites, and interfaces with private lands with similar values.

In British Columbia the *Ministry of Forests Act*, *Forest and Range Practices Act* and accompanying regulations, as well as the *Weed Control Act* and accompanying regulations require that land users and occupiers control invasive plants, including noxious weeds on private and public land. Invasive plants impact ecosystems by displacing or replacing native plant species. All resources occurring on infested lands are impacted to some degree by these invasive plant species, whether it is the loss of productive forage, browse for wildlife and livestock or loss of aesthetic values as is the case with recreation. The socio-economic impact to the province is large, and therefore efforts to reduce these impacts through prevention and control is an integral part of managing Crown land. Within the Province of British Columbia Crown lands account for approximately 94% of the total land base. The *Integrated Pest Management Act* and accompanying regulations provides the statutory authority to allow pesticide use on public lands as described in a Pest Management Plan (PMP). This PMP covers the treatment of invasive plants within the Southern Interior Forest Region (RSI).

The goal of the Invasive Alien Plant Program (IAPP) in the RSI is to prevent the introduction of new species of invasive alien plants, and reduce the spread of existing invasive plants to minimise the impacts on the various ecosystems and resources within this area. To achieve this, Integrated Pest Management (IPM) principles will be used as described in this PMP. IPM involves invasive plant inventory, selection of treatment method that most effectively target specific invasive plant species while minimizing impacts to the environment, and evaluation of effectiveness of treatment.

This PMP outlines the MoF's IAPP to control and prevent the introduction of invasive alien plants.

## 1.0 INTRODUCTION

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This Pest Management Plan (PMP) has been prepared by the RSI Invasive Alien Plant Program (IAPP) to describe its invasive plant prevention and control activities. Upon confirmation by the administrator of *The Integrated Pest Management Act*, the PMP will provide both authority for the use of herbicides in the treatment of invasive plants and the framework for the decision-making process involved with invasive plant control. For the purposes of this PMP, invasive plants are considered those plants identified by the Ministry of Forests Invasive Plants Advisory Committee to be impacting plant communities on Crown land and require treatment. These plants will for the most part coincide with those occurring both on the *Invasive Plants Regulation* (appendix 8) and Provincial noxious weeds list but are not limited to these.

This document will provide information on:

1. Legislated obligation to control invasive plants on Crown Land.
2. The monitoring process to evaluate the impacts of invasive plant populations on the environment, including impacts to the plant communities they infest.
3. Categorization, and prioritization of invasive plants for their treatment within the RSI
4. Site prioritization (injury threshold)
5. Inventory and data management of invasive plants within the RSI.
6. Integrated Pest Management principles applied to treatment of invasive plants including; prevention, biological, manual, cultural, and chemical control methods and the decision-making mechanism for method of treatment.
7. Information on the safe handling of herbicides and environmental protection strategies.
8. Monitoring procedure for treatment sites and post treatment evaluation.
9. Interagency co-ordination.
10. Annual reporting of activities.

### 1.1 History of Invasive Plant Control

Invasive plant control conducted by the MoF is intended to eradicate new invading plant species, reduce rate of spread of existing populations of invasive plants to areas not yet infested and to reduce the population density of established infestations. This will minimize the impact of invasive plants on wildlife habitat and biodiversity and reduce the economic impact of invasive plants on forage supply, timber and recreational values.

The MoF has been controlling invasive plants through an Integrated Pest Management program for many years. Earliest biological control efforts were directed on St. John's wort and later to diffuse knapweed and other invasive plant species. Currently an integrated pest management (IPM) approach is directed at over 40 primary invasive plant species within the province of British Columbia.

## 1.2 Overview of the Plan Area

The RSI (Figure 1) has a diverse range of riparian, grassland, forested, and alpine ecosystems. Within this area resource use includes but is not limited to; grazing, recreation, parks, community watersheds, and wildlife. Invasive plants can infest many of these areas. Therefore having a management plan to address both the prevention and treatment of these species when they occur is essential to the management of these lands. Crown land also borders private land throughout the region and co-ordination through local weed committees is important for the overall success of the program.

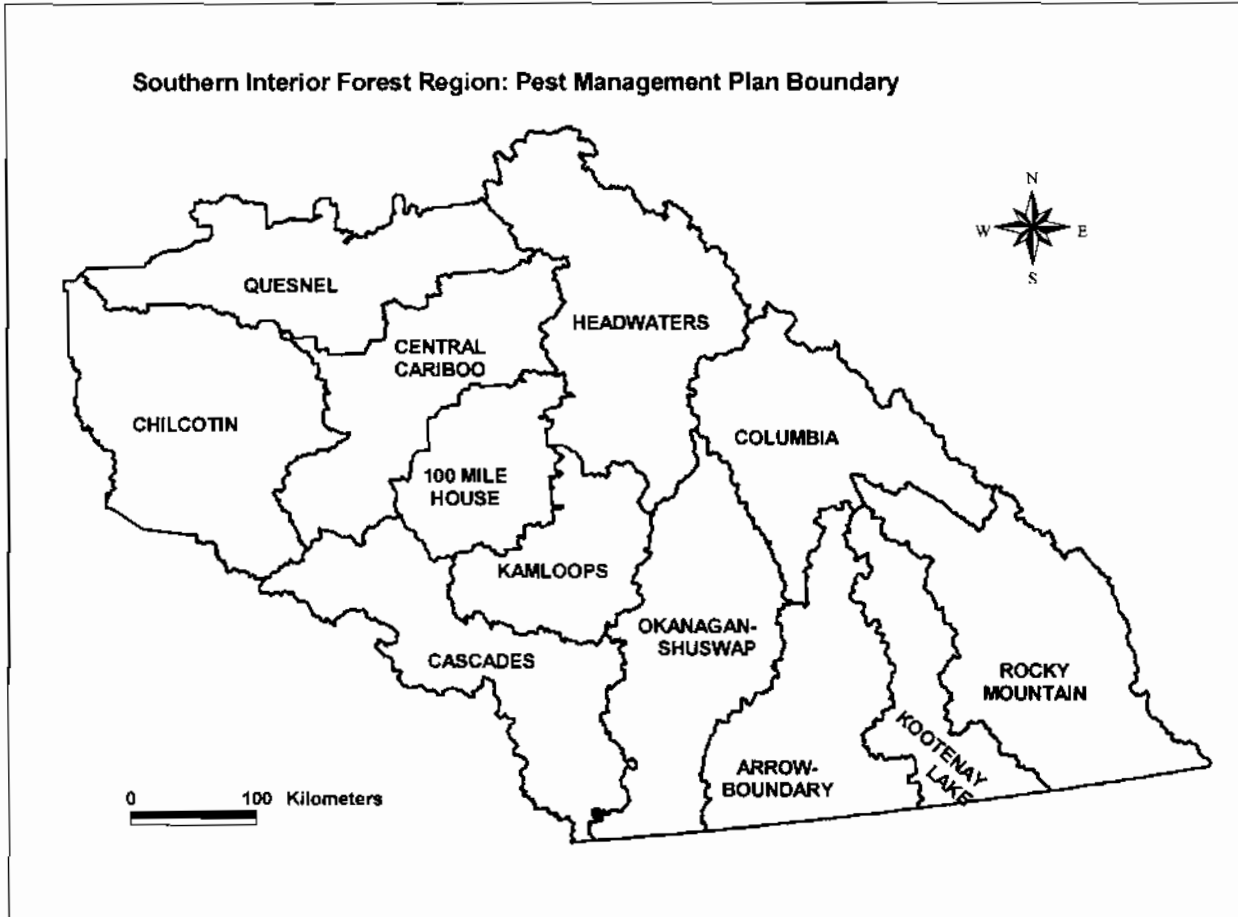


Figure 1 Southern Interior Forest Region (PMP Boundary)

## 1.3 Term of Plan

The term of this PMP will be for 5 years effective upon confirmation of the plan.

## **2.0 LEGISLATION AND REGULATORY REQUIREMENT**

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The treatment of invasive plants within the province of British Columbia falls under numerous Federal and Provincial legislated Acts, regulations and policies. Appendix 1 lists those most pertinent to this PMP. The main Legislation by which invasive plants are treated on Crown land is the *Forest and Range Practices Act* and Regulations including the Invasive Plant Regulation (Appendix 8), and *The Integrated Pest Management Act* and Regulation.

### **2.1 Regional Pesticide Review Committee (RPRC)**

The Regional Pesticide Review committee is comprised of representatives from the Ministries of Agriculture Food and Fisheries, Health, Forests, Environment Canada and the Habitat Protection section of Ministry of Water Land and Air Protection. Members of the committee have the responsibility for reviewing and commenting on the draft PMP's to ensure that pesticide treatment proposals will not cause unreasonable adverse effects to the environment or human health.

### **2.2 Land and Resource Management Plans**

Invasive plant control and other activities undertaken by the Ministry of Forests are subject to Higher Level Plans. Land and Resource Management Plans within the region (LRMP) specify objectives for the management of Crown land within the area of the LRMP including noxious weed control objectives. Some of these objectives are:

- Range – prevent and control invasive plants on Crown land;
- Endangered and rare species – where feasible, use non-chemical methods to control noxious weeds within rare species habitats;
- Access – minimize or reduce the impacts of noxious weeds or weed species of concern due to road development and use as well as off-road use; and
- All categories – minimize soil disturbances to reduce or eliminate establishment and spread of noxious weeds.

### **2.3 Pest Management Regulatory Agency**

The Pest Management Regulatory Agency (PMRA) was established in April 1995 in response to the recommendations of the Pesticide Registration Review Team. The review team was charged with studying and making recommendations to improve the federal pesticide regulatory system. The federal legislative authority for the regulation of pesticides in Canada is the *Pest Control Products Act* (PCPA). The PMRA administers the PCPA for the federal Minister of Health. The PCPA regulates the use of substances that claim to have a pest control use to minimize risk to human and environmental health.

### 3.0 MOF INVASIVE PLANT MANAGEMENT

#### 3.1 Invasive Plant and Site Prioritization (Injury Threshold)

The following section details what priority is placed on various invasive plant species occurring within the RSI. This matrix also describes the rating system used to rank an invasive plant site (injury threshold). The site ranking and invasive plant categories are tools used to determine what control strategy should be implemented to deal with infestations of invasive plants. Biological control will be incorporated for use on appropriate invasive plant species where infestations are beyond initial attack (eradication) and containment by conventional treatment.

#### Invasive Plant Categories

The following table categorizes invasive plant species of current priority in B.C..

*Table:1 Invasive Plant Categories*

CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
Anchusa	Blueweed	Baby's Breath	Nodding thistle
Gorse	Canada thistle	Batchelor's Buttons	St. Johns wort
Leafy spurge	Common Tansy	Black knapweed	
Marsh Thistle	Dalmation toadflax	Brown knapweed	
Perennial Pepperweed	Diffuse knapweed	Bull thistle	
Puncturevine	Field Scabious	Bull thistle	
Purple Loosestrife	Hoary Alyssum	Burdock spp.	
Rush Skeletonweed	Hound's-tongue	Common toadflax	
Spotted knapweed	Orange hawkweed	Giant knotweed	
Sulphur cinquefoil	Plumeless thistle	Hoary Cress	
Yellow Starthistle	Scotch thistle	Japanese knotweed	
	Tansy ragwort	Meadow knapweed	
	Teasel	Ox-eye daisy	
	Yellow hawkweeds	Russian knapweed	
	Yellow Iris	Russian knapweed	
		Scentless chamomile	
		Scotch Broom	

**Category 1** Invasive plants that pose extreme risk for invasion and spread into undisturbed sites. They also have a large area of 'ecologically at risk' habitat in the RSI. Sites less than 0.5 hectares, including all new infestations within containment zones of other invasive plant species will be considered for control.



**Category 2** - Invasive plants that pose a high risk of invasion and spread in undisturbed sites. Less aggressive than category 1 plants but pose similar threat to 'ecologically at risk' areas within the RSI. Sites less than 0.25 hectares would be considered for control.

**Category 3** - Invasive plants that pose a moderate risk to invasion and spread into undisturbed sites. These plants pose a threat to 'ecologically at risk' areas within the RSI.

**Category 4** - Invasive plants that pose a low to moderate risk of invasion and spread into undisturbed sites.

### 3.3 Invasive Plant Sites

The Ministry of Forests has also ranked invasive plant sites or potential invasive plant sites according to priority. The definition of the four priorities is shown in the following table.

*Table:2 Site Priorities*

<b>Priority</b>	<b>Purpose or Intent of Treatment</b>
1 Extremely High Risk	To stop the spread of invasive plants threatening non-infested, highly susceptible areas. These sites are generally less than or equal to 0.25 ha. and are widely separated by distance or physical barrier from the infestation site. These sites have a high probability of control.
2. High Risk	To stop the enlargement of sites in highly susceptible areas. These sites are less than or equal to 0.5ha. These sites must have a good probability of control.
3. Moderate Risk	To stop the enlargement of sites of greater than or equal to 0.5 ha in highly susceptible areas or less than or equal to 0.5 ha. In moderately susceptible areas. These sites must have a good probability of control.
4 Low Risk	To stop the enlargement/contain sites in moderately susceptible areas of greater than or equal to 0.5ha. . These sites must have a good probability of control.

### 3.4 Treatment Thresholds

Invasive plant species Categories and site Priorities are reviewed yearly by the Ministry Invasive Plant Committee. Table 3 illustrates the various combinations of invasive plant categories with site priorities to establish level of treatment priority. Depending on number of sites within any level, allocation of funding to the IAPP program determines extent of treatment at a program level.

*Table 3: Treatment rationale by species category and site (injury threshold)*

IP Category	Site Priority	Program Level
1	1	Initial Attack
1	2	
2	1	
1	3	Containment
2	2	
2	3	
3	1	Full Program
3	2	
3	3	

## 4.0 INTEGRATED PEST MANAGEMENT PROGRAM

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Integrated Pest Management (IPM) includes pest identification, risk assessment, inventory, and application of most appropriate method or methods for controlling pest populations with follow up monitoring and evaluation of treatment success to improve the control of the pest. The Ministry of Forests Invasive Plant Program (IAPP) is committed to the principles and practice of IPM and uses the following techniques in an integrated program to manage invasive plants.

The short-term goal of the IAPP is the prevention of new invasive plant species from becoming established (initial attack) and to control current infestations from expanding in area (containment). Tools used are identification of invasive plant species, site priority, inventory, assessment of impact to environment, followed by site specific cultural, herbicide or biocontrol treatment. Maintaining or improving an infested site to better health and vigour, and proper ecological functioning and condition, is the long term objective of the IAP. In many ecosystems where invasive plants have become well established, biological control treatment will maintain the populations of invasive plants to a level that will allow the proper function of that system.

## 4.1 Inventory and Monitoring

To address resource impacts of invasive plants and to effectively plan provincial, regional and district weed containment and control strategies, inventory of invasive plant species is required. Within the RSI a comprehensive invasive plant database has been developed for recording information on invasive plant inventory and treatments. This database provides valuable information for land use planning and invasive plant treatment. Information is collected and entered into this database by IAPP staff. The following forms are used to record inventory, treatment, and monitoring information on invasive plant sites:

- Invasive Plant Inventory Form (Appendix 2)
- Invasive Plant Treatment Form (Appendix 3)
- Biological Agent Release Form (Appendix 4)
- Biological Control Agent Monitoring Form (Appendix 5)
- Post treatment monitoring form (Appendix 6)

## 4.2 Treatment Options

Once a site has been assessed for the presence and impact (injury threshold) of invasive plants, some form of treatment is assigned to the site. The following treatments are used as part of the RSI IAP:

- Prevention
- Cultural Control
- Physical/Mechanical Control
- Biological Control
- Herbicide Control

Each of these treatment options is discussed in greater detail in the following sections.

### 4.2.1 Prevention

Preventing the initial establishment and spread of invasive plants is the first, most effective, and often most overlooked method of invasive plant control. Invasive plants will invade those areas that provide suitable habitat for survival. This includes soils disturbed through road or recreational trail development, right of way disturbances for fence construction, and timber harvesting to name a few. For these reasons it is important to clean equipment, livestock and personnel when moving from infested areas to prevent the introduction of invasive plant seeds to non-infested sites. Another important method to prevent the introduction of invasive plants is to ensure potential seed bed area in the form of soil disturbance is minimized. A healthy perennial vegetative cover is needed to best out-compete invasive plants for space, light, water, and nutrients and therefore

seeding of disturbed sites with appropriate perennial grass species is important to reduce risk of infestation.

Prevention begins with the correct and early identification of potential problem invasive plant species. Once the plant is identified, the most effective methods of control can be prescribed.

The habitat, growth and methods of regeneration and spread of each species have to be determined. Each species has a period or periods within its life cycle when it is most susceptible to different control treatments.

The IAPP program works with the various forest industry and livestock associations to provide the necessary information for identification, prevention and treatment of invasive plants occurring on Crown Land.

#### **4.2.2 Cultural and Mechanical Control**

Cultural and mechanical methods of control are also used as part of the RSI IAPP to prevent and treat invasive plants. The following, lists a number of cultural and mechanical methods that are frequently used to prevent or control invasive plants:

- Seeding,
- Irrigation,
- Fertilization,
- Livestock grazing,
- Hand pulling and cutting,
- Mowing, and
- Burning.

The IAPP within the RSI uses the methods of hand pulling and cutting of invasive plants as an alternative treatment to herbicides where they are not permitted or practicably used. Some of these situations are:

- Site is within Pesticide Free Zone (close to water);
- There is particular concern with damaging adjacent plants with herbicides;
- Site conditions preclude the use of herbicide treatment (coarse textured soils); and
- Herbicide “window of opportunity” has passed (weather or plant growth is outside herbicide control parameters).

### 4.2.3 Biological Control

It is the intent of the MoF IAPP to introduce biological control agents when and where appropriate to reduce invasive plant populations. It is recognized that early identification and treatment of sites with herbicide to eradicate the invasive plants and prevent future impacts is necessary to keep these plants in check. Sites that have a long established population of invasive species, and when a biological control agent is available and proven effective, biocontrol will be used as a treatment to reduce chemical inputs to the environment and achieve long term control on site. Biological control is the most desirable method of weed control, both economically and environmentally on these sites. Biocontrol agents (predominately insects) are released to attack and weaken target plant species and over time reduce the size of host populations. Biocontrol agents are utilized in areas where weed infestations are too extensive to be reduced effectively by other treatment methods.

Within the Ministry of Forests, the biological control program responsibilities are shared by the Forest Practices Branch, MoF regions and districts. Forest Practices Branch is responsible for liaison with other Canadian and international agencies and contracting for initial agent search, screening, initial propagation and initial field releases.

Where biological control agents have been released as a treatment, ongoing monitoring for establishment and dispersal of agents is an integral part of determining impact of to the invasive plant population.

Table 4 lists examples of biological control agents currently being released on invasive plants within the RSI.

A complete listing of biological control agents in general use, and those being developed for invasive alien plants in British Columbia is available on-line at: <http://www.for.gov.bc.ca/hfp/pubs/interest/bioagent/bioagent.htm>

**Table:4 Biological Control Agent examples currently being used**

<b>BIOCONTROL AGENT</b>	<b>WEED SPECIES</b>	<b>MODE OF ACTION</b>
<i>Agepeta zoegana</i>	Spotted knapweed	Root feeder
<i>Apthona cyparissae</i>	Leafy spurge	Root/shoot feeder
<i>Apthona czwalinae</i>	Leafy spurge	Root/shoot feeder
<i>Apthona nigriscutis</i>	Leafy spurge	Root/shoot feeder
<i>Chrysolina hyperici</i>	St. John's wart	Leaf/shoot feeder
<i>Cyphocleonus achates</i>	Diffuse/spotted knapweed	Root feeder
<i>Eriophyes chondrillae</i>	Rush skeletonweed	Reduces seed production by galling the stem
<i>Galerucella spp.</i>	Purple Loosestrife	Feeds on leaves and stems
<i>Larinus minutus</i>	Spotted knapweed	Eats and kills seeds in the seed head
<i>Larinus obtusus</i>	Spotted knapweed	Eats and kills seeds in the seed head
<i>Longitarsus quadriguttatus</i>	Hound's-tongue	Damages root
<i>Mecinus janthinus</i>	Dalmatian and Common toadflax	Reduces seed production and root growth
<i>Metzneria paucipunctella</i>	Spotted knapweed	Eats and kills seeds in the seed head
<i>Mogulones cruciger</i>	Hound's-tongue	Reduces vigour of plant through damage to the root and stem
<i>Pelochrista medullana</i>	Spotted knapweed	Leaf feeder
<i>Puccinia acroptili</i>	Russian knapweed	Rust species affects photosynthesis and growth
<i>Puccinia chondrillina</i>	Rush skeletonweed	Stem rust
<i>Puccinia jaceae</i>	Diffuse and Spotted knapweed	Rust species affects photosynthesis and growth
<i>Rhinocyllus conicus</i>	Plumeless thistle, nodding and Canada thistle	reduces seed production of infested plants
<i>Sphenoptera jugoslavica</i>	Spotted knapweed	Root feeder
<i>Urophora affinis</i>	Diffuse/Spotted knapweed	Seed reduction in seed head (galls)
<i>Urophora quadrifasciata</i>	Diffuse/Spotted knapweed	Seed reduction in seed head (galls)
<i>Urophora solstitialis</i>	Plumeless thistle	reduces seed production of infested plants
<i>Urophora stylata</i>	Bull thistle	Seed reduction in seed head (galls)

#### 4.2.4 Herbicide Control

Various herbicides are approved and used for spot treatment of invasive plants in British Columbia. Herbicides are used on sites where eradication or containment of invasive plant species can be achieved. Containment areas have been established for many invasive plant species and target plants within the resulting containment areas are treated with appropriate herbicides. Herbicides will be applied using conventional methods of backpack sprayer, ATV mounted with tank and hand nozzle, and truck with tank and hand nozzle. Boom spraying will be utilized on larger sites. All herbicide treatments will be on a spot treatment basis to minimize the amount of herbicide used and potential impact to the environment. Table 5 shows the various herbicides used and their applicable application rates.

*Table 5: Herbicide Application Rates*

<b>Herbicide Trade Name (active ingredient)</b>	<b>Weed Species Controlled</b>	<b>Rate kg. ai/ha.</b>
Tordon 22K (picloram)	Most broadleaf plants	0.54 kg. ai/ha
	Canada Thistle	1.08 kg. ai/ha
	Leafy Spurge Toadflax	2.16 kg. ai/ha
Roundup (glyphosate)	All plants (non-selective)	3.0 kg. ai/ha. wick application 33% solution
Transline (clopyralid)	Compositae species (under coniferous tree canopy)	0.3 kg. ai/ha
Grazon (picloram, 2,4-D)	Broadleaf invasive plants	0.455 kg ai. Picloram/ha plus 1.68 kg ai 2,4-D/ha
Escort (metsulfuron methyl)	Canada thistle, Perennial pepperweed,	18 g ai/ha
	Common Tansy, Field Scabious	12 g ai/ha
Dyvel DS (Dicamba, 2,4-D, Mecoprop)	Hoary Alyssum only	3.25 L/ha.
Amsol 2,4-D Amine 500 (2,4-D)	Broadleaf plants (coarse texture soils)	2.1 kg. ai/ha.
Surfactants	On plants with physical characteristic limiting uptake of herbicide	As label indicates

*Tordon 22K* is a selective (broadleaf), residual herbicide that can remain in the soil for several years and continue to control susceptible vegetation. This is a systemic herbicide for use on a wide variety of broadleaf invasive plants. Picloram (active ingredient in Tordon 22K) may persist in the soil, therefore care must be taken to avoid areas where soil may be moved or where there is a shallow aquifers or domestic water intake. The mode of action and soil persistence allows for a broader application window.

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

*Transline* is a selective, residual herbicide. It has the advantages over Tordon 22K in that Transline is less persistent in soil and it does not kill woody species such as trees and shrubs when applied to target species in close proximity to their stems. Transline is the herbicide of choice when an overstory of trees and shrubs is present at the infestation site and there is a need to minimize or prevent damage to these non-target plants.

*Grazon* is a herbicide containing both 2,4-D and picloram. Therefore it provides immediate control with the 2,4-D and longer-term, residual control typical of Tordon 22K. Grazon provides a wider application window than either Tordon 22K alone or 2,4-D. 2,4-D is a selective, non-residual herbicide that targets most broadleaf invasive plants and brush.

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

*Dyvel DS* herbicide contains diacamba, 2,4-D and mecoprop as active ingredients for broadleaf invasive plant control. It is used in the MoF IAPP program specifically for the control of Hoary Allysum.

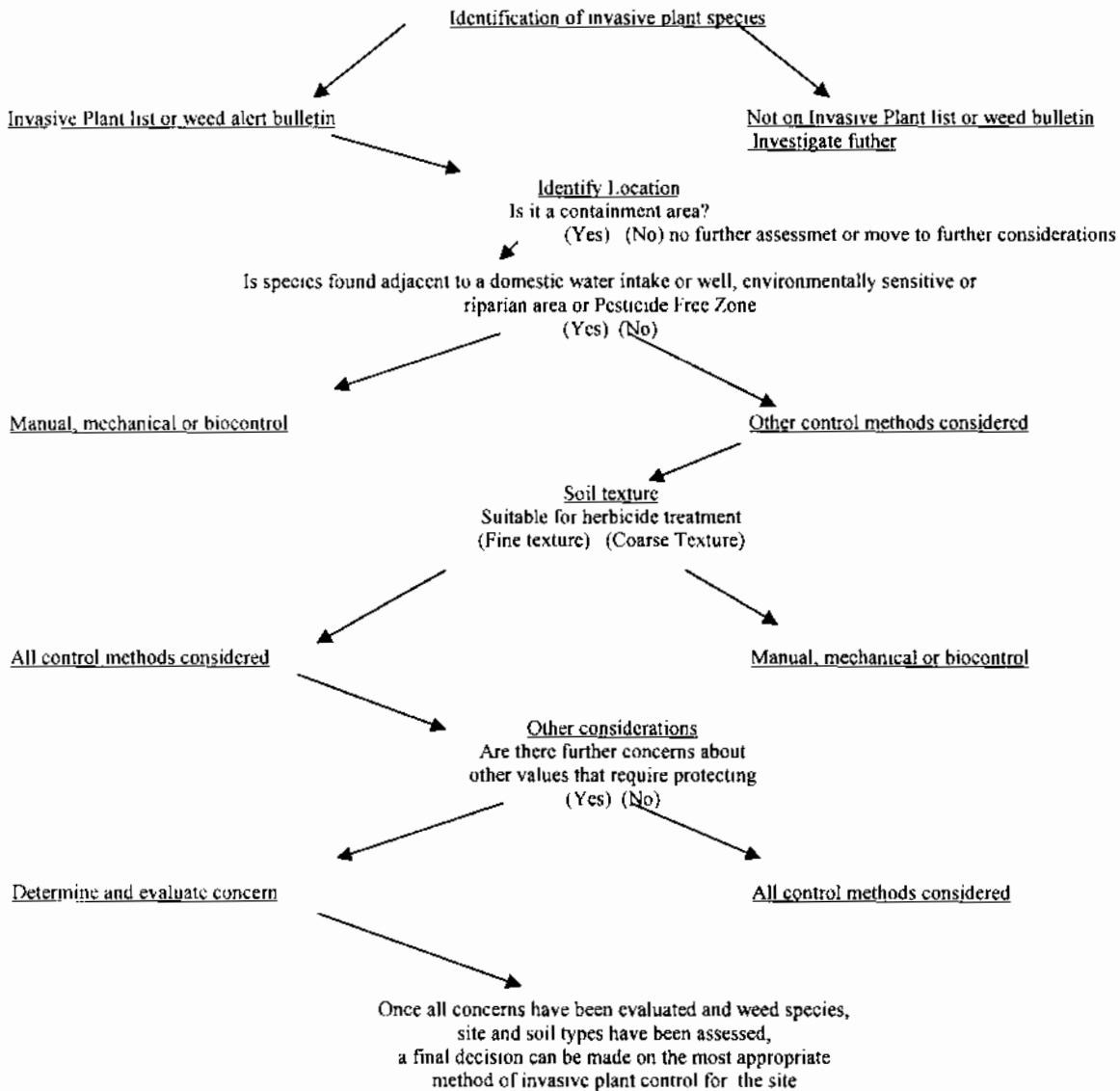
*Surfactant* is used when treating plants which have some physical characteristic that limits herbicide uptake. For example, Dalmatian toadflax treatment with most herbicides requires the use of a surfactant due to a waxy cuticle on the leaves.



## 5.0 TREATMENT SELECTION

### 5.1 Treatment Selection Flow Chart

Treatment selection is based on information compiled during pre-treatment assessments of both invasive plant species and sites. The decision tree matrix is designed to address most circumstances but recognizes that site-specific conditions and professional judgement may override the decision tree's recommended treatment strategy.



## **6.0 TREATMENT AREA EVALUATION**

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Prior to treatment, sites are assessed for presence of invasive plants and impact they have to the site. Impact (injury threshold), is assessed by site susceptibility and size of current invasive plant population (Table 2). Site treatment is prescribed based on the decision matrix, which takes into consideration site priority, invasive plant present, size of infestation, soil type and location (see decision tree in Section 4.1).

A selection of sites will be evaluated by MoF to determine effectiveness of treatment in reducing the impact of invasive plants, compliance with PMP, and contract and label conditions. Dyes are used with herbicide treatment to aid in both the accuracy of treatment as well as post treatment evaluation. Evaluation also consists of herbicide efficacy, plants missed, use of flagging near Riparian Free Zones, and target species treated. For mechanical treatment sites are assessed for possible regrowth and need for a second treatment.

Biological control is evaluated for agent establishment within 2 years after release. Once establishment is verified on a site, assessment of dispersal and efficacy of the agent is also assessed.

## **7.0 ENVIRONMENTAL PROTECTION**

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The *Integrated Pest Management Act* and regulations require a description of the environmental strategies and procedures that will be followed under the plan. The following represent these strategies within the RSI.

### **7.1 Community Watersheds And Water Intakes**

Within community watersheds a Pesticide Free Zone (PFZ) and buffer zone will be maintained adjacent to source water bodies and a minimum of 30 meters will be observed around water intakes when herbicide treatment is used. These will be identified on weed treatment maps prior to treatment. Treatment contractors will mark these zones using designated marking materials prior to treatment.

### **7.2 Surface Water Wells and Intakes**

A Pesticide Free Zone (PFZ) of 10 meters will be maintained from all bodies of surface water. Adequate buffer zones will be associated with PFZ's to ensure integrity of surface water and riparian areas. A minimum 30 meter buffer will be maintained from all domestic water intakes and wells. Where known, this information is made available to applicators as part of the weed treatment plan prior to treatment.

### 7.3 Aquifers

Where groundwater or aquifers are within 1.8 meters of the surface, soils will be assessed for texture to a depth of at least 50 cm prior to herbicide treatment. Where soils are found to be coarser than sandy loam, Tordon 22K, Grazon and Transline treatment will not occur.

### 7.4 Ditches

Tordon 22K, Grazon, and Transline will not be applied to roadside or other ditches that drain directly or indirectly into natural water courses or sources used for irrigation purposes or into any fish bearing stream.

### 7.5 Fish And Wildlife Resources

To prevent contamination of water in fish bearing streams, Tordon 22K, Grazon, and Transline will not be applied to ditches that flow directly or indirectly into fish bearing streams. A pesticide free zone will be maintained along all water bodies.

Wildlife habitat can be significantly impacted by invasive plants, specifically areas of deer winter range along south-facing slopes. Standard invasive plant control strategies will be conducted within these areas unless it is identified that a site requires additional treatment to maintain critical habitat.

### 7.6 Species Requiring Protection

Where 'At Risk' plant species have been identified in a higher level plans, wildlife management areas, and other plans, they will be managed accordingly within the IAP. Several species of plants have been identified by various LRMP's and First Nations bands within the RSI for ethnobotanical purposes and will be managed within the IAPP by ensuring all herbicide applicators are familiar with plant identification and that these species will receive minimal impact during treatment activities. These species include but are not limited to: saskatoon (*Amelanchier alnifolia*), nodding onion (*Allium cernuum*), balsam root (*Balsamrhiza sagittata*), Indian potato (*Claytonia lanceolata*), Indian hemp (*Apocynum spp.*), and bitter root (*Lewisia rediviva*).

Additional species will be added to this list as they are identified by First Nations bands and other groups or individuals within the RSI.

## **7.7 Spot Treatment**

To minimize risk of environmental impacts to both soils and non-target plants, herbicides are applied in a spot treatment basis on target plants identified in the assessment process.

## 8.0 OPERATIONAL PRACTICES

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### 8.1 Qualifications Of Personnel

The development of the Southern Interior Region Invasive Plants Pest Management Plan is conducted by a licensed Professional Agrologist who is employed by the Ministry of Forests to co-ordinate invasive plant control activities within the region. Familiarity of both the invasive plants and habitat is important to the development of the plan, including treatment decision making processes. Site identification, treatment plan development, and post treatment site inspections are conducted by experienced MoF Invasive Plant Program staff.

The treatment of invasive plants manually and chemically within the district is conducted by experienced contractors who are holders of a service license for the treatment of invasive plants with herbicides. All persons applying herbicides working under MoF contract must be either a holder of, or working with someone who holds a valid British Columbia Herbicide Applicators Certificate.

### 8.2 Herbicide Handling Practices

#### 8.2.1 Herbicide Transportation

*The Transport of Dangerous Goods Act* regulates the handling and transportation of poisonous substances which may include herbicides. The *Integrated Pest Management Act and regulations* also specify certain transport procedures. The following procedures are followed with respect to the transport of herbicides as part of the IAPP within the RSI:

- herbicide to be carried in a secure lockable compartment;
- herbicide to be transported in original labelled container;
- no more than 1 container of each herbicide to be transported during spray operations;
- herbicide to be carried separately from food, safety gear and people;
- spill equipment to be carried on vehicle; and
- appropriate documents and placards to be carried in or placed on vehicle during transport.

#### 8.2.2 Herbicide Storage

Herbicides will be stored in accordance with the *Integrated Pest Management Act* and regulations; this includes storing in a secure, lockable room that is vented to the outside and accessible only to those with authority to do so. The storage is

equipped with necessary spill equipment, first aid kits, and the appropriate Material Safety Data Sheets of herbicides stored.

### **8.2.3 Mixing And Loading**

Mixing and loading of herbicides will be conducted as per instructions contained on page F-2 of the MOF **Herbicide Field Handbook**<sup>1</sup>, as well as chapter 5 of **Handbook for Pesticide Applicators**<sup>2</sup> and according to label directions. In addition, a pesticide spill kit and contingency plan will be maintained at the mixing and loading sites.

### **8.2.4 Container And Residual Pesticide Disposal**

The responsibility of container disposal associated with Invasive Plant program lies with the contractor. It is the contractors responsibility to triple rinse empty herbicide containers and dispose of at appropriate landfill sites. Any unused chemical supplied by the Invasive Plant program will be returned and stored in approved herbicide storage facility.

## **8.3 Spill Response Plan**

A herbicide spill kit on all vehicles used in invasive plant control shall contain as a minimum the following articles:

- Instructions for spills,
- Emergency Telephone Numbers,
- Agricultural white lime (25 kg.),
- Kitty litter (2-20 kg. Bags),
- Large plastic garbage bags (4),
- Shovels (2),
- Nutrasol (1),
- ABC Type Fire Extinguisher,
- Polyethylene or plastic tarp (10'X10' minimum),
- Dustpan and shopbrush,
- Flagging and Rope,
- Herbicide First Aid kit, and
- Personal Protective Safety gear (rubber gloves, safety glasses).

<sup>1</sup> Boating, Jacob. 1998. **Herbicide Field Handbook**, Revised. March 1998. Forest Practices Branch. BC Ministry of Forests

<sup>2</sup> Adams, Robert (ed.) 1995. **Handbook for Pesticide Applicators and Dispensers, Fifth Edition**. BC Environment, Pesticide Management Program

A spill plan will be approved prior to commencement of invasive plant treatment by the contract coordinator or Regional Invasive Plant coordinator. The spill plan will meet minimum standards and procedures as described on page G-5 of **Herbicide Field Book**<sup>3</sup>.

#### **8.4 Boundary Marking Procedures**

All herbicide treatment of invasive plants within the Southern Interior Region will be outlined on the annual treatment plan indicating site and treatment. Each site is identified to provide accurate location and recording of treatments. At each site the contractor will ensure adequate signage and or marking is in place if it occurs within a public use area or near surface water.

#### **8.5 Equipment Maintenance and Calibration**

Equipment will be supplied by the contractor and be in good working condition. Equipment will vary depending on site. An inspection and calibration of equipment will occur prior to commencement of weed treatment activities each year (Appendix 7). Weekly calibration of equipment is required for the duration of the weed treatment activities. An operational log is submitted weekly with treatment records to the contract co-ordinator providing information on equipment maintenance and calibration.

#### **8.6 Herbicide Treatment Plan**

Herbicide treatment plans are developed by the RSI IAPP program and includes sites to be treated, targeted invasive plants, type of treatment, and additional site comments. The treatment plan has an associated set of digitized invasive plant maps providing site location information as well as weed species and density of invasive plants within sites. New sites identified within the region are entered into a regional invasive plant inventory database of site attributes and are mapped for inclusion in future treatment plans. Invasive plant treatments are also entered into a database once completed and assessed using the appropriate treatment evaluation forms (appendix 6).

#### **8.7 Weather Monitoring**

An anemometer (wind speed) and thermometer will be used at the treatment sites before herbicide treatment occurs to ensure weather conditions are suitable for herbicide application. Foliar treatments will only be carried out when:

- Temperatures are less than 27 degrees Celsius;

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<sup>3</sup> Boating, Jacob. 1998. **Herbicide Field Handbook**, Revised. March 1998. Forest Practices Branch. BC Ministry of Forests

- Wind speed is less than 8 km per hour;
- No precipitation is forecast for at least 4 hours; and
- Label conditions will supersede the above conditions except where they are less stringent.

## **8.8 Herbicide Application Procedures**

The following herbicide application procedures will be followed within the RSI.

- Treatment sites will be assessed prior to treatment to confirm target species, treatment area boundaries, and location of water bodies or riparian areas in the vicinity of sites.
- If open water or riparian areas occur near a treatment site, marking ribbon will be used to mark the Pesticide Free Zone and buffer prior to herbicide treatment.
- During herbicide application, gloves, boots and overalls will be worn by applicators.
- Herbicide will be applied on a spot not exceeding 2 meters diameter on a single plant or 1 meter at the perimeter of a larger infestation.
- Herbicide will be applied at label rates using the methods to achieve efficacy of active ingredient.

## **8.9 Written Records**

The RSI IAPP will retain records of site assessment and invasive plant inventory as well as operational herbicide and other treatment records. These records will include:

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

## **8.10 Follow-Up Reports**

The RSI IAPP will submit annual summaries of herbicide use and hectareage treated to the Deputy Administrator of *Integrated Pest Management Act* of Water Land and Air Protection on the appropriate forms prescribed by the Deputy Administrator by December 31 in each year of the plan.



## 9.0 PUBLIC NOTIFICATION & CONSULTATION

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### 9.1 General Public

Prior to submitting the final PMP to the Ministry of Water, Land and Air Protection for confirmation, MoF will publish (2) Notices of Intent to Submit a Pest Management Plan for confirmation in local newspapers within the districts of the region. Concerns regarding the PMP must be received in writing within 30 days of the newspaper notification. The PMP applicant will respond to written concerns and actions to address the same will form part of the PMP as appropriate.

Upon confirmation of the PMP and at least 21 days prior to treatment with herbicide an annual notice of intent to treat will be provided to the Administrator of the *Integrated Pest Management Act* and regulations and it will contain the following information:

- Name and business location of the confirmation holder;
- Map or diagram clearly identifying treatment locations;
- Geographic features requiring PFZ's or a no-treatment zone;
- A description of the proposed treatment including herbicide and method of application; and
- Total area to be treated that year

### 9.2 First Nations

First Nation consultation will follow policy and procedures provided by the Ministries of Aboriginal Affairs. Results of the consultation process with First Nations will be documented and available for review. Concerns addressed at the time of referral and consultation of the PMP will be addressed where appropriate within the plan.

### 9.3 Interagency Co-ordination

The Ministry of Forests has been the leader in invasive plant control in the province of British Columbia and actively involved with co-ordinating weed 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 Weed Control Act states that 'every occupier has the responsibility to control noxious weeds', MoF conducts its integrated invasive plant program within the RSI in communication and co-operation with other 'land occupiers' including but not limited to,

- Range Act agreement holders
- BC Hydro
- BC Ministry of Agriculture, Fisheries and Food

- BC Ministry of Highways
- BC Ministry of Water, Land and Air Protection
- BC Parks
- First Nations
- Regional Districts
- The Nature Trust of B.C.

#### **9.4 Amendments**

MoF will forward to the Ministry of Water, Land and Air Protection in writing any amendments requested under the confirmed PMP as per *Integrated Pest Management Act Regulations* section 58.

## 10.0 APPENDICES

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- Appendix#1      Legislation**
  
- Appendix #2      Invasive Plant Inventory Form**
  
- Appendix #3      Invasive Plant Treatment Form**
  
- Appendix #4      Biological Control Agent Release Form**
  
- Appendix #5      Biological Control Agent Monitoring Form**
  
- Appendix #6      Post Treatment Monitoring Form**
  
- Appendix #7      Equipment Calibration and Checklist**
  
- Appendix #8      Invasive Plant Regulation**

## Appendix #1 LEGISLATION

### Federal Legislation

*Plant Protection Act* describes the requirements for the introduction of biocontrol agents into Canada.

*Pest Control Products Act* summarizes the registration and availability of pesticides. Prohibits application under unsafe conditions.

*Migratory Birds Convention Act* describes the requirements to protect migratory birds from pesticides.

*Fisheries Act* establishes criteria for the protection of fisheries and fish habitat from pesticides.

*Transportation of Dangerous Goods Act* provides information regarding the storage and transportation of pesticides (and other dangerous goods).

*Food and Drugs Act* describes restrictions on pesticide use on livestock forage and where livestock will be consumed by humans.

*Waste Management Act* outlines procedures for the disposal of pesticide wastes.

*Canada Seeds Act* provides guidelines for the content of noxious weed seeds in crop seed, and transportation of crop seed in Canada.

### Provincial Legislation and Authority

*Weed Control Act* outlines the obligation to control designated noxious weeds, not necessarily with pesticides, by the land occupier.

#### *Forest and Range Practices Act Part 5, Division 1, Section 47*

A person carrying out a forest practice or a range practice must carry out measures that are

- (a) specified in the applicable operational plan, or
- (b) authorized by the minister

to prevent the introduction or spread of prescribed species of invasive plants.

*Forest Act* and *Ministry of Forests Act* authorize the Ministry of Forests to control pests (not necessarily with pesticides).

***Invasive Plants Regulations:*** For the purposes of section 47 of the *Forest and Range Practices Act*, the prescribed species of invasive plants are listed to be specified in applicable operational plans.

***Pesticide Control Act*** prohibits the application of pesticides, including herbicides, from Crown land except under a pesticide use permit by a licensed pesticide applicator. Also lays out requirements for the handling, storage, disposal, and sale of pesticides.

***Environmental Appeal Board Procedure Regulation*** governs the process for appeals of pesticide use permits and pest management plans.

***Environmental Management Act*** outlines the process for appeals of pesticide use.

***Wildlife Act*** establishes criteria for the protection of wildlife and wildlife habitat.

***BC Transportation of Dangerous Goods Act*** provides information regarding the storage and transportation of pesticides.

Other provincial and federal legislation includes:

- ***Worker's Compensation Act***
- ***Plant Quarantine Act***
- ***Pesticide Residue Compensation Act***
- ***Plant Protection Act***
- ***Provincial Transportation of Dangerous Goods Act.***

## **Provincial Policy**

***Silviculture Policy - Forest Seedings of Recently Disturbed Land*** describes opportunities for forage seeding is appropriate to limit encroachment of invasive plants.

***Forest Health Policy - Forest Health Concerns*** outlines forest management techniques that will be used to prevent damage to forest and range resources from causal agents, such as invasive plants.

## **Provincial Guidebooks**

### ***Range Management Guidebook***

- describes what invasive plants are, and outlines strategies for preventing their spread to new areas in forest operations.
- describes how noxious weed management and control is part of a range use plan.





**Appendix #4 Biological Control Agent Release Form**

Data entered?

**BIOLOGICAL CONTROL  
RELEASE RECORD**

Temp \_\_\_\_\_  
Field No \_\_\_\_\_

Entered by \_\_\_\_\_

Treatment Date                  Time          Map                  Site                   
(assigned in data entry stage)

Applicator \_\_\_\_\_ Contractor \_\_\_\_\_

GPS / UTM Grid Zone      Easting                  Northing                   Same as site?

**Biological Control**

Bio Agent Code                  Source \_\_\_\_\_ Bio Agent Stage  
 Adult  Egg  
 Pupa  Other  
 Larvae  All  
 Quantity     

Target Plant Species                  Collection Date                 

Private Land Owner \_\_\_\_\_ Telephone # \_\_\_\_\_  
 Land Contact \_\_\_\_\_ Telephone # \_\_\_\_\_

**Biological Monitoring**

Date                  Surveyor \_\_\_\_\_ Bearing 1      Distance 1       
 GPS / UTM Grid Zone       Same UTM as site? Bearing 2      Distance 2       
 Easting                  Plant Count      Bearing 3      Distance 3       
 Northing                  Bio Agent Count      Bearing 4      Distance 4       
 Spread

Duration of Count in minutes     

Bio Agent Presence  Yes  No (if yes, then select indicator below)

Foliar Feeding Damage  Seed Feeding Damage  Larva(e) Present  Oviposition Marks  
 Root Feeding Damage  Adults Present  Pupa(e) Present  Exit Holes / Tunnels

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Sketch Map include north

Note: mandatory data fields are indicated with shaded boxes and underlining. Last revision: May 26, 2004





## BIOAGENT MONITORING RECORD

SITE NUMBER: \_\_\_\_\_ / (\_\_\_\_) \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Agent
District
Year  
Site Number

DATE CHECKED: \_\_\_\_ / \_\_\_\_ / \_\_\_\_      TIME: \_\_\_\_ : \_\_\_\_      CHECKED BY: \_\_\_\_\_  
Y    M    D

WEED SPECIES: \_\_\_\_\_ / \_\_\_\_\_      MAPSHEET: \_\_\_\_\_

LOCATION: \_\_\_\_\_  
 \_\_\_\_\_

GPS CHECKED?: yes  no       ZONE: \_\_\_\_\_      UTM : |\_|\_|\_|\_|\_|\_|\_|\_|    |\_|\_|\_|\_|\_|\_|\_|\_|

NAD 83 \_\_\_\_\_

GPS OK IN FILE?: yes  no       EASTING      NORTHING      (WAYPOINT #)

WEATHER: \_\_\_\_\_      ELEVATION \_\_\_\_\_

**WEED DENSITY:**      <1 plant/m<sup>2</sup>:       2-5 plants/m<sup>2</sup>:   
 6-10 plant/m<sup>2</sup>:       >10 plant/m<sup>2</sup>:

**SIZE OF INFESTATION:**      \_\_\_\_\_ m<sup>2</sup> = \_\_\_\_\_ ha ;

**WEED DISTRIBUTION:**    Continuous Stand:       Scattered Patches:   
 Distribution Code (1-9): \_\_\_\_\_

**AVERAGE TALL PLANT HEIGHT:**    <30cm       31 - 60 cm:     61 - 80 cm:   
 81 cm - 1m:       > 1 m



## BIOAGENT MONITORING RECORD Pg2

**BIOAGENT FOUND:** yes  no

**SEARCH EFFORT** (e.g. #plants checked before found, # insects per plant):

**DISPERSAL** (e.g. furthest distance and direction away from post that insects found):

**COMMENTS:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**WORTH PHOTO RETAKE?** yes (take now or on  no (no real change   
slightly (check next year)  date: \_\_\_\_\_) or no original photos)

**PHOTOS TAKEN?** yes  no  **STORED IN FILE #:**  
\_\_\_\_\_

*Data from this form entered into regional biocontrol database? Yes !!* Date: \_\_\_\_\_ Initials: \_\_\_\_\_



**Appendix #7 Equipment Calibration and Checklist**

<b>CALIBRATION RECORD</b>	
	Date _____
	Calibration # _____
	Company _____
	Calibration Location _____

**Instructions**

(for 400L / ha application)

Measure a 25m by 25m 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
			1
			2
			3

Please photocopy form for additional space as required.

## Appendix #8 Invasive Plant Regulation (FRPA)

### Invasive plant species specified

2 For the purposes of section 47 of the *Forest and Range Practices Act*, the prescribed species of invasive plants are as follows:

<b>Weed Species</b>	<b>Scientific name</b>
Anchusa	<i>Anchusa officinalis</i>
Baby's breath	<i>Gypsophila paniculata</i>
Black knapweed	<i>Centaurea nigra</i>
Blueweed	<i>Echium vulgare</i>
Brown knapweed	<i>Centaurea jacea</i>
Bull Thistle	<i>Cirsium vulgare</i>
Canada Thistle	<i>Cirsium arvense</i>
Common Burdock	<i>Arctium minus</i>
Common Tansy	<i>Tanacetum vulgare</i>
Dalmatian Toadflax	<i>Linaria dalmatica</i>
Diffuse Knapweed	<i>Centaurea diffusa</i>
Field Scabious	<i>Knautia arvensis</i>
Giant Knotweed	<i>Polygonum sachalinense</i>
Gorse	<i>Ulex europaeus</i>
Hoary Alyssum	<i>Berteroa incana</i>
Hoary Cress	<i>Cardaria draba</i>
Hound's-tongue	<i>Cynoglossum officinale</i>
Japanese Knotweed	<i>Polygonum cuspidatum</i>
Leafy spurge	<i>Euphorbia esula</i>
Marsh Thistle	<i>Cirsium palustre</i>
Meadow Hawkweed	<i>Hieracium pilosella</i>
Meadow Knapweed	<i>Centaurea pratensis</i>
Nodding Thistle	<i>Carduus nutans</i>
Orange Hawkweed	<i>Hieracium aurantiacum</i>
Oxeye Daisy	<i>Chrysanthemum leucanthemem</i>
Perennial pepperweed	<i>Lepidium latifolium</i>
Plumeless Thistle	<i>Carduus acanthoides</i>
Puncture vine	<i>Tribulus terrestris</i>
Purple Loosestrife	<i>Lythrum salicaria</i>
Rush Skeletonweed	<i>Chondrilla juncea</i>
Russian Knapweed	<i>Acroptilon repens</i>
Scentless Chamomile	<i>Matricaria maritima</i>
Scotch broom	<i>Cytisus scoparius</i>
Scotch Thistle	<i>Onopordum acanthium</i>
Spotted Knapweed	<i>Centaurea maculosa</i>
St. John's-wort	<i>Hypericum perforatum</i>
Sulphur Cinquefoil	<i>Potentilla recta</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Teasel	<i>Dipsacus fullonum</i>
Yellow Iris	<i>Iris pseudacorus</i>
Yellow starthistle	<i>Centaurea solstitialis</i>
Yellow toadflax	<i>Linaria vulgaris</i>