

Invasive Plants in British Columbia Protected Lands: A Strategic Plan



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Contract No. CPPA6052

January 2006

EXECUTIVE SUMMARY

Invasive plants currently occupy over 100 000 ha in British Columbia and threaten another 10 million ha of grassland and open forests in the interior, and Garry Oak habitats on the coast. In recent surveys of 189 protected lands, more than 70 invasive plant species were found, and 98% of the protected lands contained invasive plants. These species were distributed over 11 biogeoclimatic zones and 41 subzones. Collectively, the subzones most affected contain over 1200 rare ecosystems, vascular plants, vertebrates, and invertebrates. Control of invasive plants is necessary to maintain the integrity of natural ecosystems, and to reduce the threat of these species on native plants and animals.

The purpose of this strategic plan is to provide a framework for invasive plant management in protected lands. The strategy has two main purposes: 1) to enhance public and government awareness of the threats that invasive plants impose on protected lands, and 2) to provide recommendations for developing an effective and coordinated program that is scientifically based, sensitive to regional needs, and complements other provincial initiatives.

The strategy adopts an Integrated Pest (Invasive Plant) Management approach for an invasive plant program. This approach uses a mix of cultural, mechanical, chemical, and biological treatments to control invasive plants, while minimizing undesirable effects on other organisms and the environment. Inventory, prevention, and restoration practices are also included as part of this method.

Strategic Plan

The ecological complexity of British Columbia captured in protected lands requires a comprehensive strategy for dealing with invasive plants. The strategic plan consists of the following three goals that collectively address ten objectives: 1) prevention; 2) reduction and control; and 3) long-term invasive plant management.

Goal 1. To Prevent the Introduction, Establishment and Spread Of Invasive Plants

1. Awareness and Education. Awareness and education are important factors in the identification and early detection of invasive plants, which promotes timely and effective control in protected lands. *Actions: Recommendations are made for developing a public outreach program; developing a provincial web site; preparing guidelines for park users and contractors to mitigate introduction and spread of invasive plants in protected lands; and staff and contractor training for plant identification.*

2. Risk Assessment and Prevention. Risk assessment and prevention are practices that are implemented to reduce the introduction and establishment of invasive plants in new locations. A successful prevention program includes the abilities to: 1) predict which invasive species are likely to enter the province, region or protected lands through species

risk assessments; 2) identify new species immediately; 3) develop a rapid response plan for new invaders; and 4) apply site-specific control measures to prevent new species from establishing and spreading. **Actions:** *The plan recommends the development of a simple and scientifically based species risk assessment process for evaluating the relative threat of new invasive species to plants, animals and other resources; incorporating species risk assessments into protected lands planning and management activities; preparing and circulating "invasive plant alerts;" and developing guidelines for importing forages, feeds and construction materials into protected lands.*

3. Early Detection and Rapid Response. Early detection and a rapid response is the most successful, cost-effective, and least environmentally damaging means of controlling invasive plants. Effective rapid response is best accomplished when an agency (or agencies) has a clear mandate to act; and the financial, human, and physical resources available for immediate deployment. **Actions:** *The plan suggests regular communication with other agencies within British Columbia, and adjoining provinces and American states to identify new species that may become a threat; eradication of new species to the province, regions or protected lands; and conducting ongoing monitoring of susceptible sites within protected land.*

Goal 2. To Reduce The Impacts Of Existing Invasive Plant Populations On Biodiversity and Natural Resources In Protected Lands

1. Coordination, Cooperation and Partnerships. The distribution of invasive plants in British Columbia transcends jurisdictional boundaries. Cooperation and coordination among agencies and private landowners is essential because they allow treatment across jurisdictional and ownership boundaries in an ecologically effective manner. **Actions:** *The plan recommends a continuing participation in the Invasive Plant Council and partnerships with other agencies, landowners, and First Nations to address mutual goals and objectives. It also suggests cooperating in the development of suitable native plant products for restoration projects in protected lands.*

2. Planning and Inventory. Planning and inventory furnish the basic information necessary for prioritizing invasive plant treatments, and provide direction for developing prevention practices and monitoring strategies. **Actions:** *The plan proposes completion of baseline inventories; compilation of provincial and regional invasive plant management plans, pest management plans, and invasive plant lists; and constructing a process for setting priorities and allocating resources for invasive plant management among protected lands and Ministry of Environment regions.*

3. Integrated Invasive Plant Management Treatments. Integrated Management involves combining the best mix of cultural, mechanical, chemical, and biological treatments with prevention and restoration practices to control the establishment and dispersal of invasive plants. **Actions:** *The plan advocates establishing priorities for individual invasive plant species and ecological sites on a regional and protected lands basis; implementing suitable control measures using best management practices; and*

conducting restoration measures to promote recovery of native vegetation, and protect rare and endangered species and ecosystems from invasive plants.

4. Monitoring and Evaluation. Monitoring and evaluation are important procedures for assessing the efficacy of treatments, and determining if the invasive plant program is accomplishing its goals and objectives. This information provides a feedback loop for adaptive management and effective long-term planning. *Actions: The plan recommends regular monitoring to evaluate treatment effects; updating invasive plant distribution and density maps, and databases on a regular basis; and an annual review of regional and provincial plans to assess overall success. Stable and consistent funding for inventory, monitoring, and evaluation efforts are essential for effective program delivery.*

Goal 3. To Provide A Framework And Capacity For Long-Term Invasive Plant Management In Protected Lands

1. Policy, Mandate, and Legislation. Mandates, policies and legislations provide authority and direction for invasive plant management in protected lands. Although the *Weed Control Act of BC* defines the legal obligation of landowners to control noxious weeds on Crown land under their jurisdiction, no core policy or legislation exists that integrates federal and provincial policies and legislation as they relate to protected lands. *Actions: This plan suggests the review of existing Ministry legislation, policy and mandates to ensure they are meeting the present needs to control invasive plants in protected lands. It also recommends participation in an inter-agency review of provincial legislation, regulations, and policy to ensure they meet provincial needs for invasive plant control; identification of policy gaps; and assurance that staff and contract employees are aware of current policy and legislation. The strategy further recommends that the Ministry develop provincial-scope vision and mission statements for invasive plant management in protected lands.*

2. Leadership and Organization. A successful invasive plant management program requires effective leadership and organization at all levels to implement programs that are consistent with those of other agencies and private landowners. It also ensures that activities within the Ministry are coordinated in an expedient manner. *Actions: This strategy recommends that Ministry staff participate in the Invasive Plant Council and the Inter-Ministry Invasive Plant Committee so that the Ministry's priorities and concerns are represented, and the goals and objectives of a provincial strategy are included in Ministry management activities. The Ministry also should participate in regional and local invasive plant committees; and assist in acquiring additional funding and technical resources where possible to accomplish the strategic plan.*

3. Research and Technology Transfer. Research provides the scientific foundation for sustainable invasive plant management. Original research in British Columbia is essential to evaluate treatment effects from herbicides and biological control agents that are relevant to conditions in British Columbia. *Actions: Although the Ministry of Environment may have a low capacity for original research, this plan recommends that the Ministry assists in developing applied research priorities; supports the research and*

testing required to approve new biocontrol agents into Canada and British Columbia; participates in monitoring and evaluating impacts of biological control agents and other invasive plant treatments in protected lands; and contributes funding to research on control methods and impacts of invasive species of management concern in protected lands.

CONTENTS

EXECUTIVE SUMMARY	ii
INTRODUCTION	1
What are Invasive Plants?.....	1
Scope of the Problem.....	1
Purpose of Plan and Layout.....	2
STRATEGIC PLAN.....	3
1 GOAL To Prevent the Introduction, Establishment and Spread Of Invasive Plants in Protected Lands.....	3
1.1 <i>Objective</i> Awareness and Education.....	3
1.2 <i>Objective</i> Risk Assessment and Prevention.....	4
1.3 <i>Objective</i> Early Detection and Rapid Response	5
2 GOAL To Reduce The Impacts Of Existing Invasive Plant Populations On Biodiversity and Natural Resources In Protected Lands	6
2.1 <i>Objective</i> Coordination, Cooperation and Partnerships.....	6
2.2 <i>Objective</i> Planning and Inventory.....	7
2.3 <i>Objective</i> Integrated Invasive Plant Management Treatments	8
2.4 <i>Objective</i> Monitoring and Evaluation.....	8
3 GOAL To Provide A Framework And Capacity For Long-Term Invasive Plant Management In Protected Lands	9
3.1 <i>Objective</i> Policy, Mandate, and Legislation	9
3.2 <i>Objective</i> Leadership and Organization.....	10
3.3 <i>Objective</i> Research and Technology Transfer	10
INVASIVE PLANT MANAGEMENT WORK PLAN	12
REFERENCES	26
Appendix 1. Glossary	27
Appendix 2. Legislation, Authorities, Policies, and Guidelines.....	29

LIST OF TABLES

Table 1. Criteria for ranking invasive plant actions at a strategic level.....	12
Table 2. Priority ranking of action items with a high relative importance.	24

INTRODUCTION

The complex topography and varied climate of British Columbia produces the greatest biological diversity of any province in Canada. In recognition of this diversity, nearly 12.5% of the provincial land base has been reserved in over 825 protected lands¹ that were established for “*the protection of the natural environment; the preservation and maintenance of recreational values; and to preserve representative and special natural ecosystems, species, features and phenomena*” (MOE 1997). Unfortunately, alien plants have invaded many ecosystems in the province, including those set aside in protected lands, and these species now represent an imposing challenge to the Ministry of Environment’s mandate and legislated responsibility.

What are Invasive Plants?

Invasive plants² have been defined as “*species that are non-native to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health*” (CEQ 1999). Although not all alien plants are harmful, those that are invasive pose a formidable threat in protected lands to biological diversity, rare and endangered species, and ecological processes such as succession, energy flow, and mineral and nutrient cycles.

Scope of the Problem

Invasive plants currently occupy over 100 000 ha of grassland and open forest in British Columbia and perhaps another 10 million ha are susceptible to invasion. In recent surveys of 189 protected lands, more than 70 invasive plant species were found, and 98% of the protected lands contained invasive plants (Miller and Wikeem 2005). These species were distributed over 11 biogeoclimatic zones and 41 subzones with most infestations occurring in dry subzones of the Bunchgrass, Ponderosa Pine, Interior Douglas-fir, Interior Cedar Hemlock, Coastal Western Hemlock, and Coastal Douglas-fir zones. Collectively, these subzones also contain over 1200 rare elements consisting of ecosystems, vascular plants, vertebrates, and invertebrates. Control of invasive plants is

¹ Protected lands include parks, protected areas, ecological reserves, and conservation lands.

² See Appendix 1 for a glossary of technical terms used in this report.

necessary to maintain the integrity of natural ecosystems, and to reduce the threat of these species on native plants and animals.

Purpose of Plan and Layout

Although weed control programs have been ongoing for over 50 years in British Columbia, the *Invasive Plant Strategy for British Columbia* report released in 2004 (FBC 2004) provided new impetus for improving cooperation among governments, non-government agencies, First Nations, and private land owners in their control. The strategy also conveys a new vision for agencies to consider in developing invasive plant management plans for lands under their administration.

This plan was prepared to provide a framework for invasive plant management in Ministry of Environment protected lands. The strategy has two main purposes: 1) to enhance public and government awareness of the threats that invasive plants impose on protected lands in the province, and 2) to provide recommendations for developing an effective and coordinated program that is scientifically based, sensitive to regional needs, and complements a broader strategy for the province. Delivery of the plan will play a vital role in the Ministry of Environment meeting its statutory obligations to control invasive plants, and its mandate to preserve the environmental heritage of the province for future generations.

The plan is organized into two sections. The first section identifies goals, objectives and actions necessary to implement the plan. The second section outlines a detailed work plan to achieve the objectives identified in section one. Best management practices have also been developed to provide support for implementation of action items (Miller and Wikeem 2006).

STRATEGIC PLAN

No single method or strategy can successfully manage all invasive plant species in every environment. Integrated Pest (Invasive Plant) Management is a system for planning and implementing invasive plant programs that are environmentally and economically sound. This strategy uses the optimum mix of cultural, mechanical, chemical, and biological treatments to control invasive plants, while minimizing undesirable effects on other organisms and the environment. Inventory, prevention, and restoration practices are also included in this approach.

British Columbia has used an integrated approach for invasive plant management for over 20 years with significant positive results. The local knowledge and experience gained from this process is an important resource to draw on in establishing an invasive plant management program for protected lands. The following section identifies goals, objectives and recommends actions to provide effective invasive plant management. The strategic plan should be considered a dynamic document that requires involvement of all appropriate Ministry staff to meet its objectives, and to implement and improve the plan over the long-term.

1 GOAL To Prevent the Introduction, Establishment and Spread Of Invasive Plants in Protected Lands

1.1 *Objective* Awareness and Education

Awareness and education are important factors in the correct identification and early detection of invasive plants. Well-trained staff and an informed public can be important assets for locating and reporting new infestations in protected lands. In turn, this promotes timely and effective control of invasive plants. Increased awareness among decision-makers including managers, policy makers, and politicians, enhances their participation in accomplishing solutions. Tools for extension and education should draw on existing resources or be developed in appropriate partnerships with government and non-government agencies.

Actions:

- 1.1.1. Support partnerships and participate in the development and implementation of a public awareness and outreach program through the Invasive Plant Council.
- 1.1.2. Provide information on the identification and management of invasive plants in protected lands through displays, pamphlets, brochures, videos, and park activity events.
- 1.1.3. Support and participate in developing an invasive plant management website for early detection, training, and education.
- 1.1.4. Provide initial invasive plant management training for ministry staff and contractors.
- 1.1.5. Conduct annual plant identification training for park rangers, area supervisors, field technicians, maintenance staff, contractors, and other Ministry staff as required.
- 1.1.6. Participate in developing and conducting workshops, field days, and training sessions to enhance staff understanding of invasive plant issues and update staff on recent developments in control and management.
- 1.1.7. Develop an invasive plant herbarium as an identification aid, and for training and education purposes.
- 1.1.8. Contribute funding to increase invasive plant awareness and education through the Invasive Plant Council.

1.2 *Objective Risk Assessment and Prevention*

The purpose of invasive plant risk assessments is to discern high-risk species that are likely to cause adverse effects (injury, disease, or death) to humans, other species, or the environment. These assessments are usually based on plant adaptations and tolerances such as climatic adaptation, habitat suitability, reproductive methods, and dispersal capabilities. The biological performance of invasive plants already in the province, and in other protected lands, should also be considered to assess the risk of known species in the new location. Results from species risk assessments allow managers to make informed management decisions that will reduce the economic and ecological harm caused by invasive plants.

Prevention is the proactive practices that are implemented to reduce the introduction and establishment of invasive plants in new locations. A successful prevention program includes the abilities to: 1) predict which invasive species are likely to enter the province,

region or protected lands; 2) identify new invasive plant entries into British Columbia and protected lands; 3) implement education, regulation, inspection, and/or quarantine programs to prevent entry of those species; 4) develop a rapid response plan for new invaders; and 5) apply site-specific control measures to prevent new species from establishing and spreading beyond their point of entry. Prevention is not limited to “new” species to British Columbia but includes detecting all new infestations in a particular region or protected land. All invasive species should be considered of equal high priority at this management level.

Actions:

- 1.2.1. Construct a simple, objective and scientifically based invasive plant species risk assessment. This process should focus on evaluating the relative invasiveness among species, environmental and economic impacts, and potential distribution of invasive plants.
- 1.2.2. Ensure that the BC Parks Impact Assessment procedure includes invasive species risk assessments.
- 1.2.3. Identify potential new invaders and high-risk sites within protected lands, especially those adjacent to lands in other jurisdictions.
- 1.2.4. Conduct ongoing monitoring to detect new invasive species.
- 1.2.5. Circulate "invasive plant alerts" with photos, line drawings, and descriptions of new species entering protected lands, regions, or the province.
- 1.2.6. Develop guidelines for park users and contractors to mitigate the introduction and spread of invasive plants in protected lands.
- 1.2.7. Develop guidelines and regulations for control of gravel, sand, mulch, and road-building materials that may contain invasive plant seeds or propagules.
- 1.2.8. Initiate an invasive-plant-free program for forage, feed, and straw for commercial and recreational horse and pack animal users in protected lands.
- 1.2.9. Encourage commercial and recreational users to feed horses and pack animals processed feed for 24-48 hours before entering protected lands.

1.3 *Objective* Early Detection and Rapid Response

The most successful, cost-effective and least environmentally damaging means of controlling invasive plants is through early detection and a rapid response. Once new species establish and begin to disperse, the cost of control escalates rapidly and the possibility of local eradication diminishes. Effective rapid response can only be

accomplished when an agency (or agencies) has a clear mandate to act, combined with the financial, human, and physical resources available to deploy immediately.

Actions:

- 1.3.1. Develop a mechanism through the Invasive Plant Council and /or Inter-Ministry Invasive Plant Committee to communicate regularly with other regions, ministries, agencies, provinces, and adjoining American states to identify new or rapidly dispersing invasive species that may become a threat in British Columbia.
- 1.3.2. Develop a mechanism through the Invasive Plant Council and the Inter-Ministry Invasive Plant Committee for early intervention on new invasive plants introduced into the province, regions and protected lands.
- 1.3.3. Eradicate new invasive species before they establish permanent populations capable of dispersing to other locations.
- 1.3.4. Develop or improve existing early detection processes (invasive plant alert) that enables new infestations to be reported to all Ministry of Environment regions and partners so they can be eradicated or controlled in an expedient manner.
- 1.3.5. Conduct ongoing monitoring of susceptible sites within protected lands such as trails, day use areas, parking lots, maintenance compounds, etc.
- 1.3.6. Provide specialist information and advice on biodiversity, and species and ecosystems at risk in developing early detection protocols.

2 GOAL To Reduce The Impacts Of Existing Invasive Plant Populations On Biodiversity and Natural Resources In Protected Lands

2.1 *Objective* Coordination, Cooperation and Partnerships

The long-term success of a Ministry of Environment invasive plant strategic plan depends on a strong and effective provincial invasive plant program where all agencies and landowners participate in a coordinated effort. As elsewhere, the distribution of invasive plants in British Columbia transcends jurisdictional boundaries. Cooperation and coordination are essential components of any invasive plant management program because they allow treatment across jurisdictional and ownership boundaries in an ecologically effective manner. They also mitigate duplication of effort and promote the efficient use of scarce human and financial resources.

Actions:

- 2.1.1. Cooperate with and support the Invasive Plant Council initiative for a provincial invasive plant management program.
- 2.1.2. Dedicate staff and support the Inter-Ministry Invasive Plant Committee.
- 2.1.3. Encourage partnerships with other provincial and federal ministries, local governments, non-government agencies, landowners, conservation groups, and First Nations to assist in accomplishing clearly defined mutual goals and objectives.
- 2.1.4. Cooperate with other agencies to produce suitable native plant products for restoration projects following disturbance.

2.2 *Objective Planning and Inventory*

Proper planning is fundamental to a successful invasive plant program. Inventory is the critical first step and furnishes the basic information necessary for prioritizing invasive plant treatments at a landscape level. It also provides clear direction for developing prevention practices and designing monitoring strategies.

Actions:

- 2.2.1. Conduct baseline inventories in protected lands to determine the invasive plant species present, their distribution and densities, and formulate suitable treatments.
- 2.2.2. Develop a working definition of invasive plant that reflects the Ministry's mandate, policy and legislated responsibility.
- 2.2.3. Create and maintain invasive plant species lists at provincial and regional levels.
- 2.2.4. Use the species risk assessment process [suggested in 1.2.1 above] to confirm which invasive plants should be included or removed from provincial or regional lists.
- 2.2.5. Prepare, maintain and update provincial and regional invasive plant management plans, pest management plans, and work plans.
- 2.2.6. Develop standard procedures to assist setting priorities and allocating resources among protected lands within regions, among regions, and with other agencies where appropriate.
- 2.2.7. Participate in provincial, regional and local planning meetings to ensure that internal Ministry invasive plant management plans are consistent with the broader landscape and local level plans and priorities, where applicable.
- 2.2.8. Cooperate and support the development and implementation of the provincial invasive plant database.

- 2.2.9. Provide professional and technical advice into the structure, content, and potential outputs from the provincial invasive plant database to ensure that it serves provincial and Ministry of Environment needs.
- 2.2.10 Monitor high-risk areas to detect new invasions or range extensions of invasive plants within regions and individual protected lands.

2.3 Objective Integrated Invasive Plant Management Treatments

Integrated invasive plant management treatments include cultural, mechanical, chemical, and biological methods. Site-specific goals and objectives are often best achieved by using a combination of treatment methods. The specific combination must consider factors such as the location and physical characteristics of the site, the relative availability of treatment options, the susceptibility of the target species to the treatment method, and the relative risks and benefits of the options. Important site factors to consider include soil texture, slope, proximity to water, plant community composition, and species at risk.

Actions:

- 2.3.1. Prioritize invasive plant species and priority sites on a regional and protected lands basis considering species risk assessments, the BC Parks Conservation Risk Assessment Procedure, results from inventory or monitoring, provincial or regional invasive plant lists, and broader level plans.
- 2.3.2. Implement suitable control measures using best management practices.
- 2.3.3. Survey protected lands after treatments have been applied and evaluate restoration needs relative to immediate and potential invasive plant threats.
- 2.3.4. Promote the use of ecological restoration as a control measure to protect rare and endangered ecosystems from invasive plant invasion.
- 2.3.5. Conduct restoration projects within protected lands on disturbed ecosystems that are at-risk from alien plant invasions.

2.4 Objective Monitoring and Evaluation

Monitoring and evaluation are important procedures for gathering information and assessing the effectiveness of treatments. Evaluations should be directed towards determining if the invasive plant program is accomplishing its goals and objectives, and whether the existing program is still desirable and realistic. This information provides a feedback loop for adaptive management and effective long-term planning.

Actions:

- 2.4.1. Monitor and evaluate invasive plant treatments and restoration projects for effectiveness and improvements.
- 2.4.2. Update invasive plant distribution and density maps, and databases, as an ongoing program activity.
- 2.4.3. Promote stable consistent funding for inventory, monitoring, and evaluation efforts.
- 2.4.4. Review plans annually to monitor Ministry program success and inter-agency success.

3 GOAL To Provide A Framework And Capacity For Long-Term Invasive Plant Management In Protected Lands

3.1 *Objective* Policy, Mandate, and Legislation

Mandates, policies and legislations provide authority and direction for invasive plant management in protected lands. Although over 100 acts, regulations, policies, and guidelines pertain to invasive plants in Canada (Appendix 2), no core policy or legislation exists that integrates this information for British Columbia, and especially as they relate to protected lands. Nonetheless, the Ministry of Environment has a legal obligation through the *Weed Control Act of BC* to control noxious weeds on Crown land under its jurisdiction.

Actions:

- 3.1.1. Review existing Ministry legislation, policy and mandates to ensure they are meeting the present needs to control invasive plants in protected lands.
- 3.1.2. Through the Invasive Plant Council and Inter-Ministry Invasive Plant Committee, participate in an inter-agency review of provincial legislation, regulations and policy relevant to the prevention and control of invasive plants to ensure they meet Ministry of Environment needs and are consistent with internal Ministry policies and legislation.
- 3.1.3. Identify policy gaps where they exist and amend these policies consistent with current invasive plant management objectives.
- 3.1.4. Ensure all staff and contract employees are aware of, and understand, current policy and legislation.

- 3.1.5. Develop provincial-scope vision and mission statements for invasive plant management in protected lands. Review the existing mission statement prepared for the Okanagan Region, and the vision statement presented in the *Invasive Alien Species Framework for BC* report, to determine if they are appropriate from a provincial perspective.

3.2 Objective Leadership and Organization

A successful invasive plant management program requires effective leadership and organization at the provincial, ministerial, and local levels to organize and implement programs and develop partnerships. Leadership at the provincial level is essential so that Ministry of Environment efforts are coordinated and consistent with those of other agencies, private landowners, and First Nations where necessary. It will also ensure that activities within the Ministry are coordinated in an expedient manner.

Actions:

- 3.2.1. Commit staff and resources to the Invasive Plant Council to ensure Ministry of Environment priorities and concerns are understood by the council, and the broader objectives and goals of a provincial strategy are included in Ministry policy, guidelines and management activities, where appropriate.
- 3.2.2. Encourage and support the development of regional invasive plant management committees and local programs throughout the province, and commit Ministry of Environment staff to participate.
- 3.2.3. Support and assist in acquiring additional funding and technical resources when necessary to accomplish the strategic plan.
- 3.2.4. Dedicate staff and resources to ensure that Ministry programs can be successfully delivered in a cost-effective manner.

3.3 Objective Research and Technology Transfer

Research provides the scientific foundation for sustainable invasive plant management. Although research from the United States provides some information relevant to British Columbia, there are limitations. Most invasive plants found in the province are at their northern distributions in North America. Treatment effects from herbicides and biological control agents that are reported in southern environments may not be readily applied to conditions in British Columbia.

Actions:

- 3.3.1. Assist in developing applied research priorities and direction that will contribute to an effective invasive plant program in British Columbia.
- 3.3.2. Support the research and testing required for approval of new biocontrol agents into Canada and British Columbia.
- 3.3.3. Promote and assist in the research and evaluation of biological control agents and other invasive plant treatments in protected lands.
- 3.3.4. Encourage collaborative research on invasive species in protected lands.
- 3.3.5. Contribute funding to research on control methods and impacts of invasive species of management concern in protected lands.

INVASIVE PLANT MANAGEMENT WORK PLAN

Action items for the strategic plan have been identified in the work plan that follows. Although all of the action items are considered important to the successful delivery of the program, each has been ranked as high, medium and low using the basic criteria described in Table 1. Those action items classified as “high” have been further ranked from 1 to 14 (Table 2). This ranking is based primarily on a logical order of activities to plan, organize, and deliver the program. Some action items have the same level of ranking where a clear distinction in order could not be made.

Table 1. Criteria for ranking invasive plant actions at a strategic level.

Ranking	Relative Importance	Timing
High	Fundamental – The action item is of primary, essential, or underlying importance.	Important to be done earlier than later. Other priorities rely on it.
Medium	Important - The action item is significant and necessary to program delivery.	Follows from earlier priorities but important for delivery of other action items.
Low	Valuable - The action item is helpful, useful, or beneficial to program delivery.	Timing not critical, may be associated with opportunities and issues as they arrive.

GOAL #1 To Prevent the Introduction, Establishment and Spread Of Invasive Plants in Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #1: Awareness and Education</i>		
1. Support partnerships and participate in the development and implementation of a public awareness and outreach program through the Invasive Plant Council.	Support and contribute to the development of public awareness program through the Invasive Plant Council.	Medium (M)
2. Provide information on the identification and management of invasive plants in protected lands through displays, pamphlets, brochures, videos, and park activity events.	Develop and implement extension /communication plan in concert with regions.	Low (L)
3. Support and participate in developing an invasive plant management website for early detection, training, and education.	Discuss with Inter-Ministry Invasive Plant Committee (IMIPC). Develop or participate in website.	L
4. Provide initial invasive plant management training for ministry staff and contractors.	Develop training package including plant identification. Provide support to regions to implement.	High (H) H-10
5. Conduct annual plant identification training for park rangers, area supervisors, field technicians, maintenance staff, and contractors, and other ministry staff as required.	Develop training plan including plant identification package. Provide support to regions to implement.	M
6. Participate in developing and conducting workshops, field days, and training sessions to enhance staff understanding of invasive plant issues and update staff on recent developments in control and management.	Support and provide workshops, field days and training sessions as part of training plan.	L
7. Develop an invasive plant herbarium as an identification aid, and for training and education purposes.	Secure resources and develop region-specific herbariums.	L

GOAL #1 To Prevent the Introduction, Establishment and Spread Of Invasive Plants in Protected Lands
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<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #1: Awareness and Education</i>		
8. Contribute funding to increase invasive plant awareness and education through the Invasive Plant Council.	Identify and secure funding.	M
<i>Objective #2: Risk Assessment and Prevention</i>		
1. Construct a simple, objective, and scientifically based species risk assessment. This process should focus on evaluating the relative invasiveness among species, environmental and economic impacts, and potential distribution of invasive plants.	Critically review existing invasive plant species risk assessment procedures used elsewhere; and adjust as required. Develop standards.	H-4
2. Ensure that the BC Parks Impact Assessment procedure includes invasive species risk assessments.	Develop and apply guidelines as required.	M
3. Identify potential new invaders and high-risk sites within protected lands, especially those adjacent to lands in other jurisdictions.	Assess sites within protected lands and identify areas at risk to invasion. Continue to identify potential new invaders.	M/H
4. Conduct ongoing monitoring to detect new invasive plants.	Secure funding and support regions in regular monitoring activities.	M/H
5. Circulate "invasive plant alerts" with photos, line drawings and descriptions of new species entering protected lands, regions, or the province.	Determine current status of invasive plant alerts in other ministries. Collaborate on delivery/development of alerts.	L
6. Develop guidelines for park users and contractors to mitigate the introduction and spread of invasive plants in protected lands.	Develop policy and guidelines in concert with regions and implement.	M

GOAL #1 To Prevent the Introduction, Establishment and Spread Of Invasive Plants in Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #2: Risk Assessment and Prevention</i>		
7. Develop guidelines and regulations for control of gravel, sand, mulch, and road-building materials that may contain invasive plant seeds or propagules.	Develop policy and guidelines in concert with regions and implement.	M
8. Initiate an invasive-plant-free forage, feed, and straw program for commercial and recreational horse and pack animal users in protected lands.	Develop policy and guidelines in concert with regions and implement.	L
9. Encourage commercial and recreational users to feed horses and pack animals processed feed for 24-48 hours before entering protected lands.	Encourage users to feed processed feed to horses and pack animals prior to entering protected lands.	L
<i>Objective #3: Early Detection and Rapid Response</i>		
1. Develop a mechanism through the Invasive Plant Council and /or Inter-Ministry Invasive Plant Committee to communicate regularly with other regions, ministries, agencies, provinces, and adjoining American states to identify new or rapidly dispersing invasive species that may become a threat in British Columbia.	Participate on IMIPC, Invasive Plant Council, local invasive plant committees, and encourage cross-border discussions.	M
2. Develop a mechanism through the Invasive Plant Council and the IMIPC for early intervention on new invasive plants introduced into the province, regions and protected lands.	Develop early detection and rapid response protocols. Secure funding and implement.	M
3. Eradicate new invasive species before they establish permanent populations capable of dispersing to other locations.	Confirm commitment to rapidly respond to new threats and provide support to regions.	H-11

GOAL #1 To Prevent the Introduction, Establishment and Spread Of Invasive Plants in Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #3: Early Detection and Rapid Response</i>		
4. Develop or improve existing early detection processes (invasive plant alert) that enables new infestations to be reported to all Ministry of Environment regions and partners so they can be eradicated or controlled in an expedient manner.	Determine status of early detection processes in other agencies. Support enhancement of existing processes, or development of new programs. Implement process.	M
5. Conduct ongoing monitoring of susceptible sites within protected lands such as trails, day use areas, parking lots, maintenance compounds, etc.	Secure resources and support regions in regular monitoring activities.	M
6. Provide specialist information and advice on biodiversity and ecosystems at risk in developing early detection protocols.	Provide staff expertise as required.	L

GOAL #2 To Reduce The Impacts Of Existing Invasive Plant Populations On Biodiversity and Natural Resources In Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #1: Coordination, Cooperation and Partnerships</i>		
1. Cooperate with and support the Invasive Plant Council initiative for a provincial invasive plant management program.	Maintain support of and participate in Invasive Plant Council.	M
2. Dedicate staff and support the IMIPC.	Dedicate staff.	H-3
3. Encourage partnerships with other provincial and federal ministries, local governments, non-government agencies, landowners, conservation groups, and First Nations to assist in accomplishing clearly defined mutual goals and objectives.	Encourage partnerships to assist in accomplishing clearly defined mutual goals and objectives.	M
4. Cooperate with other agencies to produce suitable native plant products for restoration projects following disturbance.	Collaborate with other agencies or provide leadership in developing native plant nursery stock.	L
<i>Objective #2: Planning and Inventory</i>		
1. Conduct baseline inventories in protected lands to determine the invasive plant species present, their distribution and densities, and formulate suitable treatments.	Provide support to regions to complete inventories on a priority basis. Analyze results and identify treatment requirements. Secure funding.	H-10
2. Develop a working definition of invasive plant that reflects the Ministry's mandate, policy and legislated responsibility.	Develop working definition in concert with regional staff.	H-1
3. Create and maintain invasive plant species lists at provincial and regional levels.	Establish and update invasive plant lists at all levels.	H-6

GOAL #2 To Reduce The Impacts Of Existing Invasive Plant Populations On Biodiversity and Natural Resources In Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
Objective #2: Planning and Inventory		
4. Use the species risk assessment process (Goal 1, Objective 2, Action 1) to confirm which invasive plants should be included or removed from established provincial or regional lists.	Annually review lists and adjust as required.	H-5
5. Prepare, maintain and update provincial and regional invasive plant management plans, pest management plans, and work plans.	Encourage all regions to develop invasive plant management plans, pest management plans and annual work plans.	H-8
6. Develop standard procedures to assist setting priorities and allocating resources among protected lands within regions, among regions, and with other agencies where appropriate.	Develop standard procedures with regional staff assistance.	H-7
7. Participate in provincial, regional and local planning meetings to ensure that internal Ministry invasive plant management plans are consistent with the broader landscape and local level plans and priorities, where applicable.	Participate in invasive plant meetings at all levels.	M
8. Cooperate and support the development and implementation of the provincial invasive plant database.	Encourage staff to review and use provincial database.	M
9. Provide professional and technical advice into the structure, content, and potential outputs from the provincial invasive plant database to ensure that it serves provincial and Ministry of Environment needs.	Review current Ministry of Forests and Range database. Secure funding for identified revisions.	M
10. Monitor high-risk areas to detect new invasions or range extensions of invasive plants within regions and individual protected lands.	Monitor and re-inventory high-risk areas on a regular basis.	M/H

GOAL #2 To Reduce The Impacts Of Existing Invasive Plant Populations On Biodiversity and Natural Resources In Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
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Objective #3: Integrated Invasive Plant Management Treatments

<p>1. Prioritize invasive plant species and priority sites on a regional and protected lands basis considering species risk assessments, the BC Parks Conservation Risk Assessment Procedure, results from inventory or monitoring, provincial or regional invasive plant lists, and broader level plans.</p>	<p>Prioritize invasive plant species and priority sites on regional and protected land basis.</p>	<p>H-8</p>
<p>2. Implement suitable control measures using best management practices.</p>	<p>Provide resources and implement control measures.</p>	<p>H-11</p>
<p>3. Survey protected lands after treatments have been applied and evaluate restoration needs relative to immediate and potential invasive plant threats.</p>	<p>Conduct post-treatment surveys to determine restoration needs.</p>	<p>M</p>
<p>4. Promote the use of ecological restoration as a control measure to protect rare and endangered ecosystems from invasive plant invasion.</p>	<p>Develop policy and guidelines for restoring native habitats to control invasive plants.</p>	<p>M</p>
<p>5. Conduct restoration projects within protected lands on disturbed ecosystems that are at-risk from invasive plant invasion.</p>	<p>Secure resources and ensure restoration projects are completed.</p>	<p>M</p>

Objective #4: Monitoring and Evaluation

<p>1. Monitor and evaluate invasive plant treatments and restoration projects for effectiveness and improvements.</p>	<p>Complete efficacy monitoring on all treatments and projects. Analyze results and adjust management strategies as needed.</p>	<p>M</p>
<p>2. Update invasive plant distribution and density maps, and databases, as an ongoing program activity.</p>	<p>Regularly update maps and databases.</p>	<p>M</p>

GOAL #2 To Reduce The Impacts Of Existing Invasive Plant Populations On Biodiversity and Natural Resources In Protected Lands
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<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #4: Monitoring and Evaluation</i>		
3. Promote stable consistent funding for inventory, monitoring, and evaluation efforts.	Secure funding and establish as a program item.	H-12
4. Review plans annually to monitor Ministry program success and inter-agency success.	Review plans annually.	M

GOAL #3 To Provide A Framework And Capacity For Long-Term Invasive Plant Management In Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #1: Policy, Mandate, and Legislation</i>		
1. Review existing Ministry legislation, policy and mandates to ensure they are meeting the present needs to control invasive plants in protected lands.	Review legislation, policy and mandates.	M
2. Through the Invasive Plant Council and Inter-Ministry Invasive Plant Committee, participate in an inter-agency review of provincial legislation, regulations and policy relevant to the prevention and control of invasive plants to ensure they meet Ministry of Environment needs and are consistent with internal Ministry policies and legislation.	Support and participate in inter-agency legislation review through IMIPC.	M
3. Identify policy gaps where they exist and amend these policies consistent with current invasive plant management objectives.	Identify policy gaps and amend policy as necessary.	M
4. Ensure all staff and contract employees are aware of, and understand, current policy and legislation.	Include policy and legislation as components of training plan.	M
5. Develop provincial-scope vision and mission statements for invasive plant management in protected lands. Review existing mission statement prepared for the Okanagan Region, and the vision statement presented in the <i>Invasive Alien Species Framework for BC</i> report, to determine if they are appropriate from a provincial perspective.	Develop Ministry vision and mission statements.	H-2

GOAL #3 To Provide A Framework And Capacity For Long-Term Invasive Plant Management In Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #2: Leadership and Organization</i>		
1. Commit staff and resources to the Invasive Plant Council to ensure Ministry of Environment priorities and concerns are understood by the council, and the broader objectives and goals of a provincial strategy are included in Ministry policy, guidelines and management activities, where appropriate.	Commit staff and resources.	H-3
2. Encourage and support the development of regional invasive plant management committees and local programs throughout the province, and commit Ministry of Environment staff to participate.	Support participation in regional invasive plant committees and local programs.	M
3. Support and assist in acquiring additional funding and technical resources when necessary to accomplish the strategic plan.	Adopt strategic plan and secure resources required to implement.	H-13
4. Dedicate staff and resources to ensure that Ministry programs can be successfully delivered in a cost-effective manner.	Dedicate staff and define clear lines of responsibility and authority.	H-9

Objective #3: Research and Technology Transfer

1. Assist in developing applied research priorities and direction that will contribute to an effective invasive plant program in British Columbia.	Identify information gaps and develop applied research priorities. Collaborate with other agencies in securing resources to implement applied research.	L
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GOAL #3 To Provide A Framework And Capacity For Long-Term Invasive Plant Management In Protected Lands

<i>Action Item</i>	<i>Action Required</i>	<i>Relative Priority</i>
<i>Objective #3: Research and Technology Transfer</i>		
2. Support the research and testing required for approval of new biocontrol agents into Canada and British Columbia.	Cooperate with Ministry of Forests and Range, and Agriculture and Agri-Food Canada in developing and testing biological control agents. Provide funding and assist in identifying priorities.	H-14
3. Promote and assist in the research and evaluation of biological control agents and other invasive plant treatments in protected lands.	Assist in research and evaluation of various treatment methods.	L
4. Encourage collaborative research on invasive species in protected lands.	Support collaborative research.	L
5. Contribute funding to research on control methods and impacts of invasive species of management concern in protected lands.	Secure funding.	M

Table 2. Priority ranking of action items with a high relative importance.

Goal Number	Objective Number	Action Item	Ranking
2.	2.	2. Develop a working definition of invasive plant that reflects the Ministry’s mandate, policy and legislated responsibility.	H-1
3.	1.	5. Develop provincial-scope vision and mission statements for invasive plant management in protected lands. Review existing mission statement prepared for the Okanagan Region, and the vision statement presented in the <i>Invasive Alien Species Framework for BC</i> report, to determine if they are appropriate from a provincial perspective.	H-2
3.	2.	1. Commit staff and resources to the Invasive Plant Council to ensure Ministry of Environment priorities and concerns are understood by the council, and the broader objectives and goals of a provincial strategy are included in Ministry policy, guidelines and management activities, where appropriate.	H-3
2.	1.	2. Dedicate staff and support the IMIPC.	H-3
1.	2.	1. Construct a simple, objective, and scientifically based species risk assessment. This process should focus on evaluating the relative invasiveness among species, environmental and economic impacts, and potential distribution of invasive plants.	H-4
2.	2.	4. Use the species risk assessment process (Goal 1, Objective 2, Action 1) to confirm which invasive plants should be included or removed from established provincial or regional lists.	H-5
2.	2.	3. Create and maintain invasive plant species lists at provincial and regional levels.	H-6
2.	2.	6. Develop standard procedures to assist setting priorities and allocating resources among protected lands within regions, among regions, and with other agencies where appropriate.	H-7

Goal Number	Objective Number	Action Item	Ranking
2.	3.	1. Prioritize invasive plant species and priority sites on a regional and protected lands basis considering species risk assessments, the BC Parks Conservation Risk Assessment Procedure, results from inventory or monitoring, provincial or regional invasive plant lists, and broader level plans.	H-8
2.	2.	5. Prepare, maintain and update provincial and regional invasive plant management plans, pest management plans, and work plans.	H-8
3.	2.	4. Dedicate staff and resources to ensure that Ministry programs can be successfully delivered in a cost-effective manner.	H-9
2.	2.	1. Conduct baseline inventories in protected lands to determine the invasive plant species present, their distribution and densities, and formulate suitable treatments.	H-10
1	1	4. Provide initial invasive plant management training for ministry staff and contractors.	H-10
1.	3.	3. Eradicate new invasive species before they establish permanent populations capable of dispersing to other locations.	H-11
2.	3.	2. Implement suitable control measures using best management practices.	H-11
2.	4.	3. Promote stable consistent funding for inventory, monitoring, and evaluation efforts.	H-12
3.	2.	3. Support and assist in acquiring additional funding and technical resources when necessary to accomplish the strategic plan.	H-13
3.	3.	2. Support the research and testing required for approval of new biocontrol agents into Canada and British Columbia.	H-14

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Appendix 1. Glossary.

Alien plant. Plant species that have established in an environment outside their natural distribution. Terms such as *non-native*, *exotic*, *adventive*, *introduced*, and *naturalized* are common biological synonyms for these species and contrast with terms such as *native*, *indigenous* and *endemic*.

Biodiversity (Biological diversity). The diversity of plants, animals, and other living organisms in all their forms and levels of organization, including genes, species, ecosystems, and the evolutionary and functional processes that link them.

Biogeoclimatic zone. A geographic area having similar patterns of energy flow, vegetation, and soil as a result of a broad, regional climate.

Biological control. The use of living organisms, such as predators, parasitoids, and pathogens, to control invasive plants.

Chemical control. The application of synthetic or naturally derived herbicides to control or eradicate plant species.

Climate. The average weather conditions of a place over many years.

Crown land. Land that is owned by the government of Canada or British Columbia.

Cultural control. An invasive plant management practice that manipulates plant populations by cultivation, pulling, cutting, or other techniques that are applied by hand.

Ecosystem. Organisms together with their physical environment, forming an interacting system, inhabiting an identifiable space.

Endangered species: Any indigenous species, or sub-species, threatened with imminent extinction throughout all, or most of its range.

Environment. The sum of all external conditions that affect an organism or community and influence its development or existence.

Eradication. Elimination of every individual plant of an invasive plant population, including all viable seeds, and vegetative propagules.

Habitat. The natural abode of a plant or animal, including all biotic, climatic, and edaphic factors affecting life.

Herbicide. A chemical that is designed to kill or regulate the growth of specific plant species or groups of species.

Integrated invasive plant management. An approach to invasive plant management that uses more than one control option including cultural, mechanical, chemical, and biological controls in an integrated program. This approach has formerly been called Integrated Pest Management and Integrated Weed Management.

Invasion. The arrival of an organism in an area where it was not formerly represented.

Invasive plant. A plant that is non-native to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.

Landscape. The fundamental characteristics of a specific geographic area, including its biological composition and physical environment.

Mechanical control. Control of invasive plants by physical and mechanical means such as plowing, tilling, chain sawing, and weed whacking.

Native plant. Plant species that are part of the original flora of an area.

Non-native. A species that is not native to the region in which it is found.

Noxious weed. Any plant species so designated by the *Weed Control Act of British Columbia*.

Prevention. All activities that interrupt the dispersal of new invasive plant species into a geographic area or specific location where they were not previously found.

Propagule. A plant part, such as a bud, tuber, root, or shoot, that can be detached and is able to grow in a new environment.

Risk. In risk assessment, the probability that an adverse effect (injury, disease, or death) will occur under exposure to a specific agent.

Species at risk: an extirpated, endangered, threatened species, or a species of special concern.

Succession. The progressive replacement of plant communities on a site that leads to the climax or potential natural plant community.

Weed. 1) A plant growing where it is not wanted, 2) A plant that interferes with management objectives for a given area of land at a given point in time.

Appendix 2. Legislation, Authorities, Policies, and Guidelines.

Over 100 acts, regulations, policies, and guidelines have authority over pesticide use for control of invasive plants in Canada. Some legislation relevant to British Columbia includes:

Federal Legislation

Canada Seed Act. Provides guidelines regulating invasive plant seeds in crop seed and the transportation of crop seed in Canada.

Fisheries Act. Describes criteria for protecting fisheries and fish habitat from pesticides.

Food and Drugs Act. Outlines restrictions on pesticide use on livestock forage.

Migratory Birds Convention Act. Summarizes the requirements for pesticide use to protect migratory birds.

Pesticide Control Products Act. Reviews the criteria for registration of pesticides, the safe conditions for their use.

Plant Protection Act. Describes the requirements for the introduction of biological control agents into Canada.

Species at Risk Act. Protects species at risk and their habitat in Canada.

Transportation of Dangerous Goods Act. Provides guidelines for the transportation and storage of pesticides and other dangerous goods.

Waste Management Act. Describes procedures for disposing pesticide wastes.

Provincial Legislation

BC Transportation of Dangerous Goods Act. Describes requirements for the transportation and of pesticides.

Ecological Reserve Act. Provides guidelines for protecting natural vegetation in Ecological Reserves.

Environmental Appeal Board Procedure Regulation. Provides an appeal process for pesticide use permits and pest management plans.

Environmental Management Act. Outlines the appeal process for pesticide use.

Forest Act. Authorizes the Ministry of Forests and Range to control pests on Crown land.

Forest and Range Practices Act. Describes responsibility for invasive plant control for a person conducting a forest and range practice use, and lists target species under the Invasive Plant Regulations.

Park Act. Describes the management of native plants and their habitat, and, the protection of natural features.

Integrated Pest Management Act. Regulates the use of pesticides (including herbicides) for invasive plant control and explains that a Pesticide Use Permit or a Pest Management Plan is required before they can be applied.

Plant Protection Act. Regulates the spread of insects, invasive plants, or diseases that adversely affect plants in British Columbia.

Range Act. Provides grazing guidelines on Crown land including tenures in parks or protected areas listed in Schedules D and E of the Park Act.

Waste Management Act. Outlines waste management procedures for the handling, storage, and disposal of pesticides and herbicides.

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

Wildlife Act. Establishes criteria for the protection of wildlife and wildlife habitat.

Provincial Policy

BC Parks Conservation Program Policies. Vegetation Management - Management of Exotic Plant Species Policy outlines circumstances under which the Ministry of Environment will control invasive plant species in protected areas.

MOF Silviculture Policy – Forest Seedlings of Recently Disturbed Land. Describes opportunities for forage seeding when seeding is appropriate to limit invasive plant invasion.

MOF Forest Health Policy – Forest Health Concerns. Outlines forest management practices that will be used to prevent damage to forest and range resources from causal agents, such as invasive plants.

Other Processes, Guidebooks, Higher Level Plans, and Legislation

Land and Resource Management Plans

Municipal Bylaws.

Range Management Guidebook

Regional Pesticide Review Committee

Soil Rehabilitation Guidebook

Worker's Compensation Act.